Risking carrageenan: a critical geography of prudentialism in preventive health

by

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Declaration

This thesis contains no material which has been accepted for a degree or diploma by the University or any other institution, except by way of background information and duly acknowledged in the thesis, and to the best of my knowledge and belief no material previously published or written by another person except where due acknowledgement is made in the text of this thesis.

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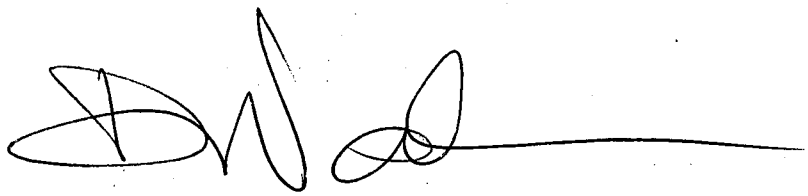

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This thesis incorporates the outcome of data analysis undertaken in collaboration with Dr Elaine Stratford as part of a research project under her supervision. The collaboration relates to research on media representations of microbicides and pertains to sections of chapter six of the thesis. The findings of that research have been reviewed as a paper for the journal Gender, Place and Culture and are in revision for resubmission.

Elaine Stratford

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somewhat marginal status of seaweed in the west that generates a special passion about the subject, and there were certain people I encountered along the way who were not only knowledgeable and well informed about the industry, but who managed to impart an enthusiasm that is contagious. Particular thanks must go to Dave Myslabodski fielding my endless emails for clarification, for adventures on PEI and my chance to ride in a car with seaweed number plates. Dimitri Stancioff, who not only spent days and hours relating his vast knowledge of the industry to me, but who also welcomed me into his home in Maine and showed his passion for life in general. John Galluzzo of the Maritime and Irish Mossing Museum in Scituate, Massachusetts deserves thanks for my out of season tour of the museum, for making the trip to PEI and for eating seaweed pie. Seaweed pie is the signature dish of the Miminegash Irish Moss Interpretive Centre and Seaweed Pie Café, run by the Women in Support of Fishing in West Prince County of Prince Edward Island. Thanks to Irene Novaczek for all her support, introductions and for taking me to meet the remarkable women in Miminegash. I was so warmly welcomed by people in that community I found it extremely hard to leave. Particular thanks to Ronnie Costain, Lou Anne Gallant and the team, Earl and Karen Gavin, Donnie Jones, Audie, Danny and Launa Murphy, Lee Sheshon and particularly Mabel, Willy and Wayne Thibodeau. Also in PEI thanks to Harry Baglole and Mary Boyd. My accommodation at the 'Marine Plants Experimental Station' on PEI and access to various sources of information would not have been possible without the support of Glyn Sharp at the Bedford Institute of Oceanography in Nova Scotia, many thanks.

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I dedicate this thesis to the memory of my grandmother Frances Lewers (1907-2005). She rarely worried about what she consumed and lived to the grand age of 97.

Abstract

Since 1945, a seaweed derivative known as carrageenan has grown in importance in relation to how industrial food and pharmaceutical industries respond to demands for preventive technologies in public health. In advanced liberal nations, carrageenan is particularly interesting as an actor-network through which are exhibited anxieties about processed food and health, controversies over carcinogeneity, and the hopes embodied in technologies to prevent obesity and HIV/AIDS. These matters are of central concern in the research reported here, whose main aims are to build on insights from critical studies of public health and to contribute to scholarly formulations of a new critical geography of public health. Attention is drawn to evidence that preventive health is deployed such that individuals and communities are expected to avoid conditions of ill-health by acting as prudent and moral citizens. Prevention and prudentialism seem to expose individuals and communities to novel health technologies, knowledge and tactics of governmentality that, in turn, appear to shape social life and subjectivities across various scales and locations. Risk minimisation and risk aversion have become paramount in the spatial and temporal threads that comprise the fabric of social life and identity formation and performance. In this light, a third and related aim is to examine how and to what effect various notions of risk are deployed in the constitution of preventive technologies for public health. Particular attention is paid to a qualitative exploration of risk mitigation via carrageenan's use in fat-free and low-fat foods, preventive treatments for HIV/AIDS, and responses to cancer. A substantive part of this thesis concerns an analysis of risk minimisation and risk aversion in the practice of public health, and that are implicit in carrageenan-based technologies. Such technologies include microbicides and some fast food products, whilst practices associated with them cover the use of food labels and media coverage of all these concerns. Indebted to insights from governmentality and actor-network theory, I speculate that prevention

in public health discourses target individuals from a distance with the aim of encouraging them to modify their behaviours by acting on their own conduct. I also explore the spatial and temporal implications of this governing at a distance, asking if preventing risk is spatial insofar as it affects subjects of risk, and temporal in that the prevention of risk affects the present. The findings reveal deeper moral and political orderings to risk that are less emancipatory than they may appear, and that have demonstrable effects on the carrageenan industry.

Illustration: Seaweed farms at low-tide, Nusa Lembongan, Bali, Indonesia 1999
Source: Photo by author

Preface

I never intended to write a thesis about carrageenan and issues of public health. After completing an honours thesis at the Australian National University focusing on seaweed farming in Indonesia, I had thought I would spend my PhD resolving questions about the emergence of what had seemed to me, a rather perplexing and significant new form of aquaculture. I understood that seaweed farming was related to changes in food and other markets (particularly processed foods) and patterns of trade and consumption, and whose effects were having a surprisingly positive reception amongst communities in Indonesia, the Philippines and elsewhere. As I wrote in my honours thesis about farming on the Island of Nusa Lembongan in Indonesia 'almost every person interviewed commented on the *kelaparan* (hunger or famine) that was a permanent feature of living on the island before the 1980s prior to the introduction of seaweed farming' (Burges Watson 1999: 28).

I was perplexed because of the lack of critique of such an innovative new development in aquaculture; it almost seemed too perfect. I wrote that there was little published on the environmental effects, but that seaweed farming was providing an important source of income for formerly impoverished communities, and because of this it seemed to have few detractors. On one occasion in 2000 I gave a slide presentation about my findings at the annual meeting of the Marine and Coastal Community Network in Canberra. I was surprised that the members of MCCN, whom I considered to have a strong environmental focus, seemed particularly enthusiastic in their support for this important new form of income for coastal communities. I showed them a slide (the illustration preceding this preface) of the extensive farming operations in Nusa Lembongan, Bali, where seaweed covered almost all the inshore coastal zone in some areas. I had expected many questions about the environmental consequences, but there were few. Moreover there seemed

little interest in what was generating this rapid increase in demand for seaweed. Did they consider seaweed benign, or did its location make it less of an environmental issue than if it had been in a so-called developed country?

Later, investigating the decline of seaweed harvesting in Prince Edward Island, Canada, where the carrageenan industry had been the mainstay of a number of previously impoverished communities in the west, I came across something that I was not expecting. Of the 32 people I interviewed, many similar in age to me, all had stories to tell me about cancer deaths in their families. I was 37 years old and I only knew one family friend who had died of cancer; it came as a shock to hear of cancer so often in a remote coastal community. It had nothing directly to do with the decline of seaweed farming in their community; indeed many informal suggestions were that the problem was related to fertilisers used on Prince Edward Island's famous potatoes (others suggested cigarettes were a factor). Members of the community harboured anger about the geographical reorganisation of the industry, one entailing a dramatic reduction of seaweed harvesting in the west and a sharp increase in farming in the east, but the high prevalence of cancer seemed to be accepted with a resigned fate. Amongst concerns about environment, health and their geographies, I began to wonder what risk meant and if it meant different things in different places. Then September 11th, 2001 happened and risk and anxiety extended into another dimension altogether.

In making his case on September 12th 2002 for the invasion of Iraq, President George W. Bush referred to what he called the grave and gathering danger to international security posed by Iraq's biological and chemical weapons. Reiterating the threat at the United Nations Security Council on February 5th, 2004, US Secretary of State, Colin Powell, stated that the invasion was justified by 'facts and conclusions based on solid intelligence' (Kessler 2004: A01). Despite the solidity of evidence, over a year later weapon stockpiles

had not been found in Iraq. In an about-face, Colin Powell admitted to a *Washington Post* reporter that he may not have recommended the invasion had he known that there were no stockpiles of banned weapons. Powell remarked that the 'absence of a stockpile changes the political calculus; it changes the answer you get' (Kessler 2004: A01).

The political calculus changed the answer. In Powell's confession what is revealed is that risk was not wholly visible in the first place. Rather, risk was rendered visible through calculations of probabilities, not materiality of weapons. Only after the weapons failed to appear was the mis-calculation revealed. In the estimation, management and action that followed the initial calculus, Iraqi citizens faced the deployment of solid, material tanks, guns and other weapons of US risk mitigation. In a reversal of brutalising effects, the destruction executed by the western military forces preceded a risk of weapons of mass destruction. Preventing a risk did not simply guard against possible future risks, but had manifold *consequences in the present.*

Members in a Canadian community of seaweed farmers did not appear to take action against the risk of cancer, the MCCN did not seem overly concerned about potential environmental issues in Nusa Lembongan, and yet the US was prepared to invade a sovereign territory on the basis of a calculation of risk. I thought risk would be an interesting topic for investigation in relation to its temporal and spatial qualities.

Preventive activities are increasingly common among individuals, organisations and institutions in relation to public health. Probiotic foods, mediated messages encouraging reduced intake of alcoholic beverages, barrier methods to diminish the risk of sexually transmitted diseases, testing genetic predispositions to particular health conditions; each exemplifies practices of preventive health. I thought, when I discovered that carrageenan had uses in technologies for preventive health, it might be possible to join

some of the dots. After my reading exposure to theories of risk, geography and actor-network theory, this thesis is an attempt at just that.

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List of acronyms

ANT	Actor-Network Theory
API	Active pharmaceutical ingredient, US
CAM	Complementary and Alternative Medicine
CSPI	Centre for Science in the Public Interest, US
FDA	Food and Drug Administration, US
FMC	The FMC Corporation
FSANZ	Food Standards Australia New Zealand
GRAS	Generally Recognised as Safe, US
IHT	Innovative health technologies
IOM	Institute of Medicine, US
JEFCA	Joint FAO/WHO Expert Committee on Food Additives
NHSA	National Heart Savers Association, US
NLEA	Nutrition Labeling and Education Act, US
NMR	Nuclear magnetic resonance
OTC	Over the counter pharmaceutical products
PEPFAR	President's Emergency Plan for AIDS Relief, US
RST	Risk Society Thesis
SCF	Scientific Committee on Food, European Commission
STS	Science and Technology Studies
USAN	United States Adopted Names Council
USDA	United States Department of Agriculture

This thesis uses the author-date system of referencing outlined in the 6th edition of the Australian Government Printing Service style manual for authors, editors and printers and adapted for use with endnote bibliographic software by the University of Queensland (2002).

Chapter 1

Risk in the new public health

It is difficult to overemphasise the extent to which western society is concerned with the aversion of risk and how this informs thinking and praxis in public health. Ewald (1993: 221) suggests that risk has 'acquired a kind of ontological status'; it does not just indicate something that might happen, but is a factor in how people understand and respond to questions of health. Faced with questions about how to avoid illnesses before they happen, material technologies, bodies and actions are mobilised by people, institutions and organisations to modify the present and fight against the past. Actions against risk in this mode of thinking help define *the new public health* (Petersen & Lupton 1996).

Carrageenan is a derivative of seaweed and a technology of risk management. Known also as a hydrocolloid, it is one in a family of substances with hydro (water) and colloidal (gelling) properties that include agar, alginates and a variety of non-seaweed substances. A chemical definition of hydrocolloid is a 'non-crystalline substance with very large molecules which dissolves in water to give a thickened (viscous) solution' (McHugh 2003: 2). Hydrocolloids have many uses in food, chemical, pharmaceutical and other industries that may be used singly or in conjunction with other hydrocolloids and, to some extent, are interchangeable. Carrageenan has uses, *inter alia*, within food and pharmaceutical industries as a common additive for its stabilising, thickening and emulsifying properties. At different times it has been investigated for active properties in pharmaceutical products.

In this thesis I examine carrageenan's growing importance in the responses of industrial food and pharmaceutical industries to the demand for preventive technologies in public health. Drawing upon the literature on governmentality inspired by Foucault, I treat the new public health as a particular mentality and/or regime of government and administration (Dean, M 1999b: 2). Using carrageenan as both an intrinsic and instrumental case study (Stake 1994), I explore the workings of prevention in public health, and specifically the constitution of carrageenan within changing and polyvalent rationalities of risk. My purposes are to consider the modes of calculation of risk; the technologies and practices through which the governance of risk and carrageenan has its effects; and the implications for individuals in the changing nature of governance and its articulation, and visibility, within public health. Further, I consider how individuals are refashioned as prudent consumers of health through the *powers of freedom* (Rose 1999). The research is intrinsic insofar as it offers insights into the particular case study of carrageenan, and instrumental in its concerns with critical geographies of public health (Brown, T & Duncan 2002) to 'provide insight into an issue or refinement of theory' (Stake 1994: 139).

By bringing risk to account in the present I question the effects of preventive actions against risk, first in relation to carrageenan and its development, and second, by extension, to obligations and responsibilities that emerge for prudent consumers of health. I also question how particular ways of thinking about public health and risk affect the carrageenan industry and map the implications of these effects for prudent and moral subjects. Across the thesis prudentialism is the primary focus; explored through the case study of carrageenan with respect to three public health examples - carcinogenicity, HIV/AIDS and obesity; and three major themes - visibility, spatiality and futurity - themes I relate to these empirical public health concerns. Furthermore, I examine the effects of risk on and through carrageenan and in relation to individual and collective subjectivities. My proposition is that there are deeper moral and political orderings to risk functioning within the

new public health whose effects are less emancipatory than may appear; and whose effects on the carrageenan industry are demonstrable.

My work is positioned in a scholarly community whose members are considering the manifold effects of the increased role of preventive health and its relation to individual subjectivity in contemporary societies (Lupton 1999a, 1999c; Petersen & Bunton 2002; Petersen & Lupton 1996; Webster 2002). It is also engaged in a larger task of addressing the underlying geopolitics of prevention as an effect of particular political rationalities and techniques of government (Dean, M 1999b; O'Malley 1992, 1996; Rose 1996, 1999). Nonetheless, this work is both original and significant in questioning the rationality of preventive health *by placing at the centre of analysis* a material technology that registers with the public almost entirely through informational mediation, and through which the logic of public health strategies may be traced. It is deliberately far-reaching in scope but focused at a micro-scale on the empirical example of a substance that is most often used in minute amounts, but whose spatial reach is great.

The new public health and prudentialism

The term *new public health* draws attention to how regimes of power and knowledge associated with regulating public health have, since the mid 1970s, reoriented away from earlier models typified by closer attention to infectious disease and biomedical interventions against individual pathologies (Petersen & Lupton 1996). The new public health describes a way of thinking about health in which priorities are established in terms of the health of *the public*, raising the centrality of population in the measurement and actions regarding health, and in terms of *environmental* conditions and *risks* individuals are exposed to. In practical terms, the new public health manifests in concerns of particular kinds: measurement of the likelihood of illness at the scale of population; a focus on environmental conditions likely to produce illness; and in aspirations to enable individuals to manage their

own health. Taken together, these concerns provide a context in which issues of prevention and health promotion have taken centre stage in seeking to address health risks to the public and new responsibilities for individuals in managing such risks. The ascendancy of prevention and health promotion in contemporary societies thus creates a governmental environment in which individuals are (supposedly) *active* participants in the management of risk (Dean, M 1999a; Nettleton, Bunton & Burrows 1995; Petersen & Bunton 2002; Pryce 2001). The public face of government through risk is found in state and privately funded health promotion and provision; in and through which prudent subjects are proximate to the codes and norms for their conduct in relation to health.

Throughout this thesis I draw upon contributions to the study of governmentality and risk to describe *how* public health happens, and carrageenan's entanglements within it. The language and actions of risk and prevention are increasingly recognised as features of contemporary life *in general*, and together form a topic of significant and growing academic research and endeavour.[1] Risk literatures and studies encompass various perspectives and, because of the ubiquitous nature of risk in social life, cross a number of academic fields including geography, sociology, criminology, politics and anthropology (for a discussion of these and other approaches to risk see for example Lupton 1999a). Questions of prevention extend beyond issue of health to encompass all manner of concerns, including for example, insurance (Dean, M 1999b; Ewald 1991) and criminal law (Levi 2000; O'Malley 1992).

Approaches to risk that fall within the theoretical ambit of governmentality extend the work of Michel Foucault in emphasising an increasing individualisation of risk as a modality or rationality underlying governance in many western societies (Brown, T & Duncan 2002; Castel 1991; Dean, M

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[1] Risk literature is extensive, but see for example: (Beck & Ritter 1992; Boyne 2003; Dean, M 1999b, 1999a; Ewald 1991, 1993; Lupton 1999a, 1999c; O'Malley 1996; Petersen 1996; Petersen & Bunton 1997, 2002; Petersen & Lupton 1996; Rose 2001).

1999b; O'Malley 1992, 1996; Petersen 1996; Petersen & Bunton 1997, 2002; Petersen & Lupton 1996; Rose 2001). Foucault first coined the term biopolitics to refer to the practices of governance that address the vital processes of human life (Foucault 1979; Rose 2001). Politics was no longer read as a system in which subjects were governed from above, but rather as one in which subjects were governed through systems for the management of life in more general terms. Foucault's understanding of the power over life he termed *biopower*. That involves the twin arms of an anatamo-politics of the human body and biopolitics of population (Foucault 1979). He suggests that by the nineteenth century power entailed intermixing anatamo-politics - as the means to integrate bodies into regulated systems and make them efficient, and biopolitics - as the means through which a population's mortality, morbidity and birth could be measured and regulated. Through these dual technologies the more or less rational exercise of power over life, and health, was enabled.

Castel (1991) has described the mentality that has made new preventive forms of intervention in public health possible as a transition from a sense of dangerousness to one of risk. He uses the example of US interventions in mental health, to describe the shift in the last hundred years of so, between an emphasis on preventive strategies that control the dangerous patient, to preventive strategies directed to individuals at risk. Assessing risks related to the health of populations, facilitates the extension of calculations of risks beyond individual manifestations of illness, to national and global environmental concerns and to calculations of risk in already healthy spaces (Brown, T & Duncan 2002; Petersen & Lupton 1996). Armstrong (1995) suggests that from the early part of the twentieth century, the incorporation of spaces of health gave rise to a new form of *surveillance medicine*. Surveillance medicine, after Foucault, is typified by the strategy of health promotion over concerns such as diet, exercise and sex as 'vehicles for encouraging the community to survey itself' (Armstrong 1995: 400). From these perspectives, health risk occupies more expansive territories of concern

in human activity than was previously the case. Moreover, one difference between dangerousness and risk is that with risk 'one does not *start from* a conflictual situation observable in experience, rather one *deduces* it from a general definition of the dangers one wishes to prevent' (Castel 1991: 288).

One effect of this turn in rationality is that there are then no limits on what can be considered a risk because it no longer depends on observable signs and symptoms but on calculations of probabilities. Another effect of these new forms of preventive intervention, is that subjects are no longer the focus of calculations for direct interventions; rather calculation is based on a combination of *factors of risk* that are likely to produce undesirable outcomes in individuals (Castel 1991; Lupton 1999a ; Petersen 1996). Moreover, from the 1970s onwards, biomedically-based disease models involving a medical cause and outcome, were no longer the only factors considered in risk calculation. Increasingly, disease is measured using *multi-causal* approaches which incorporate not only the biomedical concerns, but social and psychological factors of risk associated with different disease conditions (Brown, T 2000; Brown, T & Duncan 2002). Thus new public health is typified by an increased emphasis on health promotion as a technology through which such multi-causal and risks can be addressed, in part via the production of *prudent* individuals. O'Malley (1996) terms as *new prudentialism* the self-regulatory effect of governance through the individual. Prudent individuals regulate all aspects of their personal and collective responsibilities within family or community, through such things as a concern for personal health, and managing diet and nutrition. Risk may then be understood as one modality through which individuals are enabled to manage issues of prevention in health, and through which, Castel (1991) argues, the desire for health has become central to the formation of individual subjectivities in contemporary society.

To contextualise how such a transition became possible, in the first volume of the *History of Sexuality,* Foucault (1979) argues that government has become

more concerned with the *conduct of conduct* than with social organisation, one result of which is that the individual supposedly becomes increasingly self-regulating and self-governing. In this view, government is achieved through strategies and tactics that direct rather than control individuals and populations, or through the *powers of freedom* (Rose 1999). From this perspective a critique of governing practices involves an exploration of the mentalities that make the issues of government thinkable. Through critique, it becomes possible to view the workings of social order as effects of particular strategies of governance rather than assuming that risk, choice or freedom occur outside of these strategies (Dean, M 1999b; Rose 2001).

Central to this new interpretation of the forms of governing the health and welfare of populations were scientific and expert systems of knowledge upon which various techniques, technologies and systems of care and administration were based. Proponents of the governmentality perspective suggest that risk is central to the ordering of disease and, by association, people. Risk is *rendered calculable* through diverse expert knowledges and lay understandings (Gilman 1988; O'Malley 1992, 1996, 2001; Petersen & Bunton 2002; Petersen & Lupton 1996). The domination of scientific-institutional expertise in both constituting and interpreting risk is broadly accepted, even if risks are contested by other knowledges. For example in the area of public health, epidemiology is recognised as one complex assemblage of practices - such as laboratory experiments, statistical surveys, clinical studies and risk profiling - that has played a particularly significant role in the calculation and dissemination of health risk (Brown, T 2000; Dean, M 1999a; Nettleton, Bunton & Burrows 1995; Petersen 1996). The epidemiological framing of risk at the scale of population has particular effects, not least of which is that other scales may be under-explored.

Yet as Dean (1999a) points out, while the twin focus of governmental strategy is population health and active participation by subjects, there are also situations in which subjects or groups are specifically *targeted* for health

intervention. Hence, the classification of those at risk may also be much more broadly encompassing than were earlier rationalities of dangerousness. Take, for example, Foucault's tracery of a village idiot who is construed as criminally dangerous and in need of incarceration (Foucault 1979). Indeed,

> one of the consequences of the language of risk is that the entire population can be the locus of a vulnerability that can also single out specific populations, in a way that the language of danger, class or disadvantage cannot (Dean, M 1999a: 147).

Among other effects, the new public health expands the production and articulation of risk and at risk subjects, extends the spaces in which they may be identified, and intensifies the role of prudent subjects. Discourses that promote individual choice, as a manifestation of prudentialism, are then within the tactics of governmentality and are not outside relations of power/knowledge.

Campaigns and technologies employed to direct individuals towards preventive self-care might include for example, the distribution of condoms for sexual health, or the dissemination of information on safe sex. Through material *intermediaries*, the new public health discourses have entered previously non-medicalised spaces such that the understanding of a division separating illness from health no longer exists; in epidemiological terms the whole population comes into 'its network of visibility' (Armstrong 1995: 395). Everyone is at risk and what is then *normal* practice for individuals in relation to health is also transformed. Put another way, normality is problematised even within so-called healthy populations (Brown, T & Duncan 2002: 364). Through provision, promotion and prudentialism subjects are no longer recipients, but become *consumers* of a multiplying and expanding range of concerns about health (Brown, T & Duncan 2000; Henderson & Petersen 2002; Nettleton, Bunton & Burrows 1995). In this view, consumerism is deployed as the model upon which health systems are based and, as such, accord with a more general tendency towards consumerism as the key mode through which individuals engage with the

world. Prudent individuals are active consumers rather than passive recipients of health.

In the case of carrageenan for example, food labels provide one source of information through which individuals are enabled to make (healthy) consumer choices, thus producing through individual actions a collectively healthy population. Such biopolitical and regulatory intervention in the public sphere is nothing particularly new. In Australia, Stratford (1998a; 1998b) traces similar governmental technologies to new domestic sciences from the 1860s onward. Presently, however, the multiplication and extension of sites of biopolitical interventions in health is accelerating. Like war in Iraq, the possibility of future health events may be based on the calculus of probabilities, such that there become a 'potentially infinite' number of possibilities for intervention (Castel 1991: 289). So how do individuals choose to avoid risk?

Circumscribing freedom

In academic discussions of risk, the idea that individuals *have* choice is contentious. Different theoretical perspectives emphasise or de-emphasise the reflexive ability of subjects to make choices and of the contextual importance of factors that influence choice. For proponents of Ulrich Beck's Risk Society Thesis (RST) for example, subjects are considered more reflexive than for those who adhere more closely to Foucauldian readings of risk. According to Beck, in RST the self becomes reflexive about risk, not because of particular practices associated with governance such as the promotion of health, but through the loss of traditions and advancements in technological culture:

> Risk society begins where tradition ends, when, in all spheres of life, we can no longer take traditional certainties for granted. The less we can rely on traditional securities, the more risks we have to negotiate. The more risks, the more decisions and choices we have to make (Beck 1998: 10).

In this view, the individual encounters more and more occasions in which there are no easy answers, reflexivity becomes a necessity and, moreover, is more or less a rational activity in response to risks that are *real*.

Foucault's (1977) approach is different, and considers the construction of the body as more *docile* than *reflexive* in the face of disciplinary power (although his views about docility are tempered in later works such as the *History of Sexuality Vol 1*.). Individual choice is a delimited and, indeed, delimiting range of governmentally inspired options, and subject to forms of surveillance to monitor deviance from normalised practices. Science and expert knowledge are considered key forms of understanding through which risk messages are mediated and constructed. Once outside the circumscribed range of responses, individuals are likely subjects of governmental intervention.

In more recent scholarship that extends Foucault's work, the particular governing practices associated with a mentality of rule sometimes described as neo-liberal underscore a new understanding of the subject (Dean, M 1999b). Neo-liberalism refers to a specific style of governing populations, distinguishable from other forms of political rationality, by its winding back social governance and welfare, promoting free market economics, and working through so-called individual rights and freedoms. Under systems that are neo-liberal in character, citizens are neither completely docile, nor completely reflexive; rather they exercise a form of *regulated freedom* (Dean, M 1999b; Lupton 1999a; Petersen 1996). Under neo-liberal forms of rule, the relationship between the subject and society is reworked from government *of* to government *through*. This adjustment can be seen in Australia, the UK and the US for example, through differential techniques to wind back social institutions of health care in favour of market privatisation of services. In neo-liberal polities such as these,

> society is regarded less as a source of needs that are individually distributed and collectively borne and more as a source of energies

> contained within individuals' exercise of freedom and responsibility (Dean, M 1999b: 152).

Neo-liberalism then, implies that there are limits to the notion of freedom; it is not boundless, but is rather circumscribed within a 'sphere of freedom' (Petersen 1996). Within a sphere of freedom individuals may to some extent, be 'authors of their subjectivity' (Nettleton, Bunton & Burrows 1995). The (continual) transformations of individual subjectivities in relation to health are then '*neither* clearly liberatory *nor* clearly repressive' (Cruikshank 1994: 30).

The calculation of risk and at risk subjects in the new public health has a transformative effect on individual subjectivities and the socio-spatial landscapes of disease and health. However while the focus on individualised practices of self-care in relation to health risk underscores the new centrality of health in contemporary society, as others have cautioned, risk and health are not the only factors upon which individual decisions are made (Brown, T & Duncan 2000). Although spaces of public health are *conceived* by the complex interweavings of political rationalities, tactics of governance and material technologies, health (or its provision) is experienced and situated in place; it is *lived.*

Determining how public health and prevention work necessitates consideration of the limits and bounds of the *sphere of freedom* and the effect of individuals' subject positions in influencing their understanding of risk, as well as other factors that may be un-related to risk but that facilitate decision-making. First, there are diverse sources of information from which understandings of risk may be derived and by which individuals may manage risks differently (Lupton & Tulloch 2002; Robertson 2000). In other words, the understanding of risk is contextual and based on cultural and interpretive characteristics that have been overlooked in much of the risk literature (Wynne 1996: 45; 2002). Arguably, therefore, proponents of the RST perspective may too readily have assumed that individual understanding of

risk is derived from expert knowledge, and may have failed to fully appreciate the contingency of scientific knowledge and its communication. Second, the self is a more complex project than the RST permits, involving the embodiment of rationalities that include an aesthetic-expressive dimension (Brown, T & Duncan 2002; Petersen 1996; Rose 2001) and gender and sexuality (Lupton 1999b; McNay 1999). Third, decisions that have a bearing on health are not necessarily made simply on the basis of risk calculations. In Brown and Duncan's (2000) account of the rise of cigar bars in London, for example, the health risks associated with smoking may be less of an influence on choice than the 'exotic' places and erotic fantasies cigars evoke. Cultural and hermeneutic dimensions and regulated freedom not only complicate the idea of risk knowledge as 'ambiguous knowledge' (Wynne 2002: 460) but also contest assumptions that decision-making is only ever premised on issues of health and/or risk. The ambiguity of risk knowledge, and importance of other factors of decision-making have implications for my interest in carrageenan because it is represented in popular media sources as safe or risky based on various associations that may include seaweed, Irish moss, Ireland, food additives, cancer and chemistry, and because such representations may feed other more 'desirable rhetorics' (Brown, T & Duncan 2000: 365) such as 'naturally' sourced products - discussions of which occur throughout the thesis.

Consideration of the effect of risk then concerns *how* preventive health is enacted through regulated freedom. Thus far I have emphasised the notion of a prudent *individual* as active in self-government, but individual responsibility is linked to responsibility for others. Individuals are 'located in a variety of heterogeneous and overlapping networks of personal concern and investment – for oneself, one's family, one's neighbourhood, one's community, one's workplace' (Rose 1996: 331). On one hand, the moral discourse of individual responsibility is deployed through community. On the other, an ethics of prudent behaviour is enacted through community. In this view, a feature of risk as a modality of contemporary neo-liberal styles of

rule is that both self-surveillance and collective surveillance of health are socially constructed styles of conduct (Petersen 1996).

The significance of risk can only be considered in relation to what it is attached to; it does not *exist* without some factors be they calculations, statistics, epidemiology, management techniques. Rather than one mode of rationality, risk is polyvalent (Dean, M 1999a; O'Malley 2000). The systems of monitoring and calculating risk are varied, and each has its own assemblage of practices. One task of this thesis is to expose assemblages of risk calculations in the technologies that are deployed, the rationalities that underlie their deployment and their effects. In the measurement of carrageenan as a factor in cancer, developed in chapter four for example, I consider the *different* calculations of risk that are encountered between regulatory authorities and the views of an MD with an interest in preventive oncology.

Finally, the effects of risk do not always match the results that might be expected by the aims of prevention. Dean (1999b: 132) has commented that while risk is a modality 'shaping human conduct in the service of specific ends' and with definite aims, the effects of this mode of rationality are not always predictable. Furthermore, failure to live up to the expectations of prudentialism may have other costs: failing the self (Brown, T & Duncan 2002).

Spaces of the new public health

Whether or not individuals enact their responsibilities under the terms of the new public health, such enabling practices of self-care demonstrates a reworking of the extracorporeal spaces of health and a focus on a geography that is closest in. Rose (2001: 1) has argued that 'contemporary biopolitics is risk politics'. In his view however, risk applies less to notions of population risk, more to economic risks of health and ill-heath. The market is viewed

within (most) accounts of neo-liberalism as a space external to the governmentality of the new public health discourse[2]. While Rose's focus is on an enabling state that reworks space in order that people may govern themselves, Armstrong (1995) describes a move away from the body as the site of intervention and increased focus on extracorporeal spaces. The effects of spaces of health and illness are productive of social relations and not only:

> is the relationship between symptom, sign and illness redrawn but the very nature of illness is reconstrued. And illness begins to leave the three-dimensional confine of the volume of the human body to inhabit a novel extracorporeal space (Armstrong 1995: 395).

Once reconstituted as extracorporeal, spaces themselves become subject to risk assignations in relation to health. Lifestyles and place can then become factors of 'un-health' and subject to strategies of mitigation. For example, individuals may be encouraged to walk further each day, wear a pedometer or change dietary practices. Built environments, too, are objects of the health gaze, with their different elements contributing to obesity via excessive access to food and limited pursuit of physical activity, and with environmental health research and interventions seeking to address this complex problem (Richardson 2004). In this view, illness is no longer mapped in terms of symptom, sign and disease but through issues such as lifestyle and the identification of certain places and spaces as indicators of the likelihood of illness. The inclusion of social and physical space into the health gaze also incorporates aesthetics such as food choices, fashion and desire (Brown, T & Duncan 2002).

Both perspectives have utility in identifying spatial formations common to the new public health that are located in sites of consumption. The commodification of health care provision and the role of market forces in modifying the relations amongst individuals, health and health care, has been identified as a significant new area of study and interest. As the title of

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[2] A notable exception to this is Mitchell Dean's (1999a) concept of reflexive government. For the purposes of this thesis however, the relationship between governmental and economic spaces is not viewed as critical to the overall arguments about prudent subjects and spaces of public health.

Henderson and Petersen's (2002) edited collection *Consuming Health* suggests, one spatialisation of new public health is through sites of consumption in which the prudent subject is a consumer of health.

Campaigns and technologies employed to direct individuals towards preventive self-care might include for example, the distribution of condoms for sexual health, or the dissemination of information on safe sex. Through material *intermediaries*, the new public health discourses have entered previously non-medicalised spaces such that the understanding of a division separating illness from health no longer exists; in epidemiological terms the whole population comes into 'its network of visibility' (Armstrong 1995: 395). Everyone is at risk and what is then *normal* practice for individuals in relation to health is also transformed. Put another way, normality is problematised even within so-called healthy populations (Brown, T & Duncan 2002: 364).

In short, one important effect of the new public health discourse is that spatial topologies are modified and transformed. For example, divisions between health and illness erode; understandings of health (re)emphasise lifestyle factors; and, issues in the provision of public health may be addressed as global concerns. The incorporation of health into the general space of populations involves a comprehensive remapping of space. Moreover, by locating health and illness in spaces beyond the corporeal body in more generalised spaces such as community and global health provision, there are issues for the constitution of individual identity. As Petersen and Lupton (1996: 114) summarise, 'social relations and bodily practices take place within spaces and in places; they shape and are shaped by space and place'.

Thus, discourses of public health do not simply work through centralised state centered apparatus, but rather, 'government is accomplished through

multiple actors and agencies' (Dean, M 1999b: 26) and through transformations of space.

Much recent critical scholarship has addressed the discursive production of people and places in new public health; (Lupton 1999a, 1999c; Petersen & Bunton 2002; Petersen & Lupton 1996) however less attention has been given to such concerns within geography. Space and place, then, are crucial to the operation of public health and is given effect by the turn to the new public health. It is through this lens that I explore carrageenan.

Critical geographic scholarship and public health

A critical approach to the analysis of geographies of public health emerged in recent debates within post-medical geography, (Brown, T & Duncan 2002; Dyck 1999; Kearns & Moon 2002; Parr 2004) and it is with such debate that the theoretical underpinnings of this thesis resonate most strongly within the field of geography. Developing a *geography* of public health from the micro-terrains of individual bodies to the macro-terrains of global politics advances the critique of prevention and risk towards a consideration of and focus on the spaces and places in and through which governance of health is lived, perceived and conceived (Lefebvre 1991).

Brown and Duncan's (2002) vision for a new *critical geography of public health* builds on 'governmentality approaches' to risk and medical sociology and draws upon insights from post-medical geographies of health. They argue for a critical edge to health geography that scrutinises the underlying medico-morality of contemporary public health, and which acknowledges the exercise of power implicit in the focus on prevention and the active participation of subjects in managing their own well-being.

Tracing elements of a genealogy of a 'social model of health', they also describe how (contemporarily) psychological and social factors have been

incorporated into medical models of public health that extend the critical elements of health geography, but only so far. In their view, geographers have tended to use medico-social models for research rather than to adopt a more critical approach that would deliver the insights of post-structuralist scholarship. The shift from a focus on disease to one on health in the research interests of geographers, as noted by Kearns and Moon (2002) for example, may be interpreted as a transition in disciplinary interests, and a diversification and extension of geography's interest in questions of philosophy. However, in my view, the transition suggests a shift in the political understanding of health and illness, such that the turn in geography mirrors discourses of the new public health. Along similar lines, Nettleton et al. (1995) recognise that a distinction can be made between a sociology *of* and a sociology *for* health promotion and prevention. In such views, *criticality* rests with the recognition that there has been a change in the mentality that makes the thinking of health possible and not simply a shift in approach to health research. Brown and Duncan (2002) contend that in health geography few scholars adopt such a critical perspective. In addition, *criticality* is often used as a term to imply a concern for social justice and equity, and may be applied to the provision of health (Kearns & Moon 2002; Parr 2004). In this thesis, criticality, after Brown and Duncan, is represented by a willingness to *think critically* and delimit what a Foucauldian inspired critical geography might involve.

Notwithstanding Parr's (2004) hesitancy in announcing a new field within geography, and the fluidity of definitions of critical geography, Brown and Duncan (2002) suggest four themes to include in a prospective critical geography of public health. First, such an approach would be cognisant of the extensive critical new public health literature that reveals emergent common tropes in public health (Kearns 1997). A critical geography would interpret their relevance to public health practice, particularly in relation to issues of space and place. Second, the approach would question how space and place are problematised by the new public health, paying attention to the

use of place-based identities such as those implicit in the term community. Third, it would look beyond theory to interrogate situated experiences to examine how the new public health works and, I add, to ask how material technologies enable the workings of the new public health *at a distance*. Last, it would consider the notion of responsible citizenship, and examine/explore how individuals respond to or resist prudentialism in relation to health.

Critical geographies of public health incorporate elements of Foucauldian notions of technologies of self; and health as new and central arenas in which social life and multiple spaces of social life are organised. I adopt Brown and Duncan's (2002) methodological strategy for a critical geography of public health, but with one addition. I incorporate elements of a network approach that emphasise the importance of *material* actors in constituting power (and the new public health) at a distance.

Public health and ANT

Practitioners of actor-network theory (ANT) argue that it is through the description of heterogeneous networks of factors that an understanding of the workings of social order is facilitated (Callon 1999; Latour 1991; Law 1992; Murdoch 1997, 1998). In contrast to much sociological enquiry, a principal concern of ANT is that domination cannot occur solely through the workings of social interactions, but requires more stable forms in which power can be assimilated and protected from the destabilising effects of space and time. For scholars of ANT it is through networks of human and non-human actors that society takes form.

> Latour's ... portrayal of social life as necessarily dependent upon non-human resources makes space and time central to the theory of actor-networks: any consideration of the length and breadth of heterogeneous association entails shifting through space and time as we seek to determine how these two dimensions are bound into, and emerge from, the complex webs or networks which compose our socio-spatial landscape (Murdoch 1997: 332).

Murdoch's placement of space and time as central to ANT analysis underscores the importance of geography to the following analysis of carrageenan and prudentialism in the new public health. Yet as Murdoch (2001) points out, from within sociology critics of ANT suggest that there is insufficient attention to human agency in determining the course of actor-networks. The calculation of risk, described as a mentality underlying practices of governance, is a useful example in demonstrating the limits of the ANT approach arising from its abandonment of *a priori* distinctions between the social and natural. Murdoch (2001: 128) agrees that a case may be made for the problem of *human exemptionalism,* noting that humans play a particularly significant role in shaping network topologies. At the same time, ANT is a useful methodological framework through which to map the heterogeneous assemblages of human and non-human factors affecting *how* the mentalities of risk and public health are operationalised. Discourses of public health may be understood to act at a distance via material technologies and *through* and *on* space and time, a discussion of which now follows.

Space and distance in public health

Prevention in the new public health works through re-territorialisations of the socio-spatial landscapes of disease and disorder, risk and health. The significance of space and distance (temporalities and proximities) in understanding how networks of humans and non-humans are bound together is a crucial element of ANT approaches, and one critical to analyses of carrageenan and of *how* public health works.

Investigating conditions under which the new public health policies and practices are able to work beyond their theoretical formulations involves recognising how different technologies are incorporated in the functioning of public health. What is more, it is difficult (if not impossible) to imagine a place where there are no interactions between material technologies and humans in society. 'Technology is everywhere' and the relation of ends and

means is 'profoundly problematized' (Latour 2002a: 248). In one example, Strum and Latour (1987) show how the social organisation of life amongst a group of baboons must be continuously performed to last beyond the immediacy of the local interactions. This well-known case study of baboon societies has been used to demonstrate, by opposing them to human societies, the material workings of social life. Without material actors, society cannot be made durable. The significance of the material to local and immediate social interactions amongst humans is that human society seems to exist largely 'somewhere else, outside, beyond, above or below' (Murdoch 1997: 326).

Public health depends on interactions that implicate factors beyond the local and immediate space(s) of encounter, that are part of a much more complex web of interactions whose influence on individual actions in relation to health are significant. Congealments of technologies in social transactions, for example information accessible on Internet sites, enable the social to extend beyond the local and immediate such that through materials 'interactions can be stabilized, summarized and extended through space and time' (Murdoch 1997: 327). One significant argument amongst ANT scholars is that the separation that is assumed among science, nature and artefacts is artifice. Latour (1993: 31) has suggested that modernity relies on the notion of a dualism such that there must be a 'complete separation between the natural world (constructed, nevertheless, by man) and the social world (sustained, nevertheless, by things)'. In reality, Latour suggests all technologies are hybrids of social and natural, and all scientific discoveries and innovations can be examined from this perspective (see also Whatmore 2002; Whatmore & Thorne 1997). A significant implication of the ANT approach is that material actors cross and muddy the boundaries of body, state and nation. In this view, the new public health is not only a western (neo-liberal) concern, but may have transformative effects elsewhere - for bodies, states and nations, to the global scale of geopolitics.

By definition, public health is not *of itself* proximate; it is only through medicines, texts, transport systems or mediated representations that it is possible to act on the health of a remote public. In ANT, proximity and distance are understood to be effects; in public health this means configurations of discourses of the new public health and various material actors may be associated to configurations of space/time. For example, telemedicine involves the treatment of patients at a distance where the use of Internet technologies enables the expertise of doctors to be brought into close proximity with patients (Mort, May & Williams 2003; Webster 2002). As Webster (2002: 446) observes, such technologies may be seen to 're-invent the boundaries of the body in space time'. Using the metaphor of the network to describe the workings of public health, it is possible to envisage spatial relations, even body geographies, as effects of complex assemblages of social and technological life and, moreover, to understand the role of systems of governance, their processes and tactics, as elements within them.

The geographical implications of ANT are far-reaching and depend on relational understandings of space/time. Proximity and distance are not measurements or fixed co-ordinates, but describe the relations within a network. If space and distance are the (relational) effect of socially complex interactions between material and non-material factors, discourses of the new public health and its assemblages may be understood as inherently spatial and as executing transformative effects on space. Accordingly, the turn to prevention is understood to have created, or mapped, new spaces of illness/wellness and, in particular, to have incorporated healthy spaces as hitherto unmapped zones (Brown, T & Duncan 2002: 365).

The articulation of the new public health at different scales, from the geography closest in to the global scale of geopolitics, may be viewed in terms of their heterogeneous networks and spatial topologies. Yet, ANT rejects the idea of scale as a pre-existing measurement in favour of an

approach that recognises that scale, too, is determined by networks. Thus community, nation, body, and the global and local are defined by the connections and shapes of the network (Murdoch 1998).

> A network notion is ideally suited to follow the change of scales since it does not require the analyst to partition her world with any [a] *priori* scale. The scale, that is, the type, number and topography of connections is left to the actors themselves (Latour 1997: 6).

In the analysis of spatial topologies there are overlaps with theorists not normally recognised as traditional ANT scholars, but who acknowledge the importance of space to questions of governmentality and health. For example, Dean (1999b: 192) suggests that the scale of community no longer accords with traditional geographic (Euclidean) ideas but may be conceived more as the 'transitory, overlapping, multiple relations of affinity and identifications felt by self-responsible subjects'. In this vein Rose (1996) suggests that community has become a new spatialisation of government. The importance of community to how public health works is thus an effect of the new spatial topologies through which risk enters into new social formations, an example of which might be the virtual communities of health that can be found on the Internet (Parr 2002; Petersen & Bunton 2002). The emergence of community as a new space in which public health works is then an effect of discourses of risk aversion and minimisation.

Changes of scale through which carrageenan is implicated in the geopolitics of actions at a distance in the new public health, are demonstrated by congealments with material actors and innovative health technologies (IHTs) such as the McDonald's low-fat McLean Burger for prevention of obesity; food labels providing a source of public information on food contents; and Carraguard®, a microbicide in development for the prevention of HIV/AIDS. In these examples geopolitics may involve, sometimes simultaneously, contexts that include the micro-terrains of human bodies and macro-terrains of global space. Moreover, *critical geopolitics* studies how the 'geo-graphing' of global space occurs within relations of space/power and knowledge (Hyndman 2004; Ó Tuathail 1996; Roberts, Secor & Sparke

2003) opening interesting avenues of exploration for public health. After all, the emergence of global forms of health provision and mediation is premised upon global flows of information and technologies, and the interactions of material and non-material actors.

Three themes, spatiality, visibility and futurity emerge from the discussions thus far: spatiality, because of the extension and transformative effect of the sites of the new public health; futurity, because prevention is forward looking and based on calculation of risks of probable events; and visibility, because in order that individuals may govern themselves, risks must be revealed. Taking this into consideration, I will consider how I advance a critical geography of carrageenan. But before outlining the methodological approach I will take, I first consider some implications of combining ANT and governmentality approaches.

Introducing elements of ANT to studies of governmentality raises certain methodological and theoretical questions about their contrasting concerns. Dean (1998) raises these issues in a discussion of Foucaults work on 'questions of method'. He suggests Foucault's methods involved examining 'regimes of practices' as 'more or less organized or routinized ways of doing things that manifest an immanent logic of reason of their own' (185). Because of this methodological approach, Dean suggests that it is possible to see the links between Foucault's work and sociologies of science in that 'they both reject an absolutist account of knowledge' and look instead to understand how knowledge (and power) is dependent on particular regimes, practices and heterogeneous networks. The difference, according to Dean, is in the concern with 'what is constructed'. For Latour and other theorists of science and technology how 'reality' is socially constructed is of concern, whereas for Foucault it is what counts as true. On this view is not reality that is constructed, but ways of knowing the truth about it, what Dean (1998: 194) calls the 'realm of effectivity of the construction of truth'. While approaches inspired by Latour and

Foucault diverge on this crucial issue, there are overlaps in how they come to these understandings. Foucault and Latour share similar methodological strategies - they both seek to unpack networks/regimes/*dispotifs* through which power is assimilated. Yet Latour critiques Foucauldian styles of analysis for the asymmetrical focus on social science and failure to bring science to critical account (Crawford, TH 1993). Latour remarks, 'the test of his definition is to see if hard sciences can be bought into his description' (Crawford, TH 1993: 252). Certainly, there is greater attention to the everyday practices of science and technology from practitioners of ANT (see for eg. Callon 1999; Garrety 1997; Latour 1988; Law 1986). In my view, the differences in theoretical underpinnings of the *method* produce different foci and results, most significantly in *what the methods get attached to.* For studies of governmentality, the 'realm of effectivity' is approached from an *analytics of government,* addressing the discourses and multiple actors and agencies through which this is accomplished (Dean, M 1999b). For practitioners of ANT, the focus is instead on the network of actors which have the quality of power - *government is in the network.* The two approaches may therefore be considered reciprocal and complementary. As an example, it is possible to approach the analysis of carrageenan regulations from different vantage points. From the perspective of an analytics of government, there are various concrete mechanisms, such as the Food and Drug Administration (FDA), which operate as boundary objects between the diffuse world of discourses, people and things, and how public health may be enacted. Alternatively, using an ANT approach, everything in the network of the FDA, scientists, papers, technologies, have qualities of power that are the device(s) of public health. Combining ANT and governmentality approaches affords different perspectives of carrageenan and public health networks; particularly useful given that carrageenan is dependent on 'hard' science for its manufacture and representation. Moreover, as I will presently detail, a similar methodological strategy, critical discourse analysis, may be applied to garner different perspectives for a critical geography of carrageenan.

Towards a critical geography of carrageenan

In what follows I use the figure of carrageenan to explore a critical geography of risk, prevention, expert knowledge, technological development, consumerism, health and the prudent individual. In exploring the construction of carrageenan as it is related to discourses of risk and the new public health, I draw on three public health examples through which carrageenan is an actor-network in relation to medically defined illnesses: cancer, obesity and HIV/AIDS. Indebted to ANT and governmentality, and to an emerging narrative about risk as polyvalent rationality underlying the new public health and its socio-spatial and temporal topologies, the thesis is informed first and foremost by the notion of *prudentialism* and questions of visibility, spatiality and futurity in relation to health risks. Such risks occur not only in issues of pre-defined illness but in issues of pre-defined health, and I explore also issues of public health related to carrageenan within the spaces of the already healthy population in the realm of food, aesthetics (obesity) and sexuality (HIV). The geopolitical dimensions of prudentialism cover the regulatory practices both internal and external to nations as a point of contact among risk, consumers and carrageenan. Geopolitical concerns also extend to the examination of issues in post-colonial health and the provision of innovative health technologies (IHTs) across national borders. The temporal dimensions of risk flow across and between all the chapters as the past, present and future are bought into the complex networks through which risks are calculated and rendered visible.

Carrageenan lends itself to an analysis of how individuals are obliged to health prevention because, in various applications, and in the spaces in which carrageenan and public health overlap, risk minimisation and aversion require that risks be revealed. What is unique about this case study is first that carrageenan is a material technology made visible to consumers through mediated messages about it. Carrageenan is used in minute quantities for its functional properties. In the terms of ANT, carrageenan does not exist outside the networks in which it is constructed and enrolled.

Carrageenan is a hybrid form that incorporates such things as scientific technologies, scientists and systems of representation.

Second, there are few people who have extensive knowledge of the carrageenan industry, and along with its use, experts with a broad knowledge of the industry have been predominantly based in the (neo-liberal) west. The hourglass structure of the carrageenan industry is composed of extensive harvesting and farming of seaweed for carrageenan[3]; manufacture dominated by a few processors[4]; and the use of carrageenan as a ubiquitous item of consumption. Three companies, namely FMC Biopolymers, CP Kelco and Degussa, dominate the processing of carrageenan[5]. In 1996 European and American countries accounted for 63% of the purchases of carrageenan products (Bixler, 1996: 39), although there has been a growing demand for them in Asian countries. Yet beyond the worldwide sourcing of raw materials for carrageenan, localised processing and western/international focus of sales, carrageenan use has been based predominantly in western countries, where it has been widespread. The main applications are in the convenience food market, and particularly in dairy products, where 0.01% to 0.05% carrageenan may be sufficient to achieve a technical function such as thickening or emulsifying (McHugh 2003: 69). A survey of any supermarket for the term carrageenan, E407 or E407a (as regulatory names) - and by extension, a survey of its locations in homes, workplaces and bodies - demonstrates the spatial ubiquity of carrageenan in the west. Thus while carrageenan has vast spatial reach and

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[3] McHugh and Philipson describe the manufacturing of carrageenan as 'unusual' when compared with other tropical industries; even though it is common for the raw materials to be exported for value adding, carrageenan processing has been dominated by a very few processors located far from the source material (McHugh & Philipson 1989: 149).

[4] Blanchetti-Revelli describes the market relationships as one of oligopsony between seaweed producers and processors, and oligopoly between processors and carrageenan users (Blanchetti-Revelli 1995b).

[5] The carrageenan-bearing seaweed industry has been subject to various acquisitions and mergers and sources of precise data on carrageenan production amongst companies are notoriously difficult to access. Amongst the interviews conducted with industry participants it was well accepted that the three companies are the largest and most influential in the carrageenan industry. As well as maintaining email contact with industry participants, one industry source from which I received occasional email news updates on the status of carrageenan and hydrocolloid industry developments included www.hydrocolloid.com (Seisun 2004).

complex network topologies, there is a *waist* to the knowledge of the industry amongst western-dominated processors of carrageenan. During the course of this research, I have been fortunate to have access to and interview key players in carrageenan processing, about which I will expand presently.

Third, with carrageenan's deployment, the future is called to account in the present through risk and also through the two IHTs as the central topics of chapters five and six: the McLean burger and Carraguard. The calculation of risk centres on the future health of the body politic, even as the effects are registered and experienced by individuals. Carrageenan offers an empirical example through which to explore theoretical concerns associated with prudentialism and individuals' responsibilities for preventing ill-health through the themes of visibility, spatiality and futurity. In summary, carrageenan is an extremely complex actor-network. Due to the intricacy of that actor-network, the empirical data for this thesis have necessarily been derived from a broad range of sources and through research in multiple fieldwork locations.

Fieldwork, data collection and critical discourse analysis

Combining the foci of carrageenan and issues in public health in this research was an extension of prior interest in the carrageenan-bearing seaweed industry. During the work for my honours thesis *Farming the sea: seaweed cultivation in Nusa Lembongan* (Burges Watson 1999) international and national contacts in the carrageenan processing industry were developed. My fieldwork was initiated with informal conversations with farmers, local leaders, tourist operators and officials on the island of Nusa Lembongan and nearby island of Bali in Indonesia, in an attempt to understand the dynamics of seaweed farming and to uncover local issues of particular importance. During the course of the research I investigated local activities concerning the harvesting of seaweed for carrageenan, but became increasingly interested in how global markets and distant cultures of food and pharmaceutical consumption were implicit in the local.

As Blanchetti-Revelli (1995a) suggests, there is nothing unusual about incursions of western cultural forms or the reach of global capitalism, but the intensity of interconnections and their lack of visibility in the local context of a seaweed farming community is intriguing. For me such interconnections were heightened on Nusa Lembongan as it is also a popular site for international tourist activity.[6] In order to gain insight into the dynamics of the seaweed industry for the extended doctoral project, it was necessary to expand the horizons of the research to carrageenan-processing corporations and sites of carrageenan use. My concern to trace the public health related networks in which carrageenan is a part required that I gather situated points of view from multiple nodes within carrageenan networks. Therefore I synthesized conversational and semi-structured interviews with key informants in the carrageenan industry, observations of common consumption sites such as supermarkets, and extensive literature based research across global popular media and academic sources.

Selection of industry participants was built on previous research and initially relied on contacts in Indonesia and Australia which *snowballed* to Canada, the US and Europe. It might be expected that access to corporate sites would be limited for time or other reasons, however I found a level of openness to and enthusiasm for my research amongst industry participants. There are at least three possible reasons for this. First, my honours research was circulated and well received amongst some members of the seaweed industry, and may have been a factor in the access I had to corporate executives, the FMC Biopolymers extraction plant in Rockland, Maine, and various industry employees. Second, carrageenan-bearing seaweed farming has become a popular choice amongst development agencies to ameliorate poverty in low-income coastal communities in some locations, such that there may be

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[6] Tourists and seaweed farmers alike had little knowledge of the uses or market for carrageenan. Tourist brochures for Nusa Lembongan, Indonesia advertised seaweed farming as a traditional activity and suggested the *seaweed* was used in cosmetics and shampoo (Burges Watson 1999). Similarly, in farming areas in the Philippines, Blanchetti-Revelli notes the lack local knowledge about uses for carrageenan (Blanchetti-Revelli 1995a).

perceived benefits to public exposure through research publications. Third, seaweed is an unusual topic for many people in the west, and in general I found most participants in my research had a passion for the subject and were enthusiastic about sharing their knowledge.

In all, face-to-face semi-structured and conversational interviews were conducted with 44 participants in the carrageenan industry including key industry players based mostly on the east coasts of Canada and the US where the industry first established commercial roots. In particular, Harris Bixler, David Myslabodski, Gordan Guist and Dimitri Stancioff, names peppered through this thesis, have been active in relation to the commercial carrageenan industry, some from its beginnings. Some interviews were arranged by formal letters of introduction; some lasted one hour or even less, and yet others were more informal conversations over hours or days. In Camden, Maine for example, conversations with Dimitri Stancioff lasted for three full days, and could generate a thesis in themselves. In Rockland, Maine, the home of FMC Biopolymer, I spent one week interviewing various current and former employees and was given a tour of the carrageenan processing factory. Two months of fieldwork were spent in Miminegash, Prince Edward Island, Canada, a place central to the carrageenan-bearing seaweed industry until farming seaweed became commercially viable in the tropics in the mid-1970s. The knowledge I gained through participant observation of seaweed harvesting and interviews with former and current harvesters of Irish moss seaweed and local company representatives in Miminegash, underpins this thesis. All interviews elicited participants' views of the changes in the market for carrageenan, and specific consequences related to food and pharmaceutical uses of carrageenan.

Consistent with the ethical guidelines established by the University of Tasmania for fieldwork and face-to-face interviews, participation was by consent and recorded on audio-tape or in writing. Before all interviews participants were informed of their right to discontinue or withdraw from

the research. Where possible, I checked the data by reporting preliminary findings to key informants. All face-to-face interviews were audio-taped and transcribed for qualitative analysis. Furthermore, I could trace elements of the carrageenan network only so far through interviews and my physical relocations; thus much of my research incorporated, and included, communications technologies. Joanne Tobacman, protagonist in the debates concerning carcinogenicity and carrageenan (chapter four) was interviewed by telephone and email on three occasions. Data were also gathered from popular media sources including newspapers, magazines and the Internet. Details of these primary data occur in the chapters where they appear.

Texts and interview materials were analysed for connections amongst the issues raised by studies of governmentality and risk and how such concerns may be seen to constitute dialogue; and representations of issues in public health. Critical discourse analysis (CDA) (Fairclough 2001, 2003; Fowler 1991) describes a range of different approaches that share a concern with both the 'order of discourse', those relatively durable social and material structures informing the relationships between power and knowledge; and closer readings of texts. Such 'moving between' the social context of texts and the texts themselves enables sensitivity to the ways in which language and discourse figure in relations of power and knowledge and social processes (Fairclough 2001: 229). Practitioners of CDA emphasise that social change is often initiated by new discourses (such as 'the new public health') and that the emergence or appearance of such may be 'read' or appreciated through three different arenas of social practice. First as new ways of inter(acting) such as genres, second as new ways of being such as styles, and third in new kinds of practices - such as the structuring of space (Chouliaraki & Fairclough 1999). Thus, in the new public health may be typified by new forms of interaction between governments and individuals as 'consumers'; individuals behave as consumers (being); and lifestyle as a new spatialisation of government. Moreover, the analysis of such social change can be achieved via detailed textual or linguistic analysis. Texts reveal the broader

social change via the shifting articulations of genres, discourses and styles (Fairclough 2003). Thus the methodological strategy I adopt, traces the emergence of the 'new public health' discourse in association with its constitution and articulation in social practices - specifically those associated with carrageenan. Moreover, this strategy applies for both ANT and governmentality approaches in its concern with the relations amongst social practice and discourse.

It is widely perceived that there is both crisis and opportunity in the increased role of individuals negotiating issues of health. While the spaces for citizens to access and debate issues of health have clearly expanded, there is a sense that the quality of information and decision-making may be threatened by commercial interests; access to particular types of information; or overly obsessive attention to *potential* health risks. A critical discourse analysis enables consideration of *how* changes in social and political life refigure discourse, social practice and new forms of social interaction. Thus analyses of discourses and across genres of text including expert scientific sources, regulatory sites and media, and via material intermediaries contribute to a multi-faceted 'picture' of network connections amongst carrageenan, individuals and public health.

In deploying a critical geographic and network approach to the study of carrageenan I am mapping new territories of investigation by focusing on a substance whose significance is *in what it is attached to*. By bringing a theoretically-informed perspective to carrageenan as a material technology associated with health prevention I am able to explore the network spaces between and among actors, and to study in detail how actions against risk become durable within networks. This tactic is appropriate since, after Latour (1991) it is through material technologies that government is able to act at a distance and through which carrageenan's associations and networks figure in the (re)territorialisations of the spaces of contemporary governance of health.

Visibility, spatiality, futurity and carrageenan

The calculation of risk for the purposes of public health involves rendering visible the elements through and with which prudent consumers are expected to make 'rational' choices. The public surveillance of carrageenan is regulated by a variety of national and international institutions such as the US Food and Drug Administration (FDA) and the international standards enshrined in the Codex Alimentarius system[7]. Regulatory powers such as the FDA calculate the risk of carrageenan consumption and codify it on food labels where is it listed as an ingredient. Through enticements to *read the label* consumers (may) choose to consume carrageenan. Carrageenan's visibility is an essential part of the tactics of prudentialism. In general, carrageenan is a tasteless, odourless substance that adds functional properties to food. It cannot be detected by human senses other than by its effects; for example carrageenan may be used to give a fat-like mouth-feel to low-fat products, or in chocolate milk to stop the chocolate from settling to the bottom of the container. Because of such properties, consumers' knowledge *of* carrageenan may be experienced through physical senses of viscosity or mouth-feel, but it is most likely to be understood (if at all) through mediated messages *about* it.

Further, that substances such as carrageenan might be *invisible* has been raised by some proponents as contributing to a heightened sense of risk (Adam 1999; Beck & Ritter 1992; Millstone & Zwanenberg 2002). Carrageenan's use in IHTs for the prevention of obesity and HIV/AIDS is a critical and active component of the technologies of health prevention

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[7] Created in 1963 by the Food and Agriculture Organisation of the United Nations (FAO) and World Health Organisation (WHO), the Codex Alimentarius Commission establishes guidelines, standards, and codes of practice for the food industry for internationally traded products. The Joint WHO/FAO expert committee on food additives (JECFA), an expert advisory body to the Codex Alimentarius Commission, provides expert assessments of food additives, contaminants and naturally occurring toxicants. The expert assessments of substances such as carrageenan provide one source of data through which national and international institutions regulate the safety of food (Codex Alimentarius 2002).

through which choices are enabled, and not just signified. Through the (invisible) technological attributes of carrageenan used in the McLean burger, consumers are offered a low-fat alternative to a regular fat laden burger. In its use as an active ingredient in a preventive technology against HIV/AIDS (Carraguard), carrageenan is marketed as a clear gel that is invisible to others in order to encourage women to use it without men's knowledge. In the former case invisibility is a risk: it reduces the prudent capacities of the individual. In the latter, it is cast as an opportunity: a stealth technology.

The language and calculation of risk mitigation underscore the use and development of carrageenan as a product in food and pharmaceuticals. In both, carrageenan has an evidence-rich profile that is mediated across time and space. The extensive networks of information and evidence about it are enabled through the expansive reach of regulatory authorities. That profile is an official guarantee of safety, and has been a factor through which carrageenan has been authorised for use in a number of food products for preventive health, including low-fat foods. On the other hand, one outspoken MD with an interest in preventive oncology has recently gained widespread attention in the international press for her research that suggests carrageenan is a risk to human health, despite the official body of scientific evidence supporting its safety (Tobacman 1998, 2001). The ambiguity of safety claims provides food for theoretical consideration, but also for an examination of the length and reach of networks in forming and stabilising risk.

Questions of futurity associated with prudentialism and the development of IHTs is the most exploratory of the themes. Prevention, pre-emption and prediction (all characteristics of risk aversion in public health) have an orientation towards futurity, but also have different meanings and effects, some of which have been identified within critical health literature. For example, Petersen (2002: 23) suggests that prevention is primarily concerned with the avoidance of 'environmental, psychological, behavioural and

lifestyle risk factors', while predictive medicine is more generally recognised as related to developments in genetic testing and the ability to *predict* the future before it happens. My own thinking in pre-emptive[8] action is greatly influenced by Crina Archer (2004). Drawing on the work of the political theorist Hanna Arendt, Archer suggests that a new *logic* underscores practices of pre-emption that have manifested in particular in US politics in over the last decade, but have become more pronounced during the George W. Bush presidency. She posits that 'the idea that drives the logic of pre-emption is, quite simply, the claim that our theories can predict the future with a degree of certainty that eradicates the need to wait for events in the world to confirm or disrupt them' (Archer 2004: 3). In her view, unlike preventive or predictive medicine, the *accuracy* of claims is not the primary motivation for actions against risk, but the imputation that dangerousness is imminent. Indeed she suggests that invisible threats such as the missing weapons in Iraq, unfound cave dwelling terrorists, undiscovered chemical laboratories, are sufficient evidence upon which to calculate future dangerousness (Archer 2004). Indebted to such insights, I start to speculate about the applicability of pre-emption of invisibly calculated risks and its overlaps with carrageenan in my final comments on Carraguard.

The themes of visibility, spatiality and futurity are drawn together by an exploration of the possibilities, limits and extent of prudentialism and the rise of informational resources and technologies produced towards enabling prudent consumers of health.

Contemporary concerns about health

A broader social concern underlying my choice of topic is human health. As it stands, rather than diminishing in contemporary society the numbers of people suffering the effects of HIV/AIDS, cancers and obesity are widely

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[8] But note that the use of the terminology pre-emption and prevention is not always consistent. 'Prevention' in some contexts, is closer in meaning to what I term pre-emption. See for example Kegley & Raymond (2003).

regarded as worsening. Estimates from UNAIDS in 2004 indicate that globally, 36.4 million people are living HIV/AIDS and in regions such as Sub-Saharan Africa the numbers of newly infected people is continuing to rise (UNAIDS 2004). The World Health Organisation (WHO) estimates that since 1980, the numbers of individuals who are obese or overweight have tripled in some areas of North America, the United Kingdom, Eastern Europe, the Middle East, the Pacific Islands, Australasia and China (World Health Organization 2003c). The WHO (2003a) predicts that increasing cancer rates worldwide may double between 2003-2020 to affect 15 million people. Despite the range of technologies available to mitigate these pressing health issues, it appears from such statistics that individuals are not being prudent enough about prevention to turn the tide of progression of any of the three conditions. Any light that I might shed on why this might be so I consider worthwhile. I am concerned to present an argument in which risk is a motivator of social, spatial and temporal processes and to consider the status of carrageenan as a food additive and active pharmaceutical ingredient (in development). As Parr (2004: 249) has suggested, by adopting a critical approach to public health, the possibility exists that new ideas may be generated that 'hold the potential for better understanding of social processes and spaces; as well as facilitating different pathways to praxis'.

I also explore public understanding(s) of illness and health. How individuals negotiate their responsibilities as subjects of risk, and how information is understood and acted upon is critical to the outcome of public health initiatives. My in-depth interviews with key informants working within the carrageenan-processing industry in various positions around the world, revealed strong beliefs that there are no safety issues with carrageenan as a food additive. Based on the quantity and quality of scientific measurement such a position is not difficult to defend. However, if the issue of carrageenan safety is (re)framed as one of risk, the discussion broadens to encompass governmental rationalities in which risk renders carrageenan calculable. There are implications for human beings in these questions and in the

empirical chapters on cancer, the McLean burger and Carraguard these issues are explored in some depth.

Chapter synopsis

The following chapter begins with a close-in view of carrageenan and its risky assemblages, and the narrative proceeds to the final chapter, with a speculative discussion about a technology through which HIV/AIDS is being addressed at the global scale of geopolitics in which carrageenan is one ingredient. Intervening chapters focus more specifically on carrageenan, the calculations of risk associated with its use and how risk produces carrageenan, and subjects.

In chapter two I provide a geopolitico-history of carrageenan that is both background to the industry and its development, and that also contextualises developments in the industry within changing rationalities of governance and risk. Carrageenan's use as a common food additive from the 1930s to the present provides a historical context alongside which it is also possible to view the changing and polyvalent rationalities of risk and their effects. Within the histories of carrageenan, I discuss the importance of dairy as a foodstuff in which carrageenan occurs, which is itself a category with particular links to a politics of risk. I also explore the regulatory history of carrageenan and argue carrageenan is rendered visible and incorporated into the diverse strategies of governing health. It is little known by most people yet it is partly through the contribution of technologies such as carrageenan and food labels, that the accomplishment of the self-managing subject becomes possible.

However in chapter three, the limits of regulatory representations are revealed as carrageenan is explored through the spaces in and through which it is defined and manufactured. Through an examination of the science, and natural and manufactured products that reveal carrageenan, I

consider how the calculation of risk is a factor in contested representations of carrageenan. In particular the chapter brings to the fore the case study of a substance defined as 'degraded' carrageenan (also referred to as poligeenan) because of its chemical formulation and documentation and research suggesting negative effects on health. I explore how degraded carrageenan has become an object of risk surveillance and anxiety, and the contest amongst epistemic communities of interest who attempt to assert their understandings of carrageenan and risk.

Degraded carrageenan also features in chapter four, in which I examine a widely reported controversy over the status of carrageenan as a potential carcinogen and its implications for prudentialism in public health. Using the metaphor of the network and network lengthening, I consider first how networks are extended through the scientific calculation of risk, and second how risks are mediated and extended by prudent subjects.

Similarly, chapter five refers to the calculation of risk through a case study of obesity in discourses of population health. In my case study of the McLean burger, a low-fat burger developed by the McDonald's company in 1991, I explore the failure of the technology to capture the public imagination as a failure of prudentialism. Media articles that appeared at least 4 years after the McLean had been withdrawn from the market provide the raw data to examine the popular representation of individual choice and responsibility in the face of failure.

Then, in chapter six I explore some contemporary priorities in post-colonial health. Specifically, I consider a case study of an HIV/AIDS prevention technology in development - Carraguard. Preventive actions on the part of post-colonial states to guard against diseases such as HIV/AIDS are tied to debates about security (King 2002). In the new public health, the location of risks to the body politic are no longer viewed as contained by boundaries of territory, but by the 'deterritorialized networks of information collection,

management, assemblage and disssemination' (Burges Watson & Stratford forthcoming). The development of Carraguard as a technology of risk containment is developed and considered as it is associated with post-colonial priorities in global health.

In my analysis I do not examine the question of the safety of carrageenan. Rather it is the calculation and inculcation of risk in relation to carrageenan that principally concerns me. If risk has become a mode through which we govern society and those within it, then any product might be studied from a risk perspective. Carrageenan has been chosen to exemplify how ubiquitous risk is in contemporary society, not to isolate carrageenan for an interrogation of safety. However I must state a personal interest in the outcome. During the past five years I have witnessed first-hand the growth of the carrageenan-bearing seaweed industry around the world. I have been privileged to live amongst some of the many thousands of seaweed harvesters and farmers who have greatly benefited from the growth of the industry in providing a new source of income for many formerly impoverished coastal communities. I have encountered the anxieties of Canadian and Indonesian harvesters and farmers to risks of industry decline. In these and other locations seaweed harvesters' livelihood rests in part with the perception of risk associated with carrageenan amongst us, the self-regulating consumers.

The thesis is a progression and gradual expansion of a network of sorts. Through each successive chapter, the informative scope of carrageenan's entanglements is extended. It is in the politics of partial perspectives 'that sustained, rational, objective enquiry rests' (Haraway 1991: 287). This proposition is central to my thinking and greatly informs the spirit in which this dissertation is written. The gradual accumulations of information represented in this thesis are, then, my contribution to a partial perspective.

Illustration: Blanc-mange pudding, 1976
Source: Courtesy Salt Institute for Documentary Photography, Portland, Maine, US

Chapter 2

Regulating the risk of carrageenan

Carrageenan is the name given to a family of different polysaccharides extracted from various species of red seaweed found in numerous locations around the world, and in commercial quantities in countries including France, Canada, Chile, Philippines, Indonesia and Tanzania.[9] Commerce in seaweed extracts has a long history; Chinese and Japanese traders and doctors were reported to have shared information on seaweed extracts as early as 970 AD (Hansen, Packard & Doyle 1981: 7). During the nineteenth century, the gelling properties of seaweeds containing carrageenan were utilised for desserts such as blanc-mange[10], but it was not until the 1840s that the *particular* qualities of *carrageenan extracts* were recognised. It was to be a further century before a commercial industry based on carrageenan extracts developed. By 2003, annual global production of carrageenan was estimated to be worth US$240 million (McHugh 2003: 2).

From the late 1930s carrageenan industry processors sought raw material primarily from wild harvested populations of *Chondrus crispus*. Prince Edward Island, Canada, was the primary source of that raw material until the early 1970s (Anderson, Frenette & Webster 1977; Blanchetti-Revelli 1995b; Chopin 1998; Pringle & Mathieson 1986; Women in Support of Fishing 1987). Although *Chondrus crispus* remained the major source of carrageenan, in the 1950s tropical seaweed species of the *Eucheuma* variety were found to be

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[9] In the taxonomic definitions of seaweed, three divisions - red, green and brown – produce extracts that are used in a wide variety of applications. There is much crossover among the divisions, however; in general green algae have been used for human and animal feeds, browns for algin extracts and reds for food, agar and carrageenan (Burges Watson 1999).

[10] The use of whole plants of *Chondrus crispus* as a food ingredient used in jellies and puddings has been documented in Ireland, dating as far back as the 14th Century. The origin of the term 'carrageenan' is suspected to derive from Carrigeen Head in County Donegal in Northern Island, as a colloquial name given to *Chondus crispus* (carrageen) (Indergaard & Ostgaard 1991; Mitchell & Guiry 1983).

another valuable source of carrageenan. Wishing to expand the source of raw materials, Marine Colloids Inc. of Rockport Maine (now FMC Biopolymer) initially experimented with the aquaculture of *Chondrus crispus* in Canada. However, it was not found to be economically viable when compared with the cheaper tropical sources of seaweed (Chopin 1998; Pringle & Mathieson 1986). Aquaculture of the tropical carrageenophytes was developed from the 1970s in countries including the Philippines and Indonesia (Ask 1999; Doty 1981, 1987; Luxton 1993; McHugh 2003). Species such as *Kappaphycus alverezii* (common name 'cottonii') and *Eucheuma denticulatum* (common name 'spinosum'), and not *Chondrus crispus*, became key to industry development. For over a decade now, species of *Eucheuma* and *Kappaphycus* have been the primary sources of raw material for carrageenan (Ask & Azanza 2002; Bixler 1996).

As Blanchetti-Revelli (1995b) suggests, the cultivation of tropical seaweed for carrageenan represented a major geographical reorganisation of production. Moreover, because of perceived benefits flowing to villagers in numerous coastal communities in countries as far apart as Kiribati, Indonesia, Madagascar, Tanzania and the Philippines (Bergschmidt 1997; Blanchetti-Revelli 1995b; Doty 1981; Firdausy 1993; Firdausy & Tisdell 1991; Pettersson-Lofquist 1995) interest in the carrageenan industry led to the participation of aid agencies, scientists and governments. Although deserving more attention than I am able to give it here given the parameters of my study, carrageenan became linked to concerns about sustainable development, environment and economic and social risks faced by coastal communities:

> Starting from zero in 1970, when FMC BioPolymer[11] [then Marine Colloids Inc.] invented the cultivation of cottonii and spinosum along with the University of Hawaii, there are now more than 50,000 families producing over 150,000mt/year of cottonii and spinosum. This is a very successful livelihood project that meets numerous development needs such as: poverty alleviation, women in development, coastal resource management, protection and conservation of coral reefs, sustainable

[11] Marine Colloids Inc. supported research at the University of Hawaii on cultivation in the early 1960s and 1970s. FMC Corporation acquired Marine Colloids Inc in 1978/1979 thus FMC Biopolymers did not in fact, 'invent' cultivation.

livelihood/development, land reform, entrepreneurial and small business management skills development and establishment of marine parks (FMC Biopolymer 2004).

Thus seaweed farming forms one small strand of the development discourse that characterises so many post-colonial societies; with all the attendant enthusiasm of development agencies, governments and the industry itself. For the processing companies, the development of seaweed farming reduced the uncertainties associated with wild harvesting operations[12]. Farming represented a fundamental shift in the quality, cost and reliability of raw material, generating new opportunities for companies to grow and plan their business strategies. Cultivation of seaweed in the tropics increased from 1000 mt in 1971 to 100,000 mt in 2002 (Ask & Azanza 2002: 257). However, in this chapter I consider a different story about risk, one more closely associated with the consumption of carrageenan and the new public health.

Risk has an increased salience in contemporary society through which issues of health are increasingly preventively calculated and bought under control. As a result, risk discourses produce new socio-spatial relations and spur the development of technologies and systems of management. Carrageenan, too, is the subject of the governmental rationality of risk. Thus, to begin with I contextualise how carrageenan appears as a manifestation of risk in relation to the prudent consumer, *on, in* and *through* food and pharmaceuticals. I trace these concerns back to the middle of the twentieth century when carrageenan first began to be used in food products, highlighting both the extent of its use within dairy products and factors contributing to the increasing importance of dairy as a category of food.

Castel's (1991) typology of a shift from dangerousness to risk in the governmentality of health provides a backdrop to the development of

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[12] While not developed here, one area for further study might be to consider the different categories of risk that are applied to coastal communities and the communities in developing countries, as opposed to the western countries, displaced by the development of farming. In Prince Edward Island and other western locations whose populations lost incomes because of the aquaculture in tropical countries, is risk status measured in similar terms?

carrageenan as an industrial additive, however I also explore the limits of this typology in the context of markets in which *uncertainty* enables entrepreneurship. Thus I explore the constitution of carrageenan within changing and polyvalent rationalities of risk and uncertainty.

Rendering carrageenan visible

Through declarative statements on food labels, the term *carrageenan* becomes visible, solid and a material text or a *matter of fact*. Such statements lend legitimacy and durability to carrageenan. Van Loon (2003: 49) suggests that a matter of fact is not like a claim; rather it is written, circulated and (relatively) durable, and thus the label becomes part of a 'network of visibility' through which - in this instance - the white or off-white powder derivative from seaweed is stabilised as *carrageenan*. However legislation about label content and naming procedures varies across nations and so carrageenan does not always appear directly as *itself*; sometimes it is disguised in numeric codes. For example, throughout the US, *carrageenan* is listed on food labels under ingredients (Imeson 2000) while in the EU and Australia, carrageenan may be represented either by official E numbers, E407 or E407a and/or official standard names such as carrageenan (FSANZ 2004; JECFA 2001)[13]. Were they to consult food-additive guide books, EU publications or any number of official documents that specifically mention it, prudent consumers would discover that E407 is an official synonym for carrageenan (for example JECFA 2001; Lewis, Stanley & Guist 1988). However, if consumers do not decode the E number one consequence becomes the production of different knowledges of carrageenan. An FMC Biopolymers statement about labelling suggests that E numbers market negative ideas about carrageenan to the consumer:

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[13] Different extraction methods produce different 'quality' carrageenans. One method produces a product with fewer impurities and is the product described as food grade or labeled as 407 according to UN standards. The lower grade 407a has been marketed as ARC or Alternatively Refined Carrageenan, PNG or Philippines Natural Grade and SRC or Semi Refined Carrageenan. The lower grades were originally produced because of pressures in the 1970s for a cheaper grade that could be used for pet food (Bixler 1996).

> the 'sad' fact is that in Europe, all additives were assigned E numbers rather than being called by their original names, as is the practice in the USA. In today's Europe, it is possible to choose between being listed by name or by E number. For completely natural substances such as alginate or carrageenan, it is important to write out the name in full to distinguish it from synthetic additives (FMC Biopolymer 1999: no page).

In this instance the synthetic/natural distinction, as it applies to carrageenan, seems to have a bearing on the perception of safety. Clearly naturalness does not always equate with safety, but representations of naturalness have currency in marketing - an issue that is explored again in subsequent chapters. Nonetheless, even in the EU carrageenan is widely used as a preferred term. Lawrence's (2004: 203) survey of labels in the UK found that since E numbers were introduced in 1983, they have been used less and less. In my own limited survey[14] of labels in the UK, I found many examples where carrageenan was used in preference to the E number equivalents. A Marks and Spencer raspberry jelly label, for example, lists carrageenan alongside E508[15], Locust Bean Gum and natural flavouring. On the jelly label the preference for *particular* names is demonstrated; carrageenan over E407, and E508 over its common (regulatory/chemical) name potassium chloride. The key point is that food labels reveal carrageenan in particular ways and these modify public perceptions of the risks to which carrageenan becomes attached.

In summary, the declaration of carrageenan or E407 on food labels is simply that, a declaration of the existence of a substance that might otherwise go unrecognised - after all, carrageenan is tasteless and odourless and generally used in minute quantities beyond sensory perception. In dairy products for example, carrageenan is added at levels of around 0.05 - 0.1% (Bixler 1996: 43). Labels both reveal and represent a substance whose form may, for consumers, be understood differently; E407 and carrageenan may not be regarded as being quite the same. Moreover, labels are truth claims, part of a

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[14] The survey was undertaken in one Marks and Spencer supermarket in Newcastle Upon Tyne, UK, over one day, 26th March 2004. Samples of one to three brands of 15 common carrageenan containing products were noted and label details recorded.
[15] Potassium chloride.

range of discourses associated with denominative technologies of governance in regulating public health. Truth is not outside society or the exercise of power; it exists via restraints and mechanisms through which certain types of discourses *come* to be true (Foucault 1984: 72-73). A food label bearing *carrageenan* enables and sanctions a particular set of truths about it, appealing to prudent consumers for whom it counts as true. The label does more than impart information; it (re)produces a certain truth and, as such, places carrageenan in particular contexts within contemporary and historical discourses of risk.

Recognising the significance of mechanisms that enable the new public health in the present necessitates some consideration of the historical developments that have preceded them (Brown, T & Duncan 2002: 362). Taking history and discourse as the starting points from which to consider the regulatory environment in which carrageenan is made visible, carrageenan and/or food (or pharmaceutical) labels are metonymous. Both stand in the place of a declaration of an individualisation of responsibility for consumption and risk. That is, labels provide information directly to the consumer and thereby enable the possibility of choice about all the products on the label, including carrageenan. These choices are reinforced by consumer education campaigns to encourage label literacy (Hadden 1986). Thus labels presuppose and produce a certain kind of subjectivity in which prudent subjects are rational and morally committed to responsible self-behaviour. Individuals are positioned as rational consumers of health (Irvine 2002). One effect of labelling is the reproduction of subjects of regulated freedom; that is, the expectation that freedom comes with responsibility. In this view, consuming carrageenan is a (responsible) choice.

However, in the last few decades there have been significant changes in how food regulation and labelling constitute the subjects of regulated freedom. Indeed, transitions to particular systems of labelling mirror transformations from a government *of* subjects to neo-liberal forms of rule through regulated

freedom - with particular effects on the use, containment and risky profiling of carrageenan. In the following section I consider the example of US regulatory policy on carrageenan to exemplify these transitions.

Regulating carrageenan

> Over time the US Food and Drug Administration[16] has developed and increased requirements for specific forms of information to be placed on food and pharmaceuticals. Detailed in Table 2.1, the passage of food regulation can be seen to transfer more and more responsibility from the state (as an institution of consumer protection to one that provides information) to consumers in order that they may govern themselves - such provision ranging from listing food ingredients to prevent adulteration, to outlining detailed nutritional information to promote so-called healthy food choices (Committee on Nutrition Components of Food Labeling 1990).

Over time, food regulations have, among other things[17], refocused attention from the state as enforcer of honesty and fairness in food labelling, to a biopolitics of preventive health. The FDA approach to food regulation has changed enforcement of legal measures on producers (after the fact) to preventive controls that supposedly enable individuals through the provision of information.

> If there is one dominating theme [about Food and Drug history] it is the change from a law that was primarily a criminal statute, protecting consumers through the deterrent effect of court proceedings to a law that is now dominantly preventive through informative regulations and premarket controls (Food and Drug Administration 1981: no page).

Dean (1999a: 146) broadly defines two types of governmental technologies intertwined with rationalities of risk; those 'deployed from above' (such as

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[16] In the US two bodies are involved in the regulation of carrageenan and related products; namely the Food and Drug Administration (FDA) and the US Department of Agriculture's (USDA) Food Safety and Inspection Service (FSIS). The FDA initially evaluates products for safety in food, and the FSIS is responsible for the safety and labelling of meat, poultry, and egg products. The listing of carrageenan under FDA and FSIS guidelines is an official evaluation of safety which can apply to general use or in some cases, such as processed meat products, sets guidelines and/or 'official recipes' for specific uses.

[17] Other concerns in relation to labelling, that include among others the economic aspects, are not developed here. An overview of economic and other factors underlying labelling is given by Hadden, who suggest that early labelling laws may also be traced to concerns about minimization of economic risks to buyers, and the regulation of competition amongst food companies (Hadden 1986).

premarket controls) and those 'invoked from below' (such as encouraging the use of labels as information about health).

Table 2.1 Major food regulatory reforms, US

Year	Event	Stated aims	Status of carrageenan
1906	Federal Pure Food and Drugs Act and Federal Meat Inspection Act	Regulates safety and quality of food. Defines and prohibits food 'adulteration'.	Not commonly used as an ingredient or food.
1938	Federal Food, Drug and Cosmetics Act	Replaces Pure Food Act. Among provisions, labelling requirements were increased to include some 'truthful' listing of ingredients and additives on some products. Full ingredient listing not required on 'standardised products'.	1937, Krim-ko company, Chicago used ground *Chondrus* as ingredient for chocolate milk suspension.
1958	Food Additives Amendment and Delaney clause[18]	Provides for a pre-market approval system for ingredients 'added to food'. Delaney clause gives FDA powers to ban food additives found to induce cancer in 'people or animals'. Classifies over 10,000 substances as food additives.	21CFR182.7255 1961 Carrageen*in* (Chondrus extract) classified 'Generally Recognised as Safe' due to long history of use in foods.
1960			MCInc. petition FDA to expand GRAS list. Carrageenan listed as a food additive under 21CFR172.620 .
1969	White House Conference on Food, Nutrition and Health	Recommends a review of GRAS substances following FDA's ban of the artificial sweetener cyclamate as a potential carcinogen under the Delaney clause.	
1973	FDA regulations for nutritional labelling of food introduced	Voluntary for most foods, required for foods with added nutrients.	
1990	Nutrition Labeling and Education Act	Requires the mandatory labelling of all processed foods in relation to nutrition. Plus increased 'clarity' of ingredients labelling.	

Sources: Food and Drug Administration, Code of Federal Regulations, 2004; Hadden 1986; Neusheul 1987; Schmidt 2000.

Thus, in the 1970s the FDA began to allow, and then require, more and more detailed information on the *nutritional* components of food. From below, the development of increasingly informative food regulation expanded the

[18] See also chapter four on the Delaney clause

complexity of information on labels and multiplied the issues of concern for the prudent consumer.

One other effect of the discourse of the new public health and prudentialism with respect to food was a burgeoning consumer movement. Crawford (1980) understood the rise of such health-based movements in the 1960s and 1970s in the US as an effect of the changing nature of health governance and the turn to 'healthism'. Healthism he described as the focus on personal health and lifestyle modification (Brown, T & Duncan 2000; Crawford, R 1980). Healthism was then not only an objective for individuals, but also for organisations and communities whose members also became active in monitoring and promoting prevention (Brown, T 2000; Brown, T & Duncan 2000, 2002; Petersen 1996; Rose 2001). Large consumer organisations such as the American Cancer Society and American Heart Association (prudently) funded increased research and advertised the results of links between chronic diseases and diet (Levenstein 1999: 526).

Indeed consumer groups' promotion of prevention and lifestyle change can be seen to have *amplified* governmental technologies from above and below. According to the taskforce established to develop voluntary labelling laws, the impetus for nutritional labelling in 1973 had been 'to enable consumers to select a diet adequate in vitamins, minerals and protein' (Committee on Nutrition Components of Food Labeling 1990: 5). However between 1973 and 1990, *public* concern about voluntary labelling laws increased with growing numbers of consumer organisations linking concerns about chronic illness and diet - particularly because of increased attention to, and visibility of, connections between heart disease and the consumption of cholesterol and saturated fats (Hadden 1986: 149). Consumer pressure groups, such as the Centre for Science in the Public Interest (CSPI) and Ralph Nader's advocacy group Public Citizen, campaigned for greater and more *reliable* information for individuals to enable wise choices (Hadden 1986; Hilts 2003). Hilts (2003: 261) argues the CSPI played a key role in turning the focus of

labelling from honesty and fairness to the idea that 'good, detailed labelling could reduce disease' - with a particular focus on fat.

Through new scientific understandings of the relationships between nutrition and disease, and via the amplification of governmental technologies of prudentialism by consumer groups, food is now incessantly broken down into constituent parts and reconstituted within a particular medico-morality of health-based risk assessment - thereby expanding the visibility of risk, and the requirements of self-governance.

One manifestation of this atomisation of food is the 1990 US Nutrition Labeling and Education Act (NLEA) that required all pre-packaged and processed food to contain nutritional labelling of proteins, carbohydrates, total fat, saturated fat, total calories as well as other nutrients. The Act gave the FDA and USDA until 1994 to standardise food labelling and, in particular, to develop standard rules for labels with nutritional claims such as fat-free, light, and low cholesterol (Buchholz 2003; Hilts 2003). The introduction of labelling was supported by official state recognition that 'food labeling - broadly defined - can materially aid wise dietary choices' and that these choices can 'affect chronic disease and risk' (Committee on Nutrition Components of Food Labeling 1990: 4). Labelling also enabled comparisons of competing food products, such that many manufacturers modified products to have more 'label friendly' images than competitors (Schwenk & Guthrie 1997)[19]. The passage of the NLEA fuelled a sudden increase in the availability of fat-modified foods (Calorie Control Council 2001; Golan et al. 2001; Schwenk & Guthrie 1997). Within twelve months of the passage of the NLEA, the Calorie Control Council[20] estimated that around 1,439 new products with reduced- or low-fat claims appeared on the

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[19] Schwenk and Guthrie note that the increase in fat-modified foods raised concerns about the potential for negative effects on health of the increased consumption of food additives. They suggest there was insufficient evidence that the products resulted in any meaningful weight reduction (Schwenk & Guthrie 1997).

[20] The Calorie Control Council (CCC) is an industry body of low-calorie and reduced-fat food product manufacturers.

US market, 70% more than in the previous year (Calorie Control Council 2001: no page). Between 1995 and 1998, during which time many new fat-replacement technologies had received regulatory approval, an estimated 6,500 fat-modified foods were reportedly introduced onto the market (Golan et al. 2001: 36). One consequence of labelling was the widespread modification of food to appeal to prudent consumers of health.

Moreover, the battle against the bulge presented opportunities in the market for carrageenan as a technology used in fat-replacement, in items such as the McLean burger (chapter five). Despite its functionality in modifying the qualities of food for fat reduction, carrageenan rarely appears in the nutritional section of food labels in the US. Following the NLEA carrageenan was still listed as an *ingredient* in food products. Nutritional labelling did not directly change the profile of carrageenan as a risk-related concern for consumers. Rather, nutritional labelling provided opportunities for the development of new prevention technologies incorporating carrageenan. Indirectly though, nutritional labelling *enhanced* the discourse of prudentialism and elevated the status of the label by requiring that consumers *should* monitor it for a whole range of health concerns; this enhancement was reinforced by various public health education campaigns to 'read the label'. Having said all that, carrageenan has not always been listed, even as an ingredient and I wish briefly to trace its history as a food and pharmaceutical additive to exemplify the polyvalence of risk.

Generally Recognised As Safe (GRAS)

Until the late 1930s, what is now recognised as carrageenan was not widely used as a substance added to food and the term carrageenan (or carrageenin)[21] did not exist in a regulatory environment for food or pharmaceuticals. Initially, the extract of seaweed now recognised as carrageenan, was termed *Chondrus extract* within the FDA system. First used as ground *Chondrus crispus* to stabilise chocolate milk in 1937, and then

[21] Stanford (1862) coined the term "carrageenin" for Chondrus crispus extract. The term carrageenan was adopted by the American Chemical Society to reflect the use of -an as an affix denoting the presence of a polysaccharide.

developed as an extract and given expanded uses in other food products, carrageenan was not *regulated* as a food additive until the late 1960s, but was defined as a substance generally recognised as safe or GRAS following the 1958 Miller amendment to the US Food and Drug Act of 1938 (Table 2.1). Under the Miller amendment the FDA divided substances added to food into regulated food additives[22] and substances that were GRAS[23] either due to their history of use in food prior to the 1st January 1958 (the so-called grandfather clause) or on the basis of a consensus of expert opinion. It is worth detailing the framing of carrageenan between the GRAS and regulated categories for two reasons. First, as better developed in later chapters, GRAS is deployed within contemporary narratives of risk, and not only in the US where the category is applied in the official regulatory environment. Second, the development of regulated food additives can be identified within a changing politics of risk in which GRAS stands in for an earlier political conception of risk as dangerousness as advanced by Castel (1991).

The Miller amendment prohibited the use of any food additives considered inadequately tested for safety. Prohibition was significant in that 'the burden of proof shifted from the US federal government showing an additive to be harmful to the manufacturer showing it to be safe' (Hadden 1986: 131). The amendment represented a fundamental transition to a new conception of risk, and a new spatialisation of governance and responsibility in relation to food. According to Castel (1991), classical prevention was based on an understanding of danger, typically involving a relationship between a

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[22] The US Food and Drug Act (section 201 S) defines the term food additive as 'any substance the intended use of which results or may reasonably be expected to result, directly or indirectly, in its becoming a component or otherwise affecting the characteristics of any food (including any substance intended for use in producing, manufacturing, packing, processing, preparing, treating, packaging, transporting, or holding food; and including any source of radiation intended for any such use), if such substance is not generally recognized, among experts qualified by scientific training and experience to evaluate its safety, as having been adequately shown through scientific procedures (or, in the case as a substance used in food prior to January 1, 1958, through either scientific procedures or experience based on common use in food) to be safe under the conditions of its intended use' (Food and Drug Administration 1958).

[23] Substances such as spices, caramel and ascorbic acid are permitted in food without food additive approval under the GRAS system; however not all substances recognised as safe have a GRAS listing. The nomination of GRAS is 'additional' to those items regarded as commonly added to foods that are considered safe such as salt, pepper and baking powder (s.182.1 Code of Federal Regulations).

known event and a probable outcome. Similarly, though in obverse form, the category GRAS may be applied to a substance if the product had been used without evidence of demonstrated harm, on which basis it is considered 'safe'; a relationship to risk is not inevitable. In contrast, regulated food additives involve a calculation of risk because they must be *proven* safe (Food and Drug Administration 2004).

In 1958 Chondrus extract was grandfathered to the GRAS status through its previous uses. In general the GRAS definition exempts ingredients that are identical or similar to traditional food ingredients because they are considered safe. Chondrus extract was already used in milk products and *Chondrus crispus* had a long history as a traditional food in Ireland. These traditions were imported to the US with Irish immigration (Burges Watson 2005; Burges Watson & Stratford forthcoming; Chapman, VJ 1980)[24]. Thus under the GRAS listing Chondrus extract (carrageenin) was permitted for use in food under section 21CFR182.7255 of the US Code of Federal Regulations as harmless under prescribed conditions of use (Appendix 2.1).

However, for Marine Colloids Inc., the regulation of Chondrus extract limited production capability. The wording of the GRAS legislation circumscribed just one species from which the extract could be derived: the cold-water *Chondrus crispus*. During the early part of the 1950s a rapid increase in demand, and limited supply of *Chondrus crispus*, led industry

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[24] Chapman (1980 :111) suggests that the industry based on *Chondrus crispus* harvesting 'originated in Ireland and was introduced into the US in 1835'. In Chapman's account, the Irish born mayor of Boston, JV Smith, alerted the local inhabitants, immigrants associated with the Irish potato famine, to the presence of *Chondrus crispus* around the coast of Massachusetts as an alternative to the imported 'Irish moss' from Ireland and France (Chapman, VJ 1970; Lewis, Stanley & Guist 1988). From the mid 1800s until prohibition in the 1920s, *Chondrus crispus* was principally used in the pharmacopoeia and as an agent in beer clarification. The history of Irish Mossing in Massachusetts is also recounted at the *Scituate Maritime and Irish Mossing Museum*. The accompanying text to the museum is based primarily on the book by Barbara Murphy (1980) *Irish Mossers and the Scituate Harbour Village* (Ball, D., Scituate Historical Society Director, pers comm., 15 December 2003). In Murphy's book, as in the museum, Daniel Ward is credited with the introduction of mossing to Scituate, which became central to the prosperity of that community, and the Irish moss industry at the time. Ward's early history is not known, though it is suggested he originated from County Derry in Northern Ireland and arrived in Boston in around 1829. In Scituate, the industry is understood to have helped the region become more prosperous than surrounding areas, gradually drawing wealthier Irish from Boston to the region (Murphy 1980).

members to explore other seaweed species as a source of the extract that, by this time, was recognised by its chemical name carrageenan (Blanchetti-Revelli 1995b; Chopin 1998). In 1960 Marine Colloids Inc. petitioned the FDA to alter the GRAS listing to enable a wider sourcing of raw materials; both of species and by implication, source locations (Stancioff, 2002, pers.comm., 15 June). The FDA moved instead to list *carrageenan* as a regulated food additive under section 21CFR172.620, with an expanded but limited list of seaweed species from which it could be derived. The list included carrageenan from *Chondrus crispus* (Appendix 2.2).[25] Thus Chondrus extract was listed as GRAS, and the extract of *Chondrus crispus* - 'carrageenan' - was listed as a regulated food-additive. The GRAS definition remained but, for the purposes of food regulation, 'carrageenan' became and (as it stands) is the official standard for carrageenan used in food products. In short, GRAS and regulated categories do not distinguish different levels of safety regarding carrageenan; rather they involve different calculations of risk.

What prompted the FDA to change the status of the seaweed extracts to regulated food additive is unclear. However the timing coincided with an increased attention to the status of substances added to food and to public concerns about health risk associated with some particularly high profile food ingredients - amongst them saccharin and cyclamate (Hilts 2003: 202-206). Various public scandals ensued, in 1969 culminating in the Nixon-initiated White House Conference on Food, Nutrition and Health that demanded a review of all the substances in the GRAS category. One explanation for the review is that the category GRAS no longer satisfied the

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[25] Under 21CFR172.620 carrageenan is defined explicitly as an extract derived from a list of eight species of seaweed, which includes *Chondrus crispus* (Appendix 2.2). According to Stancioff (2002, pers.comm., 13-15 June), who was involved with drafting the 1960 petition for Marine Colloids Inc., the species-specific regulation came as a surprise to industry. Industry members were expecting that the FDA would recognise the need for a more general definition of carrageenan not based on specific raw material sources. 'We gave these species of seaweed as examples and we didn't expect them [the FDA] to specify species. I think if we hadn't petitioned the FDA for the use of these other seaweeds, then carrageenan would still be carrageenan from any source' (Stancioff, 2002, pers.comm., 13-15 June). Furthermore, the FDA established other categories for products that at the time were not then recognised as carrageenan. Furcellaran, an extract of seaweed which is now recognised chemically as a carrageenan, extracted from the seaweed Furcellaria was listed separately as were combinations of carrageenan and certain emulsifiers and 'salts' of carrageenan (Appendix 2.3).

new understanding of preventive, scientific pre-detection based risk. Thus, with the scrutiny of saccharin and cyclamate and the outpouring of concern that followed, the calculation and visibility of risks expanded. Or as Hilts (2003: 206) remarks, 'Americans had entered the age of risk assessment'.

The regulation of carrageenan under the food additive category 21CFR172.620 is based on detailed risk assessment that defines where and how it may be used in food; it cannot be used (legally) without such authority. Thus, 'a food additive that does not have regulatory food approval is not a food additive' (Seisun 2002: no page). Aside from the key role of regulation in determining the spaces and places in which carrageenan circulates, regulation is entangled with particular understandings of the category of risk. In this view, regulating use is a mode of calculation and mitigation of risk, working as a category that is more than simply a declaration of safety. Rather, it defines how it is possible to talk about carrageenan, who should talk about it, and that it must be visible to consumers. The transition from GRAS to regulated food additive modifies carrageenan's non-dangerousness within discourses of risk. As a regulated food additive *the safety of carrageenan no longer exists without a relationship to risk.*

Interviews with key (scientific) informants in the industry during fieldwork in Maine, US, in June 2002 and at the International Seaweed Symposium in Bergen, Norway, in 2004, reveal that as a regulated additive carrageenan is considered superior to GRAS because its status as an additive is based on a solid body of scientific evidence. Marinalg International is a seaweed industry body involved in regulatory issues, and its president observed of European legislation 'the E number is your guarantee that it is safe' (Rasmussen, 2004, pers.comm., 24 June). In this view, visibility as a regulated additive signifies non-risk. One industry representative suggested the GRAS category listing for Chondrus extract should be scrapped, saying that 'Chondrus extract isn't made anymore, so it's there [in the regulation] and

not used and it should be removed but every time somebody goes to the FDA and says to remove it they say oh we have more important things to do' (Bixler, 2002, pers.comm., 16 June)[26].

Two issues emerge from these statements. First, despite a commonly held view amongst industry members that regulated additives are safe, safety in the regulated category is based on the calculation of risk and, in later chapters, I explore how risk flows over into public concern about carrageenan. Second, because of the association with risk in the regulated category, I argue that GRAS continues to work for carrageenan in a different capacity, about which I will elaborate after clarifying the current status of carrageenan and the GRAS category.

In the public domain, both within and beyond the borders of the US, the GRAS label often erroneously appears in both expert and popular contemporary accounts of carrageenan (see for example Population Council 2002; Reilly 2003; Tobacman 2001; van de VeldeLourenco et al. 2002). That is, despite wide circulation of a myth about carrageenan as GRAS[27], Chondrus extract (carrageenin) is listed as GRAS but carrageenan is not (US Code of Federal Regulations ss 21CFR182.7255 and 21CFR172.620; Bixler, 2002, pers.comm., 16 June; Stancioff, 2002, pers.comm., 15 June). Chondrus extract, still exists 'on the books' of FDA food regulation under s.21CFR182.7255.

Notwithstanding the exclusion of carrageenan from the GRAS category, food companies voluntarily register expanding numbers of substances as GRAS[28]. In contemporary discourse it can be seen that rather than continuing to function within Castel's typology of dangerousness the GRAS category

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[26] Harris Bixler is Chief Executive Officer of the carrageenan blending company Ingredients Solutions Inc. He was formerly an employee of FMC Biopolymers/Marine Colloids, has fulfilled various roles on the Executive of the International Seaweed Association and represented the interests of the Seaweed Industry Association of the Philippines in bodies such as Marinalg.

[27] One source of the myth of GRAS was a report written in 1972 that had proposed amendments to the FDA listing of carrageenan, however the regulations were not modified. For a discussion of the confusion around this report see Tobacman (Tobacman 2001).

[28] In 1997 the FDA developed a simplified notification system in order that companies could voluntarily register products as GRAS.

incorporates a non-calculative rationality of uncertainty. Risk may provide a backdrop to the development of carrageenan within the regulatory environment; however the GRAS category, involving uncertainty without a relationship to risk, sidesteps risk calculations in new public health when there are issues related to market development. GRAS is useful within the food industry for various reasons: under the regulations, pre-market approval for use is not required (promoting uncertainty as a measure of safety.) FDA comments are the source of (independent) expertise, and FDA listing can protect manufacturers against litigation. As O'Malley (2000) proposes, there are limits to the actuarial or calculative rationality of risk as a mode of governance, particularly as it curtails entrepreneurship. In this proposition, entrepreneurship enables a different kind of future, not one that is calculated and predicted but risk taking and necessarily distinct from the past:

> uncertainty is a characteristic modality of liberal governance that relies both on a *creative* constitution of the future with respect to positive and enterprising dispositions of risk taking and on a corresponding stance of reasonable foresight or everyday prudence (distinct from both statistical and expert-based calculation) with respect to potential harms (O'Malley 2000: 461).

Risk is one modality of governance, but it is not (necessarily) the only one to have an effect on carrageenan or to interface with prudent subjects. While GRAS is no longer deployed in the regulatory environment concerned with food uses, the same is not true of the regulation of pharmaceuticals. Although by no means the only example of uncertainty in governing carrageenan, through the example of an emergent pharmaceutical, Carraguard, I now explore how uncertainty in the regulatory environment enables the rapid development of new technologies.

Risks and uncertainties: pharmaceuticals and Carraguard

As it stands, carrageenan is not permitted for use as an *active* ingredient in any pharmaceutical formulation; indeed it is only permitted for use as an

excipient[29]. Regulations for pharmaceuticals are extremely complex, and are more specific than is the case for most food products involving very particular specifications of process, composition and manufacturing (Lard, Hastings & Feigal 1994). Therefore, rather than assessing the overall system of pharmaceutical regulation in relation to carrageenan, I focus instead on the one pharmaceutical product in the pipeline that uses carrageenan as an active ingredient: Carraguard, a technology for the prevention of HIV/AIDS.

Advocates of Carraguard and some of the other microbicides have proposed that they be developed for non-prescription, or over-the-counter (OTC) use to enable easy access by consumers (Heise 2002; McGrory & Gupta 2000). OTC is then a category with particular importance to prudent consumers because it takes out the step of arranging appointments with doctors and accessing prescriptions; furthermore, it changes the nature of encounters between users and pharmaceuticals. Prescribed pharmaceuticals involve experts as intermediaries, while OTCs are considered 'safe enough for self-use' (Farley 1995: 5). The aim to develop Carraguard as an OTC then implies and demands that users be or become prudent consumers, a prospect explored at length in chapter six. Moreover, in the current regulatory environment OTC and prescription drugs are categories subject to different but overlapping systems of regulation and of risk calculation. I limit the following discussion to the regulatory situation of Carraguard as an OTC product because of its particular relevance to my focus on prudentialism. Carraguard enables proximity between the new public health goals and individuals, and as I explore in chapter six, facilitates the extension of the new public health into global realms of health provision.

The US Population Council's website detailing the development of Carraguard sums up many of the issues involved in requisite testing and

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[29] Excipients are regulated as substances that are non-active but used in pharmaceutical products to perform a range of functions. Carrageenan is permitted for use in the preparation of topical lotions, in toothpaste, for tablets and in oral syrups. As with food, carrageenan is used for its functional properties.

regulation for an OTC product, not least the manner in which the GRAS status of Chondrus extract is deployed in relation to OTC pharmaceuticals:

> Carrageenan compounds are on the U.S. Food and Drug Administration's list of GRAS (generally recognized as safe) products for consumption and topical application[30]. This classification gives Carraguard a number of advantages, including the need for fewer standard preclinical tests for regulatory approval and a greater likelihood that a carrageenan-based microbicide, such as Carraguard, could be made widely and easily available (Population Council 2004a: no page).

The wording of the status of carrageenan in relation to GRAS is very specific – carrageenan *compounds* being on the list of FDA is not the same as carrageenan being on the list. Under no federal regulation is 'carrageenan' directly classified as GRAS. This concern with wording may be considered mere semantics: on the one hand Chondrus extract is, after all, carrageenan (following the redefinition of carrageenan as a regulated food additive) but not all carrageenan is extracted from species recognised as *Chondrus crispus*. On the other hand, a more interesting question to ask is how is the GRAS category usefully deployed and to what effects in the constitution of prudentialism? My reading is that because the safety of carrageenan as a regulated food additive is measured in relation to risk, GRAS is important to the development of OTC products because it signifies safety *without* a relationship to risk – thus reducing the burden and costs of proof. While there is clear value to the developers of new pharmaceuticals in the category GRAS, there may also be a consequence for prudent consumers if the GRAS category modifies perceptions of risk associated with these developments.

The example of OTC and GRAS demonstrates the liberating effect of uncertainty on the development of new products – safety *with no risk attached* is important to the *rapid* (ergo, profitable) development of new OTC products. Establishing safety through association with prior use is the

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[30]The wording of the GRAS status of carrageenan here differs from an earlier brochure developed by the Council in which it states 'The Population Council is required to seek FDA approval of the product as an active pharmaceutical ingredient even though it has the GRAS food-additive classification' As stated previously, as regulatory definitions stand, the statement that carrageenan is GRAS is incorrect.

simplest and most cost effective way of getting carrageenan to be listed as an 'Approved Pharmaceutical Ingredient' (API). In the pharmaceutical process, a product with GRAS status and recognised use as a pharmaceutical excipient, may advance through the process of approval more rapidly. Regulating Carraguard for OTC products provides one example of the ways in which not all categories used in regulation are based on systemic, predetective risk.

At the same time, the levels of uncertainty that are acceptable in such situations have limits. In the regulation of pharmacueticals, risk assessment occurs alongside another calculus of probability: effectiveness. For example, carrageenan is listed as having been used as an ingredient in OTC laxative and weight reduction products. Under the 1938 Federal Food Drug and Cosmetic Act the rules governing pharmaceuticals had been based solely on an assessment of safety. In 1966 those rules were modified to include consideration of effectiveness. A review of all 512 OTC drugs subsequently found that 75 of them lacked evidence of effectiveness (Farley 1995: 4). Under CFR 310.5453, carrageenan is still listed as an ingredient in OTC drugs (Appendix 2.3) but based on 'evidence currently available, there are inadequate data to establish general recognition of the safety *and effectiveness* of these ingredients for the specified uses' (Food and Drug Administration 2004); my emphasis. Proving effectiveness is a costly and lengthy process.

The addition of effectiveness to the regulatory environment for pharmaceuticals has had a chastening effect on the development of new pharmaceuticals. As detailed by a 'call to action' report emanating from the advocacy group, Global Campaign for Microbicides, there has been a distinct lack of interest from pharmaceutical companies in developing microbicides. 'Large pharmaceutical companies - the normal engines of product development - have been reluctant to invest in microbicides because of concerns about scientific uncertainty' (Heise 2002: 7). The report concludes that public health groups, non-profit entities and academic researchers are

crucial to the development of products such as Carraguard. Here then is another dimension to the effect of risk on carrageenan: *risk taking in the development of microbicides is not being borne by the state or free-market entrepreneurs, but by prudent entrepreneurs.* Uncertainty and risk can also limit the economic risk taking and *creative futures* capacity of the free market. In summary, uncertainty may also be understood as a category important to the developments within the new public health and prudentialism. In responding to health issues as pressing as HIV/AIDS, the onus of responsibility transfers away from the free market and state to the realm of regulated freedom.

Regulation is just one of the manifestations of risk that profoundly alter the environment in which carrageenan circulates. A move towards prudentialism does not suggest that other factors are not at work. Polyvalent discourses of risk and uncertainty modify the boundaries of prudentialism, paradoxically encouraging both risk aversion and risk taking. Moreover, factors of risk may not always be measured in relation to the calculation of risks in an epidemiological clinic *within a* population, rather I argue, they are also calculable in relation to risks *to* the body politic and to a politics of health as an issue of security. Protecting the body politic has implications for carrageenan because such concerns have partly determined the foods and pharmaceuticals in which carrageenan occurs.

A healthy body politic: war, dairy and children

The rise in use of carrageenan as an industrial additive is often associated with events surrounding the Second World War (Chopin 1998; MacFarlane 1961; McHugh 2003) and to the category of food circumscribed as dairy (Chapman, VJ 1980; Lewis, Stanley & Guist 1988; Neushul 1987). In this section I explore the overlapping concerns of risk and the body politic; the rise of dairy as a particular category of food with symbolic values in war and

with a specific relation to women and children; and the development of carrageenan as an industrial additive associated with all these concerns.

War can be treated as both 'a contagious disease of the body politic and an addictive drug with a unique capacity to temporarily restore political health' (George 2002: 163). War transforms spaces, it has the capacity to unify populations at the same time it threatens to undermine them. As a unified whole there is a sense that disease (and war) threaten not only individuals but the body politic, requiring strategies that also address the unified whole. 'The body is a model which can stand for any bounded system. Its boundaries can represent any boundaries that are threatened or precarious' (Douglas 1966: 115). Thus as Waldby (1999) has emphasised, whenever public health is invoked, it is this collective, composite body that is the focus of strategies of mitigation. However, as the example of the Iraq war demonstrated in the preface to this thesis, calculations and strategies of mitigation occur even when the threats to the body politic are based on (mis) calculations of risk.

Franklin D. Roosevelt began his famous 1937 Quarantine speech in Chicago with the observation that 'war is a contagion'. Likening the expanding militarism of Germany, Italy and Japan to an epidemic, Roosevelt responded to war with the medical equivalent - to quarantine the US against the expanding disease,

> AND MARK THIS WELL: When an epidemic of physical disease starts to spread, the community approves and joins in a quarantine of the patients in order to protect the health of the community against the spread of the disease (quoted in George 2002: 163).

The common analogy that is made between disease and war refers, as George (2002) suggests, to the likening of the health of nation to the health of the body. It is a trope for what war does to the body politic, but also for its containment.

Before 1939, the Japanese had been the principal worldwide producers of agar. Indeed there is, arguably, a direct association between Japan and seaweed/hydrocolloids since 'seaweed as a source of hydrocolloids dates back to 1658, when the gelling properties of agar, extracted with hot water from a red seaweed, were first discovered in Japan' (McHugh 2003: 2). Agar had numerous uses in foods, bacteriological applications and industry, and had a well-developed international market. According to Chapman, because of the importance of bacteriological work during the war, 'every country conserved its stocks with great care and research was immediately undertaken in order to provide agar from local seaweeds' (Chapman, VJ 1970: 175). Geopolitical concerns, and a narrative of self-sufficiency during wartime extended to seaweed extracts: 'Even if the cost of local production surpassed the price of imported material, it would be important as a measure of national security to develop all domestic resources' (Chapman, VJ 1950: 100). Circumstances created a domestic demand for raw materials, particularly between 1942 and 1947 when the US federal government issued a 'freezing order' on Japanese agar. Domestic demand for raw material led to experimentation with alternative seaweed-derived substances. In this view, indigenous seaweed was not simply an alternative to imported seaweed; its production was an issue of domestic security, thereby protecting the US body politic from contagion and shoring up the boundaries of state.

Thus the issue of security extends to concerns internal to nations, including the US, and has direct implications for the seaweed industry and related hydrocolloids. For example, at the time of the First World War, there was an acute shortage of acetone, needed in the manufacture of cordite that was a propellant used in most British ammunitions. In California, the Hercules Powder Company developed a method of producing acetone by fermenting kelp and as a result the Californian seaweed industry became the largest kelp harvesting industry in the world at that time (Neushul 1987: 2). The Kelco Company, established in San Diego in 1927, built on the methods developed by Hercules for the harvesting and transport of kelp and became the first US

company to successfully extract the hydrocolloid, algin, from seaweed for post war uses.

Dairy in war

One of the first major markets for carrageenan was in fluid milk: 'the first real application for carrageenan was, in the modern world, to preserve the homogenisation of evaporated milk' (Bixler, 2002, pers.comm., 16 June). Very small amounts of carrageenan added to evaporated milk prevented separation of fat and whey in the milk and increased shelf life and transportability.

Consider the following extract from a history of the Carnation Company, a division of the Nestle Company:

> American mothers found it a perfect blend of convenience and sound nutrition for growing children. Cans of evaporated milk even saw action during WWI, WWII and the Korean War as American soldiers carried them into battle. The inhospitable conditions in which these brave men and women often found themselves made a versatile food product like CARNATION Evaporated Milk standard issue (Nestle Company: no page).

The overlay of motherhood, convenience, nutrition, war and children in the Nestle history of evaporated milk acts as a metaphor for the constitution of the US body politic. The use of carrageenan within dairy products was the material manifestation of particular ideas about risk and about culture and nationhood. The functional properties of carrageenan were used for modifications through which American ideas about superior foods and the constitution of perfect social bodies became possible.

Milk had been used as an infant food from the 1840s in small amounts, but in the later part of the nineteenth century milk was increasingly viewed as a 'miracle food' and, as such, began to be developed as a commodity. In keeping with developments in public health, the particular role of dairy as a nutritional category owes much to scientific discovery and promotion of milk as a source of newly discovered vitamins. Milk's miracle status as food was

reinforced especially, suggests Levenstein, for a particular understanding of the vitamins necessary for growing children (Levenstein 1988: 150). Moreover, DuPuis (2002) traces the miracle status of milk to earlier developments that are more cultural statements of a national subject position. For example, she suggests that at different times, milk represented the urban elites' vision for a perfect society in its whiteness, its appeal to nature and the countryside, and in the transformation of the socially constructed relationship between mother, child and nation. In this view, milk is a technology of nationalism with healthy milk-fed children the *window to the future* (Stratford 1996, 1998b).

Thus children and war are topics of particular importance to the rise of dairy products as a concern of an emergent new public health movement, a symbol of social and economic advancement, and a significant new market for hydrocolloids including carrageenan.

Between 1929 and 1936 Kelco personnel conducted research to refine algin to a point that it could be sold as a food stabiliser. In 1935 an employee of the Foremost Dairy Company suggested to Kelco that algin could be used in ice-cream (Neushul 1987). Two years later Kelco began to produce a product named 'Cocoloid' to suspend cocoa in chocolate milk. Between 1935 and 1939 US consumption of algin for milk and ice-cream accounted for half the total output of algin in the US (Chapman, VJ 1970; Neushul 1987). The extraction process developed by Krim-ko derived a gel from *Chondrus crispus* seaweed resulting in a commercial product whose name reflected a substance with broader recognition in the existing market; it was known as *Carragar* (a neologism of carrageenan and agar) (Chapman, VJ 1950). Thus as Lewis et al. (1988: 219) summarises, 'the modern carrageenan industry dates from the 1940s, receiving its impetus from the dairy industry'.

The fervour for milk reform was fuelled by dramatic shifts in a mentality about health related to the increased role of expertise in determining the

order of nutrition (DuPuis 2002; Levenstein 1988) and by the developing understanding that health risks were preventable through the knowledge gained in the 'epidemiological clinic' (Castel 1991; Nettleton, Bunton & Burrows 1995). In this view, nutritional information and scientific principles determining what Americans *should* eat (and Levenstein notes, sometimes without much evidence) shaped understanding and effort to reform food provision towards human health for all.

Thus it is possible to reconstitute the discussion of the rise of dairy both as a phenomenon of a body politic at risk, and as a factor influenced by the turn to a new understanding of public health and risk. In relation to carrageenan, the constitution of dairy created the opening for its development as a substance to be added to fluid milk products. Because fluid milk was particularly sensitive to contamination and impurity (as opposed to solid milk products such as cheese for example), perfecting its provision for nutrition required significant scientific, technological and organisational mastery over the conditions of its production and transportation. It was paradoxical that fluid milk should be valued for its natural simplicity, 'despite its fresh, untouched appearance, fluid milk is an industrial food' (DuPuis 2002: 160).

Milk is a potent symbolic food that, over time, has been incorporated into different discourses of public health, ranging from those associated with discourses of nutrition to those related to the protection and maintenance of the body politic. Moreover, protecting the body politic from outside contagion has its counterpart in contemporary threats of external origin such as HIV/AIDS in developing countries (chapter six).

Concluding remarks

In this chapter, I have traced a variety of events related to carrageenan and regulation in the twentieth century food and pharmaceutical industries to

developing ideas about risk, health and the well-being of populations. It is clear from this exploration however, that risk is only one mode of calculative rationality that provides a specific context through which to examine the constitution of carrageenan. Moreover, prudent consumers not only encounter risk rendered visible through intermediaries such as food labels, but also via entrepreneurship and uncertainty.

As O'Malley (1996) points out, risk has a certain polyvalence - risks can have different kinds of meanings in different contexts, as well as other modes of rationality that have their own effects on carrageenan. Risks may be calculated differently when the permable boundaries of state are modified by threats to the body politic. Uncertainty, though only explored briefly here, has its effects as well, albeit in this example, bypassing some of the more demanding aspects of risk assessment rather than modifying them. For carrageenan, risk is one component of a diverse set of governmental rationalities and assemblages of technologies which has material and semiotic effects in the relationship between individuals and their food and pharmaceutical 'choices'. I have suggested that understandings of risk (and to a lesser extent uncertainty) have produced particular ways of describing, circumscribing and manufacturing carrageenan. In the turn to neo-liberal forms of risk prevention and minimising uncertainties there is a paradox: preventive strategies in relation to health that render substances visible may increase (the sense of) health risk. In the quest for safety, labelling carrageenan as a regulated food additive involves 'postulating a risk' (Castel 1991) that prudent citizens may then combat. For carrageenan, the transition in regulation from GRAS to regulated food additive involved a fundamental reconstitution of the notion of risk, such that risk has come to be associated with carrageenan *whether or not there was any danger*. Furthermore, prevention is a mode of rationality that is more than just constituted by expert knowledge through individuals, self-regulating subjects *actively constitute* prevention through entrepreneurship. The developing uses of carrageenan

must then be understood to be effected by the political actions of prudent consumers; individuals are not merely the recipients of these changes.

To this point, I have described carrageenan as fairly unproblematic. Although there are variations on how this seemingly innocuous white powder derivative from seaweed is constituted in different contexts it is, in all the cases mentioned here, a referent with a level of durability: it is *carrageenan*. Moreover in the domain of communication between prudent consumers and the regulatory frameworks that reveal them, carrageenan appears relatively uncontested as safe. Choosing to consume carrageenan in this context is a matter of choosing also to assess a substance that has been identified, revealed and promoted. However in the following chapter I consider how knowledge of carrageenan is rather more complex; and how contested meanings have implications for prudentialism.

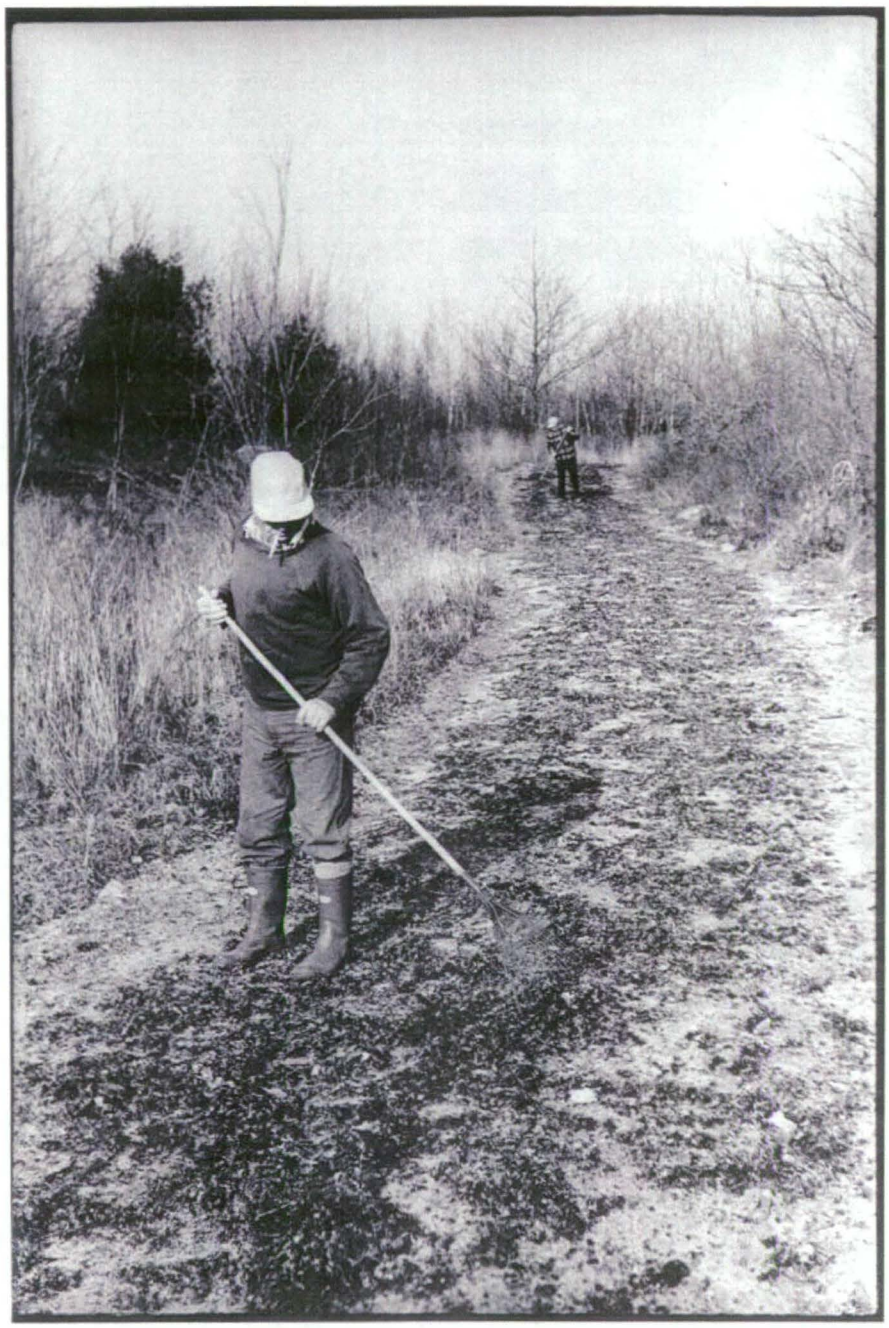

Illustration: Drying Irish moss: seaweed harvester Maine, US, 1973.
Source: Courtesy Salt Institute for Documentary Photography, Portland, Maine, US

Chapter 3

Contested carrageenans and the limits of choice

> ...it is precisely in the politics and epistemology of partial perspectives that the possibility of sustained, rational, objective enquiry rests (Haraway 1991: 287).

Understanding how a biopolitics of risk manifests requires attention to the processes, institutions, discourses and technologies through which the program of government is enabled. In the previous chapter I showed how the significance of food labels is elevated beyond simply revealing the ingredients; as a result of reading labels, prudent consumers are aligned with a contemporary program of governing the *health* of populations. The referent carrageenan becomes an 'indirect mechanism' of contemporary neo-liberal governance of health (Brown, T 2000: 1275). Carrageenan, then, is represented on the label such that any individual is enabled, for reasons of health, to choose 'rationally' whether they wish to consume the products they have secured.

However, in the unravelling of events in which chemists, entrepreneurs, harvesters, regulators, food labels, consumers and others are implicated, hundreds of carrageenan identities circulate. Carrageenan may be referred to as Irish moss extract, Chondrus extract, Danish agar, Furcellaran, Gelose, Hypnean, Carraghenate, Seaweed gum, Carrageenin, Iota, Lambda, Kappa, Lamda-kappa, Kappa-lamda, Kappa-2, Theta, Pi, Xi, Mu, E407, E407a, G4S-DA, G4S-DA2, Philippines Natural Grade, Processed Eucheuma seaweed, refined carrageenan, semi-refined carrageenan, blended carrageenan, degraded carrageenan, poligeenan, Gelcarin, Viscarin, carrageen moss extract - among others. The carrageenan-on-labels is a visible referent of the program of governance that is, as Haraway (1988) suggests, reductionist; it is the *denouement* of science for public consumption, while alongside it exist multiple, and in some instances contested, carrageen*ans* (including, but not

limited to, the examples listed above). Yet carrageen*ans* may be of particular relevance, and be visible, in different spaces such that singularity and plurality are not necessarily in conflict.

Different 'bodies of learning' and institutions share knowledge (*savoir*) amongst members that unite them as an epistemic community (Foucault 1989). Such communities have common ways of seeing particular problems or issues that together mould authoritative discourse and social practice. Liberal rule involves a proliferation of expertise, authorities and institutions through which carrageenan, risk, uncertainty and subjects may align. Rather than one form of expert knowledge producing carrageenan, there are many epistemic communities that both render carrageenan knowable and calculable, and produce alternative and *sometimes* conflicting knowledge about it. In the contest over some identities of carrageenan between and amongst different epistemic communities, different carrageen*ans* periodically unsettle what carrageenan-on-labels refers to or comes to be attached to. Such identities enmesh material *and* metaphorical difference - they describe both differentiations in the material constitution of carrageenan and implicate different epistemic communities including chemists, phycologists, marketers, health professionals and other technical and trade expert groupings. Moreover, these communities are not (necessarily) bound by the geographies of space. The globalisation of meanings attached to carrageenan through the flows of knowledge within epistemic communities creates de-territorialised pools of information on which to draw.

In what follows, I consider how carrageenan is constituted amongst two epistemic communities of relevance to the carrageenan industry - chemistry and trade. My aim is not to provide any comprehensive list of partial perspectives of carrageenan, but to demonstrate that they exist. I then explore how partial and contested carrageen*ans* are reconfigured in the food regulatory environment and examine the *virtual impossibility* of containing the (now visible) risks associated with them.

In the process I consider the contingency of scientific knowledge that reveals carrageenan, and ask *how* (and if) prudent consumers are enabled to make so-called rational choice. First, I explore the politics and problematics of prudentialism where there is an epistemology of singularity (or reductionism) in governing risk at a distance. Food label descriptions involve categorising carrageenan to maintain the categories as ontologically stable. In order for labels to *work* as categories of risk calculation, carrageenan may not exist as a plurality of meanings (at least not for the production of label-reading prudent consumers). I then examine how different identities, chemical formulations and processes produce carrageenan as a plurality of carrageen*ans* but attempt to reinscribe singular carrageenan where risk and public consumption is concerned (to circumscribe the plurality of meanings in the public sphere). Finally I build on social studies of science and technology in viewing the constitution of knowledge (carrageenan-on-labels) as an exercise of power (Cruikshank 1994; Foucault 1984; Haraway 1988). Three issues emerge in this task, first (how) is 'carrageenan' less stable as a category than might be expected by the expert renderings on food labels; second (how) does the lack of spatial fixity of risk modify efforts to stabilise carrageenan; and third (how) do efforts to categorise carrageenan and contain risk problematise prudentialism, raising questions about the emancipatory extent of these new territories of government.

Chemically simulating carrageenan

For many years Chondrus extract was a black box technology such that properties of gelling, stabilising and thickening were known but there was limited understanding of the constituents of carrageenan or its means of operation. Over time, knowledge of carrageenan has been developed amongst different epistemic communities, such that it now refers to a range of substances with different properties. The expansion of knowledge about carrageenan has led to a situation in which, as one industry expert described

it, there are 'no barriers ... in the manufacturing of carrageenan products, carrageenan product lines' (Foss, 2002, pers.comm., 20 June). Chemists, polymer scientists[31], engineers, laboratories, laboratory technologies and so on, make carrageen*ans* visible and knowable via different processes, technologies and modes of analysis. In short, they are heterogeneous and simulated as well as real.

One chemistry book circumscribes carrageenan as a 'family of gel-forming, viscosifying polysaccharides that are obtained commercially by extraction of certain species of red seaweeds' (van de Velde & De Ruiter 2002: 247). A chemical definition has *reach* in scientific circles: it is authoritative, and well maintained in chemistry books and, through the connections of scientists, of codes and regulations. Chemical definitions of carrageen*ans*, however, are intricate tapestries that take meanings from the classification of idealised structures and the technologies that produce or reveal them. Amongst others, Latour has emphasised how systems of classification interact with so-called natural entities (such as a seaweed extract) to produce hybrid forms that incorporate the 'natural' product and 'social' form of measurement (Bowker & Star 1999; Latour 1993; Murdoch & Lowe 2003). According to Latour it should not be assumed that the science and actors such as carrageenan are dissoluble. Rather he suggests, the science that classifies and divides actors such as carrageenan is part of the heterogeneous matrix *of* carrageenan (Latour 1997, 2002b). Thus rather than a simple act of identifying divisions within a complex substance like carrageenan, the act of division guarantees the creation of *hybrid forms*. What is more, 'the interaction between classificatory division and heterogeneous relation ensures that classificatory schemes continually struggle to keep complicating entities at bay' (Murdoch & Lowe 2003: 319). Consequently, it would be expected that what is understood as a process of refinement to the science that renders carrageen*ans* knowable, rather than assuaging all conflict over definitions of

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[31] Polymer science is concerned with the chemistry and physics of substances composed of 'chains' of molecules (or monomers).

carrageenan, requires continual maintenance and protection from destabilising forces.

One source of 'complicating entities' are earlier definitions of carrageenan that exist within already established heterogeneous networks some of which are particularly resistant to change. At interview with me, Dimitri Stancioff expressed his frustration at working for a carrageenan producing company in the regulatory environment of the FDA, 'Nomenclature is difficult, especially when you are working with people in government. They think once you've said this is such and such, and you change it [pause] well it's impossible' (Stancioff, 2002, pers.comm., 14 June). Perhaps impossible is too strong a word; however it is clear that, in the US at least, the nomenclature for carrageenan is durable within the regulatory environment in part because of the length and complexity of interactions in which it is enmeshed. In line with theories from within ANT I have emphasised that the multiple definitions and ways of calculating and measuring carrageen*ans* are themselves part of a productive process of constituting carrageenan. The distinction that is assumed between carrageenan and the act of describing or delimiting what carrageenan is (and all its attendant technologies) is artifice; multiple hybrid carrageen*ans* circulate that are not independent of the modes and systems of classification. Moreover, the stability of hybrid forms can be seen to be tentative when displaced or replaced in different contexts, or when constituted by different forms of representation - a discussion of which now follows.

While ANT has been slower to incorporate discussions of the importance of visual images and representations, carrageenan's heterogeneous networks may also include, or in some views be displaced by, visual representations of carrageenan. Baudrillard (1988; 1994) suggests that in the scientific quest to know, representations begin to circulate in ways not simply divorced from the original, but no longer with equivalence to an original:

> the logical evolution of a science is to distance itself increasingly from its object, until it dispenses with it entirely: Its autonomy is only rendered even more fantastic – it attains its pure form (Baudrillard, 1988: 7).

At the molecular level of description, carrageenan does not *in fact* exist, but rather is represented as the basic structure of a network upon which other elements hang like various-length necklaces with combinations of pendants. The metaphors used in chemo-taxonomy for the basic structures of the 'generic name' or 'family of carrageenans' are made up of a 'backbone', and represent an 'ideal structure' (van de Velde & De Ruiter 2002; van de VeldeKnutsen et al. 2002).

The *pure* form of carrageenan is a series of idealised structures whose representation uses number and letter codes, and two- or three -dimensional schematic diagrams (Figure 3.1). Here carrageenan is represented by chemical notations detailing a range of ideal types with particular chemical characteristics, based on visual models in different configurations of space *plane, spatial, three-dimensional and computer models* (van de Velde & De Ruiter 2002). According to Baudrillard, simulations 'feign ... what one doesn't have' (Baudrillard 1994: 2). However ANT views the visual practices of science in social constructionist terms. Simulations reflect how the 'human hand' and visual image are bound together in heterogeneous networks. The problem, suggests Latour, is that there is an expectation about the rational disembodied nature of scientific objectivity. 'Objectivity is supposed to be acheiropoiete, not made by human hand. If you show the hand at work in the human fabric of science, you are accused of sullying the sanctity of objectivity, of ruining its transcendence, of forbidding any claim to truth, of putting to the torch the only source of enlightenment we may have' (Latour 2002b: no page). For theorists of ANT, the material is what holds society together, knowledge of carrageenan cannot be separated from the technologies of knowledge and systems that produced it.

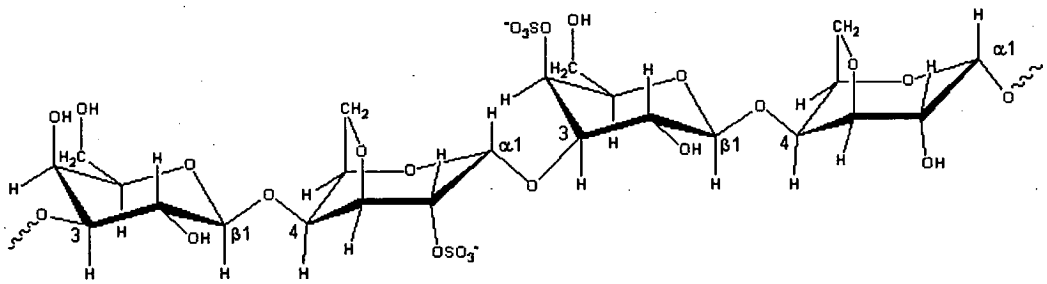

Figure 3.1 Carrageenan: a schematic representation of an 'ideal' structure

Baudrillard's theory of simulation suggests that society *as a whole* is increasingly organised through models and codes. The distinction between the materiality of carrageenan and the model of ideal carrageenan becomes blurred such that the model becomes the basis of the real; or in Baudrillard's terminology, carrageenan enters the realm of the *hyper-real*. In this view, it would be expected that the ideal types represented by chemical formulae begin to circulate as agents of what carrageenan is or comes to be.

> The hyperreal for Baudrillard is a condition whereby the models replace the real, as exemplified in such phenomena as the ideal home in women's or lifestyle magazines, ideal sex as portrayed in sex manuals or relationship books, ideal fashion as exemplified in ads or fashion shows, ideal computer skills as set forth in computer manuals, and so on. In these cases, the model becomes a determinant of the real, and the boundary between hyperreality and everyday life is erased (Best & Kellner 1991: 119).

In this view carrageenan circulates as an ideal type with various chemical identities that may be measured using a variety of different machines and calculations. Material technologies such as nuclear magnetic resonance spectroscopy machines (NMR) reveal carrageenan in relation to ideal forms, from where they are mobilised within heterogeneous networks:

> Nowadays NMR spectroscopy (both ^{1}H- and ^{13}C-NMR) is one of the standard tools for the determination of the chemical structure of carrageenan samples. The NMR spectroscopy of carrageenans is used in industry and for research with *different approaches corresponding to different ultimate goals or interests* (van de VeldeKnutsen et al. 2002: 74).

The technologies of NMR, scientists, laboratories and textual renderings of 'fact' are some of the factors that feed into a network that constitutes

different carrageen*ans*. Beyond the rendering of NMR machines, there is no singular carrageenan, but rather blends of carrageen*ans*. The variable extracts of seaweed complicate what is circumscribed as carrageenan, seaweed extracts vary from sample to sample, location to location, source to source, and may all have a different composition of elements. Moreover, 'even small variations in composition can have an enormous influence on their functional properties. For instance carrageenans containing irregularities (around 3%) 'give much better gelling properties in dessert applications' (Rollema & van de Velde 2003: 1). Carrageenan(s) is, in this case, the model upon which irregularities are positioned as deviations from the real. Chemical laboratories and NMR spectroscopy (or other modes of chemical analysis) are key to how carrageenan is mobilised within chemo-taxonomies; and within industry accounts of functionality. One such account follows.

In March 2002, one of FMC Biopolymer's employees, Gordan Guist, guided me on a 2.5 hour tour of a carrageenan-processing factory in Rockland, Maine. Unstructured conversations with Guist and one other employee encountered during the tour of factory, were audio-taped and transcribed. The data were analysed to ascertain carrageenan's visibility through the various stages and processes in the factory. Extracts from the tour commentary provide useful examples of the processes involved in both rendering carrageenan visible and knowable, and in constituting carrageenan according to the spaces in which it exists, and the desires or ambitions of those directing its development.

As the seaweed enters the factory it is a heterogeneous collection of spatialised material and non-material factors: carrageenan does not arrive in the factory in a *pure* form. Depending on where it is grown, how it is harvested and how any particular harvesting community treats it, seaweed arrives in the factory as an aggregate of social and material factors and carrageen*ans*. As we enter one of the testing rooms, Gordon Guist impresses

on me the point that knowing the 'raw material' is knowing a composition of elements:

> Gordan: We have raw materials testing laboratory with our wizard of weed, Walter.
>
> Duika (to Walter): What are you testing for?
>
> Walter: We test for moisture, sand, salt. On each weed sample we give it a log number, what it is, supplier, date it came in, process and then we do a phenol assay - to see what it is supposed to be ... [then test for] moisture, sand and salt.

Testing utilises categories of expected seaweed properties based in part on records of place, time, method and batch, and models and techniques of measurement, to determine specific properties of the seaweed. The geographic account of the seaweed provides background data upon which to measure its material significance. For example, moisture varies according to how much and where it has been dried, and that can occur at various stages from harvesting to sale. Sand, salt and water measurements contribute to the anticipation of carrageenan content and the relative value of the seaweed. Various compositions of sandy, salty, moist seaweed result in differential returns. After the sand, salt and moisture tests, the washed sample is inspected for seaweed that is not carrageenan-bearing and then the *actual* carrageenan is extracted from it. At this point of the scientific rendering of *actual* carrageenan, any knowledge of its functional properties is undeveloped. Knowing carrageenan in the factory involves recognising its unique, if predictable, functional properties. Guist explains that samples are then tested for particular qualities:

> Gordon: For this one we'll do a viscosity, a water gel, we'll get a penetration and a dessert gel and might do - like cottonii, we might do a milk gel.

Tests vary on the basis of seaweed type; expectations about the particular functional properties for 'cottonii' seaweed varying from those of, say, *Chondrus crispus*. But further, the enrolment of use factors contributes to the

sorts of tests, as well as chemical modifications, that can result in different functional properties. In the processing room, Guist explains how a process of heating and the addition of an alkali break down the seaweed. He continues,

> so at some point we are going to pump this heated solution through inline mills; this just chops up the seaweed and aids in the breakdown and getting the carrageenan into solution. Then we pump it into holding tanks. We allow the seaweed to sit for a period of time, depending on the application. If it is a gelling application it may require 40 hours because it is a chemical modification [that] occurs; by knocking off sulfates, an anhydrogalactose ring is formed and this gives carrageenan its gel potential. Now if you are looking for a lambda carrageenan that is non-gelling you don't modify any at all, so we hold it for a much shorter period of time in the tank.

Different processing techniques can modify the carrageen*ans* that are produced. As the process progresses and the knowledge of carrageenan is broken down into constituent parts, *emergent* carrageenan is considered in terms of the particular qualities of the batches of carrageen*ans*. The constituent properties of different seaweeds, their techniques of analysis, and the desired uses of them, are modified using knowledge of time and chemical properties. Additional chemicals produce various blends of carrageen*ans* with different functional properties. Processing seaweeds for carrageenan may or may not involve chemical modification and can be achieved by different methods. The exact details of methods of production do not circulate in the public sphere, but general descriptions of the approaches can be accessed in numerous publications (Bixler 1994; McHugh 2003; van de Velde & De Ruiter 2002).

In chemical terms, carrageenan is a model that stands for numerous chemical combinations in a range of substances with recognisable properties that may be modified for particular uses. Within industry, carrageenan circulates as a model upon which to know (and manufacture) a range of functional properties. Carrageenan is revealed differently within epistemic communities, but also across them as the following discussion of commercial naming demonstrates.

Industrial naming: terms of exclusion

Greek terms - principally iota, lambda and kappa - are used in industry to describe particular gelling, emulsifying and stabilising properties of ideal type carrageenans. Despite the more exacting chemical number and letter codes for carrageenan developed over the past 30 years, older chemical definitions – Greek terms - have continued to circulate in both scientific and trade circles, and are viewed within industry as names 'of the trade'. The following selection, from an Food and Agriculture Organisation (FAO) introduction to hydrocolloids by McHugh (2003) in *A guide to the seaweed industry*, is typical of accounts in which 'lambda, kappa and iota' are utilised to associate functional properties with uses and origins:

Table 3.1 Commercial uses of carrageenan

The carrageenans of commercial interest are called iota, kappa and lambda. Their uses are related to their ability to form thick solution or gels, and they vary as follows.	
Iota	Elastic gels formed with calcium salts Clear gel with no bleeding of liquid (no syneresis) Gel is freeze/thaw stable
Kappa	Strong, rigid gel, formed with potassium salts Brittle gel forms with calcium salts Slightly opaque gel, becomes clear with sugar addition. Some synaeresis
Lambda	No gel formation, forms high viscosity solutions

The carrageenan composition in red seaweeds differs from one species to another	
Chondrus crispus	mixture of kappa and lambda
Kappaphycus alvarezii	mainly kappa
Eucheuma denticulatum	mainly iota
Gigartina skottsbergii	mainly kappa, some lambda
Sarcothalia crispata	mixture of kappa and lambda

Source: McHugh 2003: 61.

According to one industry representative, the terminology is still used because 'it is a question of technical support' (Foss, 2002, pers.comm., 20 June). Naming carrageenans requires the incorporation of sophisticated technologies. Furthermore, the continued mapping of lambda, kappa and iota to particular seaweed species and particular functional properties achieves a variety of purposes; it may simplify knowledge for buyers on one hand but, on the other, such simplifications also serve to obfuscate, exclude

and produce economic value. The carrageenans 'of commercial interest' have transactional value among processors and food, pharmaceutical and industrial manufacturers. In simplifying terminology, the sophistication of chemical analyses comes to be located with key players (and places) in industry. Concomitantly, processing companies benefit from the ability to produce product lines of carrageenan as always *partially* revealed. By naming a product lambda with customised functional properties for particular uses, a level of invisibility has economic advantages - it is not reproducible without sophisticated and expensive technologies and can be sold as a more expensive speciality product.

The uses of Greek terms connote associations that the newer chemical taxonomies do not. As Bowker and Star (1999: 5) remark, 'each standard and each category valorises some point of view and silences another. This is not inherently a bad thing - indeed it is inescapable. But it *is* an ethical choice and as such it is dangerous, not bad, but dangerous.' The valorisation of functional uses over chemical formulation creates a situation in which the carrageenans of commerce circulate in the public sphere of markets and industry as a delimited range of types. Carrageenans of commerce are recognised by types.

Paradoxically, scientific advancements in analytical chemistry and the developments of more sensitive technologies render carrageenans more and more visible and minutely differentiated. Meanwhile, the networks in which carrageenan is enrolled in trade are constituted as a specific range of carrageenans, and on food labels as carrageenan, E407 and E407a. The significance of these views is that where 'carrageenan' appears on food labels, to carrageenan processors and chemists it is a (relatively) undifferentiated, sign value of many carrageen*ans*; without these knowledges carrageenan involves a different set of calculations. Thus rather than one product, knowledge *and production* of carrageenan varies between and within epistemic communities such that *carrageenan is internally and*

exogenously a network. The social and spatial reach of carrageenan is immense, but is also subtle and highly differentiated.

While carrageenan describes a network of factors between epistemic communities the *term* carrageenan may be likened to what Bowker and Star (1999: 297) term a 'boundary object'. Boundary objects arise over time from durable co-operation among epistemic communities. They are 'working arrangements that resolve anomalies of naturalization without imposing a naturalization of categories from one community or from an outside source of standardization' (Bowker & Star 1999: 297). In chemical terminology, on food labels and industry parlance, carrageenan is a descriptor that resolves the anomalies of difference between communities and enables communication between them. Carrageenan has reach through technologies of communication. However, the calculation and description of carrageenan is only one factor of the network through which it is revealed, as carrageenan may become linked to other concerns such as those of risk and health.

Releasing the genie: degrading carrageenan

> Carrageenan is the most thoroughly studied polysaccharide that has ever come down the pipe (Bixler, 2002, pers.comm., 16 June).

In a geopolitics of singularity, risking the consumption of carrageenan is an either/or proposition that disallows the possibility of partial perspectives. However since the 1970s, a substance described as *degraded* carrageenan has emerged around which questions of carrageenan safety *as a whole* circulate. In what follows I provide some background to the development of degraded carrageenan and the subsequent health scares concerning it. The development and surveillance of degraded carrageenan provide further insights into the changing modalities and rationalities underlying the new public health and risk calculations. Moreover, the status of carrageenan as a boundary object is profoundly problematised by degraded carrageenan, raising important questions about the limits of prudentialism.

I asked Harris Bixler why carrageenan is so well studied:

> Ah ... because it goes back - now there's some more history for you. In the early 1960s Glaxo - that is now GlaxoSmithKline Beecham (at that time it was a separate pharmaceutical company in England), had developed with a French associated company a product called *Ebimar*, which was carrageenan that helped in the curing of peptic ulcers - well I say cure, but whether it was a palliative or cure we don't know. But it is an anti-histamine. So they knew that if they could get people to eat quantities of carrageenan it would be helpful. If you try to get somebody to eat high molecular weight carrageenan it would gag a maggot - I mean its really slimy stuff. So Glaxo scientists came up with this idea - well we'll degrade it. We'll chop up like spaghetti and we'll make 10% solutions and you can drink it (2002, pers.comm., 16 June).

Through a process known as degradation with acid (or depolymerisation), the chemical structure of carrageenan was modified along with its gelling qualities. Degraded carrageenan was developed in the 1950s as a powder that could be mixed with a liquid without forming too strong a gel in order that a larger dose of carrageenan could be administered. Stancioff explained the development of degraded carrageenan as follows:

> What we wanted to do was basically take the piece of string and cut it, that was the idea - but what happened was that some of the string was being destroyed (Stancioff, 2002, pers.comm., 14 June).

In Stancioff's analogy, the idea that the string could be 'cut' as opposed to 'destroyed' suggests degraded carrageenan did not meet the chemical typology of an ideal type carrageenan. The analogy of a string usefully describes the chemical understanding of carrageenan as a polymer chain[32]; that is, repeating units of similar chemical structures in a string or chain. Continuing the analogy, the length of the string not only modifies the gelling quality of the carrageenan, but also determines molecular weight, which becomes 'lighter' if cut - although different ideal type carrageenan(s) are also understood to vary in molecular weight. In this view, degraded carrageenan refers simultaneously to a literal chemical process to reduce the complexity

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32 A polymer is a substance with a molecular structure built of a number of repeating units of molecule(s) (monomers) bonded together. In the case of carrageenan or other biopolymers, these units are understood to bond together in a *chain* of repeating lengths.

and the integrity of the structure of an idealised carrageenan molecule, and metaphorically to a process through which the meaning of carrageenan is reduced or debased. With a shortened polymer chain (in chemical terms), a reduced viscosity (in functional terms), and a positive association with medical uses for peptic ulcer, the degraded form of carrageenan was named *Ebimar* and sold over the counter in France (Informatics Inc. 1972; JECFA 1974) among other pharmaceutical applications (Cohen, S & Ito 2002).

In the late 1960s, Marcus and Watt, two researchers working under contract to the developers of *Ebimar* were employed to undertake research to establish the mechanism through which degraded carrageenan worked. During animal experimentation with both degraded and undegraded or native carrageenan, Marcus and Watt (1969) discovered that, at certain doses, both could produce ulcerations in the caecum of the guinea pig, but ulcerations were more severe with the degraded form[33]. They concluded the 'significance of our results in relation to human ulcerative colitis is at present only speculative and must await more comprehensive investigation' (Marcus & Watt 1969: 188S). In 1969, carrageenan use was already widespread and as Marcus and Watt reported, at the time of their publication there had been 'no reports of adverse effects' associated with carrageenan usage (Marcus & Watt 1969: 187S). As the results of Marcus and Watt's investigation were speculative, any action to modify its use in the general population would fall into the logic of preventing risk through biopolitical interventions in public health.

One effect of the research of Marcus and Watt was an increased surveillance and risk profiling of carrageenan. Moreover, increasingly issues of safety became an international concern given the global reach of the carrageenan

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[33] In contemporary scientific experiments, degraded carrageenan is widely used in medical testing procedures for conditions of inflammation. At high doses, both the so-called native and degraded forms of carrageenan produce lesions under certain conditions and in certain species of animals. Degraded carrageenan is used widely in laboratory experiments to produce a standard 'rat paw oedema model' for testing anti-inflammatory drugs (see for example: Winter CA, Risley EA and Nuss GW (1962) Carrageenin induced oedema in hind paw of the rat as assay for anti-inflammatory drugs. *Experimental Biology and Medicine*, vol. 111, pp.544-547).

industry. 'Speculating a risk' required a response. Industry members conducted further studies involving other kinds of animals that 'had to be done to stave off the claims that were brought up by Watt and Marcus' (Bixler, 2002, pers.comm., 16 June). As detailed in toxicological reviews of carrageenan, since 1969 scientific assessments of carrageenan have included short-term and long-term generational studies involving different dosages of degraded and non-degraded forms, and various animal studies including rats, mice, rabbits, resus monkeys, squirrel monkeys, pigs, gerbils, baboons, hamsters, ferrets, chick embryos and dogs (Cohen, S & Ito 2002; Greig 1999; JECFA 1974, 2001; Tobacman 2001). Despite the increased attention to carrageenan, in no regulatory environment has it been recognised or reported to produce adverse effects in humans sufficient to warrant it be discontinued for use. The most recent review of carrageenan emanating from the JEFCA for example, maintains the status of carrageenan as a safe additive, with an Acceptable Daily Intake (ADI) 'not specified' (JECFA 2001). However, restrictions on the use of carrageenan were enforced - but not universally, a topic taken up momentarily.

Before considering the modifications to food regulation that followed various 'risky' revelations about degraded and/or low molecular weight carrageenan, it is worth considering the effect of speculations and obliged responses. Without commenting on the substance of the many reports on carrageenan since 1969, the timing of their emergence supports an argument that the proliferation of studies were initiated by suspicion, consistent with a biopolitics of risk. Furthermore, the chemical industry *in general* had been shaken by a series of high profile controversies. Two cases in particular are widely viewed to have had a major impact on the public perception of risk associated with the chemical industry. In 1961 Thalidomide was withdrawn from the market following the revelation of links to foetal abnormalities. In 1962 Rachel Carson published *Silent Spring*, drawing public attention to the harmful effects of pesticides such as DDT (Heaton 1994; Smith 2001). Carson's book was a particularly potent factor in the formation of

environmental movements around the world and in challenges to the authority and adversarial approach of 'man's' scientific dominion over nature[34]. Nerlich's study of metaphor in *Silent Spring* demonstrates that the rhetorical effect of the book is to constitute a dualism between the artificial/unnatural and natural/environment. Using the title to exemplify the dualism, Nerlich suggests '*silence* evokes death, the end of nature, the unnatural and artificial, emptiness and sterility, whereas *spring* is usually associated in western culture with birds, singing, new beginnings, life, unspoiled nature, and wilderness' (Nerlich 2003: 118). *Silent Spring* has been the topic of much academic scholarship and although there are many avenues and overlaps that could be explored in its significance to the debates over carrageenan, I only point to them here. For the purposes of this chapter, the significance is that the bad publicity generated by *Silent Spring* and Thalidomide contributed to a background hum of anxiety about chemicals and the chemical industry in the public sphere - related to dualistic visions of nature/society - occurring at a similar time frame to the emergence of concerns about health risk and carrageenan.

Once revealed as a risk it is no longer possible to argue that carrageenan is safe, that it bears no relationship to risk; the risk-genie cannot be put back in the bottle. As a result, and given that the network in which its risk profile is established is not outside of 'objective' scientific studies of carrageenan risk, the status of carrageenan's safety as a food additive is susceptible to destabilisation. In this particular case, carrageenan safety is contingent as competing for and against arguments in scientific accounts (re)construct it in terms of risk.

While the risks raised by Marcus and Watt were not geographically located (carrageenan was used in similar products across the food industries of the US, Europe and Australia for example) the responses to the scare about its

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[34] Feminist scholarship on Carson and *Silent Spring* points to the gendered nature of nature/society/science and attacks on Carson, and to more subtle readings of the gendered nature of science and scientific research. See for example (Smith 2001).

potentially harmful effects varied. Comparing carrageenan food regulation in the EU and US, for example, reveals that the EU (and its former structures) has consistently pursued a more risk averse strategy. For example, carrageenan is not permitted as a food additive in baby formulae in the EU but is in the US. Moreover, in 1972 the FDA reviewed carrageenan safety in light of Marcus and Watt's research, amongst other studies of carrageenan and risk (Informatics Inc. 1972).

The 1972 monograph on carrageenan, contracted by the FDA to the Informatics Inc company, reproduces an accumulation of scientific arguments typical of more recent reviews (For example Cohen, S & Ito 2002; JECFA 2001). The monograph documents scientific literature on carrageenan published around the world for the period 1920-1970 and includes the following factors: summaries of animal studies; nomenclature of carrageenan and seaweed types; early visual diagrams of 'proposed' structures for carrageenan; tables and text detailing studies and comparisons of animal studies involving guinea pigs, rats, gerbils, rabbits, monkeys, hamsters, mice, guinea pigs and baboons; tables and text documenting levels of consumer exposure to carrageenan through food consumption; evidence of long-term and short-term animal studies including studies of carcinogenic status; teratogenic studies (to check for possible significance to birth defects); and studies with different carrageenan types. Amongst the 68 pages there is only one paragraph in which 'man' [sic], carrageenan and safety occur in the same section, reproduced in full as follows,

> A preparation of degraded carrageenan (der. E. Spinosum), Ebimar, has been used in France for over fifteen years as a chemotherapeutic agent for peptic ulcer. Bonfils reports that two hundred patients receiving Ebimar at a dosage of 5g/day for six months to two years were monitored closely, and radiological examination was performed at intervals of not greater than four months. None showed any signs of ulcerative colitis (Informatics Inc. 1972: 18).

Whilst there was no evidence of dangerousness or harm to human bodies, there was a large body of evidence suggesting risk. Futurity then, takes precedence over the past. Dimitri Stancioff attended the meeting at which

the Informatics report and motion to modify the regulations for carrageenan were discussed:

> I was at the meeting so I remember it all very clearly ... we had a large number of people from FDA ... and people from industry. We had the director of the medical college came down with the research Dr Goldberg had done; he supervised most of the studies - a specialist in cancer, particularly of the intestinal tract. They argued that they could not see any problem, the problem seemed to be with guinea pigs at high doses and the rat studies indicated that the likelihood of having a problem with degraded carrageenan, even in rats, there didn't seem to be any results that indicated any ... problem. But [in] the undegraded carrageenan, the regular standard carrageenan, they found no problem, and even [among] the guinea pigs, with the regular carrageenan, the effect was much less. So [the] FDA decided ... so they decided to let carrageenan continue ... oh yes people from the infant formula companies were very very concerned because they said we cannot make these products without having a stabiliser in them because they just don't work right; so that also helped to sway the FDA people. So they decided that they would review everything and write a new regulation for carrageenan. But at the time they would just limit the molecular weight to a miminum of 100 000 daltons; the average weight should be above 100 000; this was the work that we did, which corresponded to a viscosity of approximately 5 centipoise at a concentration of 1.5% at 75 degrees C. They were content with that but we should do more studies. The Albany medical college said we should study [resus] monkeys which, in fact, they had already started [and] studies had been made in Denmark on pigs. All this information was being put together and FDA kept an eye on this.
>
> But then questions started arising immediately among those who were concerned ... Marcus and Watt came out with more papers saying they found lesions in rats and mice. We continued more studies in BIBRA in the UK [British Industrial Biological Research Association] [that were] very highly regarded. And they tested not only rats and guinea pigs but several other things, resus monkeys, gerbils; they came up again with carrageenan seemed to be okay if it was not degraded. At that time the EC also decided, they came up with a definition of carrageenan, they didn't come up with any molecular weight but the carrageenan should not be degraded (Stancioff, 2002, pers.comm., 14 June).

Common to both Stancioff's report of the meeting and the Informatics report are the scientific calculations of risk through which evidence of safety can be measured. There were no discussions of the socio-political context under which the research was conducted.

Whatever the apparent risk, carrageenan is claimed to be safe on food labels. One method for assuring safety is to exert influence, indeed, determine what constitutes carrageenan. Within the regulatory environment, following many often-contradictory studies about the safety of degraded carrageenan, discussed fully in the following chapter, an absolute *distinction* has been made between degraded (chemically produced) and native carrageenan. However, in expert literature degraded carrageenan is commonly positioned *in relation to* native carrageenan. A 1974 Joint FAO/WHO Expert Committee on Food Additives (JECFA) review of carrageenan exemplifies the relationship as it was represented at that time:

> *Degraded* carrageenan is prepared from the extract of *Eucheuma spinosum* by partial hydrolysis[35] using dilute HCl[36], followed by purification. The sulfate/galactoside ratio[37] is the same as in the native form but the molecular weight is only 20 000. This material is not used by food manufacturers but is sold as an antipeptic agent on the continent (JECFA 1974).

As the JEFCA review notes, the form of degraded carrageenan was not used in the food industry. However degraded carrageenan was, by association, related to undegraded forms, *particularly those with low molecular weight.* Using the network analogy, the deployment of these terms in the regulatory environment for carrageenan increased an already complex ontological status of carrageenan (lambda, kappa, iota and so on) involving restricting the molecular weights, native and non-native forms through which carrageenan could be known.

From one perspective, speculations about risk and subsequent 'positive' reviews of safety can be seen to reduce uncertainties and thereby minimise danger. Through risk assessments and reviews, carrageenan is proven 'safer' than if the sceptical studies of its efficacy had not been done. But, on the other hand, the presence and/or aggregation of risk concerns multiplies the domains within which associations between carrageenan and risk *can* be

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35 A chemical reaction in which water reacts with a compound.
36 Hydrochloric acid.
37 The sulphate/galactose ratio refers to the 'backbone' structure of the ideal carrageenan types.

made. Van Loon (2003) describes as a 'second order virtual-symptomatic' system the augmentation of risks bought about by technological attempts to contain risk. As the example of carrageenan shows, once a risk associated with ulcerations in guinea-pigs had been revealed, further methods for assessing the risk were used - and the risks multiplied. As I have noted elsewhere, the attempt to overcome risk contributes to the proliferation of risk (Burges Watson 2004).

The possibility of a relationship or equivalence between carrageenan and degraded carrageenan heightens perceptions of risk associated with the substance. Maintaining a demarcation between the two then becomes linked to ideas about what is safe and what is not. One result is a process of translation in which the focus of carrageenan's surveillance is oriented away from safety in general terms, and towards whether carrageenan is degraded (also delimiting the possibility that degradation may be partial or may occur by so-called 'natural' means). Perhaps unsurprisingly, in 1989, a working group of the American Medical Association, the US Adopted Names (USAN) Council, deployed novel nomenclature for degraded carrageenan: poligeenan. The manager of regulatory affairs for FMC Bioploymers was quoted in a *Newswire* report after the acceptance of the new term:

> Low molecular weight derivatives had erroneously been referred to as 'degraded' carrageenan in some literature. By this action, we can now communicate the fact that there are two distinct products -- carrageenan and poligeenan -- with different characteristics and different applications' (PR Newswire 1989: no page).

As the institutional reaction of FMC Biopolymers suggests, the distinction between degraded and native carrageenan did not, in fact, produce a demarcation that was sufficient to allay fears about the risk profile of carrageenan.

Despite efforts to dissociate the degraded form from the range of 'typical' carrageenans, a notion of equivalence remains in much contemporary literature. Even when concerns were raised about the potential of degraded

carrageenan to produce health effects in the 1990s by carrageenan's 'Rachel Carson', Joanne Tobacman (chapter four), regulatory authorities responded by arguing that native form was not found to pose any threat to human health in the amounts consumed (JECFA 1974, 2001).

To summarise the problematic of carrageenan's risky profile, the ideal of safety relies on sustaining a network in which an increasing number of risky elements must be (re)stabilised as safe. A 'second-order virtual symptomatic system' is created from the multiplied domains of assessment; creating in its wake, contested carrageenans.

The limits of choice

The example of degraded carrageenan demonstrates that in order for carrageenan to remain 'safe' for human consumption, scientific knowledge and expertise are enrolled to continuously reproduce a bounded and simplified view of carrageenan. On one hand the limitations imposed upon carrageenan's description, as it appears on labels, is also a (dangerous) choice; it is the outcome of debates and contested expert knowledges that represents what may be considered the best of what is available to science. But the information *is* translated and, in the case of carrageenan, the translations are not universally the same. Labels such as E407 or E407a or carrageenan are meaningless unless one can also trace their origins, but the carrageenan of the food label is simulacrum. Carrageenan is idealised, simulated, contingent and a boundary object; a representation. It exists across a range of different epistemic communities, and there are consistent elements that flow across some locations, but not others. The carrageenan that is revealed within the 'likely' spaces of consumers of public health is not an impartial rendering. The knowledge of carrageenan is situated, and within each utterance of a name exist various associations and linkages, physical and social, that tie carrageenan to particular regimes of knowledge

and power. Yet for prudent consumers of health, the knowledge of carrageenan is presented as a choice.

As others have cautioned, the ideal of active citizenship promises unrestrained freedom and freedom to choose - yet often overlooks the constraints through which that freedom is granted, and the obligations that 'freedom' demands (Petersen & Bunton 2002; Rose 1999). Moreover, for prudent consumers the complexity of science that renders carrageenan, and risk, knowable is, to use a geographic metaphor, *displaced* and *distant* (Jackson 1999). Rather than attaching significance only to the visibility and construction of risk, there are questions of the spatiality of risk: the distance that exists between prudent consumers and the risk calculations amongst epistemic communities that I have hitherto described in relation to carrageenan, demonstrate there are limits to 'informed' choice. As Whatmore describes consumer experiences of food in general, "the mark of 'consumer choice' belies a diminshed understanding of, and control over, what it is we are eating and the social conditions under which it is produced"(Whatmore 2002: 36). Rather, the carrageenan of food labels is metonymy, and choice is not so much freedom from political restraint as it is to be informed (as artifice) about what the political restraints are. Moreover, under the terms of new public health, choosing carrageenan is an obligation.

Haraway (1991: 191-2) offers an alternative to the kinds of scientific reductionism that produce the carrageenan of food labels. For her, the answer to objective enquiry lies in 'partial, locatable, critical knowledges sustaining the possibility of webs of connections called solidarity in politics and shared conversations in epistemology'. The appeal to *criticality* in knowledge is all very well, but for the practices of self-governance how does one *fit that* on a label? Given the new responsibilities of self-governance, I now turn to an exploration of the constitution of carrageenan in the media. In particular, I analyse the Internet as an *enabling tool* in the range of communication technologies through which science knowledge is

increasingly mediated (Petersen & Bunton 2002: 184). Specifically, I explore the case of a controversy involving the contested knowledges of carrageenan and carcinogenicity and their implications for public health.

THE IRISH FRANKENSTEIN.

Illustration: The Irish Frankenstein, 1843
Source: Library of Congress, Prints and Photographs Division

Chapter 4

Fabricating science fictions and diasporic communities of carcinogenicity and health

> It is difficult to recognise a wolf in sheep's clothing (Tobacman 2002: A176).

> 'Carrageenan is a wolf in sheep's clothing,' says Dr. Joanne Tobacman, an assistant professor of clinical internal medicine at the University of Iowa in Iowa City (Gordon 2004: no page).

In this chapter I examine how carrageenan is constructed as a risk factor through the calculation and translation of risk. I explore how carrageenan is constituted as a carcinogen, and detail the unfolding controversy in which the various stakeholders attempt to assert their power over the description and (allegedly) risky profile of carrageenan. The chapter documents the events surrounding a widely publicised controversy over the safety of carrageenan concerning ulcerations and carcinogenicity, different elements of which have been profiled in chapter two.

In the October 2001 edition of *Environmental Health Perspectives* (EPH), an online peer reviewed journal on environmental factors and human health, a scientific literature review of carrageenan safety appeared. Written by US based researcher, Joanne K. Tobacman (2001) the article reviewed 45 animal studies on carrageenan, ulcerations and carcinogenicity, and advised that there was (already) enough evidence to 'support an argument to reconsider the advisability of use of carrageenan as a GRAS[38] food additive' (Tobacman 2001: 992). Along with some of her earlier, less publicised studies of carrageenan and comments about them, Tobacman's paper was widely

[38] As detailed in chapter two, there is confusion over the regulatory status of carrageenan under FDA regulation. Strictly speaking, carrageenan that is used in food and pharmaceuticals is *not* listed on the official GRAS list of items.

quoted in the international media (for example Chapman, J 2001; Krantz 2002; Sicherman 2001) and appeared on numerous Internet sites (for example Cohen, R 2004; Farlow 2004; Weil 2004a). Through mediated accounts and among members of the seaweed and food industries, the studies and pronouncements were central to a controversy that sent 'ripples around the world' (Krantz 2002: 1A).

Using the metaphor of the network and processes of translation from within studies of ANT (Latour 1991; Murdoch 1997; Whatmore & Thorne 1997), I consider how carrageenan and cancer are brought into proximity as a network, and through translation, spread across globe. The chapter is divided in two. The first section considers Tobacman's problematisation of carrageenan as an effect of the calculation and *translation* of carrageenan/risk in the passage of communications and carrageenans within and between scientific knowledges. In the second section, I examine how the stability of risk is transformed through expanding networks of risk and via 'disaporic' communities of health: virtual communities that exist 'only to the extent that their constituents are linked together through identifications constructed in the non-geographic spaces of activist discourse, cultural products and media images' (Rose 1996: 333). I consider what the controversy reveals about the location, role and reflexivity of communities in formulating health knowledges. In the process of tracing the discursive construction of carrageenan as a potential carcinogen I discover that the Tobacman carrageenan cancer scare is maintained by individuals and in communities whose members share understandings of risks comparable to Potts' (2001; 2004) *ecological* approach to health.

A wolf in sheep's clothing?

Tobacman's *EPH* review suggested that the weight of evidence against carrageenan was sufficient to warrant its use be 'reconsidered'. The data upon which the review was based were generated by the scare over *Ebimar*

outlined in chapter two. As detailed, the growing field of risk assessment and the revised system under which proof of safety was required, as well as the development of degraded carrageenan/poligeenan and demonstrated links to ulceration and tumours in some laboratory animals at certain doses, generated a snowballing interest in carrageenan safety (in general). The increase of reports, safety profiles, organisations and risks associated with it amplified the intensity of carrageenan's surveillance, thereby *network-lengthening* the risks (Whatmore & Thorne 1997). For Tobacman, rather than proving safety, the weight of evidence was one among other factors that combined to produce and expand the risk. In a telephone conversation with me on 3rd December 2003, Dr Tobacman speculated about the links between data and risk when she said:

> I guess that underlying this issue is the consideration about how much data are sufficient to make a judgement about carcinogenicity? Many animal studies demonstrating ulcerations and neoplasms from carrageenan exposure were completed decades ago. What evidence and how much evidence does it take to lead to changes in policy and behaviour?

Tobacman's position on carrageenan emanates from within an episteme of environmental epidemiology and preventive oncology, through which evidence of safety (in the regulatory authority's view) could be transformed into evidence of risk. Tobacman described her interests as follows:

> I'm interested in preventive oncology. I have trained in Internal Medicine and then in the Medical Oncology Branch and the Environmental Epidemiology branch at the National Cancer Institute (Tobacman, 2003, pers.comm., 3 December).

Preventive oncology was a term first used in 1975 to describe a new speciality research area of preventive medicine (Reynolds 2001). It is a technical means for preventive interventions in public health issues related to cancer. Reynolds (2001) describes two distinct lines of intervention within the field. Primary interventions are those involved in such things as treatment of malignant lesions or responses to screening mammography. Secondary interventions identify such things as air pollution or 'industrial incursions' (Reynolds 2001: 340); a typology of interventions that accord with transitions

from 'old' to the new public health. Tobacman's research on the lifestyle factors of diet in relation to breast cancer prevention fit within the latter, and thus within the general rubric of a biopolitics of preventive health. Locating cancer and its mitigation in populations and via their dietary practice is a 'particular objective reality about which one can have knowledge' (Dean, M 1999b: 107). The rationality underlying a biopolitics of prevention, as I suggested in chapter one, also underlies regulatory approaches; however the 'objective reality' about which Tobacman claimed knowledge was based on a different rendering of that knowledge and the *interpolation* of risk.

Rather than *carrageenan* being the key element in Tobacman's research agenda, it was one of a number of factors through which cumulative associations were made amongst the risk of breast cancer, women's health, population and environment via her research on carrageenan in the laboratory. I asked Tobacman specifically about her interest in carrageenan:

> Carrageenan, as you're aware, has been widely used experimentally for several decades. I became interested in mammary myoepithelial cells predominantly because they are absent in invasive mammary cancers. I thought that was significant, but was not being studied very much. I was working with the myoepithelial cells in the lab, and was studying their ionized calcium using confocal microscopy[39]. I wondered what effect carrageenan would have on the cells, since it forms gels with calcium. Surprisingly, I found that carrageenan was very harmful to the cells (Tobacman, 2003, pers.comm., 3 December).

Tobacman's laboratory research was principally concerned with the environmental epidemiology of cancers, but more specifically was related to breast cancer and its appearance in a particular (and less studied) cell type. As commonly used inflammatory agents in laboratory experiments (such as

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[39] Confocal mircroscopes, unlike the more traditionally used electron microscopes, enable a new time-space imaging of the objects of study. While electron microscopes require thin 'slices' of the object through which to view a snapshot of its two dimensional characteristics, confocal microscopy utilises laser technologies and a sweeping of the object by pinpointed light enabling an 'optical sectioning' of the object to produce a representational three dimensional image. Confocal microscopy is a recent innovation and is being widely adopted, particularly within biological sciences. Hurn writes that the relevance to biological science is that 'changes in living cells can be studied over time' (Hurn 1988) The technology of image production enabled by the confocal microscope in ANT terms, is part of the technology of knowledge. Chapter three also makes reference to the use of images and representations within scientific practice.

the rat paw oedema model) some carrageen*ans* were already items in the laboratory toolbox. Experimental uses of 'carrageenan', histories of risk, mammary cells grown in a laboratory, cancer, a research gap and the various technologies within the laboratory, supported the development of a suspicion about carrageenan. Carrageenan was thus incorporated into Tobacman's research program on myoepithelial cells rather than the other way around. Surialink Associate[40] David Myslabodski commented on Tobacman's myoepithelial research in interview with me:

> The whole approach may be flawed. You just cannot test a product against any type of cells. Aren't you first required to show that the agent has 'natural' access to the cells? That is, if carrageenan in real life never comes in contact with these cells what is the point? (Myslabodski, pers.comm. 2005, 20 January).

Tobacman's research did not explain how the association between carrageenan and mammary cells involved *and required* the participation of the researchers hand. As Murdoch (2001: 118-19) puts it, there has been an 'exchange of properties between entities' such that the 'complex ecology' in which Tobacman's research is situated is part of the co-construction of carrageenan as a factor in cancer in myoepithelial cells.

Furthermore, after an association between carrageenan and myoepithelial cells had been made, Tobacman's research reoriented towards carrageenan as the key actor. Translation is a process in which the original is no longer the same as that which preceded it (Brown, SD 2002; Latour 1991; Murdoch 1997). Such a refocus in research interest may be understood to affect a process of translation; Tobacman's research reorientation and carrageenan as a risk factor in breast cancer.

The *EPH* article was not the first published by Tobacman on the topic of carrageenan and cancer, but it followed several investigations of relationships amongst mammary carcinoma, carrageenan and cancer more

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[40] Surialink is a web-based network of 'seaplant professionals' and information source on commercial seaweed industries. www.surialink.com.

generally (Tobacman 1997, 1998, 2001; Tobacman et al. 2002; Tobacman, Wallace & Zimmerman 2001; Tobacman & Walters 2001). Placing the article in context with her other research, it can be seen that the review accumulated suspicions of risk into one document. On this basis it is worth reflecting further on how risk accumulation (the lengthening of networks of risk) occurs. A publication outlining the breast cancer and carrageenan research usefully demonstrates the process of network lengthening.

A media release issued from the press office at the University of Iowa following the publication of Tobacman's (1997) paper illustrates the speculative nature of the breast cancer research and associations with carrageenan as an object of risk. Provocatively entitled *'Food additive may have breast cancer-causing properties'* (Ohman 1997: no page), the review demonstrates how a narrative of risk about carrageenan and breast cancer unfolds as a *network* of associations. Embellishing the concern through association with everyday items of consumption the release begins: 'Lambda-carrageenan, a food additive widely used in milk products such as infant formula, pudding, ice cream and whipped cream, may have cancer-inducing properties'. Lambda-carrageenan is a specific representation of a particular type of carrageenan linked to various production processes, seaweed species and locations. The specificity of 'lambda-carrageenan' in Ohman's press release does not match up with uses of lambda-carrageenan within industry accounts or the title that suggests the concern relates to the sum of carrageenan as a 'food additive'. Moreover, lambda-carrageenan has a 'very small' market share in comparison with the kappa, iota and kappa-lambda type carrageenans (Myslabodski, pers.comm. 2005, 20 January).

The second paragraph relates an already established association between 'a form of' lambda-carrageenan and ulceration leading to cancer in animals – establishing its credentials as a potential risk. Next, the release states that the 'facts of ulceration' made Tobacman wonder if the additive also affected breast cells in a way that might lead to cancer - a suspicion that, it is

suggested, led her to test lambda-carrageenan by adding it to tissue cultured cells in a laboratory. Finally the author of the piece asks 'Do these findings mean that lambda-carrageenan, which has been on the market since 1937, is a cancer-causing food additive?' Here the answer is less accusing than the title of the press release suggests. Tobacman is quoted saying '"We can't say that, yet ... We have taken one step forward and found an interesting association. Having new territory to explore with regard to environmental agents that may be *smoking guns* with regard to breast cancer is good news to cancer epidemiologists who have been looking for an environmental aetiology for breast cancer"'. Finally the release states that Tobacman is seeking funding for further studies (Ohman 1997: no page).

Various dimensions of preventive actions against risk are demonstrated by such a narrative: the tendency of media accounts to embellish the risks (Boyne 2003; Fowler 1991; Lupton 2004); how finding *new territory to explore* has currency in research; and that deducing *new territory* may not emanate from experience of observable phenomena in human bodies, but from accumulations and extrapolations of *calculations* of risk. In the case of Tobacman's research, probability about breast cancer was advanced through the construction of *new* associations. Breast cancers, cancer, ulcerations and a form of lambda-carrageenan came together as an effect of a 'mass of currents rather than a single line of force' (Whatmore & Thorne 1997: 291).

It is possible to trace a similar process of accumulation of negative associations forged by Tobacman's publications leading up to the *EPH* article. Three papers associating carrageenan with carcinogenicity are demonstrated by laboratory experiments with breast cells (Tobacman 1997, 1998, 2001). Tobacman's (1997) paper justifies the enquiry on the basis of the ubiquity of carrageenan in food, and existing studies of carrageenan and its effects on intestinal cells - the animal studies referred to in chapter two. The paper develops an association between lambda-carrageenan's use as an addition to foodstuffs and an *enquiry* on the effect of low-concentrations of

lambda-carrageenan on myoepithelial cells in a laboratory. The myoepithelial cells have lost their connections with the network space of the body and become instead part of the research network involving Tobacman.

The abstract for Tobacman's next paper, a presentation given in a session titled 'dietary factors' for the 1998 meeting of the International Society for Preventive Oncology in France, further reported effects of lambda-carrageenan on myoepithelial cells demonstrated in a laboratory (Tobacman 1998). The titles of the two papers forge different associations however. While the first remains within the laboratory ('Filament disassembly and loss of mammary myoepithelial cells after exposure to lambda-carrageenan'), the second extends the significance of the laboratory research beyond the laboratory ('Effects of lambda-carrageenan on human mammary myoepithelial cells *and relation to mammary carcinogenesis*') [my emphasis]. Expanding the network further, in the same year that the *EPH* review appeared, Tobacman and her colleagues' (2001) *Medical Hypotheses* article used an epidemiological technique known as a 'time-trend' analysis to correlate the increased use of carrageenan in the twentieth century with the increased incidence of breast cancer. The authors wrote that 'although time-trend correlations represent a weak form of evidence, when significant positive correlations are found, they can support further evaluation' (Tobacman, Wallace & Zimmerman 2001: 596). The findings of the *Medical Hypotheses* article supported what Tobacman described as carrageenan's 'candidacy' for further consideration for its 'possible etiological significance in the increased twentieth century incidence of mammary carcinoma' (Tobacman, Wallace & Zimmerman 2001: 596).

Taken together, the titles and content of the *EPH* and *Medical Hypotheses* journals are indicative of the preventive, predictive scientific context in which Tobacman's research was generated, and illustrative of how the accumulation of research contributed to network-lengthening the risk - progressively expanding the scales of carrageenan's risky significance.

Latour (1991) uses the term *immutable mobiles* to describe actors (themselves already networks) whose network stability is not disrupted by mobility across spaces and times. As an immutable mobile in the context of Tobacman's research, allegedly cancerous carrageenan holds together from the laboratory to the general environment of population health through interactions that include epistemological and governmental concerns. Via the discourse of environmental epidemiology, rules about the spatial (non) limits of the laboratory research are met and, by extension, enable the use for such research within other realms, for example - as I will discuss presently - the mediated space of the Internet where prudent consumers are likely to encounter it.

Moreover, in addressing the extracorporeal context of breast cancer and preventive ethos of actions in relation to it, (all) women and (all) carrageenan come to be remapped and placed even further under the risk spotlight. The case study offers a reminder of the constitutive power of risk and prevention:

> 'Prevention' in effect promotes suspicion to the dignified scientific rank of a calculus of probabilities. To be suspected, it is no longer necessary to manifest symptoms of dangerousness or abnormality, it is enough to display whatever characteristics the specialists responsible for the definition of preventive policy have constituted as risk factors (Castel 1991: 288).

In contrast to Tobacman's epistemological framing, reactions to her work from within the seaweed industry and regulatory authorities point to the instability of cancerous carrageenan and suggest a differently constituted, though not unrelated understanding of risk. As I argued in chapter two, regulation also remaps the spaces of risk and health. In the April and June 2002 editions of *EPH* a series of letters appeared on the subject of the review. Two of the letters were critiques of Tobacman's findings from the General Secretary of Marinalg International[41], Pierre Kirsch; and from Phil Carthew

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[41] Marinalg International represents the interests of the seaweed processing industry in relation to safety risks, before international regulatory agencies such as the Codex Alimentarius and the European Commission.

of the Unilever Safety and Environmental Assurance Centre[42] (Carthew 2002; Kirsch 2002). The counters to Tobacman's claim were fourfold, based on the weight of evidence supporting carrageenan use, the scientific credibility of Tobacman's results, animal studies and issues of dose. Kirsch (2002: A288) emphasised that, *worldwide*, food regulatory authorities 'unanimously' agreed on the safety of carrageenan as an additive when used 'at amounts only limited by the amount necessary to achieve its technical function'. Carthew (2002: A176) suggested that Tobacman had, among other things, 'inappropriately extrapolated from animal data with regard to human risk' and not included certain critical studies in her evaluation of carrageenan.

The animal studies and dose issues entail different tolerances to ideas of risk. In one article Tobacman raises the proposition that carrageenan exceeds the standards set by the 1958 Delaney amendment to the Food and Drug act in the US (Tobacman 2002: A176). The wording of the Delaney amendment was such that 'no additive shall be deemed to be safe if it is found to induce cancer when ingested by man or animal, or if it is found, after tests which are appropriate for the evaluation of the safety of food additives, to induce cancer in man or animal' (Dean, R 1989: 6). The legislation has been extremely controversial. Some argue that zero risk is necessary to protect the health of the members of the public, others that carcinogens occur naturally in many foods and are of little risk. Noah (1999: 34) suggests that the Delaney clause is used with less rigidity in food and drug law in the contemporary period because its wording preceded the kinds of sensitive technologies that now make negligible risks calculable. Where there is 'reasonable certainty of no harm', the Delaney clause is no longer used. Uncertainty is also a strategy of governance (O'Malley 2000). In animal studies, amongst different animals, carrageenans, degraded carrageenans, dosage levels and humans there are a vast array of possible associations and demonstrated contestation between different positions. Anything *can* be a risk (Ewald 1991).

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[42] Unilever is one of the world's largest producers of consumer food products. Carrageenan containing foods under their portfolio include the diet product Slim-Fast.

A European Commission report, established with the express purpose of reviewing Tobacman's *EPH* and *Medical Hypotheses* papers, was particularly critical of her findings in relation to the *Medical Hypotheses* article about which it concluded that it:

> did not support the hypothesis that breast cancer may be causally related to intakes of carrageenan and other water-soluble polymers used as food additives. The Committee noted that such correlations might be found for any dietary component or chemical to which there has been increasing exposure during the twentieth century (Scientific Committee on Food 2003: 6).

In this view Tobacman had radically over-determined the hypothesis; rather than carrageenan as a (possible) factor in breast cancer, *any dietary component* with the conditional period of time associated with rising cancer rates, *could* be linked to breast cancer. The Committee's report suggested that the breast cancer scare was rather more akin to a wild guess than a search for 'objective' truth. However such a view fails to consider the discursive terrain of Tobacman's (or their) analysis and how such risks are constructed *within* the new public health.

Thus far I have outlined some of the features of the controversy concerning the calculation of risk in relation to cancer and carrageenan generated by Tobacman's research. Although her work may be viewed as consistent with the rationality of preventive oncology - an assessment of acceptable uncertainty and the weight of global expertise dis-enabled her findings. The power of Tobacman's statements is enabled only by the connections that can be commanded because, as Latour suggests, without connections, statements lose their power (Latour 1997: 4). The weight of combined regulatory authorities and expertise was in sharp contrast to, and ultimately diminished, the lonely authority of Tobacman's research in the melange of scientific assessments of risk.

The force of risk is not simply in its calculation by Tobacman or her detractors; it also depends on what happens to the statements. The 'fate of a statement is in the hands of others' as the statement is *transported* and *transformed* (Latour 1991). Although Tobacman was not able to generate support within the regulatory environment, her research was not limited to that space of encounter. There is a spatial imperative in transport that suggests, in the case of the research message, the involvement of communication technologies. Tobacman's research was widely circulated in the national and international media, and appeared on numerous health related websites as I will presently detail. Stabilising the findings of the research may be achieved via both the hands of others and of self in the enrolments of material technologies of communication and the messages that are transported by them.

Inculcating carcinogenicity

On their own, Tobacman's research papers might have generated little by way of reaction from industry, regulatory authorities or the public. However, as the General Secretary of Marinalg suggested to a reporter from the *De Moines Register*, 'The problem is, as you probably know, she [Tobacman] made a lot of noise in the press ... we had a lot of clients and consumer organisations who came back to us and said, what is this?' (Krantz 2002: 1A). Rather than analyse the range and extent of media reportage of Tobacman's findings, in the following section I consider examples of articles that were found through a LexisNexis[43] search that specifically mentioned her work. Perhaps not surprisingly, the articles I cite below include those from the *Daily Mail* and *Star Tribune* that were raised as significant in my interviews with seaweed industry members.

The appearance of media articles generated responses from Marinalg (amongst others) as the representative organisation of the food hydrocolloids

[43] LexisNexis is a searchable database of more than 5000 global media sources.

industry (Marinalg International 2002). As has been argued in relation to genetic pre-detection, in presenting a risk, there is an implied obligation to respond (Hallowell 1999).

An article in London's *Daily Mail* quotes Tobacman as recommending that people 'avoid ingesting' carrageenan, suggesting it posed a 'definite risk', and that 'it is possible people are developing gastrointestinal cancers and ulcerations through eating products containing carrageenan' (Chapman, J 2001: 47). Bruce Sylvester, writing for McGraw Hill Company's *Biotechnology Newswatch* reported that 'a lot of people think it might cause cancer', quoting only the key features of Tobacman's *EPH* article as well as outlining her breast cancer and carrageenan research. The article quoted Tobacman in ways that suggested society was saturated by the risk posed by carrageenan such as, '"It's all over the grocery store" Dr Joanne Tobacman, assistant professor of medicine at the University of Iowa in Iowa City told BTNW' (Sylvester 2001). The media article embellishes the risk by emphasising 'a lot of people', 'cancer', 'breast cancer' and the sense that it is impossible to avoid carrageenan. The media uses Tobacman's authority in new ways to relate previously unrelated factors of risk, breast cancer and carrageenan. I asked Tobacman about the media articles:

> D: Many of the media sources you are quoted in suggest that carrageenan should be avoided?
>
> J: I think there are sufficient data with regard to harmful gastrointestinal effects of carrageenan that it should not be included in food products. It's very difficult to study human intake of carrageenan, due to variation in carrageenan content of different food products and variation in individual intake day to day and over longer time intervals. Also, ethical issues limit study of direct effects of carrageenan exposure in people. I think that the animal data are consistent and compelling.

The wording of the *Daily Mail* article did not reflect the imperative statement that the existing data 'should be sufficient to accept the harmful effects', even if that is how Tobacman framed the issue in her communication. Rather, as Latour (1997) suggests, the significance of the statement is never enough to

predict where it will go. For example, writing in the *Star Tribune* (Minneapolis) Al Sicherman argued that carrageenan *is* a cancer suspect, emphasising the discovery of carcinogenicity by Tobacman. The appeal to something newly discovered (rather than a reinterpretation of something already known) is perhaps not unexpected in the context of media's task to report the news as-it-happens. Moreover, the message was globally rendered without an awareness of the differences amongst national regulatory environments. The *Jerusalem Post* (Israel), despite reporting the JEFCA conclusions on carrageenan as a safe additive, also suggested that on the basis of the 1972 FDA report, there was 'no substantive regulation of carrageenan in food' [anywhere] (Siegel-Itzkovich 2001: 8). Thus carrageenan risk is decontextualised and recontextualised within the immediacy of virtual media health space. The media rework the time-space of the scare by bringing immediate news into a new realm of virtual time-space.

The media articles did not question whether there *was* a risk associated with carrageenan, but made different statements about risks. Like the transition from GRAS category to regulated additive, through such accounts, carrageenan's mediated portrayal as a risk is rendered durable. Carrageenan no longer exists without a relationship to risk, and through the dissemination through the Internet and mediated accounts that render risks visible, this is true virtually *anywhere*. Risk is transmitted through the embodiment of carrageenan as a risk in communications technologies – carrageenan's risk becomes *immutable*.

Diasporic communities of carcinogenity and health

'Diasporic' communities, in the sense used by Rose (1996: 333), refer specifically to Internet based communities that are not reducible to time-space coordinates, but which exist as community by virtue of informational interconnections and shared interests. The Internet is recognised as a significant new source of public information about health risk and

prevention (Henderson & Petersen 2002; Parr 2002; Petersen & Bunton 2002). The presence of the Internet and information about carrageenan on health sites enables health consumers at a distance by bringing remote knowledge into close proximity. However, as the following example demonstrates, information about carrageenan and risk is also translated when it comes in contact with diasporic communities of health.

In August 2002 a 'google' search using all of the terms *carrageenan, Tobacman* and *cancer* returned 51 websites. Using the same concurrence of terms in June 2004, 186 websites documented a relationship between Tobacman's research, carrageenan and cancer. In the expanding networks suggesting links between carrageenan and cancer, information appeared on numerous health related websites (Table 4.1).

In Petersen and Bunton's (2002) view the rise of virtual communities of health on the Internet is one effect of the weakening of health and welfare provisions under neo-liberal policies. However that does not mean that the institution of government is no longer involved. Alliances between health promotion campaigns and political activists of health through community groups (and there are many examples that might be cited from HIV/AIDS to breast cancer) can target those at risk, (potentially) creating a new spatialisation of government through community (Parr 2002; Rose 1996).

Internet-based communities may take a variety of forms, and unite communities of interest in all manner of heterogeneous networks. Of interest are the spatial qualities of such sites. Internet-based communities, suggests Rose (1996: 333), are diasporas insofar as they exist in a non-geographic space through the participation of images, cultural products and discourses that are shared amongst members. Such communities may have a shared identification or sense of fate, and via computer technologies and the networked space of the Internet, inhabit extensive spatial configurations. Moreover diasporic communities may be posed as a problem precisely

because such communities invoke a reach that is 'global', 'world' or 'national' (Rose 1996: 333).

Table 4.1: Selected Carrageenan/cancer resources on the Internet (accessed June 2004)

Association	Internet Address	Description
Crusader Enterprises	thehealthcrusader.com	Offers to wield a 'sword of truth in a world of lies', through regular contributors to an e-zine that claims to expose the 'lies' of corporations and medical industries. Sell a variety of health supplements and accessories. Strong religious and natural health overtones.
Dr. Christine H. Farlow, D.C. The Healthy Eating Advisor	healthyeatingadvisor.com	Offers a range of nutritional advice on 'healthy eating' from *Christine Hoza Farlow* , a chiropractor with a speciality in nutrition. Consumer links to nutrition supplements tailored to individual needs through biochemical testing of urine samples, and books such as Farlow's *Food additives: a shoppers guide to what's safe and what's not.*
Healing Well	healingwell.com	Information and resources on disease, disorders and chronic illness established in 1996 by Peter Waite. Medical professional focus. US based but claims a global reach.
HealthyPages and Prime Impact Events & Media (Ltd)	healthypages.net	Complementary and Alternative Medicine directory for the UK, with added information resources on topical issues of public health.
Weil Lifestyle, LLC	drweil.com	Based on the principles of 'integrative medicine' claims to treat the 'body, mind, spirit'. Consumer products include vitamin and mineral supplements.
Dairy Education Board	notmilk.com	Web site of controversial US anti-dairy campaigner Robert Cohen. Extensive list of articles opposing milk and other products. Contains multiple links to vegetarian and vegan organisations.

A further geographic implication of virtual health provision after Parr (2002), has one *possible* trajectory; that virtual spaces liberate individuals from a governmentality of health. In this view, organisations that work together on issues of breast cancer, HIV/AIDS or other health concerns *may* act within the discourse of prudentialism; as people who invest in their own well-being by sharing knowledge (sometimes exerting influence that is problematised as excessive) *or* by actively resisting government at a distance. The entity that is the 'Tobacman carrageenan scare' is an opportunity to examine the workings

of a politics of resistance to consider how websites construct or can be seen to participate (or not) in prudent diasporic communities in relation to carrageenan, health or other concerns.

Amongst the first 80 hits from the google search, 20 report the publication of the *EPH* article in 2001 (the majority of which are on health websites); 29 reproduce the title or abstract of Tobacman's journal articles; four are in-depth comments from carrageenan-producing companies in relation to the Tobacman scare; five are from US based companies which utilise carrageenan. Only six health-related websites comment beyond the initial media reports about the scare (Table 4.1).

It is noteworthy that all the companies that respond to the controversy about carrageenan's carcinogenicity have a natural health focus. The natural health focus of debate is mirrored by the six Internet health sites in Table 4.1, which identify questions of carrageenan's natural health status and/or associate carrageenan's risk status with particular products recognised as natural and/or organic. Indeed, *organic* soy milk is central to the most outspoken and detailed statements against carrageenan (Cohen, R 2004; Weil 2004a).

Two sites critical of carrageenan contain written material by the same author, Robert Cohen, on the sites *notmilk.com* and *healthycrusador.com*[44]. Dupuis (2002: 215-218) writes about Cohen's activities as a key activist in an anti-milk movement and author of a controversial book *Milk: the Deadly Poison.* She describes his book as a 'compilation of every critical statement ever made about milk' and, in contrast to the perfection narrative of milk, as a 'classic downfall narrative taken to the extreme' (216). In her view, there is a similarity to the perfection and downfall narratives in that both attempt to create a 'perfect politics' in which *no form of compromise or negotiation is necessary* (DuPuis 2002: 217). Accordingly, it is possible to view the

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[44] The article also appears in a print edition of Health Crusador, the bi-monthly health newsletter '*Crusador*', April 15, 2004.

carrageenan cancer scare as embodying a political *incorrectness* that poses a problem for carrageenan's detractors. Before assessing this proposition, it is worth establishing the political tone of the other sites that debate the carrageenan scare. One is principally devoted to a lengthy critique of Robert Cohen's work and the critique of carrageenan from the founder of *Vegsource Interactive*, a health information site on plant based diets (Nelson 2002). Two are alternative health sites that reproduce news articles about the *EPH* and *Medical Hypotheses* papers with added commentary. Two are question and answer sites run by independent health practitioners, but both comments about carrageenan refer to questions about the safety of so-called 'natural' soy milk.

Exploring the other side of the debate, two prominent organic soy milk companies in the US, *White Wave* and *Eden Foods* produced public statements critiquing Tobacman's research and statements in support of the research (Esko 2004; White Wave Company 2004). Metagenics, a natural medicine therapies company based in California, not only argues against Tobacman's findings but, based on research showing carrageenan has anti-viral and cholesterol lowering properties, foretells the development of new (all natural) carrageenan health technologies (Minich 2003). On its website, Toms of Maine, a manufacturer of health care products such as toothpaste, claims to only use natural ingredients and describes carrageenan as a 'naturally sourced material' (Toms of Maine 2004: no page).

The location of the debates within what might be termed a diasporic natural health community (because their scope and reach remain unclear) can be seen to unsettle the assumptions about the use of carrageenan as a natural product in food, and the 'perfect politics' of such a position. A press release issued by FMC Biopolymer in 1999 notes that there has been a trend towards hydrocolloids including carrageenan because of a widely-held belief that it is a natural ingredient (FMC Biopolymer 1999: no page). The market value of natural food products aside, the particular focus on natural and organic

products draws on more desirable rhetorics, and dualisms between nature/society. The perfect politics of communities of interest in the reaction to the Tobacman cancer scare can be placed in the context of the expansion of interest in natural/organic foods and movements more generally.

The rise of an organic food movement in the US and elsewhere has been debated by geographers and others in terms of its significance as a new social movement (Cwiertka 1999; DuPuis 2002; Guthman 2003). Guthman (2003) describes this debate as one in which the organic movement is viewed either as a form of political opposition to industrial food, or in terms of the construction of taste as a product of the manipulation of the consumer through relations of production and provision (a broadly Marxist view). One difference in the two positions concerns issues of reflexivity and agency. A further possibility not raised in these accounts is the desirability of 'natural' consumption, and that 'perfect politics' incorporates prudent behaviour in a unique way.

Of examples related to the case of Joanne Tobacman's work on carrageenan and risk, all four themes emerge - political opposition to industrial food, the market manipulation of taste, rhetorics of desire, and a reflexive form of risk aversion in managing uncertainties that can be associated with discourses of new public health.

Cohen's (2004: no page) diatribe against carrageenan for example, is directed as much *against* industrial culture as it is a defence of natural or organic food. The risk associated with carrageenan is embellished through association with substances recognisably industrial in character like 'alkali solvents', 'vaseline', 'paints', 'monosodium glutamate', 'aspartame' and suggesting that 'carrageenan is the magic ingredient used to de-ice frozen airplanes'. However while he does question the natural status of carrageenan, Cohen also critiques the category of natural. 'Carrageenan is about as wholesome as monosodium glutamate (MSG), which is extracted from rice, and can equally

be considered natural'. Combining the two so-called risks has the effect of intensifying the scare. But at the same time Cohen remarks that 'just because something is natural, doesn't mean it is safe ... Got poison? You will if you eat the black dots on the 'eyes' of potatoes' (Cohen, R 2004: no page).

In a similar vein, *Dr Mercola's Natural Health* website, which advertises its credentials as 'the world's most visited and trusted natural health website', links carrageenan to risky concerns about processed food. The lone comment from Dr Mercola following an expose of the Tobacman *EPH* article is: 'just because a food additive appears to be natural, like something from seaweed, does not necessarily mean it is harmless. The general rule: Follow the eating plan and minimize processed foods' (Mercola 2001: no page)[emphasis in the original]. Although Mercola's statement is an acceptance of certain limits to the perfect politics of natural (ergo healthy) food, nowhere is there an equivalent expression of compromise or negotiation suggesting processed foods might not (always) be harmful.

The controversy about carrageenan emanating from within the alternative health movement is perhaps best represented by the face-off between the position of the well-known advocate of 'integrative medicine' Dr Andrew Weil, and the response from the macrobiotic/organic food company *Eden Foods*. *Eden Foods* responds to what its makers deride as 'inaccurate information' on the Weil's health website where it is recommended people avoid products containing carrageenan (Weil 2004a: no page). The integrative medicine envisioned by Weil is a reaction to what he considers a health care system that is now 'dysfunctional', related to the unintentional erosion of patient-physician relationships within biomedical models of disease (Snyderman & Weil 2002). It is worth reproducing definition of Snyderman and Weil's integrative medicine[45] and to consider the overlaps with key features of a biopolitics of preventive health:

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[45] There is some controversy over the use of the term 'integrative medicine' amongst different accounts. I refer here only to the definition used by Weil in (Snyderman & Weil 2002)

> *Integrative* medicine is the term being used for a new movement that is being driven by the desires of consumers but that is now getting the attention of many academic health centres. Importantly, integrative medicine is not synonymous with complementary and alternative medicine (CAM). It has a far larger meaning and mission in that it calls for restoration of the focus of medicine on health and healing and emphasizes the centrality of the patient-physician relationship. In addition to providing the best conventional care, integrative medicine focuses on preventive maintenance of health by paying attention to all relative components of lifestyle, including diet, exercise, stress management, and emotional well-being. It insists on patients being active participants in their health care as well as on physicians viewing patients as whole persons - minds, community members, and spiritual beings, as well as physical bodies. Finally it asks physicians to serve as guides, role models, and mentors, as well as dispensers of therapeutic aids (Snyderman & Weil 2002: 396).

Consumption, preventive health care focusing on lifestyle factors and active participation are all virtues of prudent health seekers. The difference is not in the constitution of the individual as a cautious subject of risk, but in the source and access to a new form of expertise and the spaces of that expertise.

Dr Weil's website demonstrates a preference for natural and organic products, and a series of different forms of ancient wisdom and traditions taken from Japan and China. The founders of *Eden Foods*, established in Michigan in the late 1960s, trace their philosophical origins to the macrobiotics movement and the Japanese Zen master George Oshawa. The company promotes, and its activities are based on, organic agricultural practices and small-scale family farming, organic and 'traditional Japanese' foods - including seaweed products. For both companies, the 'commercial (re)production of imaginative geographies' involving China and/or Japan tie into much more complex rhetorics of desire (Brown, T & Duncan 2000; Cook & Crang 2002; Cwiertka 1999). Such rhetorics may modify, and also feed into discourses within the new public health. Weil advocates a natural health approach to cancer prevention including recommendations about the consumption of natural Japanese and organic foods, soymilk, omega-3 fatty acids, green tea, and vegetables; and advertises and sells his books and nutritional supplements towards this goal (Weil 2004b: no page). Dr Weil's approach is a biopolitics of preventive, organic, natural and traditional

health *consumption*. A study of lifestyle magazines and Internet sources of CAM in the UK reveals a striking similarity with the Internet sources I consulted on natural health and carrageenan, that mass-mediated CAM (or integrated health approaches) is at its most fundamental a consumer movement, and one that offers new proximities to the new public health through a 'sensuous, seductive and erotic world' (Doel & Segrott 2003: 750).

Moreover, as a newly marketed consumer movement, preventive health care focusing on lifestyle factors, alternative therapies and active participation – is not dissimilar from representations by *Eden Foods*. The company statement issued 'in response to consumer concerns' offers reassurance that Edensoy is safe, healthy, nourishing and that consumers may drink it with 'peace of mind' (Esko 2004: no page). Its lengthy retort invokes the JEFCA and FDA literature, as well as traditional uses of Irish moss seaweed. A marketing executive from *Eden Foods* writes that the process for extracting carrageenan 'can be easily duplicated in the kitchen by boiling red seaweed wrapped in cheesecloth', and that 'We hold documentation showing that absolutely no chemicals are used in producing our carrageenan' (Esko 2004: no page).

In these views it is not the question of how safety and risk are measured, but another, where health resides, which intrigues. One possible response is *somewhere outside industrial culture, beyond the medical model, and in an 'alternative' consumer culture*. Doel's and Segrott's (2003) elucidation of the phenomenal growth of CAM and integrated medicine approaches in the UK asks a question that is also relevant here: *(how) are prudent subjects associated with alternative health movements?*

A virtual geography of an ecological oncology

> bodies in virtual space ... are open to inscription from the fractured discourses which their owners encounter and propagate. Nowhere is this more obvious than when considering discourses of health (Parr 2002).

Writing on breast cancer activism in the US and UK Potts, (2004: 144) shares with Tobacman a combination of two already-blurred subject positions. Tobacman is critical of the lack of regulatory attention to the extracorporeal spaces through which breast cancer risk may be assessed and mitigated. Like her, Potts identifies as an activist and academic involved in a 'breast cancer/environment movement'. She suggests that 'alternative experts in the breast cancer/environment movement have undertaken reassessment of the date on suspected bio-hazards, by questioning, for example, the ADI (acceptable daily intake) assumptions of a suspected carcinogen' (Potts 2004: 138). Like Tobacman, in advancing her position she advocates enrolling those outside the biomedical model.

In Potts' (2001; 2004) view the re-examination of the aetiology of breast cancer involves a fundamental rethinking of the spaces upon which risk is inscribed. An 'ecological approach' to public health protection 'shifts the aetiological enquiry from the individualized, the personal, the interiorized space emphasized by the genetic and screening discourses of cancer, to an assertion of the significance of the outer, shared, public space' (Potts 2004: 135). Potts positions her research and activism as incorporating a broader view of health that attempts to reincorporate the social dimensions of disease. In her view, the breast cancer movement has been successful at reinterpreting breast cancer as a disease that is experienced by individuals, but which is also located within a collective environmental space. Her view of cancer activism as a reinterpretation of the spaces of health and ill-health however, may be less *resistance* to dominant discourses of new public health than it is an alternative form of relationship consisting of a 'naturalised' and prudent individual to a biopolitics of health. Rather than asserting, as she suggests, the legitimacy of 'lay expertise' in challenging the governance of health via biomedical models and biopolitics, the example of carrageenan suggests it is very difficult to resist the lure of health consumption. Rather than an ecological/social view, the 'environment' typified within the carrageenan example signifies a reified, imaginary ecological space that

offers a safe haven from the toxic 'other' space of contemporary culture. In other words, what all these perspectives share, to greater or lesser extent, is a biopolitics of preventive health and a dualistic conception of nature/society and inability to reconcile the interconnections. Because of the dualistic mode of thinking, carrageenan poses problems for the separation between nature and society. In one 'domain' it is a natural product that may be extracted from seaweed in the local space of the home and, in the other, is an industrially produced food additive. The relationships among consumption, neo-liberalism and nature are not evident in the discourses of participants in the controversy.

As it stands, carrageenan's status as a food additive has not greatly suffered as a result of negative publicity. I found little evidence of companies turning away from carrageenan. Only one, Stonyfield Farm, the largest producer of organic yoghurts in the US, modified its production after receiving consumer calls that were in response to media reports about Tobacman's *EPH* article. Dianne Godbout, the Consumer Relations Coordinator for Stonyfield Farm, informed me in an email communication on 27th March 2002 that 'Our quality assurance looked into the report and thought it would be best to take the side of caution and remove it from our ice cream and yoghurts'.

The regulatory status of carrageenan in the US has not been reviewed on the basis of Tobacman's findings. However the same is not true in the EU. In March 2003, the Scientific Committee on Food (SCF) of the European Commission, consisting like JEFCA, of independent qualified experts on fields such as toxicology, chemistry, medicine and nutrition, reviewed Tobacman's 2001 papers from *EPH* and *Medical Hypotheses* (Scientific Committee on Food 2003). Although the report was critical of many (if not most) of Tobacman's findings, there was one issue upon which the Committee felt further research should be undertaken - the possibility that 'native' carrageenan could be degraded either by processing techniques or by acids during digestion. Like earlier controversies over baby formula and

carrageenan mentioned in the previous chapter, the perception of risk in Europe was deemed serious enough to warrant a response. Thus regardless of the critique of Tobacman's research by the JEFCA, the EU enacted new regulations to limit the amount of low-molecular weight carrageenan used in food (European Union 2004). The regulations, to take affect in April 2005, are based on the report of the SCF which concluded: 'if feasible, a molecular weight limit of not >5% below 50 kDa should be introduced into the specification, in order to ensure that the presence of any degraded carrageenan is kept to a minimum' (Scientific Committee on Food 2003: 6). The SCF report did not suggest there should be no degraded carrageenan in food, but rather suggested limits on low-molecular weight carrageenan. Yet the EU regulation specifically states that 'Carrageenan shall not be hydrolysed or otherwise chemically degraded' (European Union 2004). Moreover, websites of US based companies that utilise carrageenan represent a strict demarcation between the degraded and undegraded forms. For example, an *Eden Food* 'facts report' on carrageenan states:

> There are two types of carrageenan, undegraded (food-grade) and degraded (hydrolyzed with acid). Undegraded carrageenan has been used on a huge scale in food production worldwide since the 1930s, and its safety has been assured by the FDA Gras status ... Chemically treated, degraded carrageenan however, is a known carcinogen (cancer causing agent) and is not used or permitted in food production, but is frequently used to experimentally induce intestinal inflammation in animal studies (Esko 2004: no page).

One conclusion that can be drawn from the *Eden Food* example is that the carrageenan industry has created a rod for its own back in perpetuating a politics of singularity and the myth of exact 'types' of carrageenan. While the definitions of degraded/poligeenan and undegraded forms were instigated in part to allay fears, these definitions may yet fuel further anxieties if (and when) degraded carrageenan, in whatever amount and through so-called natural processes, is (re)discovered in food.

Furthermore, assuaging anxiety may involve addressing more than the regulatory environment. As I have argued, Tobacman's research went

beyond the calculation of risk in directly challenging the risk calculations of two of the foremost regulatory agencies worldwide, and advocated active resistance to these positions. Tobacman responded to the 'anti-program' of the regulatory authorities by seeking to enrol the participation of others in her cause. Neither has Tobacman relinquished her campaign against carrageenan using the 'power' of politicised natural health/alternative communities.

> Duika: Do you feel your research is taken as seriously as it should be?

> Joanne: No, but the regulatory climate is 'loose' and there has been so much disinterest in regulation for many years. One of the people I have spoken with is Dr Sidney Wolfe, who is Director of the Health Research Group of *Public Citizen*. *Public Citizen* has been very involved with some of the initiatives to remove harmful drugs from the market. I am hopeful that they will take on the carrageenan issue as well.

The Health Research Group of *Public Citizen* is a consumer advocacy group established by Ralph Nader in 1971. As it stands, *Public Citizen* does not publish information on the topic of carrageenan or of carrageenan safety, however the attempt can be viewed as an ecological activism in the quest to enrol and recruit prudential consumers of health towards her cause.

Furthermore, industry has entered the contest over carrageenan's representation in the 'diasporic' debates on the Internet. FMC Corporation purchased the domain name www.carrageenan.info on January 28, 2004.[46] The website contains information linking to amongst others, the JEFCA report that shows carrageenan safe (but not visible are any links to show the industry connections of the site itself). A 'google' search on the term carrageenan or carrageen in January 2005 returned carrageenan.info as the only sponsored link; thus assuring a primary position and 'positive review' for those prudential consumers who might seek information using this method.

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[46]*Afilias*, established in 2001 is a top-level domain registry for sites ending '.info'. The *Afilias* global registry database was searched on a one off basis on January 14, 2005 at http://www.afilias.info/cgi-bin/whois.cgi.

Concluding remarks

In this chapter I have focused on a controversy surrounding the safety of carrageenan which I link to the political rationality of risk and its expression within the material and non-material dimensions of the new public health. Using the network analogy I have shown how, in forging associations between speculative calculations of risk, there is a transformative effect on carrageenan and the spatial topologies of public health. The chapter has described the process through which the valorisation and identification of risk accumulate and highlights how different discourses in the new public health may come into conflict. In this case study, preventive oncology, regulation of risk and prudent consumers of health are all incorporated within a biopolitics of preventive health discourse despite conflict between them. In particular the chapter has emphasised the emergence of an *ecological prudentialism* that espouses resistance to a biopolitics of health at the same time it is incorporated within it.

I have also explored how risk is constituted through a process of network-lengthening and translation such that *calculations of risk become factors of risk.* The example of carrageenan suggests that calculating risk is an unstable process in which a continuing cycle of programs and anti-programs produces greater and greater complexity and uncertainty. The paradox of expanding risk assessment is that it becomes harder to prove carrageenan safe. Moreover, as public health is increasingly governed through community, the location of risk disperses and becomes *virtually immutable.*

At the same time, while risks may be masked and/or made proximate by other more desirable rhetorics nurtured within consumer culture, the prospect of resistance to dominant discourse appears mute. The example of cancerous carrageenan suggests that active supporters of the biopolitical model are alternative communities that might be more commonly associated with opposition to neo-liberal modes of governance. This paradox is less surprising than it may seem as the *power of freedom* is championed by both

ends of the political spectrum. The problem of risk perception associated with carrageenan is then related to ideas of freedom and choice - topics taken up in the next chapter.

Illustration: 'Too much free will', The Guardian
Source: Thompson (2004)

Chapter 5

Choosing health: What ever happened to the McLean burger?

> Our customers will recognise the choice and variety on the menu and that we support them by providing relevant nutritional information so they can make informed decisions. They know their own diet and lifestyle best (McDonald's UK Press Office 2004: no page).

As an enabling technology for the prevention of obesity, a low-fat burger introduced to McDonald's outlets in the United States in 1991 would seem a win-win for all concerned. In the McDonald's McLean Deluxe burger, consumers were able to have their cake and eat it, to consume a fatty *tasting* burger that, *thanks to the addition of carrageenan to the ground beef patty,* had a reduced fat content. In the figure of the McLean, it seemed, the cultural dimension of food choice could be bypassed altogether by reformulating the extracorporeal space of food rather than expecting or demanding reflexivity in the behavioural practices of eating. Health advocates and others were full of hope for the expanding low-fat food choices that would follow the McLean in the battle against the obesity epidemic. Prospects for carrageenan producers in the market for low-fat foods were excellent.[47] The McDonald's company could look forward to higher profit margins for McLean products than for 'regular' burgers, and could (be seen to) conform to public health guidelines.

The McLean flopped. McDonald's withdrew it from the market in 1996 and introduced a premium, fat dense, Arch Deluxe beef burger. Despite the return to fat, from the year 2000 onwards, popular press articles reported the introduction of numerous so-called healthy food items to McDonald's and

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47 Annual consumption of ground beef in the US in 1991 was 7 billion lb (3.175 billion kg) (Huffman and Stevenson, 1991). Given that annual production of carrageenan was approximately 9000MT in 1991 (Bixler, 1996) if all the ground beef in the US had been reformulated to be low fat, and if carrageenan been used at the recommended level of 0.05% in all burgers, the market for carrageenan would have increased by 1587.5 MT, or 17.6% per annum.

other fast-food outlets such as Wendy's, Burger King and Taco Bell. Low-fat and low-carbohydrate composition foods, salads, fruits in bags and veggie burgers were among the products developed to change consumer perceptions about fast-food outlets as unhealthy. However in current media accounts about this shift in marketing, the spectres of earlier food innovatives, such as the McLean burger, loom large. In articles that specifically mention it, the McLean appears as a portent of failure: a symbol of the inability of fat-free fast-foods, or new developments low-fat/low-carb technologies, to limit the further expansion of waistlines; and of the non-performance of individuals to meet their responsibilities as self-regulating and prudent subjects of risk.

Despite the development of new technologies such as the McLean, several authors have noted how the provision of choice (within a sphere of freedom) often fails to reach goals suggested by strategies of prevention (Crossley 2004; Hallowell 1999; Henderson & Petersen 2002; Valentine 1999). People's choices about health and food are known to be extremely complex, involving cultural and other factors that extend beyond the *rational* expectations calculated and disseminated in expert accounts (Bell, D & Valentine 1997; Brown, T & Duncan 2000; Henderson & Petersen 2002; Murcott 1998, 2001; Probyn 1999, 2000; Wynne 1996). The complexity of choice is limited by situated social identities, diverse cultural framing of bodies, and variations in understanding illness and health in different contexts. What is understood as choice is not consistent across different publics or different individuals. Thus choice comes into conflict with the aims and discourses of health promotion and prevention.

Taking the contingent nature of choice and limits of freedom into account, I now consider what can be gleaned about prudentialism from the failure of a technology that promotes choice and signifies freedom. I look beyond carrageenan's literal values in modifying the fat content of the McLean, to examine its functionality in a symbolic network that incorporates issues of

food, health, risk and prudentialism. First, I briefly review the problematisation of obesity in setting the scene for the development of the Mclean and the spatial configurations it gives rise to. Second, drawing on the perspectives of key informants in the carrageenan industry and developers of the McLean, I detail the constitution and subsequent failure of the McLean in the marketplace. *How* did the McLean fail? Third, I consider media representations of the failure, resurrection and mobilisation of the McLean in popular press articles appearing four years or more after it had been withdrawn from the market. I examine the discourses of public health that underlay the newsworthiness of media narratives.

The chapter demonstrates that the media reproduce and embody a particular risk rationality, which, among other things, (re)constitutes individuals as prudent subjects. Furthermore, it highlights how the development of the McLean has been drafted anew to tell particular stories about the past, present and future of prudentialism and technological food innovation. These tasks permit me, in short, to consider the currency of risk in the socio-political transformation of a 'fast' food and its articulation in a critical geography of public health.

The will to health: obesity and risk

A politics of urgency and the obesity 'epidemic'

Concerns about obesity have been present in the Anglo-American sphere since early last century. However as Levenstein (1993: 202) documents in the US, and equally true elsewhere, these threats were rarely taken to refer to, and focus on, the health of populations as has been the case from around the 1960s onward. In keeping with the discourse of the new public health, obesity has become a pressing health issue for populations and not simply individuals. Furthermore, there has been an increased attention to moral and behavioural conduct of individuals in relation to obesity (Stratford 1998a, 1998b).

Before exploring the health focus of current efforts towards obesity, it is worth remembering that the aesthetic of slimness has a long history; take, for example, the use in the west of corsetry throughout much of the period from the 1500s to the early 1900s (Stratford 1998a, 1998b) or the use of dieting, very much in mode from the 1920s (Levenstein 1988: 205). Feminist accounts draw attention to the gendered nature of the 'ideal body' within the social context of patriarchy that have, at many times and places in history, constructed 'fat' women's bodies as transgressing the spaces of the normal; as 'bodies out of bounds' (Bordo 1993; LeBesco & Braziel 2001; Orbach 1985)[48]. In turn a *pathologising* of fatness as transgressive has led to what as Besco and Braziel term the 'trope of the symptomatic fat body' (LeBesco & Braziel 2001: 3). The common acceptance of fatness as indicative of negatively ascribed behaviours and ways of being in the world places the fat body as a trope for all manner of other disorders. Obesity may be cast as an internal problem, a lack of will power, a failure of the self. Commonly many people (in particular women) pursue the slim body, often at great personal cost, through active self-management. Bordo (1993) has argued that anorexia and obesity reflect elements of consumer culture - the first as a form of excessive prudentialism, the second as excessive consumption. Some feminists have espoused resistance to the normalising tendencies of bodily ideals and sought to re-colonise 'corpulence' as an object of desire and beauty (LeBesco & Braziel 2001). From all these perspectives it can be seen that obesity is profoundly problematised such that it is a geographic issue (Bell, D & Valentine 1997; Valentine 1999); a feminist issue (Fallon, Katzman & Wooley 1996; Orbach 1985) and a sociological issue (Crossley 2004).

The question of the aesthetics of the ideal body is only one factor in current tendencies to pathologise obesity, which is constructed as having serious

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48 Critiques of new health-related discourses about obesity point to pronounced judgements against fatness in American society. In *Bodies out of Bounds*, a collection of essays on fatness, fitness and diet industries, one aim is to explore how 'fat' is a socially constructed phenomenon (LeBesco and Braziel, 2001). In the same collection, Hartley's (2001) reading explores the gendered nature of fatness, arguing that discourses of fatness apply in particular (patriarchal) ways to women's bodies. She suggests normal body ideals for women tend towards smallness, even 'invisibility'. In this view, fatness is more transgressive for women than is the case for (most) men.

implications for the health of the body politic. In the contemporary expansion of official health discourses associated with the new public health, various institutions, scientists, equipment, reports and means of assessments were enrolled in support of a mode of presentation of obesity in which it was targeted as an urgent problem for America and for individuals, as it simultaneously (re)inscribed the boundaries of normalised healthy bodies. The obese body became an act of transgressing not just gender norms, but the normalised spaces of 'healthy' bodies such that fat is a 'four letter word' (LeBesco & Braziel 2001: 2) increasingly *for everyone*.

New public health discourses have increasingly promoted prudentialism such that, in the US, 'Every authority, every institution in our society urges us to fight our fat' (Seid 1989: 15). One institution producing *facts* about the obesity crisis - representative of the turn to prevention and prudentialism, and with a key role in promoting a politics of urgency about that crisis - was the US Office of the Surgeon General.[49] The Surgeon General's various influential reports on the state of the nation's health have been powerful catalysts for regulatory reform in relation to obesity. *The Report on Nutrition and Health* in 1988 and the *Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity* in 1991 raised the status of obesity to suggest that 'overweight and obesity have reached nationwide epidemic proportions' (U.S. Department of Health and Human Services 2001: v). Through the expertly derived calculations of an epidemic, as Levenstein (1993: 242) suggests, obesity had entered the spaces of the already-healthy population to become a problem for 'most' Americans.

Consistent with the preventive turn in new public health, the *Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity* was typical of the problematisation of obesity in that it was measured in relation to risk of other diseases. Measurements of population health in terms of

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49 Since 1968 the Office of the Surgeon General in the US has been a figurehead in prevention and health promotion strategies. Although originally established as a treatment focused agency, in 1968 the role of the office was reformed from bureaucratic management of the Public Health Service (among other responsibilities) to an independent advisory body on issues of public health of the nation.

mortality rates were augmented by statistical and epidemiological accounts of possible future conditions of ill-health. The report suggested that '300,000 deaths per year may be attributable to obesity', but the *potential* of other diseases provided the evidence to support more extensive preventive actions to combat the 'epidemic'. Conditions such as type 2 diabetes, heart disease, stroke, hypertension, gall-bladder disease, osteoarthritis, sleep apnea, asthma, breathing problems, cancer, high blood cholesterol, complications of pregnancy, menstrual irregularities and depression were amongst the health conditions that the report suggested could be prevented through weight control (U.S. Department of Health and Human Services 2001).[50] In summarising the contents of the report in this manner, I do not question the seriousness of any of the health conditions that are mentioned, but rather emphasise how such estimations bring the future *to account in the present* and re-map the relationships among individuals, health, practices of consumption and governance in these concerns. From below, prudent consumers were incited to action; from above, government efforts focused on reforming the food acquisition environment in order that they could act. All around, consumer products, convenience foods and profits suggested that in the *possibility of prevention* was also a potential market, and one whose profit motivation made any moral commitments to health questionable (Braziel & LeBesco 2001).

The McLean was one material technology that articulated the new public health concern with a generalised move towards prevention, through which individuals were able to regulate their behaviours. Simultaneously, prevention technologies such as the McLean target the fat body as transgressing the space of the normal and the extra-corporeal space of consumption. The construction of technologies to mitigate obesity in such

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50 Many other reports and public bodies have documented and facilitated the nationalisation of the obesity epidemic and turn to prevention strategies. The emphasis has been on risk reduction as exemplified by reports such as The National Research Council report *Diet and Health: Implications for reducing chronic diseases and risk* (National Research Council, 1989). The reports emanating from the NRC and other public health institutions are also underlain by scientific calculations of risk, identifying such things as the increased consumption of energy through fat and fat components, and the growing medical awareness of links between fat consumption and coronary heart disease and cancer.

manner (re)produces a particular vision of bodies and their relations with health, and extra-corporeal spaces and lifestyles as targets for mitigation.

Provision, promotion and surveillance: hallmarks of prevention

In 1989 the US Institute of Medicine (IOM) established a Committee on Dietary Guidelines to determine the best way to change eating patterns and reduce diet-related chronic illnesses (Institute of Medicine 2001). The IOM report was published in 1991 and identified three tactics for achieving this aim. The first was to alter the food supply by subtraction, addition and substitution to foods. Modifying the food supply included reducing fat in meat and cheese (subtraction), fortifying foods with nutrients (addition) and replacing fat in foods (substitution). The second tactic involved 'altering the food acquisition environment' by providing a variety of food choices greater than normal, labelling food to increase consumer information (chapter two), and giving point of purchase advice (Institute of Medicine 2001: 25). The third tactic suggested modifying nutrition advice from both public and private health information services.

Healthy People 2000, a report issued by the US Public Health Service, supported the aim of food modification. Significant for the food industry were prescriptive statements to 'increase to at least 5,000 brand items the availability of processed food products that are reduced in fat and saturated fat', from the 2,500 reduced fat items that could be purchased in 1986 (US Department of Health and Human Services 2000: 125). While public health discourses were promoting reduced fat foods, various consumer groups, including the Centre for Science in the Public Interest (CSPI, see chapter two), had also stepped in to the fray to assist in producing and marketing more fat-modified foods. Dietary recommendations targeted high fat foods and recommended replacement with low fat alternatives (Peterson, S et al. 1999; Schwenk & Guthrie 1997).

In a political environment characterised by obesity-angst, various new fat-replacement technologies were developed throughout the 1980s and 1990s (such as Olestra[51], Salatrim[52], Microparticulated Protein Product (MPP)[53] and Fantesk[54]) but each required testing and regulatory approval before use. With a long history as emulsifier, stabiliser and thickener, carrageenan was already an approved substance for foods. In the early 1990s carrageenan began to be marketed as one of the first of a range of fat-replacement technologies (Kurtzweil 1996)[55]. In the meat industry for example, carrageenan began to be more widely used in the 1980s and 1990s as Stancioff explained:

> The USDA is involved with anything to do with meat. So the recipes have to be known and approved by the USDA. So if you want to pump carrageenan into ham, you are out of luck unless you get permission from USDA; they were reluctant to do that, adding water to ham. But then with all this trend toward low fat and low calorie they began to allow things like carrageenan and other substances and phosphates and salts to be used, not only as preservatives, but to hold moisture to retain plumpness of meat, sometimes just to reduce the fat content (Stancioff, pers.comm., 15 June, 2002).

Thus carrageenan producers were among the first to benefit from the risky opportunity of fat-modified foods in the name of a product that would be 'win win' for government, industry and for the nation's health. New public health concerns with promotion, prudentialism and prevention legitimated increased modification of food, led by health experts and regulators. It was into this favourable space that the McLean emerged.

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51 From the initial submission to the FDA for approval of Olestra in 1987 it was not accepted as suitable for food until 1996 (Ralston, 1996).
52 Salatrim an acronym for 'short and long-chain acid triglyceride molecules' is a family of fat-replacement technologies that was filed with the FDA in 1994.
53 A protein based substitute used commonly in dairy foods, designed specifically for fat-replacement and came into common use in the early 1990s.
54 Developed by the USDA and based on a combination of starch or gum with small amounts of oil. The sole rights for production were sold to the Opta-food company in February 1995.
55 The early fat-replacement technologies used carbohydrate as the major ingredient. Avicel, a cellulose gel, Carrageenan, and Litesse, a polydextrose substance are recognised by the FDA as the 'first' fat-replacers. All three products had a long history of use in food for other purposes. Avicel as a food stabilizer, Carrageenan as an emulsifier, stabilizer and thickener, and Litesse as a humecant.

A technological fix: the McLean Deluxe

The McDonald's McLean Deluxe: 1991-1996 (RIP)

In March 1991 McDonald's introduced a new beef burger based on a formulation called AU Lean: the McLean Deluxe. AU Lean was the creation of researchers at Alabama Agricultural Experiment Station at Auburn University (Bixler 1996; Shell 2002; Stevenson 1991) in collaboration with FMC - the parent company of the carrageenan processing company FMC Biopolymers referred to in preceding chapters (Bixler 1996: 42).

The AU Lean formulation of ground beef, 0.5% carrageenan, 0.2% hydrolysed vegetable protein, 0.4% salt, and 10% water, was reported to have less than 10% fat and approximately half the calories of a 'regular' burger (Egbert et al. 1991; Huffman & Stevenson 1991)[56]. The key to the AU Lean was carrageenan, the water binding properties of which overcame the problem of dryness that would be associated with fat reduced beef that had no additives (Egbert et al. 1991; Troy, Desmond & Buckley 1999). Consumers were consulted and surveyed using statistical comparisons between the McLean and a 'regular' burger (Table 5.1). The results suggested the developers were on to a winner. 'Eating qualities were rated on a 1 to 8 scale (1 = extremely undesirable and 8 = desirable) and other qualities are given as percentages' (Huffman & Stevenson 1992: no page). In the 1980s and 1990s demand for beef 'plummeted' in the US as consumers were reported to have responded to increased concern about cholesterol and turned away from beef (Levenstein 1993: 253); hence the economic imperative to boost sales.

AU Lean was touted as a revolution in food and immediately targeted at *particular* publics. According to developers, the McLean appealed to people who were not *already* conscious about dietary fat. 'A large segment of today's consumer population is health conscious and concerned about dietary fat.

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56 The study was funded by the Beef Board and Alabama Cattleman's Association and managed by the Beef Industry Council of the National Live Stock and Meat Board.

These consumers avoid meat products with a high fat content, such as ground beef' (Huffman & Egbert 1990: 5).

Table 5.1 Results of consumer survey of AU Lean, Alabama Agricultural Experiment Station 1999

Eating Traits	20% Fat	AU Lean
Juiciness	5.8	6.7
Tenderness	5.6	6.6
Flavor intensity	5.2	6.4
Overall acceptability	5.4	6.8
Cooking Traits (%)		
Moisture	55.8	66.3
Fat	19.2	8.2
Protein	24.8	24.5

Source: Huffman and Stevenson 1991: no page.

Targeting ground beef implied that those consumers who had made the switch away from beef would return to beef, and those who continued to eat high fat ground beef, if enabled though provision, would become more prudent. Targeting fast-food outlets mapped onto particular spaces and publics as at risk: AU Lean was investigated in a USDA pilot study for possible use in the National School Lunch Program, and for hamburgers in Disneyland and Disney World theme parks (Stevenson 1991: no page). All three locations appeal to mass audiences and, while it may be overstating the significance of the particular place-based settings, in these locations the McLean targeted particular consumers – children and those already partial to a style of consumption in the manufactured 'real'[57]. As Baudrillard has said of Disneyland,

> Disneyland is there to conceal the fact that it is the "real" country, all of "real" America, which is Disneyland (just as prisons are there to conceal the fact that it is the social in its entirety, in its banal omnipresence, which is carceral). Disneyland is presented as imaginary in order to make us believe that the rest is real, when in fact all of Los Angeles and the America surrounding it are no longer real, but of the order of the hyperreal and of simulation (Baudrillard 1988: 154).

57 I refer here to Baudrillard's theory of simulation in which he advances the proposition that we have entered an era of consumption where models of the real have replaced the real. Baudrillard blurs the distinction between the two, suggesting that Disneyland is now the model for what 'real' America is (Best & Kellner 1991). There are interesting overlaps in the constitution of the McLean in terms of questions of 'authenticity' and the boundaries between what is consumed as a simulation and what is 'real'. In this view, the constitution of the McLean may be considered as the model of an ideal burger, such that the criteria for a fat-laden burger is thereafter made by comparison with the McLean.

Like Disneyland, the McLean is a simulacrum that conceals the carcereality of food choice. The McLean also conceals the uneven geographies of consumption, how eating burgers at McDonald masquerades as free choice but is bound by the power of market forces and advertising budgets; and the (uneven) dependencies on lifestyles of convenience and fast-foods. It is worth reiterating Dean's (1999a) contention that factors of risk often map onto older social divisions such as class and disadvantage, as well as between populations whose members actively seek such things as 'low-fat' alternatives and those targeted for interventions because they do not. For people on limited budgets, higher fat foods are commonly cheaper such that food choice may be linked to economic disadvantage (Valentine 1999). Moreover, as discussed in chapter two, children's bodies are subject to a greater intensity of risk surveillance and intervention than is generally the case for adult bodies. While the McLean was an intervention intended for certain publics, consistent with the new public health, the whole population came under the public health and manufacturers gaze: the McLean acts across geographical scales that encompass both the micro-terrain of bodies and through the (re)construction of social spaces of inequality *and* universality.

The developers of AU Lean saw the McLean as just a first step in a range of foods to allow American consumers *in general* to have their cake and eat it too. A 1991 press release from the Auburn University suggested that the

> AU Lean story is not just about a one-time, one-product development. Plans call for a family of meat products that will offer American consumers healthy diet options without giving up the meat they desire (Huffman & Stevenson 1991: no page).

Moreover there was a high priority attached to achieving the goal of provision. The construction of obesity as an 'epidemic' generated a politics of urgency about developing modified fat products. For the McLean, the normal trial period that would pre-empt the introduction of a new food product was expedited:

> As might be expected, commercial acceptance of AU Lean came in a hurry. McDonald's was first, going nationwide in March 1991 with its own version of the Auburn mixture after a short marketing test in selected cities. This burger, selling under the trade name McLean Deluxe, is now offered in 8,800 outlets and is gaining wide acceptance (Huffman & Stevenson 1991: no page).

According to Huffman and Stevenson (1991) the reason for the burger's speedy introduction was the broad-based and pressing concerns about nutrition and health that, because of the dominant market position of fast-food, provided the greatest opportunities for fast results. 'The fast-food industry was the first target for acceptance of AU Lean, since this represents the largest market for ground beef. Getting a low-fat, healthy hamburger into the fast-food chains was thought to offer the greatest potential impact on nutrition and health' (Huffman & Stevenson 1991: no page). New public health works through a heterogeneous assemblage of factors in which the McLean was embroiled. The desire to produce a low-fat burger was associated with governmental ideas of health, consumer concern about cholesterol and the decline in demand for higher fat beef. Notwithstanding the commercial urgency experienced by the McDonald's company in the effort to deal with competitors and be the first fast-food outlet to produce a low-fat burger, the sense of urgency to achieve this aim was amplified by the turn to the new public health and calculation of obesity as an epidemic. For the development of the McLean, the sense of urgency was compounded even more because of McDonald's iconic status in these concerns, which subsequently fuelled consumer initiated bad press for McDonald's, the passage of the Nutrition Labelling and Education Act (NLEA), and targeted interventions on fast-food.

In April 1990 one of a series of unfavourable full-page advertisements directed against fast-food, and in particular McDonald's, appeared in leading newspapers[58] around the US. One advertisement was headlined, 'The

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58 The advertisements appeared in among others, the *New York Times*, *Washington Post*, *USA Today* and *Wall Street Journal*. 'The Poisoning of America' advertisements focused on McDonald's, but attacked all fast-food chains for high levels of saturated fat and cholesterol. Sokolof was identified as a 'crusader' who was motivated by his experience of a heart attack which he attributed to poor diet (Gibson 1990)

Poisoning of America! Part III'. The advertisement included a picture of a Big Mac hamburger and some McDonald's french-fries with the statement 'your hamburgers have too much fat' (Gibson 1990: B3; McKee 1992: 30). Phil Sokolof, multi-millionaire founder of the National Heart Savers Association (NHSA) and food activist, sponsored the advertisement reputedly 'to persuade McDonald's to come out with a reduced-fat hamburger (the McLean) and Congress to pass the Nutrition Labelling and Education Act' (McKee 1992: 31). In 1990 the exact details of the NLEA labelling requirements for foods had not been formalised, it was known that the total calories derived from fat per serving; as well as the grams per serving of total fat, would be required on food labels (Figure 5.1).

At the time, the Food Marketing Institute (FMI) was one of many organisations that argued that saturated fat had become the major concern of US consumers. A feature story in the food industry magazine *Food Product Design* reported that:

> The food industry is responding to consumers' demand for lower-fat foods by developing low-calorie fat replacers. The urgency to provide a nutrition-conscious public with lower-fat foods will be even more pronounced when the amount of fat and unsaturated fat in foods is required on labels (Willkes 1991: no page).

While industry members claimed that consumer pressure provided the impetus for the changes, the urgency for low-fat foods was further intensified by the imminent possibility that, with the visibility of such concerns, consumers would become informed and increasingly self-reflexive about their food choices in relation to fat in meat and other products.

Nutrition Facts

Serving Size: 1 sandwich • 214g

Amount Per Serving

Calories 340	Calories from Fat 108	
		% DV*
Total Fat 12g		18%
Saturated Fat 4.5g		22%
Cholesterol 60mg		20%
Sodium 810mg		34%
Total Carbohydrate 37g		12%
Dietary Fiber 2g		8%
Sugars 8g		
Protein 24g		48%
Vitamin A 8%	•	Vitamin C 15%
Calcium 15%	•	Iron 25%

*Percent Daily Values (DV) are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

Nutrient		2,000 Calories	2,500 Calories
Total Fat	less than	65 g	80 g
Saturated Fat	less than	20 g	25 g
Cholesterol	less than	300 mg	300 mg
Sodium	less than	2400 mg	2400 mg
Total Carbohydrates		300 g	375 g
Fiber		25 g	30 g

1 g Fat = 9 calories **1 g Carbohydrate = 4 calories**
1 g Protein = 4 calories

Percent of Calories from:

Fat-31.8% Carb-43.5%
Protein-28.2%

(Total may exceed 100% due to rounding)

Figure 5.1 Nutrition Label for the McLean
Source: McDonald's pamphlet 1991

In summary, the McLean was a micro-technology for the management of an issue in public health of particular populations, conceived at the macro-scale of population health (see Rose 1999: 5). The burger was entangled in an assemblage of risk calculations and a will to prevention from above and below that was intensified through making fat visible (in certain ways), and augmented by the active participation of individual prudent citizens and organised groups such as the NHSA and the CSPI. The McLean was conceived as a meticulous simulacrum, arranged and designed to achieve what prudentialism on its own could not - a scientific and technologically inspired provision of choice in places already choice disadvantaged. Simultaneously, the fast-food joint is represented as a governable space with particular characteristics, amenable to governmentally inspired investment in its reformation.

Initially the McLean was welcomed by consumer groups concerned with health and attracted considerable media attention. Phil Sokolof described the McLean as a 'victory for the American people' in an ABC World News report on March 15, 1991. The CSPI maintained its positive stance on the new development into 1995, as reported in the *Chicago Sun-Times*.

> McDonald's McLean Deluxe has the best nutrition profile of all fast-food burgers, according to a study released by the Center for Science in the Public Interest, the group that brought you news of the best and worst Chinese, Mexican and Italian food and movie popcorn. You could eat five McLean burgers, the center says, and still not get the fat you'd find in one Burger King Double Whopper with cheese (*Chicago Sun-Times* 1995: 10).

However, almost immediately questions began to arise about the McLean in popular press articles concerning a variety of fears about its consumption that revealed other dimensions of food choice. The body is 'geography closest in', marking the boundaries between self and other, inside and outside. Within cultural geography food is recognised as a liminal substance that may be simply mundane sustenance or may embody values and associations that, through eating, cross the boundaries of body geographies (Cook 1996; Guthman 2003; Probyn 1999; Valentine 1999). In this way the

process of eating can involve the incorporation of desires and dreams, or be 'invasive, intrusive and contaminating' (Valentine 1999: 334). As such, food is recognised as a powerful metaphor for an ethics of existence (Probyn 2000).

The McLean appeared in media articles as contaminating the body through association with technology as other to nature and society. A *New York Times* article linked the development of the McLean with dystopian images drawn from science fictional characters heralding a new era of functional foods. 'A technological triumph, maybe. But is America ready to eat like the Jetsons? ... Food technologists see the McLean as a precursor to simulated fish fillets and french fries fortified with cancer-fighting phyto-chemicals' (O'Neill 1991: 1).

Other articles referred to the polluting potential of the McLean as an all too natural 'seaweed burger' (Peterson, L 1991; Schlosser 2001). A *Washington Post* report detailed a television advert for Hardee's fast-food chain in which a Hardee's restaurant manager stated, 'I've heard that McDonald's uses seaweed and additives, and we would never consider using fillers, flavor enhancers, [brief pause] seaweed ...'. Except as a food additive seaweed is not commonly consumed in the US and the incitement to disgust revealed deeper cultural, moral and ethical orderings associated with food choice (Miller, WI 1997; Probyn 1999). Hardee's advanced such fears to promote the goodness of its own low-fat burger. Moreover, in the same article the *Washington Post* writer exposes his xenophobia by casting seaweed as an ethnicity capable of a polluting effect; 'Japanese' food:

> I called McDonald's.
>
> I spoke with their head chef, Toshiro Fujitsu, and ... no, I'm just kidding. Actually, I spoke with Terri Capatosto, director of media relations (Kornheiser 1991: F1).

The cultural and aesthetic dimensions of food choice and questions of the McLean's authenticity were among factors that limited the chance of its

success. The developers considered the McLean had been 'tailored to meet the needs of the diet conscious consumer' (Huffman & Egbert 1990: 27). From this viewpoint, people would eat the McLean because it was a rational, healthy choice; because no change was required in sensorial taste; and because the reconstitution of the McLean does not modify cultural values of eating a fast-food burger. Given its rapid rejection, the last concern was clearly disputed as soon as the McLean entered the market, however there were more than cultural and aesthetic reasons for this.

The McFlopper

> ... after a year on the market and an estimated [US]$70 million in research and marketing costs, the McLean Deluxe apparently doesn't have many people biting. Call it the Flopper (Farhi 1992: D10).

In February 1996, the McLean was withdrawn from the market. In a presentation to the 15th International Seaweed Symposium (published in the journal *Hydrobiologia*), Bixler summed up his reading of the McLean burger as a *marketing* disaster:

> The McDonald's McLean hamburger was a marketing mistake as will be many of the hydrocolloid fat substitutes that have flooded the market in recent years. In the case of low fat hamburger[s] the marketeers forgot that people don't go to McDonald's for nutrition; they go for fast service, uniformity, and a familiar taste or mouthfeel. And they certainly weren't highly motivated by the higher price McDonald's decide to charge for the product. FMC (Philidelphia, PA, US) and Auburn University (Auburn, AL, US) collaborated on what was certainly a technical tour de force, but J.Q. Public wasn't impressed. Iota carrageenan will swell in cold water, so it can be mixed with fresh ground beef. It also has enough fat-like characteristics and moisture binding ability to make up for some of the lost succulence and the dry taste of lean beef hamburgers, but it still was not enough to mimic the attributes of a regular-fat-content burger (Bixler 1996: 42).

In Bixler's view various factors contributed to consumers' rejection of the McLean: McDonald's was not a suitable *venue* for nutritional food; the burger was rated lower than other products in terms of its *monetary value*; and, while its technological sophistication was impressive, it did not provide *sensory experience* equivalent to a full-fat burger. Based on these concerns the consumers' choice not to consume was rational.

Indeed others in the food manufacturing and carrageenan industries suggested that the technology had fundamental flaws associated with the failure to adequately test the new burger before its introduction (Thorn 2002: 102). One key informant from FMC Biopolymers suggested that the

> McDonald experience was that they replaced fat in hamburger, which is fine for a freshly cooked burger, but it doesn't age well on the heating rack with infrared lights on it (Foss, 2002, pers.comm., 20 June).

Under conditions likely to be experienced in a fast-food outlet, where products must withstand time under heat, the McLean shrivelled like seaweed drying on a beach, and the advantages of carrageenan were lost such that the texture became as one commentator put it, 'like a hockey puck' (Shell 2002: 197).

Moreover, the low-fat market was viewed by some within the carrageenan industry as a food fad that, with or without the McLean, was unlikely to represent any long-term change in food habits. Using the example of various other diet-related products, Bixler (1996) demonstrated the boom and bust nature of diet-related food products containing carrageenan (Figure 5.2).

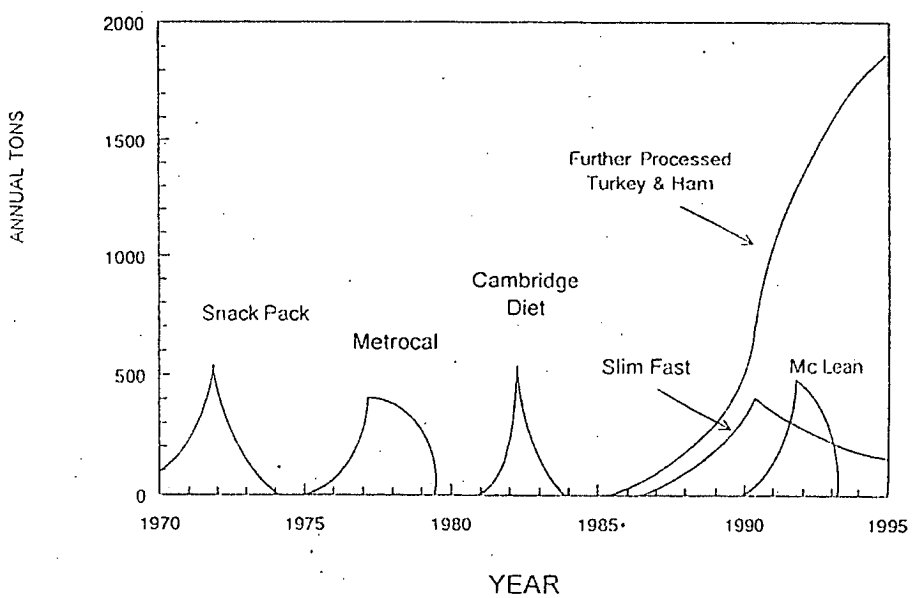

Figure 5.2 Industry representation of fast-food failures
Source: Bixler 1996: 42

In an interview that I conducted with Bixler in 2002, he reiterated the faddish nature of diet foods:

> you know, we go through fat foods every 5 years it seems, and that low fat craze did lift the carrageenan demand, but it fell just about as quickly as it lifted it, it's not all that popular today (Bixler, 2002, pers.comm., 16 June)

The boom and bust nature of diet products, an approximate five year cycle in relation to the carrageenan products in Figure 5.2, occurred during the period identified as the new public health with its characteristic prevention, promotion, prudentialism and multi-causal approach to risk factors (Brown, T & Duncan 2002). Figure 5.2 suggests that diet products such as Metrocal, Cambridge Diet, Slimfast and the McLean had instant market impact, but ultimately failed to capture public imagination - they were not durable as material technologies of prevention. All 'failed' in the market. The enthusiasm followed by rapid decline in the shape of the demand for snack pack and Cambridge does suggest a boom-bust consumer product; however the curve in the McLean and Metrocal indicates that these products were (slightly) more enduring. Arguably, this pattern could be related to prudentialism and the enthusiasm of consumer groups for the McLean, or to individuals adopting the McLean as a 'prudent' choice.

A second feature of the graph is the unmistakable success of the 'real winners' - processed turkey and ham (Bixler 1996: 42). These products are also low-fat with the addition of carrageenan, but are not promoted for low-fat qualities as diet products, but for monetary value, demonstrating the rationality of economic choice. Moreover the success of processed turkey and ham can be partly attributed to the changed regulations regarding the use of carrageenan in food[59]; a present and unintended effect of risk discourse about prevention. Taking these points into consideration, the successes and

59 Use of carrageenan in poultry products is also attributable to new processing methods developed in Europe to maintain the moistness and texture of cooked products. It is not accurate to suggest that the use of carrageenan in poultry can be attributed directly to regulatory change, however it may be one factor in its acceptance.

failures of diet products suggest that prudentialism also has a geography and one that does not easily map onto groups already marginalised by their socio-economic status. Low-fat may be less a rational choice based on aesthetics or health than one based on economic hardship and social milieu.

To this point, I have explored the constitution and mobilisation of the McLean as a governmental technology of health promotion and prevention. Individuals were enrolled, mobilised and constituted as prudent consumers and, through consumer pressure groups, were engaged to support the McLean's speedy development. I have suggested that the McLean was a failure in technological and cultural terms, and that its mobilisation as a consumer health product limited its chance of success. On this basis, it may be considered rational that consumers did not buy it. As various commentators have noted, risks may be debated and constructed as universal by experts, but they are experienced in particular and local settings (Brown, T & Duncan 2000; Lupton 1999a; Valentine 1999; Wynne 1996). For the McLean, as well as being a technological failure, the universalising tendencies of the new public health did not match up with the realities of everyday life.

Media and the McLean

Was the McLean simply introduced too rapidly? Certainly its technological shortcomings might have been ironed out with more research and development, but is it possible that individuals were not ready for the McLean, that they were not yet sufficiently prudent to accept the modified food environment? Examining media articles that have appeared between March 1999 and March 2004, I address Brown and Duncan's (2002) concern for the workings of the new public health, by exploring how individuals respond to prudentialism in the wake of the McLean's failure.

In March 2004, I searched LexisNexis[60], a comprehensive database of global new sources, which includes newspapers, news transcripts, wire services, trade journals, and newsletters, for the terms 'McLean' and 'McDonald's' in the previous five years (a period returning sufficient data for analysis, and at least two years after the McLean had been withdrawn from the market). The LexisNexis search produced 83 hits, of which 70 were domestic US sources, seven Canadian, three international (no place identified), one Indian and one Australian. The American domination of media accounts is reasonable given that the McLean burger was only introduced into the US market. All of the articles about the McLean appear between eight and 13 years after its introduction, and four to seven years after it was withdrawn from the market. In all of the media accounts, the McLean burger is *history* such that its incorporation in these stories immediately suggests a concern or interest in failure of the prudent subject - in effect also stabilising the discourse of prudentialism.

Despite the evidence suggested by key informants in the carrageenan industry, not one of the 83 articles about the McLean mentions its technological shortcomings. Only one, in the Canadian broadsheet *The National Post*, enunciates any negativity about flavour or textures of the McLean, and even there the suggestion is disputed. A lone paragraph quoted the expert opinion of Professor Anderson from the Department of Nutrition at the University of Toronto: '"I liked it", he recalled, "It had freshly sliced tomatoes and a meat patty with a plant-based binder in it that made the meat stick, in the absence of much fat. But it flopped. People complained it tasted like cardboard"' (Hutchinson 2003: A10). The article suggests that consumer complaints were in contradistinction to his so-called expert view. That expert opinion favoured the view that failure was consumer driven rather than derived from any technological shortcomings of the burger.

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60 LexisNexis is a searchable database of more than 5000 global media sources.

In the articles I surveyed the McLean was no longer represented as a failure of a technologically innovative health product, or as failing because of its entanglement with the politics of acting at a distance. Significantly, the omissions of blame associated with the technology are replaced by blame that reconstitutes failure *in the terms* of discourses of the new public health. As Rose (1999: 32) suggests, 'governable spaces are not fabricated counter to experience; they make new kinds of experience possible'. Failure is not counter to the goals of new public health as its appropriation confirms the ideals of prudentialism. In contemporary media articles, the McLean is subject to flaws that reinforce the new public health, an exploration of which now follows.

Like industry perceptions of the McLean's failure noted earlier, media articles emphasised marketing mistakes - and the failure on the part of McDonald's to understand what consumers wanted. In these views, members of the public either did not respond to the product as marketing experts anticipated, or had not been consulted: 'Food companies misjudged the public's appetite for nutritionally conscious products, generating such notable flops as Kellogg's low-fat Pop-Tarts, Kraft's reduced-fat Chips Ahoy and the McDonald's McLean Burger' (Ignelzi 2004: 1). In this view, the 'public's appetite' is reinforced as a catch-all phrase, suggesting, like new public health discourse, that there is or should be a unified public view on nutrition that is irreducible to situated experience of individuals in their daily lives. Yet other press reports suggested that fast-food companies had not conceived the hard sell required to modify consumer behaviour to this mode of thinking. One such article in the US edition of the *Economist* magazine stated, 'Selling unhealthy products may be difficult ... but selling health can be tough too' (*The Economist (US)* 2003: 12). In such a view marketing food depends on the active construction and sale of food as health-related. Arguably, consumers might not consider fast-food in such terms.

None of the articles that was analysed from the LexisNexis search mentioned consumer food choices in terms of the sorts of 'faddish' behaviour emphasised by Bixler. Food consumption was not then viewed in purely cultural/aesthetic terms. However reference to consumer interest was a different matter. The media reported that 'consumers didn't bite' (Vilbig 2001: 12); that 'it fell flat because of low demand' (Evans 2004: F1); that 'nobody bought it' (Gharib & Yastine 2003); that 'it went nowhere' (Stainsby 2001: no page); had 'anaemic sales' (Ecke 2003: 1A); and just 'didn't fly' (Rector 2002: 3F).

Despite suggesting the McLean was a failure because of factors to do with marketing and consumer taste, blame was a common sentiment in many of the articles. Amongst media, industry and individuals accounts, *the lack of a will to health is a shared strategy of blame.* According to an article in the *Copley News Service,* a syndicated organisation feeding stories to various media sources in the vicinity of San Diego, consumers are not yet 'nutritionally conscious' (Ignelzi 2004: 1). Others point to the 'bloated prices' of the McLean in relation to other burgers, reducing consumers' perception of 'value' (Evans 2004: F1). From these perspectives the McLean was at least in part, a *failure of the consumer* to consume.

Some authors questioned the morality of companies, one pair asking, 'Are the food companies serious, or merely engaged in public relations?' (Johnson & Fauber 2003: 01A). The difference between responding to consumer demands and public relations is moot, and yet the question is meaningful in that it suggests a distrust of the company's *will to health.* In an about-face from previous expressions of support for the McLean, the CSPI Executive Director argued: 'What the processed food industry wants is to get people to continue to eat processed food ... they don't care if the foods cause obesity or not' (Johnson & Fauber 2003: 01A). Other authors are forthright in suggesting that new food introductions are cynical exercises on the part of McDonald's to deflect criticism from obesity lawsuits, media, government and the public.

In this view, changes were not consumer-driven in the sense one might normally attribute to that phrase, but a response to obesity-related law-suits, or the healthy profit margins achievable from the production and sale of modified food products. 'McDonald's, like other chains, denied its changes have anything to do with lawsuits. "It's really all about the customer and the feedback that we've been receiving from the customer," says spokeswoman Lori Miller' (Evans 2004: F1). Such views focus responsibility for health on the consumer and construct economic space as merely responding to, and not constructive of, governmental spaces of health. The laws of supply and demand, and not of the new public health are what govern economic space. Hence as Rose (1999) has pointed out, economic space has its own temporal and spatial configurations under neo-liberal systems of governance, to which governance of spaces inscribed by such discourses as new public health, are expected to defer.

While I have emphasised various public health concerns as they underlie contemporary images of the McLean, media accounts representing food risks often resort to controversy and dramatisation to increase a story's newsworthiness (Fowler 1991; Lupton 2004). In the articles I surveyed, the McLean was symbolically used, via accounts that appeared at the time of its introduction, to discredit new food modifications through dystopian images of *frankenfood, culinary alchemy,* a *lab creation,* from a *test tube* exhorting the *experimental* nature of such introductions. Some noted that there was no choice about such innovations, since food changes were already in development in the laboratories and marketing institutes of the various companies, and were inevitable because of the significant investments in their development. On the other hand, science was also presented in positive health terms, some authors noting the rise in popularity of 'functional foods' - or foods with added health benefits (May 2003: 1). The construction of nature/science in these accounts wavers, and exemplifies the difficulty of maintaining such dualisms as reified (Murdoch 1997).

Choice and the technological fix

Unlike articles that appeared at the time of the introduction of the McLean, none of the later coverage mentions cultural concerns about 'seaweed' or taste. Upon reflection, these elements of an aesthetic-expressive dimension of the McLean vanish from popular accounts. In the mode of self-governance, the McLean is redeployed to promote prevention, choice and the technological 'fix', even in the face of disappointment.

Like the critique of consumers' failure to embrace the McLean, the prospect that consumers or companies have the ability to change to new food products was represented in media accounts with a high degree of scepticism. 'Today it is far from clear whether the public will embrace the next generation of lower-fat brats [bratwursts] and McLean burgers ... Already there is ample evidence that it won't be easy for food companies and the public to change their ways' (Johnson & Fauber 2003). In this view the McLean exemplifies how consumers are (already) 'flawed' such that innovative health technologies (IHT) have little chance of success. However, some authors also deemed that choice was pointless because the development of IHTs was not *really* about healthy food choices anyway: 'as with the low-fat food trend of the '80s and '90s, people are flocking to low-carb products with the misguided notion that these foods will automatically help them lose weight' (Ignelzi 2004: 1). Some articles went so far as to suggest that fast-food and healthy food might be 'mutually exclusive' (May 2003: 1) or even that fast-food is *dangerous*. Such representations place fast-food deeply under a preventive health gaze, and deny the possibilities that fast-food has other cultural values and may have importance as a form of voluntary risk taking in the construction of individual subjectivity (Lupton & Tulloch 2002). Furthermore, the consumption of fast-food may be related to temporal concerns; speed and convenience.

An article in the *Vancouver Sun* discounts the possibility that manufactures can develop new food products able to match up with lifestyle realities:

'"There have been a lot of attempts [to create healthy fast-food] and people are constantly saying they're concerned about health," Chan says, "but in reality, when they're time-strapped and under the gun, they go for what's the easiest." Fast-food just isn't fast enough for us' (Stainsby 2001: no page). Using this line of reasoning, food and health prevention have a temporal dimension that suggests an inverse relationship between health and speed. Time is money and fast-food is cheap, convenient and (therefore) unhealthy. However choice is complex and varies for many reasons, some of which have been identified in this chapter. What is understood as good for individuals by regulators and health professionals comes in conflict with the desires of individual consumers. The preferences through which people choose are situated within complex cultural/aesthetic concerns and socio-political orderings.

Despite repeated suggestions that the McLean was a failure, that new technologies may not stem the tide of obesity, and in spite of the production of a level of distrust of such solutions, in media articles about the McLean burger there is a strong focus on consumer choice. Given that low demand is represented as a significant reason for failure, and that consumers voluntarily chose not to eat the healthier option offered by the McLean one might ask what kinds of choices are consumers and media demanding?

In relation to the expansion of low-fat alternatives to fatty foods, one article suggests that 'choice is the key. We boomers know there's a problem with fast-food, but many of us also love its convenience and cheapness. The solution: give us a choice ... And something else: don't try to make burgers into health food by creating some heavily processed Frankenstein substitute. McDonald's just annoyed customers with the late, unlamented McLean burger ... With health and nutrition moving rapidly up our list of priorities, we do insist on having a choice' (Bryan 2002: D1). However the equation of choice, health and rational decision-making assumes that individuals can or will modify their choices and elevate the health concern over all others.

The constraints that limit choice – even in the terms of health - are acknowledged in media articles. Writing in the *Poughkeepsie Journal* (New York) Evelyn Gezo, a dietician, demonstrates the paradox of choice with the recognition of its inadequacy. Firstly Gezo asks if fast-food can change given the continuation of advertising, over-sized portions and all-you-can-eat-buffets. The article implies food companies have changed, with Gezo pointing to the increasing popularity of salads and McDonald's new 'happy meals', containing salad and a pedometer. However, Gezo continues, 'depending on the salad and salad dressing chosen, they can provide just as many calories and fat'. Finally she concludes 'most of us would agree that we don't expect all menu items to get high marks for being healthful, but as the number of health-conscious consumers eating meals away from home increases, it sure would be nice to have a choice' (Gezo 2003: D5).

While consumers call for choice, food manufacturers also appear to understand that is precisely what they are doing – and indeed that people have a duty to make choices. On this matter, a number of articles raised the issue of obesity lawsuits in the United States. '"The idea of suing McDonald's because you are obese is absolutely ridiculous. Just don't eat the stuff", said Jeff Kanter, an analyst who tracks food companies for Prudential Securities' (Koenig 2002: A3).

An article from a Montana newspaper the *Great Falls Tribune* suggested that excessive consumption was a choice. 'Deb Hudson, of the Golden Corral, an 'all you can eat' fast-food restaurant in Montana, was adamant that customers were not expected to eat too much – and it cost her business if they did: "Holy cow," she said, "there are people who can really put away the food. But", she added, "that's their choice "' (Ecke 2003: 1A).

Extending the notion of choice to individuals as *consumers* is a tactic of neo-liberal governance – choice is expressed as decisions taken in/by the market.

A piece by Charles Bernstein, editor of the chain restaurant industry magazine, *The Chain Leader,* argues the 'market should decide':

> Meanwhile, the Senate is eyeing potential bills for billions of dollars to 'improve nutrition,' encourage more physical activity and devise ways of decreasing obesity-- all noble ideas but difficult to enact. There is a serious threat of government 'fat taxes' and 'snack taxes,' as well as potential lost sales or customers saying no to restaurants that don't have enough 'healthy' foods. I agree there should be healthful choices too. Yet as part of our free enterprise system, let's have consumers vote with their purchases as they did when they voted out McDonald's McLean burger. Let the market decide, not the 'nannies' and not the government. Restaurants should not be scapegoats for society's ills. I side with CIA President Tim Ryan, who affirms that 'we're all going to die eventually, so let's get over it and enjoy our food. We should really eat what we want to eat' (*Chain Leader* 2002: 12).

The suggestion that we eat what we want to eat implies that choice exists somewhere outside the social fray. In this scenario everyone is aiming for the same thing: a *sense of choice* is demanded - and to some extent produced. As Rose (1999: 10) argues 'ideas of freedom have come to define the ground of our ethical systems, our practice of politics and our habits of criticism'. In the practice of freedom through choice there is also the maintenance of a system under which choice can be practised. As Dean (2002) also suggests, the very idea of empowerment of those 'powerless' (in this case those people who need the McLean to be able to enact choice) is problematised if the networks that enable that power are bought into focus.

Present effects of risk and food

Sense of choice may be provided through IHTs and an increased range of food items added to fast-food outlets menus. However, prevention and sense of choice have effects, not least of which include expanding the opportunities for business and profit from health into new arenas. The incentive to reorient the manufacture of foods for health and consumer preference may be financially lucrative for producers, a factor critiqued by a variety of authors (Fischler 1999; Goodman & Watts 1997). Goodman and Watts (1997: 243) for example, argue that 'this is not a trend likely to be discouraged by the food

industry, since it also represents a change with commercial possibilities'. In the same vein, an FMC Biopolymers brochure highlights the attraction for companies, when it states that technologies such as carrageenan have 'the advantage of the fact that they comprise an extremely small part of the products to which they are added. While used in small quantities, they significantly increase the value of the end product by many times what it costs to add them' (FMC Biopolymer 1999: no page). At the same time, not all developments in health promotion related to fat modification are always profitable. According to Coeyman (1995 :36), Ben and Jerry's ice-cream company did not gain from the low-fat craze and its potential for increased profits, or from increasing consumer choice. Mandatory labelling of the fat contents of products caused an 'unprecedented consumer reaction to the high fat content' and for the first time (though transitory) Ben and Jerry's experienced a quarterly financial loss. Moreover, for carrageenan producers the opportunities presented by fat-modification were less significant than initially had been expected. I asked Gordon Guist of FMC Biopolymers if the low fat market was dead for carrageenan.

> Fat replacement is a portion of the business but it is certainly not a significant portion at this point .... Low fat yoghurt market still a possibility but we haven't seen it much at this point (Guist, pers.comm., June 3, 2002).

On the other hand, despite the failure of the low-fat McLean and other diet foods, carrageenan continues to be valued for its functional properties that both reduce fat and increase profits. 'Carrageenan with or without gum blends is the most widely used binder in the series of current low-fat meat products due to its ability to retain moisture' (Troy, Desmond & Buckley 1999: 507). Extending the network of carrageenan beyond its functional properties, a further factor that has contributed to the increased use of carrageenan in meat was the changed regulatory environment - due in part to concerns about prevention of obesity. The material effects of prevention may become durable in unexpected ways. The difficulty for the consumer is knowing what the benefits are and for whom, as Bixler remarked of carrageenan use in reformulated poultry products:

> Although the consumer clearly gets a better product from this technology, the reason the use has grown so rapidly is the distinct advantages to the poultry processor. The first bullet, water binding, is the way the poultry processor improves the yield. Originally the processor was only interested in binding the water normally lost in curing and cooking, but the technology has now progressed to the point where 30% to 50% of added ingredients are injected into the meat. This really improves the yield, because salt water can now be sold at meat prices (Bixler 1996: 43).

This problematic effect of risk is not lost on consumers, and may be expressed as distrust of IHTs. The media is one source that has a tendency to reveal, in black and white terms, such economic benefits to companies. A report from Merrill Lynch, quoted in the *Milwaukee Journal Sentinel* for example, hints to the market benefits food modification for prevention: 'a mere 1% shift in spending in at-risk food categories such as cookies, lunch meats and cheese would translate to almost $1.5 billion in potential revenue for companies' (Johnson & Fauber 2003: 01A).

One cost of prudentialism is that the habits of criticism are those of blame, of consumers, companies, marketers, restaurants and governments. In the example of the McLean burger I have highlighted the complex and heterogeneous set of factors through which food modification occurred such that there should be no easy targets for blame. Yet in mediated accounts targets are described, identified and singled out in ways that rarely incorporate such complexities and even less commonly attribute blame to particular systems of governing populations.

Finally, prudentialism is a regulated freedom and one in which the appeal of 'choice' is less emancipatory than might be expected. Purchasing salt water in reconstituted chicken is a choice under the terms of prudentialism because there is the opportunity to read the label as Bixler continued:

> There is no deception here, however, at least in the US. The label must clearly state that the product contains X% added ingredients, and it must do so in large letters. This does not seem to deter the shopper looking for a bargain; since these products are usually priced below products without added ingredients. Needless to say, unless consumers

> find something in these products to complain about, they will be with us for a long time to come (Bixler 1996: 43).

Avoiding 'deception' however, requires that the consumer reads the label as a *matter of course* rather than as a matter of health. Prudentialism is then no longer a choice but an obligation.

Moreover, freedoms may be more directly curtailed through discourses of prudentialism. On the 10th March 2004, the republican dominated US House of Representatives passed a bill entitled the 'Personal Responsibility in Food Consumption Act', by a margin of 276:139. Under the Act, yet to be passed by Congress[61], individuals will no longer be able to sue companies for 'frivolous' claims about obesity. The Act is designed:

> To prevent legislative and regulatory functions from being usurped by civil liability actions brought or continued against food manufacturers, marketers, distributors, advertisers, sellers, and trade associations for claims of injury relating to a person's weight gain, obesity, or any health condition associated with weight gain or obesity.[62]

Whether or not there are any possible benefits of modifying the food environment for healthy living, there is the potential for a reduced sense of the authority, applicability or benefit of transferring such responsibility to the realms of free market capitalism.

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[61] The so-called federal 'cheeseburger' bill was amended and approved by the House of Representatives Judiciary Committee on May 25th, 2005 (H.R 554). Similar legislation protecting fast-food industries from lawsuits have been adopted in some states. The first 'cheeseburger bill' (a term coined by the Congressional Research Service) was adopted in Louisiana in June 2003 and in 2004 Arizona, Colorado, Florida, Georgia, Idaho, Illinois, Michigan, Missouri, South Dakota, Tennessee, Utah and Washington enacted measures to prevent lawsuits against fast-food industries on the basis that fast-food causes conditions such as obesity, diabetes or hypertension (Madigan 2005).

62 The Office of the President issued a Statement of Adminstration Policy in relation to the Act on 10th March 2004 "The Administration strongly supports House passage of H.R. 339. Food manufacturers and sellers should not be held liable for injury because of a person's consumption of legal, unadulterated food and a person's weight gain or obesity. H.R. 339 would help prevent abuse of the legal system and help curb the growing problem of frivolous lawsuits in the United States. At the same time, the legislation would carefully preserve the right of individuals to have their day in court with non-frivolous civil liability actions. These civil actions are enumerated in the bill and respect the traditional role of the States in our Federal system with regard to such actions. The Administration looks forward to working with Congress to make certain the legislation does not have unintended consequences as it moves forward".

Assembling the McLean

In this chapter I have considered the failure of the McLean in an assemblage of forces constituting the new public health. Within this work, I have suggested the McLean is a failure not just as a technology, but as a material embodiment of the new public health. Yet, Dean (1999a: 145) suggests that failure is not the 'abandonment of the attempt to construct coherent programs of government', but a moment at which new forms of rationality and new technologies of governance may emerge. The McLean has not been revived, but there are other IHTs and tactics that may be employed in governing health. As it stands, the problematisation of obesity in terms of lifestyle factors open to the prudential consumer remain central to US public health policy. Opening an FDA sponsored workshop in November 2003, Anne-Marie Lynch underscored that centrality when she observed:

> The good news is that obesity and co-morbidities are preventable through healthy eating, nutritious food in proper amounts, and physical activity. And the bad news is that many Americans are not taking the steps to prevent obesity and its co-morbidities. The Administration has put forth a prevention agenda focused on a healthier U.S., which promotes four fundamentals of good health. These are: physical activity, healthy eating, regular preventive checkups, and avoiding risky behaviors (Food and Drug Administration 2003: no page).

If the example of the McLean is considered as representative of more general responses to technological advancement in food and prudentialism, there is reason to suspect a preventive, altered food environment approach to obesity. The McLean burger was not a success in improving health, and involved a technological blunder as much as it was underpinned by social or marketing mistakes. Furthermore, the McLean demonstrates how the discourse of choice may overlook the lived geographies of other forms of disadvantage, including the economics behind food decision-making. As well, in its wake, failure is the consumer's perception of the possibility of success. These media accounts suggest consumers will expect and even demand even more products like the McLean, but they do not expect them to work.

The limited success of a biopolitical intervention such as the fat modification of a fast-food burger provides a compelling example of the limits of choice as a strategy of health promotion and prevention. The *biopolitical* dimension refers to the ways in which strategies of neo-liberal governance reconfigure individual subjectivities as consumers of health within the free-market. The McLean example raises a problematic coalition between the medicalisation of obesity and the economic advantages for companies in reformulating food for health profit (though in the end, this did not eventuate for the McLean), and the economic realities of everyday life.

The extracorporeal spaces of food in this example appear too complex to be reformulated when based only on rational health grounds. The provision of choice is unrealistic because there is an underlying assumption that prudent subjects value health as paramount in relation to other concerns. A governmentality of prudentialism may not 'produce' healthy subjects, yet it seems remarkably efficient at producing prudent subjects who value choice in situations decontextualised from factors that disenable them. As it stands, the McLean was limited in acting at a distance in public health. In the next chapter I consider a further example of carrageenan's incorporation into a technology of prevention that extends beyond the borders of US populations, and into the spaces of international health.

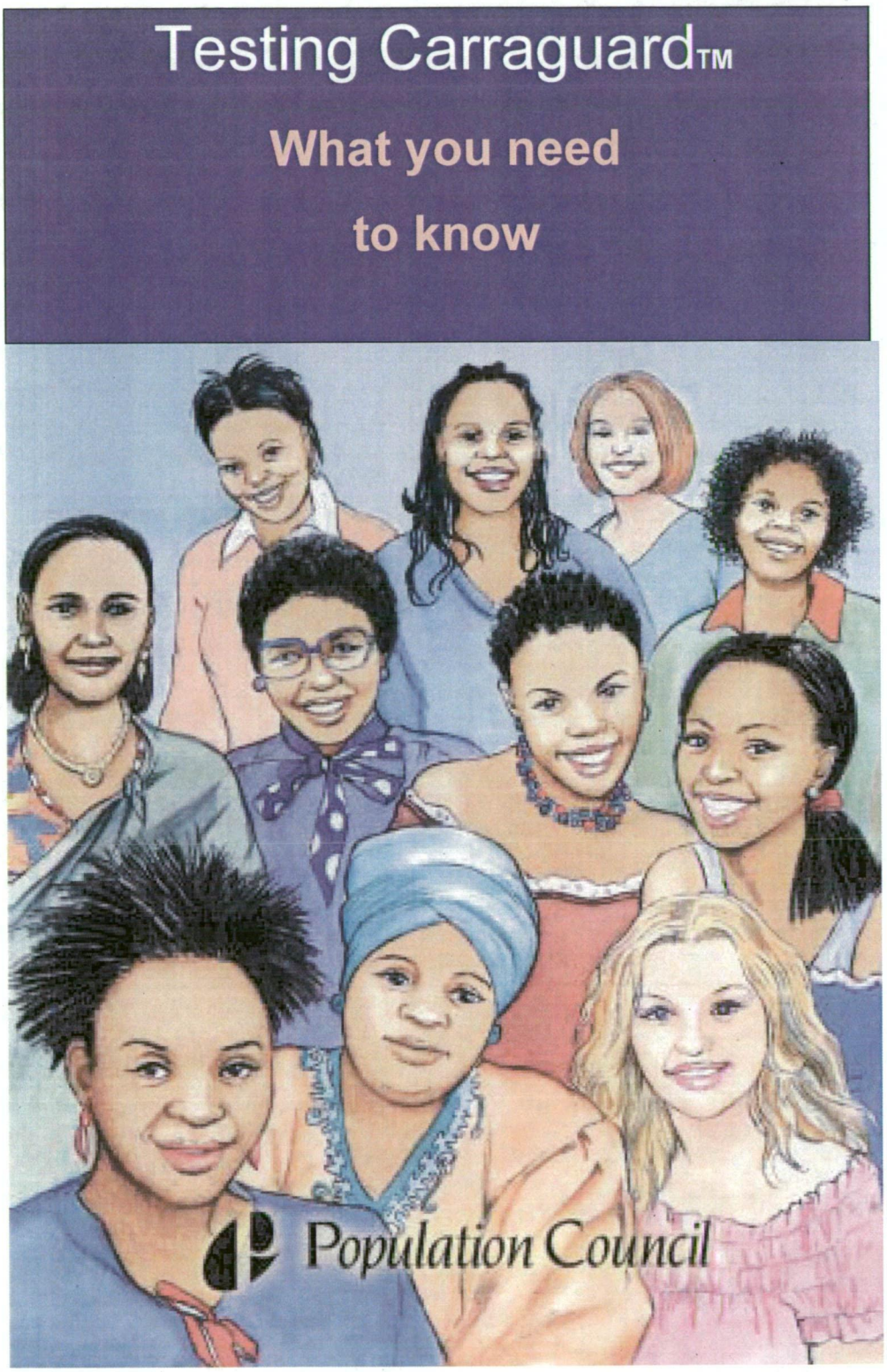

Illustration: Cover page, information brochure on Carraguard clinical trials
Source: Population Council 2004

Chapter 6

The geopolitics of Carraguard®

Carraguard is a carrageenan-based preventive technology in development by the Population Council, a US based philanthropic organisation, to mitigate the spread of HIV/AIDS and other sexually transmitted diseases. When applied as a gel Carraguard appears to provide a (partially effective) physical barrier to the virus that causes AIDS, as well as some other sexually transmitted diseases. It is designed for vaginal use and can be formulated to have either contraceptive or non-contraceptive effect (Population Council 2002, 2004a). My analysis of Carraguard forms the final substantive component of my dissertation, extending and building upon the carrageenan actor-network traced in previous chapters. Carraguard provides an interesting actor-network through which to examine pharmaceutical industry responses to pressures for preventive technologies. My aim is to explore the extent, durability and transformations of or within networks that incorporate carrageenan and discourses of new public health and it is the geopolitics of Carraguard, from the micro-scale of (women's) bodies to the global scale of international politics, that is the chapter's primary focus.

I begin by tracing both the actor-network of Carraguard as a material technology of prevention and its links to carrageenan and the new public health. Because Carraguard is a technology that obliges female users to be prudent, I argue that gender relations are implicit in Carraguard, for example, in the ways changing public health priorities feminize HIV/AIDS. Moving from the new public health to broader issues of how Carraguard is represented, I consider how the media constitute and reflect public knowledge about carrageenan and microbicides and I examine the

geopolitics of such representations. The findings from the media analysis and secondary materials underscore a fundamental alignment between discourses of prudentialism and women's empowerment in the promotion of microbicides.

The chapter incorporates data from secondary sources including Population Council documentation, microbicide advocacy publications, academic writing and media sources. I draw on and augment the findings of a co-authored paper submitted to the journal *Gender Place and Culture* in tracing the constitution of Carraguard from the micro-terrain of women's bodies, to the macro-terrain of community, sub-national jurisdictions and nation-states; international, supranational and global networks (Burges Watson & Stratford forthcoming)[63]. For this paper we applied a critical discourse analysis to an extensive survey of popular media representations of Carraguard, and to representations emanating from the United States Population Council and other microbicide advocacy organisations. The paper considered three questions related to prudentialism: first how are certain behaviours, identities, interventions and means of surveillance enrolled in preventing HIV/AIDS by Carraguard; second, to what extent are microbicides legitimated by their construction as a women's technology; and third, do technologies such as Carraguard enable risk to act at a distance as well as into the future?

The particular geopolitics associated with microbicides and Carraguard unsettle the centrality of linkages among preventive technologies, neo-liberalism and public health that have been developed elsewhere in this thesis. In the final sections, the network incorporating carrageenan and Carraguard is traced to recent developments in the US and the new found enthusiasm for microbicides demonstrated in the 2004 US President's

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[63] This thesis incorporates the outcome of data analysis undertaken in collaboration with Dr Elaine Stratford as part of a research project under her supervision. The collaboration relates to research on media representations of microbicides and pertains to chapter 6 sections 6.2 to 6.4 of the thesis. The findings of that research have been reviewed as a paper for the journal *Gender, Place and Culture* and are in revision for resubmission.

Emergency Plan for AIDS Relief (PEPFAR) (Global Campaign for Microbicides 2004; Office of the United States Global AIDS Coordinator 2004). In the case of Carraguard, I ask whether concerns about public health and prevention are sufficient to account for policy on microbicides and HIV/AIDS emanating from the White House. With reference to the Bush Administration's neo-conservative values and Crina Archer's (2004) commentary on *pre-emption* and security, I examine how the new enthusiasm for Carraguard and microbicides may be viewed as consistent with an emergent neo-conservative *pre-emptive politics of public health.* In doing so I am flagging the need for future research and will consider whether pre-emption constitutes a new kind of space/time configuration in public health.

The worth of Carraguard and other initiatives for the prevention of HIV/AIDS is not in question in this chapter. HIV/AIDS is a condition that threatens to kill millions of people and has far-reaching implications for the reproductive capabilities, economies and governance of entire nation states and supra-national regions (Bancroft 2001; De Waal 2003; Gayle 2003). Mitigating the suffering and death caused by HIV/AIDS demands global attention. However, my purpose is to unsettle the tendency of technologies of remote control to embody (and employ) rationalities that are dubious, and whose socio/technical congealments remain under-explored (Webster 2002). As the case of the McLean burger illustrates, IHTs can (and sometimes do) fail. Indeed, as Webster (2002: 447) observes, precisely because they are so complex 'contemporary health technology networks may be particularly difficult to build'. I conclude that the example of Carraguard demonstrates how the development of critical geographic and other social studies of health technologies help to reveal partial perspectives (Haraway 1988; Hyndman 2004) and provide insight into broader, potentially destabilising, factors within health technology networks.

Carraguard as an actor/network

The opening scene for a 21 minute video about Carraguard (Pandamonium Productions 2003), developed for the Population Council to attract and inform recruits to the phase III clinical trials, exemplifies how different elements of the carrageenan actor-network are interwoven and drawn into the developing Carraguard actor-network (Box 6.1).

> Opening scene to Carraguard clinical trials promotional video: wide shot of an empty beach with pounding waves. In the distance a woman is walking towards the camera carrying a large handbag. The camera focuses on her.
>
> 'Hi, I'm Lillian Dube, and I'm going to tell you more about this stuff, and it starts right here on the beach, let me show you why...'
>
> Lillian stops, bends down and picks up a piece of seaweed from the sand
>
> 'Look at this seaweed, it's a special plant that grows. It has all sorts of good things about it that most people don't know about, one of the good things that comes from it is carrageenan which has been used for hundreds of years in all sorts of ways.'
>
> Lillian puts the seaweed back on the sand, the camera focuses briefly on the seaweed lying on the beach before panning up to see Lillian, reaching into her handbag, she draws out a bottle of lotion;
>
> 'Look, my body lotion has carrageenan in it'
>
> She replaces the lotion and draws out a large container of infant formula
>
> 'And it is used to make this baby formula thicker'
>
> Next she holds up a Carraguard applicator
>
> 'And it's also been made into this, this is a new vaginal gel called Carraguard'.

Box 6.1 Content description for first scene of a promotional video for recruitment to clinical trials of Carraguard. Source: Pandemonium Productions 2003.

Seaweed, tradition, carrageenan, baby formula, body lotion and a clean and (natural) beach scene contextualise Carraguard as benign; at least for the moment. In previous chapters I have highlighted some of the complexities of carrageenan actor-networks and the partial perspectives through which

carrageenan may be unsettled - in some instances rendered dangerous. Carrageenan, degraded carrageenan, carcinogenicity, baby formula, Irish moss and so on become the territory, but not the map, upon which prudent consumers *could* draw inferences about Carraguard's risk. Carraguard may appear benign in the context of the video, however its representation as such is a dangerous strategy. As demonstrated throughout the thesis, prudent individuals are obliged to access, various sources of information that may suggest that carrageenan (and therefore Carraguard) is a risk, even though such information may be displaced and distant. Yet, there is already evidence that dangerous linkages have been made. For example, during a question and answer section of a public health seminar in International Relations at Yale University, Dr Helen Gayle, senior advisor to the Bill and Melinda Gates Foundation, one of the sponsors of clinical trials, was asked by a student in the audience: 'With respect to Carraguard's microbicidal gel, is it carcinogenic?' Dr Gayle replied 'I've never heard that. People will say almost anything is carcinogenic' (Kapoor, Maniam & Prelogar 2002).

Furthermore, Carraguard is associated with other networks that have been mapped throughout this thesis. For example the carrageenan for Carraguard is being supplied to the Population Council exclusively by FMC Biopolymers (Population Council 2002). Carraguard is a formulation based on a *lambda-kappa* carrageenan derived from certain (but not all) species of seaweed using particular technologies of refinement (chapter three), knowledge about which is held as proprietary information by the Population Council and FMC Biopolymers (Maguire, 2003, pers.comm., 15 January)[64]. In other words, the material carrageenan for Carraguard is a specific type of carrageenan, rather than a generic product. Yet Carraguard's developers represent carrageenan as a boundary object (Bowker & Star 1999: 297) so reinforcing a politics of singularity about it. If the representation of carrageenan as ontologically stable can be contrasted to the actor-networks through which carrageenan is

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[64] Robin A. Maguire is Program manager for microbicides at the Population Council's Centre for Biomedical Research.

minutely differentiated, and as demonstrated by the Yale seminar, Carraguard is vulnerable to destabilisation through associations with carrageen*ans* – including so-called cancerous ones.

Carraguard is deployed symbolically and as a material technology. In chapter two I described Carraguard as an emergent pharmaceutical, currently in developmental stage for use as an over-the-counter (OTC) prevention technology for the mitigation of HIV/AIDS and other sexually transmitted diseases. Users of Carraguard as an OTC product are necessarily prudent. In this regard, Carraguard is also being promoted as a technology controlled by women that has the added advantage of being cheap to produce (Bell, SE 2000, 2003; Fuqua 2002; Kaler 2001; Seale 2003). Unsurprisingly, it is regarded as a particularly good option in countries with populations suffering the effects of low incomes and/or high incidence of HIV/AIDS, sub-Saharan Africa most prominent among them (Population Council 2002, 2004a). Carraguard folds into the diverse strategies of governing public health at a distance by working through and on prudent subjects.

Carraguard has two particular champions. The first is the US Population Council, a non-profit research, development and advocacy organization established by John D Rockerfeller in 1957 to address the 'population problem' in developing countries (Population Council 2003). According to the Population Council the conditions of poverty in the developing nations were and remain symptomatic of the imbalance between over-population and resource availability. At first, fertility was the target of efforts to address poverty and suffering by reducing population pressures. Early on, the Population Council also supported the Eugenics Society of America in developing a range of reproductive technologies to control women's fertility. While the priorities of the Population Council have changed, the problematization of poverty in terms of resources and population remains central to its policy platform to optimise public health outcomes and work

within a traditional sustainable development framework in which human, economic and environmental domains are balanced (Population Council 2003: no page).

The other substantial sponsor of Carraguard is the Bill and Melinda Gates Foundation, established in January 2000 by the merger of the Gates Learning Foundation and the William H Gates Foundation; the first had focused on expanding access to technology through public libraries, the second on global health improvements. The merged foundation has an endowment of US$25 billion 'through the personal generosity of Bill and Melinda Gates' (Bill and Melinda Gates Foundation 2003: no page). Thus, the substantive financial and developmental support for Carraguard emanates from the US.

Other initiatives for microbicide development that include Carraguard involve collaborations that aspire to a global reach. The World Health Organisation describes microbicides as the 'most feasible' method for primary prevention of HIV (alongside condoms) given the lack of progress on HIV vaccines, and recommends microbicide development by member states (World Health Organization 2003b: no page). Of the non-governmental communities involved in advocacy for microbicides that have emerged in recent years, and despite their 'diasaporic' existence via mediated spaces of the Internet, a substantial majority have their headquarters in the US. The most prominent are the *Global Campaign for Microbicides* (Washington D.C), *Global Microbicide Project* (Arlington, Virginia), *International Partnership for Microbicides* (Silver Spring, Maryland), and the (International) *Alliance for Microbicide Development* (Silver Spring, Maryland). As well, there are United Nations initiatives such as the *International Working Group on Microbicides* (IWGM) and, since 2004, the *Global Coalition on Women and AIDS*[65]. Without questioning the intent of any of these organisations, the US focus of

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[65] http://www.global-campaign.org/about.htm (The Global Campaign has extensive networks with organizations in many different countries around the world); http://www.gmp.org/contact.htm (also has an office in Belgium) http://www.microbicide.org/; IWGM was formed in 1993 at a WHO meeting in Geneva, Switzerland http://womenandaids.unaids.org/.

developers, and priorities of empowering women towards self-management of HIV/AIDS, match up with the new public health priorities in positioning a dominant mode of containing HIV/AIDS and other STDs in (neo-liberal) discourses emphasising personal responsibility (Pryce 2001). Like food consumption, the maintenance of sexual health is now cast as a lifestyle choice based upon principles of informed practice. Not only does such a strategy assume that choice is realistic for everyone, it also 'privileges the scientific truths of sex over the lived truths of erotic pleasure and sexual freedom' (Pryce 2001: 152). New public health discourse colonises the space of health and pleasure, and demands a particular kind of subjectivity, particularly found in recent debates concerning prudent and *gendered* subjects of risk. In summary, the geopolitics of Carraguard tie into heterogeneous networks that include carrageenan and its associated risky topologies; discourses of prudentialism; sexuality; natural/synthetic distinctions; particular places and publics; and central to the following discussion, gender concerns.

Feminising HIV/AIDS and prevention

Efforts towards the amelioration of HIV/AIDS take place not only in an international or global context, but also one in which gender relations are increasingly placed centre stage in the organisation of public health responses. Within global campaigns to curb HIV/AIDS, relations amongst gender, poverty and the virus that causes AIDS are widely understood to underscore and even fuel the epidemic (Annan 2002; Bancroft 2001; Bentley 2004; Epstein et al. 2004; Geshekter 1995). Women are regarded as particularly vulnerable to HIV/AIDS and, in recent times, have become key targets for preventive interventions (Amaro & Raj 2000; Epstein et al. 2004; Harrison, Xaba & Kunene 2001; Ramdas 2003; Treichler 1999; UNIFEM 2003). Furthermore, the concern with women and HIV/AIDS has also been tied into broader debates about gender inequalities and women's empowerment (Bell, SE 2000, 2003; Kaler 2001; Ramdas 2003).

Since the 1980s the goal of strategically empowering women seems to have gained momentum in the discourses and practices of health and development. For some analysts, the 1994 Cairo Conference on Population and Development was a turning point in a new rhetoric of empowerment (Kaler 2001; Ramdas 2003). Certainly, the parties to the Conference positioned women as the centrepiece of their activities in relation to health promotion and prevention. Arguments supporting the new centrality of women included their systemic devaluation and discrimination; the disproportionate burden they bear in caring for the sick; and their biological and socio-cultural vulnerability to HIV/AIDS (Bill and Melinda Gates Foundation 2003: 12). Furthermore, empowering women in contexts of inequalities in gender relations has long been a focus of social movements. Thus discourses around HIV/AIDS and its mitigation have twin aims: first the promotion of health, and second the emancipation of women.

Since the late 1980s, for example, Zena Stein has been among the most vocal advocates for microbicides, arguing that available prevention methods, such as the condom, fail because women are not always (and sometimes rarely or never) in a position to negotiate their use (Stein 1990, 1995). The deepening understanding of a relationship among power, gender and methods to prevent or limit HIV/AIDS generated a snowballing interest in female-controlled prevention technologies. Stein's plea was for a technology to achieve what policies for social equality could not, namely a method that embodies new social relations between men and women that empowers women to act – in short, enabling prudent action without male knowledge or consent.

The media, HIV/AIDS and Carraguard

In the overlaps between US and global efforts to prevent HIV/AIDS, gender concerns and the new public health, a problematic coalition emerges between

its western derived medico-morality and the bodies and lives that come under intense global health surveillance, and those (wealthy and/or heterosexual men) who do not (Geshekter 1995; Waldby 1996, 1999). However, Carraguard is a material technology that acts at a distance and, as the example of the McLean burger illustrated in the previous chapter, its translation in local contexts cannot be assumed to follow the expectations of its developers. Testing the effects, rather than imputed intentions, of the problematisation of HIV/AIDS in relation to a product not yet available on the open market, is far from straightforward. For this reason, I looked to mediated representations of Carraguard and my analysis rests on a number of observations about the important role of media as a source of data, and as reflecting and keynoting knowledges about the geopolitics of the new public health.

Within critical geopolitics it is recognised that the media is also a source of raw data that can be quantitatively analysed to reveal common geopolitical tropes (Dalby 2003). Media representations of Carraguard fold into diverse governing strategies of HIV/AIDS and part of the work that they perform is to map and remap the gendered and sexualised geopolitical domains of HIV/AIDS (Abma 2002; Backstrom & Robins 1998; Brown, M & Gross 2002; Gillett 2003b, 2003a; Joffe 1999; Saywell & Pittam 1996; Seale 2003; Van Loon 2003; Wilkinson 2001). Both the disease and its putative treatment are objects through which are perpetuated ongoing understandings of technology as society made durable (Latour 1991) and of risk as governable by such means.

In April 2003, the term 'carraguard' was typed into the search engine LexisNexis[66]. Secondary material was drawn from the detailed websites of microbicide advocacy groups and international organisations with

[66] LexisNexis is a searchable database of more than 5000 global media sources.

involvement in microbicide development, as well as the Population Council's own website of information on microbicide research and development[67]

The survey returned 54 news items that specifically mention Carraguard, and that appeared between January 2000 and March 2003, a period when the Bill and Melinda Gates and Rockerfeller foundations were under the spotlight for providing substantial funds to microbicides research as part of larger campaigns against HIV/AIDS. Certainly not the first scholarly attempt to examine the constitution of HIV/AIDS in the media[68] the analysis was nevertheless among the first to focus on Carraguard specifically, and microbicides more generally, within the mainstream press.

As Wilkinson (2001) suggests, it is well accepted that the media help to structure initial debates around topics, however finding a suitable conceptual framework for how such information is reflective of existing social realities, or constructive of them is fraught with difficulty. Yet it is worth noting that media sources related to Carraguard are delimited to some extent because of the emergent or pre-market nature of the technology. As revealed by the sources identified in the 54 media articles on Carraguard, knowledge about Carraguard, emanates from the cloistered networks of the developer, manufacturing, advocacy and funding organisations. Whether the media reflect or construct social realities, media messages about Carraguard can be placed within discussions of western neo-liberalism and its extension to elsewhere through an examination of the (re)constitution of such western-derived information.

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[67] http://www.microbicide.org/ (Alliance for Microbicide Development), http://www.global-campaign.org/(Global Campaign for Microbicides), http://www.gmp.org/(Global Microbicides Project), http://www.microbicidesnow.org/.
(Microbicides as an Alternative Solution), http://www.ipm-microbicides.org/ (International Partnership for Microbicides (IPM), USA), http://www.nat.org.uk/ (UK/Ireland Campaign for Microbicides/National AIDS Trust), http://www.populationcouncil.org/ (US Population Council).

[68] See for example (Adkins 2001; Backstrom & Robins 1998; Bell, SE 2003; Browne & Barrett 2001; Davis 2003; Fuqua 2002; Gillett 2003b, 2003a; Raimondo 2003; Saywell & Pittam 1996; Swain 2003; Treichler 1999; Tulloch 1992; Watney 1987).

Further, other than those people specifically involved in medical trials of microbicides, the general public is unlikely to encounter microbicides through means other than media representations of them for some years to come. The media in this sense pre-emptively cultivates, or keynotes knowledges about Carraguard and microbicides, whilst contributing to discourses surrounding the risks and uncertainties of HIV and AIDS.

In the genre of media, headlines and lead paragraphs often act to summarise articles, while 'satellite' paragraphs add detail (Fairclough 2003). Table 6.1 is a sample of headlines that illustrates the five main hooks that commonly appear in the reportage of Carraguard in the print media during the period under examination: these are HIV/AIDS, the United States Population Council, the Gates Foundation, women and seaweed.

Table 6.1 Sample Headlines on Carraguard and HIV/AIDS

HIV/AIDS
Anti HIV gel (2)
Check up. HIV block
New hope to stop Aids
PanAfrica; gel for HIV/AIDS ready by 2007
The US Population Council
Grant helps Population Council advance HIV/AIDS prevention research
NIH grant helps Population Council advance promising HIV/AIDS prevention research
Population Council to initiate microbicide trial
Women
Health: microbicides, a beacon of hope for women
NIH grant helps Population Council advance promising HIV/AIDS prevention research; support for 'novel anti-HIV carrageenan-based microbicides' research may result in more options for women to protect themselves from infections
Product to protect women from HIV is elusive
Seaweed
A weedy cure
Ice-cream gel 'may protect against HIV'
Kiss and gel
Prospects better for seaweed firms
Seaweed derivative could prevent HIV infection: researcher
Seaweed HIV-block hope
Seaweed may boost HIV war
The Gates Foundation
AIDS breakthrough finds charitable champions
An AIDS breakthrough could go begging
Bill Gates, Bono call on leaders at World Economic Forum to increase global health spending
Disease prevention: Government launches trial of gel to protect women against HIV
Gates Foundation to fund new AIDS-prevention study
Gates Foundation to fund pilot anti-AIDS study using seaweed

The headlines keynote a number of issues of relevance to my themes of prudentialism, spatiality, visibility and futurity; and to the fortunes of carrageenan industries. Carraguard is a technology with which women can 'protect themselves' through stealth (prudentialism/visibility). The Population Council, NIH, Bill Gates and Bono help to produce and promote Carraguard for those, out there, that need it (spatiality/geopolitics). As yet, Carraguard is not available and there has been some reluctance to support it (futurity). Finally, Carraguard is rendered novel, if not implausible, by its association with seaweed (natural/synthetic distinctions and the carrageenan industry).

Carrageenan is constituted in media as more than just a material ingredient of Carraguard, as indicated by the 'carra' prefix, the incorporation is a deliberate strategy on the part of the Population Council that draws the carrageenan actor-network into the narrative about Carraguard. Within the media, Carraguard appears to be newsworthy because it is constituted as a novelty item; newsworthy because carrageenan's associations with ice cream, toothpaste, jell-o or chocolate milk render it somehow implausible as a serious medical technology; newsworthy because that novelty has entertainment value; newsworthy because of the risk of trusting something so benign in a battle against something as malignant as HIV/AIDS. 'A gel made from seaweed and used in ice cream and toothpaste could protect women against HIV, scientists suggest ... Trials are due to start this year on Carraguard, which is made from red seaweed that grows on the coasts of Nova Scotia and Chile. Scientists believe it binds to the HIV virus, coating it in a paint-like surface that prevents it from attacking the human body'(Barry 2002: 24). Such associations locate Carraguard not only with places, but make durable ties with the carrageenan-bearing seaweed industry.

On this matter, some articles suggest that the long-term prospects of the carrageenan industry appear 'brighter' as regulatory environments must

expand to accommodate the use of carrageenan for pharmaceutical uses (chapter two), 'tests are going on at Drugmaker, a company based in Metro Manila, for the retooling of its equipment to accommodate the use of carrageenan in the manufacture of capsules ... (Sino Cruz 2002: no page).

Thus the Carraguard actor-network is extensive, opening up possibilities for many different associations that may span not only the sources from which the carrageenan is actually extracted, but across the length and breadth of the global carrageenan-bearing seaweed industry. Likewise public health priorities associated with Carraguard extend beyond the boundaries of the US, and into the realm of global public health. 'But what's truly groundbreaking is its potential for poor, AIDS-racked regions like Africa. Odorless and undetectable, the gel could be a lifesaver for women whose partners refuse to use protection--as long as it's sold for pennies'(Carmichael 2002). Taking the global and extra-national context of Carraguard into account, and drawing on both media and other documents, I now turn to how Carraguard is geopolitically rendered as a woman's technology.

Carraguard as a technology of women's empowerment

> A. United Nations report released last month shows that women now make up 50 percent of those infected with HIV worldwide – and in Africa that figure is now 58 percent. Today, AIDS has a woman's face (Annan 2002: no page).

> 'I believe that one of the most powerful HIV vaccines available today is women's empowerment', Noleen Heyzer (UNIFEM 2003: no page).

> [Carraguard] may be the next great hope for millions of poor women seeking to protect themselves against the virus that causes AIDS (Zimmerman 2002: 23).

In placing women centre stage in the battle against HIV/AIDS and in terms of women's empowerment, the media reportage of Carraguard is typical of

broader accounts of microbicides. For example, commemorating International Women's Day in March 2003, members of the Women's Global Health Imperative, a program in the AIDS Research Institute at the University of California, held a public briefing session on HIV/AIDS, preventive technologies and gender. Their title was *AIDS has a Woman's Face: Gender and Power: New Strategies for HIV Prevention*, which was modified from a *New York Times* article published in December 2002 and attributed to the United Nations Secretary General, Kofi Annan. Introducing the speakers for the session the program's Deputy Director, Suellen Miller, announced that 'These women demonstrate that if AIDS has a woman's face then prevention also has a woman's face'(Miller, S 2003).

If AIDS has a woman's face then prevention also has a woman's face. Does HIV/AIDS have a women's face? The answer must be no; rather, it is increasingly constituted as a disease beyond minority populations and one with the very real potential to shatter the reproductive and productive capacities of the peoples of entire nation-states and regions. How is one to read this conflation of HIV/AIDS and women and does such a tactic mean that Carraguard is being deployed as a technology of prudentialism in geopolitical networks of risk of HIV/AIDS in order to empower women. If so, to what effect?

Studies concerning the efficacy of Carraguard and all other microbicides in development have thus far, been centred on vaginal uses (Global Campaign for Microbicides 2003). The most common argument used to justify delays in testing the effectiveness of rectal microbicides stems from a perceived gap in reproductive options for women in developing nations that scientists, philanthropists and members of women's organizations argue must be addressed. Then women will be able to control their sexual activities without necessarily negotiating male consent or understanding (Bell, SE 2000, 2003; Bitangaro 2002; Kaler 2001; Thrupp, Clift & Estes 1994). From such need, specific collaborative efforts emerged among a coalition of women's groups

known as the Women's Health Advocates on Microbicides (WHAM) and the Population Council to develop *female controlled* microbicides. Yet, in reporting on this alliance, Bell (2003) has observed that the members of women's groups hesitated in the 'halls of power' in the face of established feminist critiques of population and family planning practices, specifically because the Population Council's earlier development of Norplant and the IUD were seen to negatively affect the reproductive rights of women and particularly those from minority groups. However, a renegotiated relationship between WHAM and the Population Council that focused on microbicides did acknowledge the 'growing risk of contemporary AIDS prevention strategy in meeting women's needs [which has] created a scientific context for birth control and disease prevention groups of scientists to try to work together' (Bell, SE 2003: 204). In this view, the focus on prevention seemed to alleviate the risk of women losing control of their reproductive choices and practices. But does it, and how many women have such choice in the first place?

By examining the effects rather than imputed intentions of media representations of Carraguard, it is possible to argue that networks of risk tend to favour a view of microbicides in which women's empowerment is increasingly subordinated to other risk priorities and geopolitical orderings. Success in stabilizing the networks in which Carraguard is implicated produces a *gendered hierarchy of risk*. As mere recipients of the new technology, women are valorized – alongside microbicides – as instrumental in creating equity: according to one reporter, this gel could do for women what condoms have done for men for years (Dobbs 2001). Academic accounts of such concerns suggest that women are likely to be more sexually responsible than men, particularly as the latter are seen to fail to use the reliable technologies available to them (Lerner 2001). That men 'choose' not to use condoms and are in stronger position than women to make such decisions only serves to reinforce argument among those in microbicides research and development as well as the media that women need a 'stealth'

technology. Men's power relative to women also reinforces the current focus within the practices of global health on individual prevention and personal responsibility rather than structural and systemic change. Many women do not have the power in relationships to insist that men use existing HIV/AIDS prevention methods (Lerner 2001).

Many people also have only uneven and inadequate access to condoms and other reproductive technologies, and the social conditions governing their use in different locations are unfavourable for their widespread and continued use. As the 2003 annual report of the United Nations Population Fund on HIV/AIDS highlights, for both male and female condoms, 'the challenges are significant: massive shortfalls in supply compared to current needs, frequent stock-outs, and limited resources for programming to instil safer sexual behaviours. Pervasive myths, misperceptions and fears about condoms also inhibit their use' (UNFPA 2003: 7). Given these dilemmas, it is noteworthy that violence is rarely referred to in media accounts of Carraguard and HIV/AIDS, with only one report among over 50 declaring that 'Violence—or the threat of violence—against women increases their vulnerability to HIV and reduces their ability to protect themselves against infection' (Macan-Markar 2000: no page).

The adoption of the idea that women's empowerment coexists with female controlled microbicides is apparent in the promotional tools used to justify their development - but in ways that render women mere instruments of risk mitigation. For instance, one media source suggests 'Women's empowerment is ... very important ... because if you had a product that a woman could use without her partner knowing it, it would be a way to slow down the progress of this epidemic globally' (Mayer in (Jacoby 2001: 1D). In this view, there appears to be no consideration that stealth might be difficult to achieve or maintain. Carraguard is an odourless gel, but this must not be confused with invisibility; technologies of application, education, distribution as well as mediated knowledges 'reveal' it to men; deceit - no matter that it may be

enacted for self-protection – exposes women to manifold physical and social risks.

In her study of impediments to the uptake of another preventive technology, the female condom, Amy Kaler (2001) suggests that not least among the barriers to prevention technologies gaining widespread use among certain populations in parts of Cape Town, Nairobi and rural western Kenya, is a deep-seated suspicion among the men of these populations that the female condom captures sperm. They fear that female sexual partners may later take this sperm to the 'witch doctor' for use against them, or that the loss of their sperm in such fashion will erode their virility. Kaler's research suggests that, given these reactions, women using the female condom (and this number is limited for various reasons) do so by resorting to stealth in attempts to empower themselves. Drawing on a typology developed in 1985 by anthropologist Maxine Molyneux, Kaler argues that empowerment meets both strategic and practical gender interests, but advances a third idea of empowerment as a zero-sum game in which men are necessarily disempowered; the stealthy use of preventive technologies is one example of that, delaying men's responsibilities in sexual relations. Stealth has been lauded as a possibly empowering approach for women in the use of various preventive technologies (including Carraguard) and there is a functionality to it that bridges all three categories of empowerment to which Kaler refers. Stealth is strategic because its necessity highlights the deeply entrenched regimes of practice that serve to oppress women and disempower them institutionally and organizationally relative to men. It is practical insofar as its use is a rational (if not reasonable) means by which to meet crucial needs for safety and the mitigation of terrible risks. It is a zero-sum game insofar as, by their own admission, men will seek to reclaim power, typically using violence, if they discover the act of stealth. Its capture as a marketing tool in the sale of pharmaceutical products such as Carraguard is highly contentious.

The rhetoric of empowerment is not outside the exercise of power or existing gender relations; either in relation to women's participation in the 'halls of power' or to the use of Carraguard. In the first case, the development of Carraguard has not been entirely a product of a western neo-liberal view, and indeed, its developers claim legitimacy for the new technology through the participation of women in developing countries. On the one hand this may be viewed as an initiative of women in developing countries. However, it is also possible to view their participation, and the participation of other activist organisations as a transformation of those at risk into active, prudent citizens through *technologies of agency* (Dean, M 1999b; Rose 1999).

On the other hand, discourses of empowerment can create sometimes illusory ideas of choice amongst subjects that, as demonstrated in relation the McLean burger, may be unrealistic in the context of situated social identities and can promote a sense of failure and invoke a culture of blame or even violence. Discourses that promote women's empowerment and choice must navigate between addressing social *and material* inequalities in gender relations. As Epstein *et al.* (2004: 4) comment, while there may be short term benefits of interventions that promise to empower women, 'such benefits are often short-lived and cannot survive the intrusion of material differences in power, access to money and so on'. Further, gender related violence, especially rape, not only contributes to spreading the virus that causes AIDS, but contributes to the maintenance of gender relations. Thus placing HIV/AIDS in the context of gender debates creates both possibilities and expectations about women's empowerment, and runs the risk of deflecting attention away from, or even contributing to, conditions of gender inequality and violence against women.

In summarising Carraguard's constitution as a women's technology in media, as elsewhere, I wish to emphasise the consistency with which discourses of new public health map on to, and (re)produce women as self-regulating and prudent subjects of and at risk of disease. Such discourses

produce a gendered hierarchy of risk in which inequalities in gender relations are subordinated to other geopolitical orderings. To some extent, microbicides are legitimised within public debate through their constitution as 'empowering' technologies, but at the same time women (and not men) become the key targets of prevention in which there is an obligation to respond but not necessarily the capacity to do so.

The epidemiological framing of HIV/AIDS in at-risk populations and lifestyle behaviours can skew the perception of disease such that the social context of risk and lifestyle is under-explored.

> For Sub-Saharan Africa in particular, the number of clients seen by prostitutes, the country of origin of those clients, and the degree of condom use in sexual transactions seem more important in many studies than are the reasons why women enter commercial sex work, men visit prostitutes, or refuse to use condoms (Craddock 2000).

As Brown (2000) remarks, it is in the construction of deviance from the norm or of 'at risk' groupings through which social governance is enabled. It is not that boundary-marking practices in the governance of HIV/AIDS are unnecessary, but that reflection on the effects of such practices in disciplining particular bodies at particular times rarely considers how such boundary markings seem so often to co-exist with bodies/groups/nations that are *already* stigmatised. Indeed, HIV/AIDS has been described as a *disease of signification* (Treichler 1999) serving to marginalise those already marginalised, infecting with anxiety those remote from the experience of the virus that causes AIDS, and inscribing bodies, places and spaces with calculations of risk and modes of organising them (Brown, T 2000; Waldby 1996, 1999; Watney 1987). Carraguard too, serves to reinforce the boundaries around marginal women in marginal places.

Extending 'freedom': HIV/AIDS and microbicides in the White House

As the title of the 'Office of the US Global AIDS Co-ordinator' suggests, the blurring of national and global responsibilities and efforts towards the prevention of HIV/AIDS positions public health well beyond the boundaries of nationhood. O'Tuathail defined the study of geopolitics as the study 'of the spatialization of international politics by core powers and hegemonic states' (Ó Tuathail 1996: 60). The suggestion that hegemonic states play an important role in constituting spaces of governance seems, in the current politics of terror, to remain apposite as well as proving an important counter to the ambivalence of ANT to questions of human exemptionalism (Murdoch 2001).

> As the human immunodeficiency virus (HIV) pandemic surely should have taught us, in the context of infectious diseases, there is nowhere in the world from which we are remote and no one from whom we are disconnected. Consequently, some infectious diseases that now affect people in other parts of the world represent potential threats to the United States because of global interdependence, modern transportation, trade and changing social and cultural patterns (Lederberg, Shope & Stanley C. Oaks 1992: v).

The tactics of governing risk may be internal to and/or extend beyond the boundaries of states, particularly where, as Lederberg *et al.* suggest, risk is perceived or constructed as a threat to the security of the body politic. HIV/AIDS is constructed in geopolitical discourse as one such threat to security (King 2002). In the post-colonial treatment of HIV/AIDS, mitigation occurs anew through deterritorialised networks of technologies, information and management. Nowhere is this truer than in actions against what Lederberg and the US administration refer to as the *pandemic* of HIV/AIDS (Office of the United States Global AIDS Coordinator 2004). The geographic imaginary of HIV/AIDS as a pandemic renders the disease simultaneously everywhere and (not) here - threatening because global flows and interconnections mean that HIV/AIDS is less easily confined within territorial space, but not here because threats are in the external origin of

HIV/AIDS. Rather than a pandemic, HIV/AIDS like obesity or cancer, cholera, or typhoid, exists in places woven together as a pandemic through networks of associations and the geopolitical scripting of illness, bodies and of spaces of risk (Dalby 2003; Hyndman 2004; Ó Tuathail 1996, 1999). In the contemporary context of microbicide development, the US has taken a leading role.

> The Administration unveiled their [sic] implementing program pursuant to the passage of this Act in February 2004. After years of work to increase federal recognition of the importance of microbicides research, US advocates were pleased to see 'Microbicide Development' as a topic heading in the new President's Emergency Plan for AIDS Relief (PEPFAR) ... We were particularly encouraged to see a decisive statement supporting the concept of microbicides, which was articulated more affirmatively than might have been expected in the current political climate (Global Campaign for Microbicides 2004: no page).

Than might have been expected. On the 16th December, 2004 the Senate Appropriations Committee passed the Foreign Operations Bill for the 2005 financial year with a $10 million increase in support for microbicide development, bringing the total annual support to $32 million. Alongside the commitments expressed in the PEPFAR document, the 'surprise' of advocacy groups was understandable given the apparent lack of support for microbicides that preceded the Bill, and the growing ambivalence (if not contempt) of the US government to women's empowerment. Prior to the incorporation of microbicides into the five-year President's Emergency Plan for AIDS, released in February 2004, microbicides advocates struggled to obtain support from the US government. The 2004 plan however, commits the Department of Health and Human Services and USAID to support research and testing of microbicides and the expansion of prevention trials of microbicides (Office of the United States Global AIDS Coordinator 2004: 90-91). Lori Heise, the Director of the Global Campaign for Microbicides suggested the increased funding was a 'victory for citizen advocates' and an 'important step forward for the world's women' (Larkin 2004: no page). I am more cautious in reading the new found enthusiasm and economic commitment given to microbicides in such terms, particularly with respect to

how this relates to the world's women because the context of HIV/AIDS debates and gender in US has moved increasingly towards neo-conservative values.

Under the George W. Bush Administration, many of the hard won victories extending women's reproductive rights have been under assault. An editorial published in the *New York Times* in January 2003, for example, described the Bush Administration's various reproductive reforms[69] as a 'war against women' in both domestic and foreign affairs; "Most Americans would be shocked at the lengths American representatives are going to in their international war against women's rights to control their bodies" (2003). The conflation of neo-conservative values in relation to reproductive health, and the US support for technologies that promote individual responsibility and women's empowerment seems contradictory. How can the new commitment to microbicides be understood?

In the preface to this thesis I remarked that the war in Iraq marks out a new enthusiasm for preventive interventions on the part of the US Government. Notwithstanding that Carraguard is being developed by a philanthropic organisation, the change of heart support for microbicides leaves open questions about Carraguard's association with, and/or assimilation into, the diverse strategies of colonising space that may be associated with a new kind of *American imperialism* (Pieterse 2004; Roberts, Secor & Sparke 2003; Soederberg 2004). The idea of the American empire etches another and equally complex context in which issues of security and international commerce have been enrolled in the quest for new global health priorities that rework the international and gendered geopolitics of the HIV/AIDS debate.

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[69] In particular the editorial points to Bush policy on abortion and the various attempts to undermine the 'free-choice' enshrined by the Roe Vs Wade decision; the reinstatement of a global 'gag' order preventing American health professionals from offering advice or assistance in relation to abortion; the ban on late-term abortions; and decreased financial support for global health initiatives for reproductive health within the World Health Organisation and United Nations Population Fund.

A feature of the US empire of liberty is the politicisation of privatisation such that 'the politics of neoliberalism treats politics as a business proposition'(Pieterse 2004: 124). The 'business' approach to HIV/AIDS is best represented by George W. Bush appointment of a former business CEO, Randall L. Tobias to the position of US Global AIDS Co-ordinator (Office of the Press Secretary 2003). Bush expressed little concern about his lack of a public health or medical background but rather emphasised his business credentials, stating that:

> Randy is one of America's most talented and respected executives. He was Vice Chairman of AT&T International and Chairman of ATT International, guiding the firm through immense organizational challenges. He went to head Eli Lilly and Company, one of our nation's largest and most innovative pharmaceutical companies (Office of the Press Secretary 2003: no page).

If the appointment of a CEO without any expertise in health was an issue of concern raised by global advocates of microbicides, the more troubling issue for many was his association with the pharmaceutical giant Eli Lilly. HIV/AIDS advocacy groups have been outspoken about the reduced support to the multilateral Global Fund, increased support for prevention programs focused on abstinence, and lack of demonstrable commitment to generic anti-retroviral drugs. Reluctance to fund anti-retroviral drugs has been a noted feature of all western donor programmes, attributed by some as a post-colonial contempt for African bodies (Jones 2004). Some theorists have pointed to the increased profile of technological solutions promoted by pharmaceutical and medical technology interests accompanied by the more general shift away from public health as a problem of provision and social management.

> Neoliberal empire is a marriage of convenience with neoliberalism indicated by inconsistent use of neoliberal policies, and an attempt to merge the America whose business is business with the America whose business is war, at a time when business is not doing so well (Pieterse 2004: 123)

For Pieterse, the problem facing the US is that it is severely over-stretched financially but also aiming towards greater involvement in affairs of empire.

In such a context, the economic rationale for a prevention technology such as Carraguard that is low cost option but still enables direct interventions makes sense.

Further, while the globalisation of neo-liberal values can be seen to have accompanied free-markets and economic globalisation, the American empire is underpinned by the sense that American values are universal and expressed not by economic might but by what Pieterse has termed an 'empire of liberty' (Pieterse 2004: 120). In his view, the promotion of ideals of *freedom* underpin the US military campaigns, a view that I consider relevant to the export of technologies such as Carraguard for the prevention of HIV/AIDS, and under which *freedom* is on strict terms.

> This week, I will speak in New York to the United Nations General Assembly, and I will talk about the great possibilities of our time to improve health, expand prosperity and extend freedom in our world. America and many nations are taking a bold stand in the fight against HIV/AIDS. My emergency plan for AIDS relief will provide an unprecedented $15 billion over five years to support the fight against the AIDS pandemic throughout the world, with the focus on the most afflicted countries in Africa, the Caribbean, and Asia (Bush 2004: no page).

Extending freedom through commitments to fund HIV/AIDS campaigns elsewhere comes with caveats. The PEPFAR, consistent with domestic policy, promotes *particular* kinds of interventions and funds *certain* activities. Freedom is granted so long as the activities conform, in general, to the ideal of ABC (Abstinence, Monogamy and use a Condom as a last resort), and are implemented through faith-based and community based groups. This sense of freedom is not only circumscribed, but imposes neo-conservative values.

> Despite two decades of focused attention on prevention, however, we have yet to achieve widespread success. Inappropriate and inconsistent prevention messages, stigma, gender inequality, poor knowledge of HIV status, limited testing strategies, medical transmission of HIV through unsafe injections and blood supply, and HIV transmission from mother to child continue to fuel the spread of HIV. President Bush's Emergency Plan is specifically designed to address these challenges by using evidence-based prevention programs such as the "ABC" approach of Abstinence, Be faithful, and as appropriate, the correct and consistent

use of Condoms (Office of the United States Global AIDS Coordinator 2004: 10).

Extending neo-conservative *regulated* freedoms has become a condition of health assistance to developing countries. In the war against HIV/AIDS this new form of arrogance now underlies policies that aggressively promote freedom, with strong conservative and moral views about what freedom is. Contextualised within a new public health geopolitics of American empire, the support for microbicides may be less surprising than the advocates of the Global Campaign suggest, and associated with a new kind of fusion between neo-liberal economics and neo-conservative values; ones that justify pre-emptive actions against risk.

Breaking new ground: microbicides in a pre-emptive politics?

In a recent conference paper assessing the revised *National Defense Strategy* of the Bush administration, Crina Archer (2004) argues that the notion of 'pre-emptive' intervention differs markedly from ideas of prevention and is deeply troubling for democratic politics. She suggests that where prevention has a focus on evidence and the accuracy of evidence, pre-emption operates a different set of understandings that impute a sense of 'future dangerousness'; does this suggest a return to Castel's (1991) sense of dangerousness or something else?

Citing the example of the increased state based adoption of 'Sexually Violent Predator Laws', Archer demonstrates that pre-emptive logic is not altogether new - for the past 15 years under such laws sex offenders may be confined to psychiatric institutions '*after* the completion of their jail terms, on the basis of the possibility of a repeat offense' (Archer 2004: no page). She suggests such actions are explicitly pre-emptive because there is no punitive or deterrent reason for offenders' incarceration. Rather, such actions are premised on the rationale of stopping sexual crimes before they happen. In her view, the danger of such pre-emptive arguments is that there is no acknowledgement

that risk calculations involve some degree of political judgement where the future is concerned. Moreover, without the acknowledgement of judgement, actions are constructed as 'common-sense' responses to inevitable outcomes. Such inevitable outcomes are calculations - but more troubling still is that they may be invisible to us.

Other rationales for action may be hidden and she cites such examples as regime change, promotion of Christian moral values and promotion of corporate interests. On this point there are obvious overlaps with the US commitment to HIV/AIDS and notions of American Empire. If the logic of pre-emption is guiding US policy towards microbicides, then the support for prevention of HIV/AIDS is subordinated to an excessive optimism that western science can predict where HIV/AIDS will go, and also how it should be treated. Microbicides are then *the* answer for women who will get HIV/AIDS - *as if it has already occurred.* Unlike prevention, such calculations do not take into account the question of probabilities, but *assume* certain outcomes. In this scenario, political judgement and reasonable uncertainty gives way to an 'optimism about our ability to calculate future dangerousness' (Archer 2004: no page).

Moreover, the example demonstrates how Carraguard's deployment as a technology and its effects depends in no small measure, to who deploys it. The (re)formulation of microbicides as US technologies of pre-emption may not have been anticipated by the developers. There is always a danger that technologies come to embody more than is expected.

Concluding remarks

In this chapter I have considered *how* Carraguard embodies ideas of choice and responsibility, and if such so-called choice constitutes freedom or constraint. My concern was to ask how (and if) Carraguard reconfigures and constructs biopolitics *elsewhere;* how (and if) it enables prudent subjects, and

risk, at a distance. I built on insights developed in earlier chapters to propose that through its association with its US developers and advocates based predominantly in the neo-liberal west, Carraguard is a technology of prevention that is shaped by and shapes prudentialism. Further, I suggested Carraguard acts as a gendered technology within networks of concern about HIV/AIDS, security, morality and gender.

The example of Carraguard supports an argument that prudentialism exposes individuals to technologies that shape subjectivities across scales and locations. The scales that emerge from Carraguard as a complex actor-network are various and implicate the illness, carrageenan, technologies, developers and recipients. Carraguard is global in reach through its association with priorities in post-colonial health as well as intimate and personal in the lives of women, including also those enrolled for the most recent trials in South Africa[70].

In this chapter I have demonstrated that microbicides and Carraguard (already) exist as complex actor-networks associated with various goals and priorities in *particular* visions of public health, and of central concern in this chapter, in focusing on prevention, women and ideas of empowerment. I have demonstrated that technologies of remote control may constitute an unproblematic neo-liberal and gendered subject of, and at risk of, the disease; the brutalizing effects of such a tendency serving to reinscribe various geopolitical boundaries whose effects on the pursuit of social and spatial justice are questionable. Carraguard is a gendered technology that permits the government of risk at a distance. Through Carraguard, HIV/AIDS may be created anew as a disease of marginal women in marginal places.

More troubling though, is the translation and incorporation of Carraguard into the diverse strategies of an emergent American empire, which fuses neo-

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[70] Large scale efficacy trials for Carraguard began in three locations in South Africa in March 2004 (Population Council 2004b)

liberal economic strategies with neo-conservative values. I have only begun to explore these linkages here, and more work needs to be done to assess if this example is a portent for a more extensive re- figuring of public health.

Conclusion: risking prudentialism

Carrageenan is a seemingly innocuous extract of seaweed that has grown in importance in how food and pharmaceutical industries respond to demands for prudentialism in the new public health. To facilitate a fuller understanding of *how* carrageenan functions in public health *practice,* in chapter one I combined two theoretical approaches in an analysis of it as an item of everyday consumption. The first was a critical geographic approach, combining post-structuralist scholarship that is attentive to the mentalities that make particular ways of thinking about public health possible, particularly Foucauldian inspired research on governmentality and risk. I also drew on geographic scholarship (both within and outside the formal discipline) that emphasises the importance of how space and place are affected by and affect public health. The second approach drew from actor-network theory and provided a method to map out heterogeneity in relation to carrageenan. Emerging from these approaches were my three themes of visibility, futurity and spatiality which explicitily and implicity underscored my examination of prudentialism and carrageenan in the new public health. In applying a critical geographic/network approach, and the three themes, I was able to trace out a complex and expansive network of connections across various scalar concerns - from the remote workings of public health and their proximities to individuals through material technologies such as food labels, food products and pharmaceuticals, to less formalised and even virtual spaces of health information resources including the Internet and popular media. The significance of this approach has been the partial perspectives it revealed. Such partial perspectives contribute to what Donna Haraway (1988) has identified as 'objective' enquiry.

My adoption of a critical geographic/network approach allowed me, in short, to reveal topologies and topographies of seaweed and carrageenan that have hitherto remained under-explored, and that reveal the workings of discourses of the new public health in affecting new realities for the carrageenan industry as well as for individuals within activities related to prevention, promotion and provision in public health. I was able to trace out how carrageenan is refigured and refigures what public health is and who it affects, and to reveal, in stark material form, an underbelly to choice, freedom and practices associated with health prevention. The dissertation made visible the ways in which relations of power/knowledge congeal in material and non-material networks. Through the three themes of visibility, futurity and spatiality I extended the significance of such networks beyond the immediacy of the places in which I encountered and documented them.

Chapter two explored the proximity of public health to prudent individuals through the materiality of food labels. Such technologies of public health are more than simple statements about what is in food; rather they orient individuals toward prudent behaviour(s), aligning them with particular regimes of governing health at a distance. For a number of reasons I problematised the prudent subject. First, while carrageenan appears on labels as safe, it is virtually impossible for individuals to navigate the complex informational quagmire to make assessments about it. Carrageenan describes a complex network, but is reduced to singularity in the regulatory environment, and as a boundary object amongst industry players. Carrageenan is visible yet not, exposing individuals and communities to discourses that promote the future (care) of self, and the spatial qualities of such remote yet proximate interconnections with the new public health. Yet as I documented in chapter three, carrageenan is minutely differentiated and complex across a vast field of different knowledges and situated social framings. As the complexity of knowledge about carrageenan expands within and across epistemic communities, its visibility to prudent subjects becomes increasingly displaced and distant. Moreover, what counts as a risk

in relation to carrageenan is not consistent across different contexts or different representations. For example, carrageenan that is considered 'generally recognised as safe' or GRAS is associated with risks that are different from carrageenan that is regulated as safe, but not classified as GRAS. There are consequences for prudent subjects in the different risk calculi and their (visible) representation, as material environments are modified and transformed. There are also consequences as carrageenan industries must respond to the increasingly (and seemingly unending) durable relationships established between risk and carrageenan in some contexts. Risks become virtually immutable and the carrageenan industry is obliged to respond - and inadvertently propagate that immutability.

In chapter four the extent of the informational environment, beyond the 'official' discourses of public health or singularity of carrageenan-on-labels, was considered in a discussion of carrageenan and carcinogenicity. The example showed the partial perspectives of different epistemic knowledges, and the partial perspectives that are contrived through various media. It would not take much effort for a prudent consumer of health to download information from the Internet and discover 'risks' of cancer or ulcerations arising from carrageenan consumption. Individuals are placed in a role of perpetual conflict with the trust-in-authority that is implied by a politics of singularity within regulatory environments, and the obligation to be prudent and validate what is or is not safe to consume. Complicating entities, such as degraded carrageenan/poligeenan, become risks in part because they create boundaries around what are much more complex actor-networks, and ones that may be based on future calculations of risk. Maintaining carrageenan's ontological stability becomes increasingly difficult as techno-scientific fractions of risk multiply across spatial and temporal locales. Risking carrageenan depends on partial perspectives, but most views are based on singular perspectives that are often in competition with others.

Furthermore, one complication that arose from delimitations of risk and carrageenan was unexpected material and non-material changes in what constitute such things as food products *in the present*. Refering to the US Nutrition Labeling and Education Act, I demonstrated how the food industry responded to prudent reading of labels in part by modifying food content to meet these expectations and, in chapter five, also showed that it is not always clear who benefits from such changes. Food modification for alleged public health goals has become more widespread, and has loosened some of the regulatory barriers that previously prohibited the use of products, such as carrageenan in meat, for the purposes of food modification. While manufacturers have increased the use of food additives to modify health-related properties, this does not necessarily signal that food has become either more healthy, or more risky, but it does represent a significant shift not only in what food is, but what it represents. The development of food products such as the McLean is representative of the (re)medicalisation of food and new centrality of issues of health in decision-making about the production, manufacture and (supposedly) consumption of food. The futurity of risk calculation has effects in the present. Moreover, prudentialism is no longer cast as choice but as a matter of course. Despite that, there are many 'rational' reasons to explain why individuals may choose, or not, so-called healthy options that are silenced in the matrix of the new public health. Because elements such as the aesthetic/expressive dimensions of choice are rarely considered in developing prevention technologies one consequence, demonstrated by the media analysis of articles about the McLean's failure, is blame of self and others under the terms of the new public health.

In a similar vein, the calculative rationality underscoring carrageenan as a risk in relation to carcinogeneity or ulcerations also applies to the development of the McLean and Carraguard as responses to risks associated with obesity and HIV/AIDS. These technologies have not been designed for people who suffer from obesity or HIV/AIDS, but focus on the future health

of already healthy populations and environments cast as at risk. I do not mean to suggest that obesity, cancer or HIV/AIDS are not pressing issues, but when the technologies of the McLean or Carraguard are resituated amongst partial perspectives, I have shown that they affect subjectivities of individuals and collectives within healthy populations in the present. Health technologies are not benign even when they are designed for prevention amongst the healthy.

In chapter six, I traced the geopolitics of one carrageenan actor-network through the global scales of health provision in relation to HIV/AIDS and to one possible 'futurity' - pre-emption. Microbicides articulate prudentialism for particular publics, marginal women in marginal places. Exemplified also by the McLean, the discourse of prudentialism is premised on a subject decontextualised from socio-cultural and material factors that disable subjects. For example, I highlighted how the economic geography of food choice, or violence against women is obscured when the ideal of the prudent subject is invoked. The calculation of health risk and production of prudent subjects belies the complexity of the context in which decision-making occurs. Moreover the deployment of prudent or even 'empowering' technologies of prevention such as microbicides may be undergoing a significant realignment. It may be that the development of Carraguard forms part of the underlying neo-liberal and neo-conservative political mentalities of the new public health and their extension into spaces and places beyond neo-liberal polities. However, further research is warranted to assess how neo-conservative values are affecting new mentalities in public health.

In tracing out various carrageenan actor-networks associated with prevention in public health, I made transparent how underlying mentalities of governance, and the calculations of risk, are implicit in where and how carrageenan is deployed. Carrageenan modifies the material qualities of food, is used to constitute pharmaceutical products, and different risk calculi affect different uses. Moreover, the deployment of carrageenan for different

uses affects *how* health is defined, understood and acted upon. For the carrageenan industry such developments have created both opportunities and threats. The McLean was a technology that had potential to increase the production of carrageenan-bearing seaweed industries, but it did not. Microbicides may yet revolutionise (parts) of the industry. However labels and alleged risks may turn consumers away, particularly if the network connections concerning carcinogenicity lengthen and disperse.

In more general terms, one reason I have given for many of transformations that have taken place in public health practice is the increased salience of risk in underscoring calculations, constructions and visibility of what become issues of concern and action. Risk is, to some extent, a catch-all phrase for many different governmental rationalities, although it is not, as I found with uncertainty and its relation to entrepreneurship in chapter two, the *only* rationality underlying public health activity. Moreover its construction structures debates about whether carrageenan is safe or not to consume, and multiplies and expands alleged-risks. Risk is self-propagating but risk does not *necessarily* bear equivalence to a corresponding danger. Indeed it appears that risks associated with carrageenan and carcinogenicity were deduced and emboldened from a fusion of risk calculations decontextualised from the significance of their accumulation. I do not wish to imply that carrageenan should be pronounced safe or unsafe, or that carrageenan should not be tested. Rather, by resituating safety concerns about carrageenan within such partial perspectives, it is possible to see how risks are invigorated. Such partial perspectives offer one possible avenue for reducing the angst that has characterised discussions about carrageenan as a safe or unsafe additive.

At the same time, one question that this study raised for me was *how* prudentialism has become and is maintained as central to the new public health. I have questioned the foundation of prudentialism and in particular the incitement to notions of choice. The power of prudentialism amongst many publics derives from its appeal and packaging as choice or freedom.

Laudable though this package may seem, choice and freedom do not exist outside the exercise of power. For various reasons choices are limited and in some situations, such as the provision of HIV/AIDS prevention technologies designed for 'stealth', such expectations of prudentialism may not give women greater control and may place them in physical or other forms of danger. The example given in chapter six of microbicide developments for Sub-Saharan Africa perhaps best demonstrate how such discourses of choice can be appropriated in ways that have little to do with emancipation. In the case of Carraguard, recent developments in the US concerning microbicides suggest that neo-conservative values and 'anti-choice' agendas are increasingly and visibly colonising the various domains of public health - and the future.

Prudentialism is sold through the promise of emancipation and appeals to ideals of freedom, but in some contexts gives effect to the opposite: spaces that were once less under the surveillance of public institutions, like sexuality and the simple (yet complex) enjoyment of food, are bought to public account through the discourse of prudent individualism. One effect of the new public health is that foods and pharmaceuticals are modified to respond to these new ways of thinking about public health. As one among other consequences, industries like the carrageenan industry react to new public health discourse and modify applications for carrageenan accordingly. Food labels, Carraguard and the McLean are technologies that are both developed for, and oblige prudent individualism. People may reject the McLean without any great consequence, but the 'freedom' to use Carraguard against HIV/AIDS may have costs - particularly for women. Women who may be exposed to physical danger, and/or are unable, for various other reasons, to use such technologies, may be blamed by publics for failing public health. Despite the philosophical commitment to autonomous healthy individualism, neither the provision for that, nor its execution is guaranteed to produce the effects that are expected. There are *risks* associated with prudentialism: from what constitutes choice, to the obligations such choice

demands, to the concealment of the limits of choice, and to the potential for blame.

A further conclusion that can be drawn from this research concerns the tendency of scientific and expert accounts to focus on how prudent subjects are enabled (or not) by information about safety. In my view there is much scope for the examination of how they are also disabled by the *lack* of social studies such as this that contextualise such debates. If prudentialism remains central to how public health happens, the provision of partial perspectives as advocated by Haraway (1991) would enable what she describes as more 'objective' decision-making about prevention-focused technologies.

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APPENDIX

Appendix 2.1

[Code of Federal Regulations]
[Title 21, Volume 3]
[Revised as of April 1, 2003]
From the U.S. Government Printing Office via GPO Access
[CITE: 21CFR182.7255]

[Page 467]

TITLE 21--FOOD AND DRUGS

CHAPTER I--FOOD AND DRUG ADMINISTRATION, DEPARTMENT OF HEALTH AND HUMAN
SERVICES (CONTINUED)

PART 182--SUBSTANCES GENERALLY RECOGNIZED AS SAFE--Table of Contents

Subpart H--Stabilizers

Sec. 182.7255 Chondrus extract.

(a) Product. Chondrus extract (carrageenin).
(b) Conditions of use. This substance is generally recognized as safe when used in accordance with good manufacturing practice.

Appendix 2.2

[Code of Federal Regulations]
[Title 21, Volume 3]
[Revised as of April 1, 2003]
From the U.S. Government Printing Office via GPO Access
[CITE: 21CFR172.620]

[Page 67-68]

TITLE 21--FOOD AND DRUGS

CHAPTER I--FOOD AND DRUG ADMINISTRATION, DEPARTMENT OF HEALTH AND HUMAN
SERVICES (CONTINUED)

PART 172--FOOD ADDITIVES PERMITTED FOR DIRECT ADDITION TO FOOD FOR HUMAN CONSUMPTION--Table of Contents

Subpart G--Gums, Chewing Gum Bases and Related Substances

Sec. 172.620 **Carrageenan.**

The food additive **carrageenan** may be safely used in food in accordance with the following prescribed conditions:

(a) The food additive is the refined hydrocolloid prepared by aqueous extraction from the following members of

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the families Gigartinaceae and Solieriaceae of the class Rodophyceae (red seaweed):

Chondrus crispus.
Chondrus ocellatus.
Eucheuma cottonii.
Eucheuma spinosum.
Gigartina acicularis.
Gigartina pistillata.
Gigartina radula.
Gigartina stellata.

(b) The food additive conforms to the following conditions:

(1) It is a sulfated polysaccharide the dominant hexose units of which are galactose and anhydrogalactose.

(2) Range of sulfate content: 20 percent to 40 percent on a dry-weight basis.

(c) The food additive is used or intended for use in the amount necessary for an emulsifier, stabilizer, or thickener in foods, except
for those standardized foods that do not provide for such use.

(d) To assure safe use of the additive, the label and labeling of
the additive shall bear the name of the additive, **carrageenan.**

Appendix 2.3 - Extract

[Code of Federal Regulations]
[Title 21 Volume 5]
[Revised as of April 1, 2003]
From the U.S. Government Printing Office via GPO Access
[CITE: 21CFR310.545]

[Page 38-47]

TITLE 21--FOOD AND DRUGS

CHAPTER I--FOOD AND DRUG ADMINISTRATION, DEPARTMENT OF HEALTH AND HUMAN
SERVICES (CONTINUED)

PART 310--NEW DRUGS--Table of Contents

Subpart E--Requirements for Specific New Drugs or Devices

Sec. 310.545 Drug products containing certain active ingredients offered over-the-counter (OTC) for certain uses.

(a) A number of active ingredients have been present in OTC drug products for various uses, as described below. However, based on evidence currently available, there are inadequate data to establish general recognition of the safety and effectiveness of these ingredients
for the specified uses:

...

(12) Laxative drug products--(i) Bulk laxatives.

Agar
Carrageenan (degraded)
Carrageenan (native)
Guar gun

...

(20) Weight control drug products.

Alcohol
Alfalfa
Alginic acid
Anise oil
...
Carboxymethylcellulose sodium
Carrageenan
Cholecalcierol
Choline
Chondrus
Citric acid
Cnicus benedictus
Copper
Copper gluconate
Corn oil
Corn syrup
Corn silk, potassium extract