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All in the blood: A review of Aboriginal Australians' cultural beliefs about blood and implications for biospecimen research

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Abstract

Public participation in medical research and biobanking is considered key to advances in scientific discovery and translation to improved health care. Cultural concerns relating to blood have been found to affect the participation of indigenous peoples and minorities in research, but such concerns are rarely specified in the literature. This article presents a review of the role of blood in Australian Aboriginal cultures. We discuss the range of meanings and uses of blood in traditional culture, including their use in ceremonies, healing and sorcery. We draw on more recent literature on Aboriginal Australians and biomedicine to consider how traditional beliefs may be changing over time. These findings provide an empirical basis for researchers and bioethicists to develop culturally-grounded strategies to boost the participation of Aboriginal Australians in biomedical research. They also serve as a model for integrating anthropological literature with bioethical concerns that could be applied to other indigenous and minority groups.

Keywords

Blood, biospecimen, Aboriginal, indigenous, culture, ethics

Research in indigenous populations is recognized by many governments as a priority given the poorer health of indigenous people in relation to national populations. Within the Australian context, health disparities between Aboriginal and Torres Strait Islander Australiansⁱ and the rest of the population have led to Indigenous health becoming a national health research priority (NHMRC, 2010). Achieving the goals outlined in the national strategy, however, has been complicated by the consequences of Australia's colonial history since 1788 and the damaging practices of previous research efforts (Dodson & Williamson, 1999; Thomas, 2004; van Holst Pellekaan, 2000). Indigenous people may be hesitant to participate in health and medical research, particularly biobank research, for a range of reasons. This article seeks to address one of those reasons, namely, a lack of understanding among researchers of culturally-based beliefs about biospecimens (Hoy, 2011; Kowal, 2012).

Much scholarship has shown that culture has wide ranging effects on health. Health behaviors and health seeking practices, for example, are strongly affected by societal and cultural beliefs (see for example Grassineau et al., 2007; Umeora, Onuh, & Umeora, 2005). Similarly, attitudes to and levels of participation in biobank research differ by culture and ethnicity, with non-white populations less likely to participate in biobanks and more likely to express concerns about the storage, collection and use of biospecimens (Bussey-Jones, 2010; Haga, 2010; James et al., 2008; Lemke, Halverson, & Ross, 2012; Mezuk, Eaton, & Zandi, 2008; Yancey, Ortega, & Kumanyika, 2006).

Indigenous groups are among those minorities who have criticized genetic and other biomedical studies conducted in their communities. Critics have cited a range of concerns, including lack of involvement of the community in project planning, researcher insensitivity to cultural beliefs, potential stigma resulting from the publication of research results (e.g. on genetic associations with alcoholism in indigenous communities), lack of feedback to the community once a project is completed, commercial ownership of DNA, and overall impressions of exploitation (see for example Arbour & Cook, 2006; Burhansstipanov, Bemis, & Dignan, 2002; Chang & Lowenthal, 2001; Dodson, 1998; McInnes, 2011; Wallace, 1998). For the most part, these concerns arise from a combination of: (1) cultural differences, and (2) negative experiences of research in particular and state structures in general. Both sources of concern are closely related to the process and legacies of European colonization.

This context means that researchers working in indigenous settings must take special care to: (1) understand culturally influenced beliefs relevant to research – such as beliefs about biospecimens – and ensure that study designs accommodate any culturally specific concerns, and (2) avoid unethical, insensitive or exploitative research practices. Bioethics scholars have explored these challenges through the concepts of ‘group’ or ‘cultural’ risks that apply in addition to individual risks (Drabiak-Syed, 2010; Tsosie & McGregor, 2007). In short, this literature shows that understanding cultural beliefs relevant to biospecimen collection, storage and use is essential to ethical and effective biospecimen research in indigenous communities. This is true for all biological samples, but in this paper we restrict discussion to blood as an exemplar.

Blood is a dense metaphor in most cultures. Associations and meanings attributed to blood vary widely across and within societies, and across time (Carsten, 2013; Copeman, 2009). Yet anthropological scholarship on attitudes to blood has generally neglected groups who identify as indigenous. An exception is Schwarz’s study of Navajo views on the ‘bioeconomy’ of expropriated bodily substances (Schwarz, 2009). Through an investigation of Navajo participation in blood transfusion and donation, Schwarz explains that the Navajo maintain the belief that “detached body parts and substances” retain their connection to the donor for the period of their life (Schwarz, 2009, p. 147). Alongside a strong distinction between those who are “native of the land” and those who are not, this has implications for receiving and giving bodily substances from and to anonymous donors. Fear of contamination by “enemy outsiders” causes apprehension among the Navajo about blood donation and transfusion. As a result of this “many contemporary Navajo people only accept blood transfusions under certain conditions and usually will only donate blood on behalf of an ailing relative” (Schwarz, 2009, p. 163).

Disputes between indigenous groups and researchers have revealed further evidence about indigenous attitudes to blood on biomedical practices. One such example concerns the Yanomami (also known as Yanomamö) of Brazil and Venezuela. Blood samples collected from Yanomami in the 1960s and 70s were stored at various laboratories in the United States. When allegations of unethical practices by the researchers involved arose some decades later, the Yanomami demanded the return of the samples on cultural grounds (American Anthropological Association, 2002; Borofsky, 2005; Couzin-Frankel, 2010; Tierney, 2001). The Yanomami and their advocates argued that according to their cultural belief system, the retention of the frozen blood samples prevented their deceased donors from successfully departing the world. It was therefore necessary for shamans and elders to ritually destroy the samples to ensure the separation between the world of the living and the dead (nadjamarin22, 2007; Survival International). This case demonstrates the potential importance of understanding the cultural significance of blood for indigenous groups to prevent harm and engender trust between researchers and participants.

This article contributes to the ongoing discussion about the use of blood samples from indigenous groups by exploring the variety of meanings attributed to blood samples within traditional Australian Aboriginal cultures and how these beliefs and practices may influence the attitudes of Aboriginal participants toward blood samples. After first addressing some assumptions of and limitations to our approach, we provide a structured outline of anthropological literature relevant to traditional beliefs about blood in Aboriginal populations, highlighting the potential implications for research involving biospecimens. The cosmology of Aboriginal groups around Australia is constituted by complex and fluid relationships whereby personhood, land and spirit are manipulated through acts of incorporation and excorporation of blood. Blood both acts out and is acted upon. Ethnographic data from northern and central Australia reveals blood as a source of abiding power with the ability to influence actions and emotions, to weaken and to heal the body and to transform and commute energy through the body, the landscape and the spiritual world. Drawing on more recent ethnographic research on Aboriginal attitudes to biomedicine, we also consider the likely changes and continuities between earlier eras and contemporary attitudes. We conclude by considering the potential implications of this review for the three main contexts in which blood samples are used: the use of historical samples for new research; current research involving the collection of new biospecimens; and long-term prospective biobanking. In each case cultural associations with blood will impact on decisions regarding use, storage and disposal of blood samples.

Before embarking on the review of relevant anthropological knowledge a number of caveats are required. For some readers, our goal of outlining potential cultural considerations that researchers should take into account may imply that any unwillingness of indigenous peoples to participate in medical research and biobanking can be wholly attributed to cultural difference and past negative research experiences. This is not the case. We acknowledge there are other reasons for non-participation that fall beyond the scope of this article. For example, indigenous people may not believe that biobank research will benefit them given the strong evidence for the social determinants of health inequalities, or may consider that the proposed research methods or aims are incommensurable with indigenous understandings of disease, health and well-being.

A related concern is a potential implication from our focus on biobanking that the disproportionate poor health experienced by many indigenous populations is biologically determined, and that biobanking research is the solution. Clearly, indigenous disadvantage is multifactorial, and poor socio-economic status and widespread discrimination are major causes. However, we contend that biomedical research and biobanking offer some benefit to indigenous health, and will ensure that indigenous people are not excluded from advances in 'personalised' health care. Furthermore, whether or not one believes biomedical research is beneficial, it is sure to continue into the future and some indigenous people will choose to participate. The research community therefore has an obligation to ensure that the risk of harm to indigenous people and communities is minimised, a goal to which this article seeks to contribute.

Although for purposes of length and clarity the following discussion focuses on blood, the principles outlined may apply to other bodily substances including hair, saliva and other tissues used for biomedical and scientific research. Aboriginal and Torres Strait Islander readers should be warned it includes descriptions of topics that are widely discussed in the literature but may be considered 'women's business' from a 'traditional' Aboriginal perspective.

Our use of quotation marks for 'traditional' in the previous sentence reflects our awareness of the hazards of using such a term. In an environment where indigenous knowledges are routinely ignored, suppressed and undermined, using the descriptor 'traditional' can be taken as supporting the view that indigenous 'beliefs' are epistemologically inferior to 'objective science'. We do not share this view, and consider indigenous ways of seeing the world as highly diverse, and equal to 'non-indigenous' ways (while recognizing that 'non-indigenous' or 'western' are also homogenizing, problematic categories). However, we still use 'traditional' in this article in keeping with the anthropological literature reviewed, while maintaining awareness of the limitations and pitfalls of the term.ⁱⁱ Aboriginal people were and are influenced by a broad range of factors (e.g. 'western' religion and popular culture) beyond those recorded by anthropologists interested in traditional knowledge. We contend that despite this, a review of the anthropological record of Aboriginal knowledge is still useful in generating culturally sensitive practices for the acquisition, use and disposal of blood samples for biomedical or scientific purposes. Moreover, research we discuss below identifies an emic distinction between 'traditional' and 'non-traditional' indigenous knowledge within a contemporary Native American community (Sahota, 2014), indicating that despite its limitations, the traditional/non-traditional dichotomy may be meaningful to some indigenous people.

A final limitation to note is the geographical reach of this review. There are over 500 recognised Aboriginal language groups across Australia (see Figure 1) that have been unequally impacted by colonization. The colonial frontier began on the southeast coast in 1788 but had little effect on some groups in northern and central Australia until the 1960s. Aboriginal people of northern and central Australia are more likely to retain Aboriginal languages and traditional beliefs and practices and to collectively own their land. It is these groups that have been the focus of the anthropological literature, and thus this review.

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Aboriginal Cosmological Beliefs

Although Aboriginal belief systems and practices vary by region and by group, the underlying meanings and relationships between blood and cosmological understandings have considerable overlap. Exploring these meanings requires a brief overview of the cosmological system of which blood forms a part. For Aboriginal Australians in the central and northern parts of Australia, the interconnectedness of the body, the land and the 'dreaming' is the foundation of cosmological beliefs (Stanner, 1979). The 'dreaming' is an English term equated with the sacred domain in which ancestral beings, often conceived as hybrid human-animals, created the world in the past. The actions of dreaming beings continue to be felt in the present and Aboriginal ritual is geared towards supporting these ongoing creative acts. Writing about northern Australia, Povinelli (1993) argues that the Aboriginal body can be equated with the landscape in that they are both the result of mythic action. Like the landscape they move through, Aborigines' bodies are marked by the travel of dreaming beings. Encounters with beings are indicated through bodily functions and appearances.

Extending this idea, McDonald writes that in northern Australia, "[t]he aboriginal body is an organic body which is consubstantial with, and permeable to, the living environment" (McDonald, 2001, p. 20). Stanner describes Aboriginal people as having an "enlarged" notion of the self that merges the concepts of mind, body, spirit, and personality (Stanner, 1979). Land, ancestors and bodily substance are powerfully connected and can act on each other. Povinelli notes, for example, that human blood and other secretions are able to change the land, making it 'sweet' or causing it to 'dry up' (Povinelli, 1993, pp. 31-33). Strehlowe (1971) records a similar system of influence among the Arrernte people of Central Australia. For them, ancestral activities and the bodily processes of those ancestors were transformed into land sites that represented the power of the activity, for example, the menstrual blood of an ancestor formed a lake that influences fertility and conception. Bodily secretions like blood, urine, semen, and faeces metamorphosed into rocks, ochres and water sources. These geographical sites remain tied to the power of the ancestral spirits that created them and can influence the people who inhabit them. As a result of this connection, McDonald (2006) argues, bodily health is not separate from the health of cosmos and country. Action upon and use of blood is thus equivalent to action upon spirit and country and vice versa.

The use of blood in a range of traditional ceremonies demonstrates the importance of blood to the cosmological structure of traditional belief systems. These include circumcision and initiation ceremonies usually performed on pubertal boys; 'increase' ceremonies to maintain the supply of edible plants and animals; and totemic rituals in which blood is used symbolically and literally to transfer energy. Healing techniques and sorcery manipulate illnesses using blood, and menstrual blood is seen as both powerful and dangerous to lives, land and spirits. These ritual and practical uses are discussed through broad themes relating to the meaning of blood: blood as a medium of exchange; blood as non-renewable power; the use of blood in healing; and blood as a regenerative substance. In the descriptions that follow, both the substance of blood and indigenous knowledge about blood are powerfully interactive.

Blood as a Medium of Exchange

In many traditional ceremonies, blood was used to transform and commutate energy and power. The examples in this section demonstrate how emotion and character reside in the blood and are also manipulated by it. Descriptions of traditional ceremonies in the literature from central Australia include the emu ceremony in which blood from several brothers was poured from a vein opened in their arm onto the ground and allowed to dry before being painted on; the hakea flower totem ceremony in which the blood represented a drink made of the flower; and the kangaroo totem ceremony in which bloodletting was conducted over a ceremonial stone (Spencer & Gillen, 1968).

In such ceremonies, blood acted as a medium of exchange. The strong interconnection between the human body, the land and the ancestors meant that each element could influence or change the others completely, both literally and symbolically. In more recent research, the ritual shedding of blood continues to be an important medium of exchange between these three entities, enabling the transfer of emotions and ancestral power (McDonald, 2001). For the Yolngu of northern Australia, bloodletting during initiation ceremonies caused feelings of 'lightness and happiness' among initiates (Morphy, 1989). This echoes Warner's description of bloodletting in the Djungguwan ceremony. He quotes an informant as saying 'when [the initiate] gets up he'll be very quick and feel very light; and he will be very happy because the blood running out of him will make him that way' (Warner, 1958, p. 276). Later in the ceremony, blood was used to paint sacred designs on the bodies of the participants and used as an adhesive for white down. The blood is considered sacred, the blood of ancestral beings. In still other ceremonies, this transformation of human blood into ancestral blood enabled the re-enactment of the life-generating journeys of their ancestors (McDonald, 2001).

Another example of the use of blood to enhance or manipulate emotions is the 'blood feuds' recorded in the early- to mid-twentieth century. A blood feud is a group disagreement that can only be resolved through blood being shed by the party deemed to have committed an offence such as murder. Although by the 1950s Catherine Berndt (Berndt, 1950b) noted that these had almost completely lapsed, a parallel belief was discerned in the 1970s among a Central Australian group who believed blood must be shed to finish an argument (Bell, 1983). Also in Central Australia, blood was drunk and spurted over the body before the commencement of avenging expeditions in order to make members of the party more lithe and active. Aside from strength, the men also believed that this sharing of blood would prevent the possibility of treachery. Drinking blood was also associated with meetings of reconciliation between groups who have been on bad terms with one another (Spencer & Gillen, 1968). Such dispute resolution ceremonies were believed to 'cool and quieten' the blood of antagonists (Berndt, 1950a).

Conversely, blood itself was thought to be affected by the character and conduct of a person. In northwest Australia, those who obeyed 'the Law' during their lives were said to have 'good blood and firm hard flesh'; if a person persistently offended the Law during their lifetime, his or her blood was said to go 'bad and watery' (Petri 1939:226). The inference here is that one can evaluate the substance or personality of a person literally by their

substance (Petri in Glaskin, 2006). Where such beliefs persist, they may provide a traditional cultural basis to understand the biomedical sampling of blood to evaluate health for clinical or research purposes. Both biomedical and traditional Aboriginal beliefs look to the properties of blood to garner information about the person.

Blood as Source of Power

Blood was seen as a direct source of ancestral and human power accessible by drinking blood in ceremonial contexts. In initiation ceremonies, for example, novices drink the blood of ritually experienced men to increase their strength and to imbibe the qualities of that person (McDonald, 2001). Meggitt (1965) described Walpiri circumcisions where the boy is given his older brother's blood to drink to strengthen him. This effect depends on the two sharing a common patri-spirit that can be imparted through the older boy's blood. In central Australia, when a totemic species was plentiful and was killed for food, hunters drank some of the animal's blood to give them strength (Róheim & Muensterberger, 1988). Keen (2006) has also described blood as being used for sorcery and to increase strength and hunting prowess.

These uses illustrate how blood is viewed as a powerful and empowering substance. As the wielding of such power also denotes danger, blood has been described as alternately generative and destructive and is traditionally used in both healing and sorcery (Berndt, 1965; Meggitt, 1965; Strehlow, 1971). Reid describes how sorcerers in northeast Arnhem Land heated or dried out their victims' blood in order to harness the power of the victim's spirit. Healers, on the other hand, are thought to cool and refresh blood (Reid, 1983). Writing of Central Australia, Bell describes how one woman used the blood of a rival for sorcery after a fight between them when blood was drawn. The illness of one woman ended when the other surrendered the blood in a gift exchange (Bell, 1983).

Blood is also a site of power in terms of gender relations within Aboriginal societies. Beliefs about menstrual blood are a potent example. Broadly, many Aboriginal groups believed that women hold the substance of the menstrual blood but men hold the ritualistic power to control the blood or endow it with ancestral potencies (Morphy, 1991). For example, Aboriginal people at Bathurst Island Mission Station believed that if a man puts menstrual blood on himself, the child that his wife subsequently bears would look like him (Berndt, 1950b). In such rituals, men appropriated ancestral women's blood to strengthen their bodies and access its life-generating powers (Bell, 1983; Watson, 1996).

According to McDonald (2001), an important aspect of the power of blood relates to its designation as a 'non-renewable' substance. She argues that within the cosmology of Aboriginal people, blood has been a finite substance that can be *exchanged* between body, land and spirit but cannot be simply created. The spilling of blood into the earth, the movement of blood in the spirit world and the consumption of blood and smearing of ochre on the body are all practices that reflected the power of blood. This is a system in which power is transferred and manipulated but the source of the power - the blood - remains finite.

Where it persists, this belief may have implications for the current storage of blood in biobanks, a practice that could be interpreted as retaining a vital source of power. Aboriginal people holding this belief may seek to reclaim blood samples collected in the past in order to re-enter them into the lifeforce economy and reassert their power.

Blood and Healing

Traditionally, blood has been considered to be essential to life and a source of power and danger, causing, diagnosing and curing illness. Aboriginal people in desert regions understood health in terms of blood colour and viscosity. Illness is equated with dirty, stagnant, dark, thick, 'black' or 'no-good' blood, and bright red blood indicated good health (Peile, 1997). In northwest Australia, a malevolent *maban* (magical substance often residing inside peoples bodies) was able to cause illness through acting on blood (Akerman, 1979). Healing could be effected by removing 'bad blood' and restoring or applying 'good blood', either symbolically through ritual or physically by cutting the skin. Yorro Yorro traditional healers in the Kimberley region 'suck(ed) out' the bad blood from the sick person and spat it out to make the 'good blood' flow and heal the patient (Mowaljarlai & Malnic, 1993). In east Arnhem Land, Webb (1933) also observed a healing ritual where the 'clever' man's lips were pressed to the side of the head and the healer sucked hard before ejecting a mouthful of blood deemed to contain the illness (see also Byard, 1988).

Barrett (1964) describes how, among the Warlpiri, blood was also directly used as a healing agent. Blood from a 'friendly donor' was rubbed on the face and cheek of a patient with a toothache whilst songs were sung. In another example in Central Australia, blood was poured over the head of a seriously mentally ill man whilst the healer sang (Strehlow, 1964). Blood was also drunk to cure illness in Central Australia and Queensland (Roth, 1984a, 1984b; Spencer & Gillen, 1968). Women in central Australia used blood, fat or other bodily secretions from the underarms and eyes as part of group healing rituals (Bell, 1983). Loss of blood or bad blood was also considered the cause of sickness or weakness. Reid concludes that among the Yolngu, blood was therefore a source of power but if improperly shed, a source of danger and illness (Reid, 1983).

Blood samples held in biobanks may therefore be seen by Aboriginal people who maintain traditional beliefs as a potential source of illness or alternatively as a resource for healing. There is also potential for blood donation and transfusion to be incorporated into traditional and syncretic belief systems as a healing practice.

Regeneration. Related to the role of blood in healing is its role in regeneration. In a counterpoint to the idea of blood as non-renewable, Aboriginal groups consider that blood can regenerate varying forms of life in an exchange between the living and the dead, and between ancestral beings and living humans. For example, in Western Desert 'increase' ceremonies, a kinsman pours blood from his arm vein onto a symbol (or in Aboriginal terms, a manifestation) of his totemic ancestor to facilitate the regeneration of the totemic species (Berndt & Berndt, 1944). In northwest Australia, blood is thought to be recycled between generations and is infused with the qualities and potencies of a person (McDonald, 2001). This raises the possibility that some Aboriginal people who maintain such beliefs may view

the stored samples of their kinsmen as a potential resource for use in ceremonies aimed at regeneration.

The regenerative properties of blood are also related to blood letting in mourning. In many parts of northern Australia, women in mourning cut their heads with shells or stones to let blood flow. Anthropologist Howard Morphy relates the story of Nyapilingu, an ancestral woman or ghost whose self-inflicted mourning wounds produced blood that ran into a lake. When she birthed her children in the sand dunes her blood again ran into the lake. Today that particular lake is considered so powerful that women may conceive a spirit child if they wash in it. The story demonstrates that “there is no simple separation between the blood of mourning and the blood of birth”: life and death are intertwined (Morphy, 1991). Women’s blood can be seen as a “symbol and perhaps even a mechanism” for the regeneration of the clan and the continued exchange of spiritual substance between the human and ancestral worlds (Morphy, 1991).

Continuity, syncretism and change. Ethnographic data in recent decades shows evidence of persisting ‘traditional’ beliefs about blood, but also combinations of Western and traditional cultural influences. Confidence in the healing properties of blood was observed by Devitt and McMasters in the 1990s (1998a). Whilst they found that belief in sorcery was less common, more recent reports from elsewhere in remote Aboriginal Australia found sorcery beliefs and practices concerning blood were still widespread (see for example Martin-McDonald & McCarthy, 2008).

In the study conducted by Devitt in Central Australia, persisting beliefs were recorded that drinking animal (particularly kangaroo) and human blood cured a range of diseases. One of her participants stated that feeding her blood to her baby was comparable to modern medicines, ‘just like Amoxyl’ⁱⁱⁱ (in Devitt & McMasters, 1998a). Peile (1997) noted that human and kangaroo blood was drunk to cure disease, but women need to be cautious lest they may become infertile from drinking too much: a sentiment that echoes classical beliefs about the power and danger of the substance (Peile, 1997). McDonald (2006) also found that women in northwest Australia drink kangaroo blood for health purposes when feeling ‘weak’.

Traditional beliefs about the importance of blood for health have incorporated Western therapies. Aboriginal people in northern Australia believe a variety of illnesses are attributed to inadequate amounts of blood. Accordingly, iron tablets and blood transfusions are thought to cure by generating ‘more blood’ or ‘new blood’ (Peile, 1997; Reid, 1983) although Reid (1983) maintains that surgery is looked upon unfavourably because it may ‘waste blood’.

In recent decades, traditional beliefs about blood have been increasingly affected by Western influences. Aboriginal people from northwest Australia believe that ‘rubbish blood’ and ‘black blood’ is caused by drinking alcohol to excess and smoking (McDonald, 2001, 2006). Devitt and McMasters notes that human blood is no longer fed to the ill because contemporary ‘bad habits’ mean that blood is no longer clean (Devitt & McMasters, 1998a). The traditional view linking the ‘cleanliness’ of blood to the physical and spiritual properties of the person is evident here.

McDonald's research in the northwest of Australia in the early 1990s also demonstrates the influence of global religions on contemporary Aboriginal relationships with blood (McDonald, 2001). The communities she studied identified as Christian and were also strongly influenced by customary beliefs. She argues that blood provides a key link between local, pre-colonial beliefs and Christianity. Her research provides an example of the role of blood in a contemporary Aboriginal belief system that combines old and new elements. It illustrates how distinct, sometimes conflicting beliefs are incorporated into indigenous knowledge systems that can change dramatically over time, principles that have implications for indigenous encounters with biomedicine and biobanking.

In the syncretic cosmology McDonald describes, customary understandings of blood incorporate Christian concepts such as sin. For example, the bloodstream is understood to transport the 'lifeforce' around the body. Obstructions to the healthy flow of lifeforce are caused by sorcery, but also 'sinful' activities such as drinking and smoking (McDonald, 2001). The blood of sinners is black and viscous with a tendency to coagulate, a dangerous situation that can prevent the flow of lifeforce. The blood of Christ, infused with Christian qualities of peace, goodness, kindness, love, mercy and forgiveness, flushes out bad blood and infuses clean blood. Alongside the Christian references, there is a clear link with the healing capacity of blood and a connection between blood and personal character that are likely to have predated European contact.

Other aspects of beliefs about blood vary according to Christian denomination. As explored above, customary death rituals such as shedding blood attest to the relationship between the living and the dead. McDonald describes the beliefs of different churches about this relationship and its effect on mourning practices. For adherents to the United Aboriginal Mission Church, the relationship between the living and the dead has been severed and therefore it is unnecessary for women to self-inflict head wounds and shed blood. In contrast, for adherents to the Assemblies of God Church, a syncretic understanding of mourning rituals has emerged that associates blood shedding with the blood of Christ (McDonald, 2001). McDonald's research provides an example of how traditional beliefs about blood are amalgamated with non-traditional elements. This may also apply to Aboriginal people's attitudes towards biobanked samples. For example, Aboriginal people may have concerns about collected biospecimens being used for sorcery, particularly if they are unsure about how samples will be handled and used. At the same time, donation may be incorporated into a Christian practice of charity.^{iv}

Devitt and McMasters (1998a, 1998b) studied Aboriginal experiences of end-stage renal disease (ESRD) in central Australia in the 1990s. They noted a continued reliance on customary belief as a framework for understanding and managing ESRD. The condition requires renal dialysis (unless and until a kidney transplant is successful), where the blood of a patient is filtered through a dialysis machine for many hours every week. The relationship between the body and the spirit experienced by the dialysis patients they studied was similar to that described in previous sections of this article. Body and spirit were bound together physically and metaphysically, with blood a key mechanism of this melding.

At the same time, the study illustrated how traditional understandings of blood were changed by the introduction of blood transfusions, dialysis, medication and surgery (Devitt & McMasters, 1998a). They argue that the traditional belief that the loss of blood can weaken someone or make them vulnerable to sorcery does not apply to biomedical blood donation. Peile (1997) similarly noted in the 1970s that providing a blood specimen in a clinic was often objected to until the patient realised that only a small quantity would be taken.

These sources suggest that blood provided for or used in biomedical contexts is largely tolerated. Indeed, Indigenous Australians comply regularly with medical care, including providing blood samples. This could imply that biomedical uses are considered to be outside the traditional Aboriginal domain and therefore traditional beliefs do not apply. Alternatively, it may indicate that traditional beliefs are decreasing in their intensity or are being replaced or syncretised with other beliefs, as McDonald's work suggests.

Discussion

With the development of Aboriginal Medical Services^v and an expanding network of government health centres from the 1970s onwards, even the most remote Aboriginal communities have frequent exposure to Western health care, and many are regularly involved in health research projects. In spite of the familiarity with collection of biospecimens that this experience entails, data on attitudes to blood collection for research purposes is sparse. Most scientific studies either do not report on, or gloss over, the approaches used to address ethical dimensions of their research, and those that do publish these aspects tend to be examples of best practice rather than evidence of usual practice (Couzos, Lea, Murray, & Culbong, 2005; J. Cunningham & Dunbar, 2007; Joan Cunningham et al., 2006; Eades & Read, 1999). Indeed, a study of clinical interactions between hospital staff and Yolngu patients found that serious miscommunication was the norm, and cultural values were largely ignored (Cass et al., 2002).

The single specific study of Aboriginal attitudes to use of blood samples for research reports on a study of diabetes and related disorders in Aboriginal people living in Darwin. Participants who provided a blood sample were asked whether they consented to long-term storage of the sample for possible use in future studies. Those who gave consent for their sample to be stored were more likely to be older (over 45), to be a non-smoker, to have some non-Indigenous grandparents, and to be in the group "whose consent form was administered/witnessed by an Indigenous staff member" (Cunningham & Dunbar, 2007). The authors suggest that trust may be the key to explaining these diverse factors. Older people and those who have non-Indigenous people in their family may have had more exposure and familiarity with the Western medical system and therefore have more trust in it. Aboriginal people have rates of smoking over twice the rate in the general population, and non-smokers may represent those more familiar with and trusting of Western health promotion messages. Finally, those participants whose consent form was administered by an Indigenous staff member may have felt more trust in the research project by virtue of a shared identity with the staff member. This is consistent with research reporting that minority group members are less likely to participate in research because of lower levels of trust in dominant systems (Bussey-Jones, 2010; Haga, 2010; James, et al., 2008; Lemke, et

al., 2012; Yancey, et al., 2006).

It is unclear from this study whether beliefs about blood played a role for this segment of the study population that consented to long-term storage at a higher rate. It is possible, for example, that higher levels of trust meant participants were more comfortable with researchers storing and using blood samples despite their concerns about non-renewability and the possibility of sorcery. Alternatively, this segment of the study population may not have held traditional views about blood. The latter possibility would align with international evidence from a study of Native American community members that found individuals who did not self-identify as a “traditional person” were less likely to want their samples returned at the conclusion of a study and more likely to allow stored samples to be used after a participant’s death (Sahota, 2014). In the Australian study, the association of higher rates of consent where the consent form was administered by an Indigenous staff member may support the first hypothesis, while higher rates of non-Indigenous ancestry in this group may support the latter hypothesis.

It is important to note that a large number of biomedical – and even some genetic – studies have been and continue to be undertaken in Aboriginal communities across Australia, including remote communities whose residents are, in general, more likely to maintain traditional cultural beliefs than urban populations. The success of these studies is consistently attributed to: addressing a community priority; effective community consultation; inclusion of Indigenous researchers; and adaptation of study protocols to respect cultural values (see for example Dunbar, Moberley, Nelson, Leach, & Andrews, 2007; McWhirter, Mununggirritj, Marika, Dickinson, & Condon, 2012; Wand & Eades, 2008). When these elements are present, researchers are more likely to be aware of cultural beliefs about blood and take them into account when making decisions about sample types, collection methods, storage, use and disposal.

The identification of these components of successful research with Aboriginal communities replicates international findings. A child nutrition study in New Zealand, for example, discovered that poor recruitment rates among Maori stemmed from a widespread reluctance to allow blood collection, underpinned by a belief that mistreatment of body parts could cause harm to an individual (Durie, 2004). The involvement of Maori researchers and a Maori advisory board, consisting of eight elders, helped to address this problem by recommending changes to the research protocol, including the appointment of elders as guardians to ensure the security and proper handling of samples during transportation, storage, analysis and destruction, including conducting appropriate ceremonies. These measures demonstrated to participants that respect for cultural values and the security of the samples would be maintained.

Similarly, security of samples and appropriate destruction protocols were recently highlighted as concerns of Alaskan Natives. The focus study was stimulated by the existence of the Alaska Area Specimen Bank, a large Alaskan biobank housed by the Centre for Disease Control and Prevention’s Arctic Investigation Program that contains many thousands of samples from Alaskan Natives. The study concluded that community consultation and respect for cultural beliefs relating to body parts at the time of death would increase indigenous participation in biobanks (Hiratsuka, Brown, Hoeft, & Dillard, 2012; see also Tauli’i et al., 2014). Another study found that pharmacogenetic research was viewed by

Alaska Natives as both potentially beneficial and potentially harmful to individuals and communities, and that culturally appropriate methodologies and governance structures were crucial to maintaining community trust in research and researchers (Shaw, Robinson, Starks, Burke, & Dillard, 2013). West and colleagues (2011) provided concrete examples of culturally appropriate communication techniques, by developing explanatory constructs for genetic concepts that were meaningful within the language and cultural referents for Yup'ik Eskimo community members in Alaska.

The importance of sample security for Aboriginal Australians involved in health research has been raised in relation to potential secondary and unauthorized uses, including for other research projects, for defining Aboriginality, or for forensic or paternity investigations (Kowal, Pearson, Peacock, Jamieson, & Blackwell, 2012). This review of traditional beliefs associated with blood suggests that security could also be of concern in relation to sorcery if an enemy of the donor was able to access the sample. Clearly communicating how samples will be used, who will have access to them, where they will be stored and analyzed, and how they will be disposed of, would go some way towards addressing these concerns.

In two recent genetic studies in Indigenous Australian communities, DNA was extracted from saliva samples rather than blood samples, as saliva collection was considered easier from a logistical standpoint and more acceptable to participants (Kowal, et al., 2012; McWhirter, et al., 2012). This practice, *prima facie*, appears to echo international efforts to account for cultural beliefs in sample collection, such as moves to use saliva instead of blood in the diagnosis of Ebola virus hemorrhagic fever in the Republic of Congo, where blood collection is perceived as decreasing a person's "vital force" and vulnerable to use in sorcery (Formenty et al., 2006). Despite similar cultural associations within traditional Aboriginal beliefs, anxiety or refusal regarding blood collection for clinical purposes has not been recorded among Aboriginal Australians, perhaps because of a greater degree of familiarity with Western health care. Indeed, community consultation for a genetic study of vulvar cancer in Arnhem Land communities found that blood and saliva taken for clinical or research purposes could be disposed of using standard procedures, without the need to implement the ceremonies associated with, for example, blood spilt in an accident in the community (McWhirter, et al., 2012), or the practice of the Christchurch blood bank whereby Maori chaplains perform a 'karakia' ceremony before samples are disposed of (Morrin et al., 2005). This finding suggests that, in these communities at least, there is a distinction drawn between blood in a clinical or research context, and blood in a traditional or community context.

Taken together, these studies indicate that trust is central to Indigenous participation in health research, and that trust can be facilitated by involving Indigenous people in the research, specifically asking about existing cultural beliefs relating to biospecimens in the consultation process, and designing research processes that respect these beliefs. The heterogeneity of beliefs among Aboriginal peoples means that attitudes cannot be assumed, and researchers have a responsibility to appropriately consult or use participatory research practices in order to establish the relevance of different beliefs to individual studies. As this section has demonstrated, contemporary attitudes and beliefs of Indigenous Australians regarding biospecimens are largely unreported in the literature and the issue warrants further empirical research.

Conclusion

For Aboriginal Australians, blood has held – and continues to hold – diverse meanings, the significance of which varies across space and time. These meanings intersect with the use of blood in health research and have the potential to affect the trust that Indigenous participants invest in researchers and the research process, both as individuals and as collectives.

This review provides a starting point for researchers to have productive conversations with communities, illustrating the utility of drawing on anthropological literature to address bioethical questions. The ethnographic research described above identifies some ways that Aboriginal Australians have valued and understood blood, but is necessarily limited by the geographical, social and topical interests of anthropology. Nevertheless, it suggests multiple lines of inquiry for further exploration in community engagement and for further research into contemporary Aboriginal Australian understandings of blood in order to better inform current practice, to augment past anthropological evidence, and to complement the emerging literature from indigenous populations elsewhere (Durie, 2004; Hiratsuka, et al., 2012; Morrin, et al., 2005; Tauali'i, et al., 2014). Potential lines of inquiry include whether biomedical uses of blood are considered distinct from traditional uses, or whether samples could have potential use for contemporary indigenous groups, either positive or negative (for example, regeneration ceremonies or sorcery). Other research questions include contemporary relationships between traditional and biomedical understandings of blood, and whether these understandings are viewed as incompatible or complementary by Indigenous Australians.

The material presented in this article has specific implications for each of the three (admittedly overlapping) contexts in which blood samples are used: the secondary use of previously-collected samples; current stand-alone research projects; and prospective biobanking. In determining whether historical collections can be used for future studies, both the beliefs held by the original donors and the values currently held by their living descendants may be relevant. Demonstrating respect for cultural values may go some way towards repairing relationships of trust damaged by the consequences of colonisation and historically poor research practices. For researchers undertaking current health studies, being aware of the range of possible meanings of blood can help researchers ask the right questions during community consultation, providing a foundation for culturally-grounded strategies to facilitate participant trust and increase indigenous participation. Opening the topic for discussion will also allow indigenous participants to see where options exist; for instance, that it is not necessarily a binary choice between much-needed research into priority diseases or maintenance of cultural values, but that there may be options available, such as alternative sample types (e.g. saliva), adapted storage, transport or disposal protocols, or the inclusion of relevant ceremonies. Given the powerful associations of blood and the powerful legacies of colonialism, researchers need to ensure trusting relationships are laid down before the exchange of bodily substances occurs.

Finally, prospective biobanking involving indigenous participants will benefit from including indigenous advisory boards in governance structures to provide input into protocol development, ongoing oversight of operations, and advise on the appropriateness of sample use, storage and disposal, including any ceremonial implications. Recognition of the

heterogeneity of indigenous beliefs will be key in this context, as biobanks, in contrast to individual research projects, will almost always involve participants from a range of backgrounds and geographical origins. Communicating information on how much blood will be taken, how it will be used, where it will be stored, who will have access to it, how it will be disposed of, and any possible alternatives, gives individual participants greater agency and may address potential fears. Incorporating metaphors and stories that draw on traditional beliefs relating to blood into study explanations may be useful for communicating the relevant science in informed consent processes and for fostering trust. Individual research teams would need to develop such metaphors in collaboration with communities as the relevance of particular metaphors and stories will vary by community and across time.

In each of these contexts, appreciating the range of possible cultural associations of blood can enhance the research process, engender trust in health research, improve indigenous participation rates, and result in better scientific and health outcomes. Indigenous Australians traditionally understood blood to play multifaceted roles in health, wellbeing and spirituality, and these beliefs have shifted in response to experiences with colonization, Christianity and Western healthcare. Integrating these understandings into research practice will benefit both participants and researchers.

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ⁱ Aboriginal and Torres Strait Islander Australians is the currently accepted term to refer to the indigenous people of Australia. This term is used interchangeably with 'Indigenous Australians' in this article. Indigenous is capitalised when referring to Australian Indigenous peoples and lower case when referring to indigenous people internationally. As explained later in the article, when referring to the specific literature reviewed (including in the title of this article) we use the term 'Aboriginal Australian' because the literature reviewed concerns only language groups now recognised as Aboriginal and not Torres Strait Islanders.

ⁱⁱ Henceforth the term traditional is used without quotation marks. Note also that the past tense is used when discussing traditional Aboriginal beliefs and practices that were recorded by anthropologists in the past. This usage is not intended to imply that these practices and beliefs are no longer held in some communities.

ⁱⁱⁱ Amoxyl is a popular brand name of Amoxicillin, a standard treatment for respiratory and ear infections in Australian children.

^{iv} Religiousness and the donation of blood and organs has been explored in non-Indigenous settings elsewhere (see for example Campbell, 1998; Gillman, 1999; Lam & McCullough, 2000). This literature concludes that cultural, spiritual and religious belief has an effect on donor choices. Thus syncretism of customary and Christian systems may alter customary beliefs and may result in differences in participation among Indigenous Australians.

^v Aboriginal Medical Services were created in many cities and remote communities from the 1970s. They are typically run by Aboriginal boards and provide western primary health care, health promotion programs, and some specialist health services.