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Use of Animal Fat as a Symbol of Health in Traditional societies Suggests Humans may be Well Adapted to its Consumption

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Use of Animal Fat as a Symbol of Health in Traditional societies Suggests Humans may be Well Adapted to its Consumption

Abstract

Background and objectives: Recommendations to limit the dietary consumption of saturated fat have been adopted by public health organizations in most countries. However, recent scientific studies and reviews have questioned the alleged negative health claims regarding saturated fat.

This research aims to provide a historical, evolutionary point of view to the debate through a short review of evidence for animal fat consumption by Paleolithic and recent traditional societies, and the discernment of how recent traditional societies perceived animal fat in terms of health and other lifestyle aspects.

Methodology: Literature review of the importance of animal fat's dietary consumption in prehistoric and recent traditional societies and scanning of ethnographic records for symbolic use of animal fat in rituals, linguistics and mythology. The contexts of such cultural expressions provide us with the peoples' perception of the analogues quality that animal fat imparts in its use as a symbol.

Results: Collection of 200 cases from culturally and geographically diverse traditional societies, reveals that in all three expression forms, there appears to be a clear tendency to associate animal fat with extremely positive meanings like "fertility", "sacredness", "wealth", "health", and even "a source of creation" and life itself.

Conclusion: In line with evidence for the importance of dietary animal fat in prehistoric and traditional societies, the studied traditional societies perceived animal fat as a vital component of their diet and a profound source of health rather than an impediment to health as it is presented in many dietary recommendations today.

Keywords

Fat, Animal Fat, Saturated Fat, Symbol, Evolution, Health

Cover Page Footnote

Acknowledgments – I would like to thank Prof. Avi Gopher and Prof. Ran Barkai who reviewed an earlier version of this paper and contributed important remarks. I also am deeply indebted to two anonymous reviewers whose remarks made their way in one form or another to this paper and to the editor for managing the process that saw its publication.

Introduction

The US Dietary Guidelines Advisory Committee (DGAC), in its 2015 Scientific Report(1)proposed to remove the limit on the total consumption of fat but left the recommended limit on saturated fats (SFA) consumption at less than 10% of total daily calories, citing a list of research papers. Similar recommendations are stipulated by the World Health Organization (2) while European agencies propose that SFA intake be as low as possible (3 and references therein).

Despite the consensual approach to SFA in the various guidelines there is no scientific consensus regarding the association between SFA consumption and cardiovascular disease (CVD). Harcombe et al. (4)concluded that the evidence from randomized controlled trials, at the time of the introduction of the guidelines in 1977, did not support the limitation of dietary SFA. Lamarche and Couture (3) published a review of the role of dietary SFA in CVD, calling for a review of the guidelines due to a lack of convincing evidence associating the two. A recent meta-analysis by Chowdhury, Warnakula (5) found that "Current evidence does not clearly support cardiovascular guidelines that encourage high consumption of polyunsaturated fatty acids and low consumption of total saturated fats", a conclusion that drew a number ofopposing letters(e.g. 6). Recently a Cochran report (7)found, based on meta-analysis, a small but potentially important reduction in cardiovascular risk on reduction of saturated fat intake.

The Guidelines Advisory Committee, in its 2015 Scientific Report referred to animal fat when guiding the public to reduce consumption of SFA (1), demonstrating a common perception, which often appears in dietary guidelines, that identify saturated fat with animal fat. The identification of SFA with animal fat can also be found in academia. Ahrens had already noted in 1957 (8)that the distinction between animal and vegetable fat is chemically meaningless and even misleading. Nonetheless the Cochran report cited above (7), contains a study of the effect of animal fat consumption which is treated in the Cochran report as SFA.

In several terrestrial animals studied by Cordain et al. (9), SFA as a percentage of fats ranges from 19% in marrow through 30-41% in muscle to 66% in subcutaneous fat. A review of information on the Nutritiondata website (<http://nutritiondata.self.com/>) reveals a high variation in SFA content among various types of foods and source animals. For example, beef steak contains 39% SFA, bacon 31.4%, pork leg (ham) 34.7% , cow milk being the only one to contain more than half (58%) of the fats as SFA. Theoretically then, one can consume 30% of the daily calories as bacon and still be within the 10% guidelines for SFA.

This study reviews the symbolic usage of animal fat by traditional societies in an attempt to identify their perception in regard to its healthfulness. The first significant contribution of a deep historical perspective to the question of healthy diets was arguably made by Eaton and Konner (10), comparing the present diet to a typical Paleolithic diet. Their paper presented a paradigm that minimizing the mismatch between present and past, evolutionary adapted, diets will be conducive to health. Later, Cordain et al. (11) used ethnographic data to calculate the macronutrients composition of hunter-gatherers' diets, estimating a range of 28-58% of energy derived from fat on average, and 43-58% from fat in societies above 40° N or S latitude. Cordain (12) estimated that SFA consumption in pre-agricultural societies constituted 10-15%of energy intake.

Sometimes the relevance of past societies' dietary patterns to present conditions is rejected with the claim that people in these societies did not live long enough to manifest typical western non-communicative diseases like CVD. Demographic data (13)shows, however, that in hunter-gatherer societies "Survivorship to grandparental age is achieved by over two-thirds of people who reach

sexual maturity and can last an average of 20 years". A mortality hazard factor in hunter-gatherers that is 75 to 190 times higher at the ages of 0-15 years, compared to present Western societies(13), makes the comparison of life expectancy at birth, which is the often cited difference between traditional and Western societies, inappropriate.

Most researchers agree that humans consumed significant amounts of animal meat and fat throughout their evolution(e.g. 14). Humans are able to process a maximum of about 35% of their energetic requirements from protein (15) which means that the remaining 65% has to come from carbohydrates and fat, mostly from animals.

Depending on ecological conditions, fat could compose up to 60% and more of the caloric content of animals that human used to hunt (16) which means that humans consumed significant amounts of animal fat throughout their evolution. Although a limited availability of carbohydrates is hard to imagine in our agricultural-industrial era, it is quite likely that during the Paleolithic, under cold or dry climatic conditions, availability of plant food may have been limited and energetically expensive to gather and process (17). Under such circumstances, a physiological requirement of a substantial quantity of animal fat (up to 65% of daily calories) is bound to have existed and had likely played a significant role in major aspects of human behavior such as hunting (16) and mobility (18).

Indeed several patterns in the archaeological faunal record can be interpreted as stemming from the desire to hunt fat animals and maximize fat exploitation from acquired animals. In the face of archaeological evidence for seasonality in hunting of certain animals, Speth (19) came to the conclusion that: "...fat, not protein, seemed to play a very prominent role in the hunters' decisions about what animals (male vs. female) to kill and which body parts to discard or take away". Archaeological evidence for the supremacy of fat in Paleolithic humans' hunting considerations can be deduced from the atypical predatory behavior of humans of preferring to hunt prime-adult animals over, the more vulnerable and easily obtained, young or old animals (19-21). We have argued (16) that such a hunting strategy makes sense because male and female prime adults contain a higher percentage of body fat than young or old animals during the year. Fat essentiality can also explain the apparent human preference of obtaining large game (e.g. 21), as large game contains almost double the percentage of calories from fat compared to small game(16). Also, large animals conserve more of their fat in times of nutritional distress, like dry summers and snowy winters (22) when plant food for both animals and humans is scarce. Another archaeological pattern which points to intensive utilization of animal fat is the extraction of bone marrow as evidenced by prey body parts that were preferably brought to the consumption site and by their bone breakage pattern(eg. 21, 23, 24, 25). Finally, in agreement with ethnographic evidence (26) there is archaeological evidence for a very laborious process of extraction of fat from animal bones, without the benefit of fire-proof cooking vessels, in widespread ecological settings(27-31).

There is ample ethnographic evidence for human dependence on and preference for animal fat as a food source. Kelly (32) writes: "...although ethnographic accounts abound with references to the importance of meat they equally convey the importance of fat...". He adds: "It therefore may be fat rather than protein that drives the desire for meat in many foraging societies".

Lee (33) writes about the !Kung of the Kalahari: "Fat animals are keenly desired, and all !Kung express a constant craving for animal fat". About the James Bay Cree, Rockwell (34) writes: "The Cree considered fat the most important part of any animal. One reason they valued bears above other animals was because of their body fat and because the fat rendered down into a high quality

grease". The essentiality of fat is best demonstrated in Tindale's account of the Pitjandjara of Australia (35). He writes: "When killing the animal they immediately feel the body for evidence of the presence of caul fat. If the animal is *njuka*, fatless, it is usually left unless they are themselves starving". Coote and Shelton (36) report a similar attitude among the Yolngu of Arnhem, Australia, saying that "Animals without fat may indeed be rejected as food".

In summary, ethnographic evidence corroborates archaeological evidence of the prominent role of animal fat in human nutrition and behavior.

The purpose of this paper is to contribute a historic qualitative point of view to published estimates and ethnographers' accounts of the importance of animal fat, and by reference to SFA, by researching patterns in the contexts of symbolic use of animal fat and the term "fat" in diverse cultural and environmental settings. To the extent that such corroborations exist, they will strengthen the validity of the claim that humans are evolutionarily adapted to consume significant quantities of animal fat and by reference, saturated fats.

Methodology

The Oxford English dictionary defines a symbol as: "a thing regarded by general consent as naturally typifying or representing, or recalling something by possession of analogous qualities or by association in fact or thought".

The basic research assumption of this work is that the *general consent* regarding the *analogous quality* that animal fat imparts as a symbol can be revealed by studying patterns in the context that led to the use of animal fat as a symbol.

In semiotic theory terms, a sign is a means of communication which forms a triad with an object and an interpretant. The interpretant is "a psychological event in the mind of the interpreter" (37). The interpretant was deduced by observing the psychological event that the object, animal fat (as material or linguistic expression), induced in the interpreter. For example, if animal fat is used in a healing ceremony we can deduce that its interpretant can be "health" for the purpose of the ceremony is to restore health. One is not able, however, to avoid a certain degree of subjective interpretation regarding the general meaning or intended message of the ritual and the *analogous quality* that is intended to be conveyed by the use of the symbol.

It must be emphasized that the aim was not to study the relative number of appearances of fat as a symbol compared to other symbols but to discern its symbolic meaning in the instances that have been identified. In this sense the analysis is qualitative in nature. However spatial prevalence of the symbolic use of fat depending on ecological conditions can be of additional significance so geography was recorded and analyzed.

A literature search was performed online for instances of animal fat (sometimes termed "grease" or "tallow") as a symbol in ritualistic, mythological and linguistic expressions. References to fat as a shape and to plant oils have been disregarded. Wherever practical, direct quotes of the source wording were used. In other instances a summary of the relevant text was composed.

Almost all sources, including books, were reviewed online in a digital form.

The results were numbered for easy reference and are detailed in the supplementary online information (SI).

The individual cases were listed in the SI by geographical and cultural units and were assigned to the various categories. Whenever a specific ritual category was not available or applicable, an interpretation of the ritual or mythological expression was subjectively assigned to a category. The cases are referenced throughout the text by their assigned number with the addition of SI, denoting

supplementary online information. In cases of the Mythology or Linguistic section, an M or an L respectively is prefixed to the number.

In reviewing linguistic expressions of fat, as many languages as possible were studied in order to cover the largest geographical and cultural diversity that could be accessed. Dictionaries that are accessible through the Lexilogos site (38) were explored for synonyms of the word 'fat' as an adjective, excluding those that refer to fat as a shape. Rather than composing a detailed semantic map for each language of the 31 that were reviewed, the focus was aimed at appearances that are common across languages and are close in meaning to the one that were previously identified in the ritual and mythological expressions.

Results

The search has produced 98 cases of use of animal fat in ritual ceremonies, 49 references to animal fat in mythology and synonyms to fat as a material (as opposed to shape) in 40 languages. See SI for Detailed description and reference for each case. Table 1 lists the categories and the case numbers that were assigned to them. Description of the categories appears in the Discussion section.

Table 1.
Categorization of cases of symbolic use of animal fat by analogical meaning

Meaning	Number of cases	Case numbers ^a
Richness, Abundance	8+28+14	77, 83, 84, M43, M45, M46, L1, L2, L10 (28 languages), L10 (14 languages)
Fertility	18+27	16, 32, 41, 44, 61, 62, 63, 76, 78, 81, 84, M27, M32, L4, L5, L6, L7, L10 (27 languages)
Nourishing, Desirable, Lucrative	27+12	M1, M13, M12, M14, M15, M18, M19, M23, M25, M30, M33, M34, M35, M36, M37, M38, M39, M40, M41, M42, M44, M45, M46, L2, L3, L8, L10 (12 languages)
Sacredness, Anointment	24	7, 8, 9, 10, 28, 30, 35, 36, 37, 38, 43, 53, 67, 69, 70, 74, 83, 90, 92, 97, M2, M5, M6, L1
Initiation	21	20, 22, 24, 31, 33, 46, 47, 48, 57, 58, 60, 61, 65, 66, 71, 75, 76, 79, 87, 89, 91,
Life	15	3, 5, 11, 61, 67, 98, M4, M12, M20, M21, M22, M24, M32, M47, M48
Healing, Protecting	15	2, 14, 15, 22, 40, 51, 52, 57, 67, 68, 88, M10, M16, M26, M28,
Successful hunt	13	1, 4, 7, 9, 17, 18, 34, 73, 74, 80, 85, 86, M6
Offering	11	6, 12, 13, 15, 39, 42, 61, 80, 96, M7, M9
Smearing - Other	9	17, 18, 23, 29, 45, 50, 52, 55, 56,
Burial	8	54, 59, 64, 70, 72, 82, 92, M17,
Wedding	5	16, 27, 94, 95
Taboo	5	19, 21, 22, 25, 33
Creation	5	M29, M48, M49, L9,

^aThe numbers refer to the numbers of the cases in the results as they appear in the SI. M and L before the number denote Mythology and Language cases

Discussion

The basic assumption of this study was that the 'analogous quality' of animal fat in the eyes of the studied societies can be revealed by determining the meaning of the activity that led to its utilization as a symbol.

In "The Interpretation of Cultures", Geertz (39), using Ryle's terms, defines the practicing of Ethnography as the description of the difference between 'thin' (merely factual) description of human actions and 'thick' description which involve interpretation of the thin description to provide meaning to the described action in its cultural context. Geertz (39) adds: "Analysis, then, is sorting out the structures of significations". This is what was attempted here. In discussing the various meanings, however, it is important to take into account that a significant part of a meaning can be lost in the categorization, which is an inevitable step in most cases of a scientific analysis. Thus, for example, the Andean Indians use the word *wiraqocha* which means 'sea of fat' to greet each other and it is also a name of a Mayan god (Case L2 in SI). It was categorized to Plentitude and Sacredness but it is clear that calling a god 'sea of fat' and using this expression as a daily greeting word reflects a much more profound attitude toward the centrality of fat than using fat as an anointment medium for leaders (Case 67 in SI) which was also categorized as Sacredness . Similarly, by way of example, smearing of fat on sexual parts during an initiation ceremony (case 58) was categorized as Initiation but the connection to fertility, another category, beyond the obvious association between initiation ceremonies and fertility, is quite apparent. It is therefore highly recommended that as many case descriptions in the SI as time allows are read in order to acquire a more complete comprehension of the evidence.

Each group of categories shall be discussed briefly in decreasing order by number of cases. The discussion of the meaning of various categories will be followed by a discussion of aspects common to all categories and the potential contribution of the findings to the scientific discourse of the role of animal fat in nutrition.

Fertility, Initiation and Wedding (72 cases) - The most prevalent use of fat as a symbol in the sample is to mark fertility. It encompasses all forms of expression, ritualistic, mythological and linguistic and is geographically widespread. The drive for fertility is one of the strongest drives in any species as it is a basic prerequisite for the species' existence. Both initiation, which is frequently associated with puberty, and wedding are milestones in the cycle of fertility. In some cases fat is smeared on the sexual parts of the initiated, emphasizing the fertility aspect of the initiation ceremony (Cases 20, 47, 57, 58, 71, 76 in SI). The use of fat is presumed to encourage and protect the fertility process. Fat is rubbed on the sides of a pregnant woman as soon as the pregnancy is known (Case44 in SI). Fat is spread over a woman's belly if she has difficulty having children (Case81 in SI text) and the consumption of fat provided by males to females is expected to encourage intercourse (Case61 in SI). In some cases fertility is imparted to the land by the dripping of fat (Case62 in SI). Fertility is a synonym of the word fat in 27 of the 31 sampled languages (CaseL10 in SI). One cannot rule out the possibility that in language, the fact that pregnant women are fat contributes to the synonymy. In ritualistic expression it is clear that the material fat itself is the signifier (eg. Cases16, 32, 44 in SI) and in several societies the word for 'semen' is 'fat' (Cases L4 – L6 in SI). The strength of the association between fat and fertility is best described in the mythology of the Malapa of New Guinea where "Grease (animal fat) is passing through people, plants and earth in a cycle of fertility" (Case M32 in SI).

Richness, Plentitude, Abundance (50 cases) – This category is highly populated in mythology and language. Fat is used to symbolize richness as it relates both to material prosperity like rich people and land but also to taste. Richness appears as a synonym of the word fat in 28 languages and Abundance in 14 out of the 31 sampled languages (CaseL10 in SI). Fat as a symbol of plentitude also points to its desirability as plentitude has meaning only if it is of a desirable object. A plentitude of fat is sometimes associated with heavenly conditions or actions (Cases M43, M45, M46, L2 in SI).

Sacredness, Anointment, Offering, Creation (40 cases)

People, places and objects can be sacred. Fat confers sacredness to all three. The word Messiah is Hebrew for 'the anointed'; though in the bible anointing is performed mostly with olive oil (40). In the mythology of the Pawnee of North America fat is defined as 'holy ointment' by Tirawa the creator. Fatty parts of the animal are considered sacred by the Hadza of Tanzania (Case74 in SI). Fat is used to cover the sacred stone of the Aborigines in Australia (Case53 in SI) and the Sami of Norway (Case97 in SI), "to feed the earth shrines, to anoint leaders" in the Andes (Cases 67, 69 in SI) and anoint and bless in the Massai of Africa (Case83 in SI). In the mythology of the Inuit of North America and the Eskimos of Siberia, fat conferred sacredness (Cases M2, M9 in SI). A stone tool, sacred to the Yolngu of Australia, is made from a secretly sourced type of flint called *djukurr* which means 'fat' (CaseL1 in SI). It is clear that the stickiness, smoothness and shininess of fat have also played a role in its application in anointment(40).

In a sense all the ceremonial uses of fat entail giving up the fat's nutritional utility but it is directly expressed in offerings. The more valued the item the more meaningful is its relinquishment. The offering to higher authority tags the item (fat) with an air of sacredness and has the added meaning, encountered in other categories, that fat is favored by gods.

Creation mythology is a way to relate to gods in their role as founders of the world. Two gods in Sumerian mythology, Enki and Enlil, made sure, while creating the world, that humans will have ample supply of fat (Cases M45, M46 in SI). In the Vedic mythology all animals were created from fat (CaseM48 in SI). In the Caribou Inuit's mythology, the most important prey animals, caribou and seal, were created from fat (CaseM4 in SI). In the Hindu mythology the world itself was created from fat (CaseM49 in SI) and indeed the Sanskrit word for Earth, Medini, means 'having fatness' (CaseL9 in SI).

Desirable, Nourishing, Lucrative (39 cases)

Fat appears in mythology as a desired object by superior beings like gods and dragons who also use it as a prize for mere mortals (Cases M36, M37, M38, M41, M42, M43 in SI). In many cases, it is a direct expression of the desirability of fat animals over thin animals. In language 'lucrative' can be interpreted as expressing desirability. The reason for fat desirability is sometimes expressed directly as emanating from its nourishing value (Cases M1, M25, M40 in SI). 'Nourishing' also appears as a synonym for the word fat in some languages. The most prevalent synonym of fat is 'richness' (Case L10 in SI), which can also be interpreted as stemming from fat's perceived rich nutritional value.

Life, Healing and Burial (37 cases)

Other categories like Fertility and Creation can also be interpreted as signifying 'life' but some of the cases seem to denote 'life' directly. Such is the Innu consideration of fat as a symbol of immortality (Case11 in SI) and the Kelabit tribe of Sarawak who perceived pig fat to be the most potent carrier of *lalud* - the raw life-force (Case61 in SI). In modern traditions of the Inca mythology the sucking of fat from human bodies means the sucking of life (CaseM22 in SI). Included here were cases in which fat is chosen to exclusively represent an animal, human beings and gods (Cases 98, M12, M20, M47, M48 in SI). Healing can be considered as restoring life. Fat is used in healing ceremonies in Australia (Cases 22, 40, 51, 52, 57 in SI), South America (Cases 67, 68 in SI), Africa (Case88 in SI) and North America (Cases M10, M16 in SI). Some of the uses of fat in burial can be interpreted as recovering the life from the dead. In South Australia and New Guinea the fat of the dead is eaten and in Peru it is collected and smeared over the mourners' bodies (Cases 59, 64, 70 in SI).

Other – Successful hunt, Taboo, Smearing

The use of fat in hunting ceremonies reflects both the concept of fat as representing the hunted

animal (Cases 1, 4, 7, 17, 18, M6 in SI) and of fat as the desired target of the hunt (Cases 9, 4, 73, 74, 80, 85, 86 in SI).

It can be argued that taboo on fat can attest to the desirability of fat as food, as it mostly applies to shamans who are supposed to be clean of earthly desires (Cases 25, 26 in SI) or temporarily to younger people who are allowed to eat it after the initiation (Cases 21, 33 in SI).

Smearing fat on the body is the most prevalent way of using fat as a symbol in this sample of ritual activity. Several physical qualities of fat make it an ideal medium for smearing during ritual activities. Animal fat is sticky, mixable with other substances like ochre, shiny, spreadable and chemically stable. The act of smearing is akin to immersion where the whole body takes the identity of the smeared object. According to Stewart and Strathern "The decoration of the body is a means of communicating the emotions and desires nonverbally. The human body can be a platform on which displays of morality, self-worth, ideals and sexuality are played..." (41). In Papua red signifies blood and white signified grease and smearing their mixture signifies the mixing of the reproductive substances blood and semen (41).

Conclusion and Implications

In contrast to the almost uniquely positive connotations of animal fat found in this research, other researchers(42-44) report a more complex, positive as well as negative set of attitudes towards fat in the recent past and indeed in the classics (Greek, Roman)(40, 42). With a focus on humanistic studies these researchers intentionally also investigate the mostly negative attitudes that stem from fat as a deviant human shape and a component of the human body. The difference of outcome between the studies can thus be explained by the difference in focus as this research concentrates on the usage of the material animal fat. The difference in outcome may also be explained however by diachronic factors, as the researchers of the humanistic studies concentrated on more modern cultures. This difference can be a source of future research; for example, identifying a possible diachronic trend of changing attitudes towards fat as a function of the increased availability of carbohydrates as an alternative source of nutrition to fat, and possibly also of the increased prevalence of obesity in more recent times.

Discussing the importance of symbols in human lives, Salomon (45) says: "The symbols of life and death, of fertility, and of ancestor worship mark the relationship of man to basic forces of vitality and time, of self-realization and of decline".

As this work has identified a multi-cultural use of animal fat as a symbol of life, ancestor worship and fertility, it suggests, following Solomon, that humans ascribe "basic forces of vitality" to fat.

The immediate question that comes to mind is how a substance that had been consumed by humans in significant quantities during their evolution and which was so universally desired and so universally perceived as associated with life, fertility, nourishment and healing to the extent that it was perceived as sacred in traditional societies, becomes a health risk in nutritional guidelines the world over.

As described in the introduction, contrary to common perception, the continuous denouncement of animal fat and of SFA in the dietary guidelines by the USDA was never accompanied by a clear scientific consensus. Two books by science journalists – *Good Calories Bad Calories* by Taubes (46) and *Big Fat Surprise* by Teicholtz (47) describe the historical events that lead to the seminal publication of "Dietary Guidelines for Americans" by the USDA in 1977. Both came to the conclusion that the scientific evidence that led to the guidelines' recommendation to limit fat was and still is extremely weak and controversial. Prominent nutrition scientists disagree (e.g. 6, 48) and the debate continues (49).

A detailed review of the controversy is beyond the scope of this paper. However, it is impossible to ignore the blatant contradiction between the extremely positive attitudes towards animal fat as are

reflected in the symbolic expressions and hunting behavior of prehistoric and recent traditional populations, and the negative perception among some health professionals and scientists, as it is reflected in the present public health organizations' dietary guidelines. This discrepancy begs a resolution, either by scientific explanation or by a suitable change in the guidelines.

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Conflicts of interest – None

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Supplemental Information – Detailed case descriptions.

Ritual

North America

1. James Bay Cree –In order to bring bear dreams, to insure a successful hunt, a hunter “put bear grease in his hair” and “he smeared bear grease each fall upon first entering the lodge for the winter season” (34){Successful hunt}
2. James Bay Cree - The Shamans “used bear claws and gall and bear grease in their ceremonies” (34){Healing}
3. James Bay Cree - The hunters identified with the color red and women, who traditionally rendered the grease, with the color white. (34){life}
4. James Bay Cree - During the preparation of the bear feast, bear fat was rendered apart from the meat as it had special symbolic value. Before the people entered the lodge, the feast giver smeared it on the poles of the lodge. (34){Successful hunt}
5. James Bay Cree –“The feast giver...poured...some bear grease. Finally he drank some of the grease and smeared a bit on his forehead “to feed his soul”. He passed the container of grease clockwise around the lodge and others did the same” (34){life}
6. Pawnee Indians - Small portions of the corn, and of the meat and fat, were offered to the gods. (50){offering}
7. Pawnee – In preparation for the buffalo hunting ceremony ordered by Tirawa the creator, young man are dispatched to obtain buffalo meat. They "will try to kill the fattest buffalo". Later they will be asked to put the grease of the buffalo, defined as the holy ointment, on their body in order to imitate the buffalo. All the participants, boys, girls and priests, eventually grease themselves (51){Successful hunt} {Sacredness}.
8. Innu - The Innu make sure dogs don't eat bones since they contain the fat. Eating fat from Caribou long bones is considered paying respect to “Animals Masters”. (52){Sacredness}
9. Innu - In the *Makushan* feast and ritual, fat is extracted from marrow and bone and made into a cake called *Atikupimi* “the most sacred element of the feast”. (52) {Sacredness} {Successful hunt}
10. Innu - “Great care must be taken to ensure that no fat falls on the floor or is consumed by the dogs.” (52){sacredness}
11. Innu - The bones of the bear are the symbols of life and the grease is the symbol of

immortality. (31){life}

12. The Caribou Inuit - “When I was growing up I also heard that when the weather was very, very bad in the summertime and the waters were rough for many days, the men would go looking for a raven. They would hope for a raven that was very, very fat. ... a raven with a lot of fat in the stomach. That was the best. They took the fat and pounded it with a rock. Then they threw the fat into the sea and hoped for calm waters”. (53){Offering}

13. The Caribou Inuit - “One may also mix fat taken from the intestines of a raven with part of the crop from an *aqiggiq* (ptarmigan) and throw the mixture into the water”. (54){offering}

14. The Lakota – The Lakota believe that they get scrofula from gophers. To cure it they rub the fat of animals that kill gophers like badgers. (Walker 1980:169) {Healing}

15. The Lakota – At the last part of the Sun Dance, which is a several days curing ritual, an offering is made composed of stems of chokecherry bushes, ruminant's heart's fat, red clay and buffalo loin fat (55) {Healing} {Offering}

Central Australia(All references 56)

16. Arunta (Australia) - In a marriage ceremony the bride's body “is painted all over with a mixture of fat and red ochre.” {Wedding}

17. Arunta (Australia) - “In a Kangaroo totem ceremony a captured Kangaroo is taken to the *Ungunja*, or men's camp, and there the old men of the totem, the *Alatunja* being in the middle of them, eat a little and then anoint the bodies of those who took part in the ceremony with fat from the kangaroo” {Successful hunt} {Smearing}

18. Arunta (Australia) - In another totem (Bandicoot) “the animal ...when caught, is brought into the Ungunja, and there they put some of the fat from the animal into the mouths of the Bandicoot men, and also rub it over their own bodies.” {Successful hunt} {smearing}

19. Arunta (Australia) - In the Emu totem taboo system Emu “flesh of the bird may be eaten sparingly, but only a very little of the fat; the eggs and fat are more *ekirinja* or taboo than the meat. The same principle holds well through all the totems, a carpet snake man will eat sparingly of a poor snake, but he will scarcely touch the reptile if it be fat.” {Taboo}

20. Arunta (Australia) - In a girl's initiation ceremony “the girl's breasts are rubbed with fat and red ochre”. In a similar ceremony intended to promote the growth of the breasts of a girl “Here her body is rubbed all over with fat”. {Initiation} {Fertility}

21. Emu fat is found among a list of foods that boys are not allowed to eat, presumably in order to secure preferred access to older males. {Taboo}

22. A taboo on a mother whose son is circumcised to eat any sort of fat. The woman also rub her body with grease to help the recovery of her son. The foreskin is greased and given to a younger brother to swallow “it will strengthen him and cause him to grow tall and strong.” {Taboo} {initiation} {Healing}

23. A mixture of fat and red ochre is used in preparation for the *Illapurinja*, a course or damage inflicting journey by a woman. {Smearing}

24. In connection of a medicine man initiation a broad black band composed of powdered charcoal and fat is painted across the bridge of his nose {Initiation}

25. There are “certain foods from which the medicine man must abstain at risk of losing his powers. He may not for instance eat fat or warm meat” {Taboo}

26. In a different Medicine man initiation it is said that the candidate “For a very long time also he must abstain from eating fat of any kind, nor must he touch the flesh of wild dogs, fish or

Echnida. He might eat the marrow of the bones” {taboo}

27. Fat and red ochre are rubbed all over the bodies of a boy and a girl who were promised by their parents to each other in a ceremony marking the occasion {Wedding}

28. Rings of fur strings cover with fat and red ochre are worn by the women and men. {Sacredness}

29. Men hair is well greased and also red ochred {Smearing}

30. Churinga, a holey artifact made of stone or wood, is coated with fat and ochre or charcoal. {Sacredness}

31. In initiation ceremony for a boy “with great deliberation, they rubbed him all over with grease, and then decorated his body with pinkish-white clay and bird's down.” Several other descriptions of initiation ceremonies mention grease rubbing. {Initiation}

32. Promotion of sexual desire in women is attempted by feeding her an animal internal reproductive organ half cooked and coated with grease and charmed with songs. {Fertility}

33. The Kurnai, Australia - An elder suddenly smear fat of an animal that was previously a taboo to signify that the initiated is now allowed to eat it (Howitt 1885) {Initiation} {Taboo}

Northern Central Australia (All references 57))

34. In a ceremony to enable a man to hunt a Kangaroo, Kangaroo fat and red ochre are rubbed on him by an old man {Successful hunt}

35. In a ceremony, welcoming a party that returns a *Churinga* (a sacred object), the *Udniringita* “greased and red-ochred their bodies”. {Sacredness}

36. The Unmatjera “ On the death of the headman of a totem group the successor,... mourns over the *Churinga* and rubs them with grease and red ochre” {Sacredness}

37. In the Kaitish the handling of the *Churinga* (sacred objects) also includes greasing with fat. {Sacredness}

38. Amongst the Warramunga, Walpari, Wulmala, Tjingilli, and Umbaia tribes initiation ceremonies also includes Greasing of the boys' bodies and painting with red ochre. {Initiation}

39. The Tjingilli, in a rain-making ceremony: “A fat Bandicoot is caught... The man then wraps it up in paper-bark and carries it about in a *pitchi*, singing over it until such time as it becomes very thin and weak. Then he lets it go, and the rain is supposed to follow {Offering}

40. In a healing gesture “having brought some fat and red ochre, tells the woman that her illness has been caused by magic, but that she will now cure her. Then she rubs the victim all over with the fat and ochre, and at the same time rubs her with the yam-stick, as if to draw the evil magic back again into the stick.” {Healing}

41. In the Katish tribe fat is also used, as it the Arunta in the ceremony of causing the growth of the girl's breast {Fertility}

42. “In the Mara tribe when a black-fellow wishes to become a doctor he collects a considerable quantity of fat from the *echidna*, kangaroo, emu, lizard, etc., and making a big fire towards sunset in some lonely spot where no one else is likely to come, he burns the fat, the smell of which, ascending into the sky, attracts the attention of two spirits called *Minungarra* who live there.” {Offering}

43. In the Warramunga tribe the medicine man wears through his nose a structure called a *kupija* which is composed of fur, grease and ochre {Sacredness}

44. In the Unmatjera tribe ...when it is evident that the woman is pregnant, the husband ... rubs grease over the sides of the woman, chanting as he does so. {Fertility}

45. In the northern tribes there is “fondness for red ochre. Almost every weapon and implement

which they possess has a thick coating of this mixed with grease, and the same applies to their personal ornaments” {Smearing}

46. In an initiation ceremony in the Binbinga tribe, typical of all the tribes in the western shores of the Gulf of Carpentaria, the boys are rubbed with fat many times, by several of their relatives. {Initiation}

The Northern Territory of Australia(All references (58))

47. In the initiation ceremony of the Port Essington tribe “Fat is also rubbed frequently on their private parts to make them strong {Initiation}

48. In the initiation ceremony of the Nullakun Tribe the boy “is first greased all over with kangaroo fat” {Initiation}

49. In the Nullakun Tribe, boys are also “greased all over with kangaroo fat...” in initiation ceremonies {initiation}

North-West-Central Queensland(All references 59))

50. In an example of the language of the Pitta-Pitta, Roth mention the sentence “ He will smear himself with fat to-morrow” {Smearing}

51. In connection with a coursing ceremony of an enemy, rubbing fat is mentioned as a mean to “put him all to rights again” meaning restoring his health. {Healing}

52. Roth describes a custom of smearing fat as a healing procedure “Smearing of Fat of Iguana-, snake-, or any other kind of fat or grease, mixed more or less with mud and dirt, is used as a dressing for cuts and wounds of all description, the latter never been allowed to heal by " first intention": this custom of greasing an incision is very common everywhere. A clean-cut incised wound is called in the Pitta-Pitta language koo-re-a, while any open or punctured one, due to a boomerang or spear, is named wil-pa. Fat may also be employed as a liniment for rubbing over tired or aching limbs, and in such circumstances affords apparently speedy relief. Independently of sickness, the greasing of the bodies of children and infants is referred to {Smearing} {Healing}

53. In a rain making ceremony of the *Kalkadoon* a sort of "soap-stone rubbed with fat” is used. {Sacredness}

54. As part of a mourning ceremony “...the nearer relatives, and they only, colour-grease themselves down as far as to the waist” {Burial}

55. Body greasing is practiced by Pitta-Pitta to appear “flashy”. {Smearing}

56. Women at Boulia district at public rejoicing opportunities, “and also at any time, the women... may adopt a greased yellow...pattern.” {Smearing}

South Austerlia

57. Fowler Bay – The natives, after boys are circumcised their hair was daubed with grease and clay. During circumcision a piece of soft bark or a bundle of fur or down, greased with animal fat is laid on the incision. (60){Initiation} {Healing}

58. Cooper Creek – Aborigines, during the initiation ceremony “a coat of ground charcoal mixed with grease is applied to his body and he is kept at that place for two or three days” and every evening at sundown he is freshly painted with the mix. Upon returning to the tribe he is painted with a mix of ochre and grease on the lower parts of his body (60){Initiation}

59. Narunga and Jaralde - "practiced cannibalism. Eating portion of caul-fat was prevalent in both the Ngadjuri and Jaralde (lower River Murray) tribes. Mr. Tindale mentions that the bodies

of natives were sometimes buried in the ground, and at other times they were smoke-dried over a fire. This indicates that the caul-fat must have been removed and perhaps eaten." (61){Burial}

Borneo

60. The Punan tribe - Sacrifice animals in the circumcision ceremony are called "*nzeku ye mafuta* - Steer (or goat or sheep)of the fat, whose fatty soup... 'strengthen' the initiates..." (62){Initiation}

Sarawak

61. The Kelabit tribe - Pig's fat is perceived to be the most potent carrier of *lalud* - the raw life-force which eminent from the forest. During the *irau* name giving ceremony the higher status older man distribute hand span long pieces of pig's fat and have to eat one piece for every piece given. In the initiation ceremony a strip of pig fat is hung around the neck of the father of the child. Fat, sex and *lalud* are related. During ceremonies men try to feed women with pieces of pig fat with the implication that it symbolizes a sexual intercourse which is normally perceived as a transmission of *lalud*.(63){Offering} {Initiation} {Life} {Fertility}

New Guinea

62. The Malapa - Pork sacrifices are said to 'make grease' to the earth rendering it fertile. (64){Fertility}

63. The Malapa – In the *Kor* ritual of fertility, stones that will later be buried in the ground are anointed with pork fat (kopong) and red ochre symbolizing semen and blood. (65). {Fertility}

64. General Austarlia Pauasia - "The smearing of the body with the fat of the dead is prevalent in Australia and Pauasia, is perhaps a variety of a custom to eat the dead". (66){Burial}

65. The Jale - In the Jale of New Guinea during the ceremony 'a man of knowledge' 'brushes a small bundle over the initiate's eyes and hams. The bundle contain a feather of a particular bird known to sing very early in the morning and some fat of a snake (unidentified, probably a python). The Jale believe that this application, together with the accompanying utterances, strengthens the boy's senses and ensures his healthy growth. 'Later, the maternal kinsman gives the boy a bundle containing a small lump of pig's fat wrapped in a piece of *konu* banana leaf, and asks him to keep it in his net without ever looking at its contents.'(67){Initiation}

66. The Bimin - Kuskusmin - the initiators place fat and red pigment on the chest and fat and black salt on the throat of the boys. "As final protective measure, charcoal and marsupial fat are rubbed on the boy's navels and nipples to thwart any female influences". Fat is used throughout the ceremony (68){Initiation}

South America

67. The Aymaras, Bolivia - "Andeans believe that fat is a substance of the soul, powerfully related to health and sickness, social change and political process. Fat convey many meanings for the Aymaras of Kachitu. Llama fat, *llampu*, is always used to feed the earth shrines, to anoint leaders and to dispel curses" (69){Sacredness} {Healing} {life}

68. The Andean Inca – "It was customary to cure patients by rubbing and sucking the sick man's abdomen and other parts of his body while smearing the same parts with grease. (70){Healing}

69. The Andean Indians – Llama fat, *llampu*, was used to anoint leaders. (69)

70. The Wari, Peru – In the process of cannibalism as respect for the dead, prevention of dripping of body substances to the soil was important. "A child's grieving parents would catch the fat in a clay pot and smear it over their own heads and bodies as they cried".(71) {Burial} {Sacredness}

Africa

71. The Hadza, Tanzania - In a puberty ceremony girls are “covered in animal fat so that they are very shiny...” (72){Initiation}

72. The Hadza, Tanzania - In a burial ceremony fat is held over the grave by a decorated container. (73){Burial}

73. The Hadza, Tanzania - It is forbidden to talk of a dead animal before it is dismembered as it is believed “to put at risk the animal's fat which the Hadza value more highly than lean meat”. (74) {Successful hunt}

74. The Hadza, Tanzania - “*Epeme* is the name given to certain fatty portions of large game. This meat is sacred, supposedly reserved for the eponymous spirit being, but in fact eaten by initiated men at special *epeme* feasts. The men consume the meat secretly; attendance at the *epeme* feast is a male privilege from which women are excluded on pain of rape or death”. (75){Sacredness} {Successful hunt}

75. The Becwana, Botswana - rubbed themselves with white clay mixture with fat in the initiation ceremony. They regard this as a mark of Becwana birth. They say that other tribes smear themselves with fat alone. (76){Initiation}

76. The Pokot, Kenya - is a Nilo - Hamitic tribe in north eastern Kenya, semi nomadic pastoralists. During the initiation ceremony, while the guests eat other parts, an elder take the fat from the stomach and penis of a butchered cattle and bring it to the age-mates of the initiated. (77) {Initiation} {Fertility}

77. The Pe in Cameroon - At the annual festival of the Muzey clan, a leading female participant covers her head with the fat of the peritoneum of a goat sacrificed to the clan’s protecting spirit, parading around to symbolize the flourishing prosperity of the kinship group. (78){Richness}

78. The Muzey of Cameroon - It is customary to feed the bridal in-laws with fat meat of castrated animal in order to secure the fertility of the wife (78){Fertility}

79. The Beti of southern Cameroon- the *So* initiation ceremony contains the “*Oyomo* goat silence” that takes place after the fat of the goat in the previous initiation ceremony is eaten. After the *So*, men are allowed to eat Fatty meat parts that are forbidden to women.(79){Initiation}

80. The Aka - After the successful hunt of an elephant, an offering (*likabo*) is made to thank the spirits which include raw pieces of heart fat, heart, ribs and honey. (80)) {Successful hunt} {Offering}

81. The Samburu – If a woman has difficulty in having children "a little fat is spread over the woman's belly, they will say: "May God give you a child!"". (81) {Fertility}

82. The Samburu - The mourners put fat in the mouth of the deceased (82) {Burial}

83. The Maasai - Spencer (83) describes various ceremonial uses of fat in the context of blessing and anointment. {Sacredness} {Abundance}

84. The Ju/'hoansi - “The Eland Bull dance is danced because the eland is a good thing and has much fat. And the girl is also a good thing and she is all fat; therefore they are called the same thing”. The Girl is smeared with eland fat. (75){Fertility} {Abundance}

85. The Ju/'hoansi - After the initiation period the Ju/'hoan maiden takes a portion of eland fat

mixed with *buchu* to each fire in her camp. The effect is that everyone will be hot (eager) for eating and they will want to go hunting (75){Successful hunt}

86. The Ju/'hoansi - Immediately after an Eland's hunt a "Medicine Eland Dance" is performed by the hunters "in praise of the fat".(75) {Successful hunt}

87. The /Xam - Boys and girls are smeared with eland's fat at the initiation ceremony (75){Initiation}

88. The Moro of Sudan - After A shaman's (*Bori*) runaway wife returns "The husband summons other *Bori* and they dip grass into fat and blow on the fat and daub the woman's forehead with it." (84){Healing}

89. The Nema of South Africa - A girl is anointed with fat as part of the initiation ceremony after her first menstruation. (85){Initiation}

90. The Xhosa, South Africa - During the initiation of Xhosa healer, the fat of a fat-dripping piece of meat is smeared on the inside of the skirt of the initiated and the meat is fed to the house dog. The skirt is then fasted around the initiated waist. The fat dripping piece of meat was said to represent the ancestors. (86){Sacredness}

91. The Gogo of central Tanzania - Relatives of the initiated girl must provide an animal called *mafuta* which actually means 'fat'. The fatty soup made from the animal is drunk with medicines by the initiates and the fat is rubbed on their bodies.(62) {Initiation}

92. The Ndembu, Zambia - ". "At the end of funerary rites a widow or widower is washed, anointed with oil, ... and given a white cloth". White means "The divinity as essence and source, as well as sustenance". (87){Burial} {Sacredness}

93.

Russia

94. The Yakuts - In a marriage ceremony, it was mandatory for the groom to bring a cooked horse head covered with blood and fat (88){Wedding}

95. The Yakuts - During the wedding a ritual involved contestants vying to eat a piece of mare's fat as quickly as possible without touching it. (88){Wedding}

96. The Chukchis - Chukchis living in the coastal areas brought sacrifices on the occasion of the winter solstice. Especially suitable sacrifices were fat male reindeer (89){Offering}

Norway

97. The Sami – The Sami regularly greased sacred *siedi* stones with fish fat (90){Sacredness}

Persia

98. In Zarathustrian ceremonies fat replace the killing of animal victims. (91){Life}

Mythology

North America

1. Blackfoot - "The Indians originally called it Back Fat Creek (the back fat is a particularly desirable portion of meat on the back of a buffalo)" (92){Nourishing}

2. Blackfoot - On the reason why a certain rock is sacred: "passed the rock on his way and decided to stop. He killed a buffalo, took out the liver and fat and left it by the rock. Then he spoke to the rock, "If you are the man, take this to eat." (93){sacredness}

3. Blackfoot – Kutoyis, a mythological figure, helps an old man hunt a fat buffalo cow and then an old woman kill a cow that look slim but was really very fat. The head of the village send his son to bring "some nice back fat" of the other people kill. (94) {Desirable}
4. The Caribou Inuit - "During a famine she took two pieces of fat; one she threw into the water and it became a Worlus...The other she cast on the land and it became a Caribou..." (95){life}
5. The Pawnee – Tirawa, The creator instructs the first man and woman that he created to grease the parts of every buffalo they hunt "so that you remember that there are gods in heaven" (96){Sacredness}
6. The Pawnee – A young man is sent by the Mother-Corn to his village to administer a ceremony in honor of the buffalo during which a heart, a tongue and fat of a buffalo are distributed to the village people and they all grease their families with fat. (96){Successful hunt} {Sacredness}
7. The Pawnee – It is told of a man that held a ceremony in honor of the four gods in the north. Fat was taken from a piece of meat and offered to each of the four gods. "The fat was then thrown into the fire so that the smoke would go to the heavens". (96) {Offering}
8. The Pawnee - A buffalo calf who turned into a boy brought with him a sacred bundle and told the village people that when they killed a buffalo they must put fat upon the bundle for the bundle belonged to Tirawa and the fat also belonged to him. (96){Offering}
9. The Pawnee – A girl whose uncle became an eagle because she scorned him is trying to entice him to return by offering him several different animals but he discovers the trap and avoids the meat even though in the Elk "The fat looked fine". Eventually she is being persuaded to put herself as the bate and her "breast shall be torn open. The golden Eagle will come and will want to eat the fat from your heart." (96){Choice} {Essence}
10. The Pawnee - A monster which denied access to a lake was killed and the people "cut the monster up, took fat and flesh from different parts of its body, and mixed their medicines with it." (96){Healing}
11. The Pawnee - A man who tried to escape from a group of people by swinging a frame covered with tallow that burned their faces. (96){Burning}
12. The Pawnee – A man with Special Forces pull a hair from some buffalo that become hearts and tongues but a hair from the tail of a fat buffalo cow becomes whole buffalo. Meanwhile his rival only manages to hunt a lean and thin buffalo. (96){Life} {Desirable}
13. The Osage – A boy comes to a herd of buffalo and asks old buffalo for two fat buffalo to help burry his grandmother. After the two buffalos dig the grave the grandmother kill them and make tallow. (97){Desirable}
14. The Osage - A man who was feared by the people and use to take away pretty girls and the best buffalos came to a father and son who killed a fat buffalo and demanded the buffalo. The boy does not abide and kills the man. (97){Desirable}.
15. The Witchata - A man who was granted magic arrows which can talk, hear them telling how fat and large was the buffalo they had killed. (51){Desirable}
16. The Witchata – The Young-Boy-Chief had an old woman fastened to his back. Another man, the Turtle, said the way to get her off his back was to obtain fat from a buffalo back. After he succeeded he rubbed the fat over the sore places on the Young-Boy-Chief. (51){Healing}

The Northern Territory of Australia(**All references (57)**)

17. A tradition of the Kakadu tribe mention a boy who died and whose father took out his body fat (*paloma*) and especially his kidney fat “Then he took some of the dead child's fat and put it on the fire, where it began to sizzle.” {Burial}
18. A traditional story mentions eating a certain snake by young men as taboo and mention that “*Mukalakki*” (a young man) took some of the *paloma* (fat) to a very old man who ate it and licked his lips as he did so, because the fat is very good indeed.” {Desirable}
19. Karadjeri - A boy killed his mother's mother, who always ate his entire hunt by telling her to open her mouth so that he can throw some of the Wallaby fat in. When she did he threw a hot fat in it that burned her internally and she died. (98){Desirability}

South America

20. The Yannomami - A killer is considered as a cannibal of blood of the victim and Like the Wari, Yanomami connect enemy blood to fat; they believe that it exudes out of the killer's body as grease sweat out of his forehead.” (99){life}
21. The Andes tribes - “Images of fat-snatching and blood-sucking are used by the Andeans to describe the causes of sickness” (69){life}
22. In modern traditions of the Inca mythology malevolent beings prey on people asleep at night by sucking the fat from their bodies, thus extracting life force (100){Life}

Greenland

23. Greenland Inuit – A friend gave a whole deer as a present "Choosing the one with velvety horns and leaving all the tallow in it, to regale his friend with". During the visit the friends "ate reindeer flash, and especially the tallow. The friend found it extremely delicious..." (101). On another visit the friend "several times exclaimed "this is really delicious!" and the host answered "Yes, that is because it is so very fat"" (101). {Desirable}
24. Greenland Inuit – A man who tried to "do an evil turn" to another man, cut fat from a dead human body and "with this rubbed certain parts of a seal he intended to treat his friend with". (101){Life}
25. Greenland Inuit – Akigsak managed to kill a feared monster which was a reptile and come back home after four days' walk. His father tells him that the monster was made exclusively of fat. Several men from the village, who were starving, go out to look for the dead monster and many of them die in the way. Those that reached the dead monster, which was indeed mostly made of fat, "had it for food the whole winter" (101){Nourishing}

Germany

26. German hero Siegfried found a small rivulet of hot fat issuing from a swamp and dipping his body in it acquired a protective layer of horn-like skin. (94){Smearing}

Finland

27. The Sami – The vagina is said to be "made from fat, made from butter" (90){Fertility}

Russia

28. The Siberian Eskimos - A legend tell about a friend who died and came to escort “his surviving friend through a world of noisy spirits and sleeping humans. Those protected by urine or oil fat glittering around their *yaranga* were unharmed...” (102){Protecting}

Ireland and Wales

29. Fionn mcCumhail, a mythological hunter-warrior gained all his knowledge of the world by

swallowing a drop of Salmon fat. In Welsh mythology, the poet Taliesin received his wisdom by similar Means. (103){Creation}

30. The Orochi – A brother who was looking for his sister came across a house with a roof of which the inner part was a layer of animal fat. He started to eat, tearing pieces of the roof fat. It turned out to be his sister's house. (104). {Desirable}

31. The Caucasus – The Nart saga no. 12 speak of a woman who tell a feared guest on a horse how she prepared the meal for him: "From our fat sheep/ we have readied our gravy/ from our fat old oxen / we have made our broth" (105){Desirable}

New Guinea

32. The Malapa - Grease is passing through people, plants and earth in a cycle of fertility. (106){Fertility} {Life}

33. The Kewa – A wife becomes jealous when a husband takes pork to his sister every time he visits her because it is the fat of the pork. She follows him and kills the sister and in return the husband kills his wife. (41){Desirable}

34. A python entered a woman's body/ Her brother cooked pig's fat which the python could smell. "Gradually the brother enticed the snake out, using the piece of pork..." (41) {Desirability}

Greece

35. "Prometheus was forward to cut up a great ox and set portions before them, trying to befool the mind of Zeus. Before the rest he set flesh and inner parts thick with fat upon the hide, covering them with an ox paunch; but for Zeus he put the white bones dressed up with cunning art and covered with shining fat." ...(107){Desirable}

36. "And he said to Athena: My daughter, will you go aid the Mice? For they all frolic about your temple continually, delighting in the fat of sacrifice and in all kinds of food." (107){Desirable}

37. Hestia, the goddess of hearth, was granted a privilege from Zeus of enjoying the fat of the sacrificial meats from each house. (108){Desirable}

China

38. The Hui – A dragon used to come every year to demand offerings from villages in return for rain. One village gave him pork fat while the other village, being of Muslim persuasion, could not provide pork fat. The dragon got angry and denied them rain. (109){Desirable}

39. The Hui – A shepherd lose a sheep and the owner of the sheep tells him that he should compensate with a fat yearling. (109){Desirable}

40. The Kuafu Mountain is named after Kuafu who was a good runner and tried to chase the sun to find where it is setting. He died of thirst and, nourished by the fat from his corps, his walking stick grew into a forest. (110) {Nourishing}

Japan

41. Ainu – An old tribe in northern Japan. The God of the sea send an ill whale to one village and a fat whale to another that he favors. (111){Desirable}

42. Ainu – "In ancient times, when the divine Aioina was living in the world, he one day went hunting in the mountains and killed a fat deer." (112) {Desirable}

Hawaii

43. In the description of Paliuli, which is a kind of paradise, it is described as "Land with springs of water, fat and moist/ Land greatly enjoyed by the gods" (113){Abundance}

44. Three boys living in a mountain house amuse themselves at night by making extravagant wishes for all kinds of fat foods. (113) {Desirability}

Iraq

45. The Sumerians – The god Enki, while creating the world, "erects stalls and sheepfolds, supplies them with fat and milk..." (114){Abundance} {Desirable}

46. The Sumerians – Enlil, the air-god create two cultural beings Ememsh and Enten. Enten is charged with "Cow and calf he caused to multiply, much fat and milk he caused to be produced" (114){Desirability} {Abundance}

47. The Sumerian – The birth of Ninsar, a goddess, is described as a birth of fat and good butter. (114) {Life}

India

48. In Vedic cosmogony the sacrifices were the source of everything in the world. From the sacrifice, the fat was drawn off and from it were made the "animals of the air, those of the desert, and those of the clusters" (91){life} {Creation}

49. In Hindu mythology Kaitabha and Madhu were two horrible demons. The Hari-vansa states that the earth received its name of Medini from the marrow of these demons. In one passage it says that their bodies, when thrown to the sea, produced an immense quantity of marrow and fat which Narayana used in forming the earth (115). Another version credit Vishnu with beheading the two and the fat that flowed from their bodies coagulated in the ocean to become the earth (116) {Creation}

Language

1. In the Yolngu tribe of Arnhem the word for fat - *Djukurr* - also means 'power' and is attributed to a choice quartz stone used as raw material for a sacred stone tool(117). Further meanings attributed to *Djukurr* include 'beautiful', 'cute', 'luster', 'richness', 'attractiveness' and is generally associated with spiritual quality of land and space (118) {Richness} {Sacredness}

2. In the Andean tribes language the traditional greeting *wiraqocha* means "a sea of fat". It is taken from Maya mythology in which *wiraqocha* (sea of fat) was the main god. (69) {Desirable} {Abundance}

3. In Cameroon, in Masa vocabulary, *tifuna*, "eating the sorghum cake", means living; but to lead a good life is *timulu*, "eating fat stuff". (78) {Desirable}

4. In the Jo/'hoan "eating or drinking fat" is a euphemism for sex (119). Fat, as a liquid solid, is a mediator, 'the cool result of a union of hot and cold' (119). Consumption of fat 'is metaphoric of the sexual mediation between semen (hot)and menstrual blood(cold)' (119). {Fertility}

5. New Guinea - The Melapa word *kopong*, "grease" also mean 'semen' and stand for health and fertility.(65){Fertility}

6. New Guinea – The Huli word for water is *iba* and for grease is *iban*. Semen is called *wiiban* (penis grease) and breast milk *anduiban*.(120){Fertility}

7. The Beti of southern Cameroon- "there exist for the Beti a close connection between the fat and the semen. Not only are these substances recognized as physically similar they are also held

to derive from each other". (79){Fertility}

8. The Huaorani – An Amazonian tribe in Ecuador. They call the season between May to August "Season of the fat monkey" which the season of its hunt. (121) {Desirable}
9. India – The Sanskrit word for Earth – Medini, means "having fatness" (116) {Creation}
10. We sampled 31 languages for synonyms of fat, as described in the Methodology section.

The sampled languages were: Arabic, Azeri, Bengali, Chinese, Croatian, Dutch, English, Finnish, French, German, Hebrew, Hindi, Hungarian, Indonesian, Italian, Japanese, Korean, Latvian, Maori, Norwegian, Polish, Portuguese, Russian, Scottish Gaelic, Serbian, Slovak, Swedish, Thai, Turkish, Ukrainian, Welsh.

The most common synonyms were:

1. Rich – 28 of the 31 sampled languages
2. Fertile – 27 of the 31 sampled languages
3. Abundant – 14 of the 31 sampled languages
4. Lucrative – 12 of the 31 sampled languages
5. Powerful – 9 of the 31 sampled languages

Many other synonyms, of positive and negative meanings, that are common to several languages were identified. On the positive side, words like Essence, Nourishing, Beneficial, Good, Fortunate. On the other hand the most common negative word was Stupid (Fat Head). Other common negative words were Sleazy, Dirty, Bribery, Lazy, Sluggish, Wicked, Sticky.

References

1. DGAC; Scientific Report of the 2015 Dietary Guidelines Advisory Committee. 2015.
2. Elmadfa I, Kornsteiner M; Fats and fatty acid requirements for adults. *Annals of Nutrition and Metabolism* 2009;**55**(1-3):56-75.
3. Lamarche B, Couture P; It is time to revisit current dietary recommendations for saturated fat. *Applied Physiology, Nutrition, and Metabolism* 2014;**39**(12):1409-1411.
4. Harcombe Z, Baker JS, Cooper SM, et al.; Evidence from randomised controlled trials did not support the introduction of dietary fat guidelines in 1977 and 1983: a systematic review and meta-analysis. *Open heart* 2015;**2**(1):e000196.
5. Chowdhury R, Warnakula S, Kunutsor S, et al.; Association of dietary, circulating, and supplement fatty acids with coronary risk: a systematic review and meta-analysis. *Annals of internal medicine* 2014;**160**(6):398-406.
6. Willet WC, Stampfer Mj, Sacks FM; Association of Dietary, Circulating, and Supplement Fatty Acids With Coronary Risk. *Annals of Internal Medicine* 2014;**161**(6). doi: 10.7326/L14-5018.
7. Hooper L, Martin N, Abdelhamid A, et al.; Reduction in saturated fat intake for cardiovascular disease. *Cochrane Database Syst Rev* 2015;**6**.
8. Cordain L, Watkins BA, Florant G, et al.; Fatty acid analysis of wild ruminant tissues: evolutionary implications for reducing diet-related chronic disease. *European Journal of Clinical Nutrition* 2002;**56**(3):181-191.
9. Eaton SB, Konner M; Paleolithic Nutrition - A Consideration of Its Nature and Current Implications. *New England Journal of Medicine* 1985;**312**(5):283-289. doi: 10.1056/nejm198501313120505.

10. Cordain L, Miller JB, Eaton SB, et al.; Plant-animal subsistence ratios and macronutrient energy estimations in worldwide hunter-gatherer diets 1 , 2. *The American journal of clinical nutrition* 2000;**71**(3):682-692.
11. Cordain L; Saturated fat consumption in ancestral human diets: implications for contemporary intakes. *CRC Press (Taylor & Francis Group)* 2006:115-126.
12. Gurven M, Kaplan H; Longevity among hunter-gatherers: a cross-cultural examination. *Population and Development Review* 2007;**33**(2):321-365.
13. Stanford CB, Bunn HT. *Meat-eating & human evolution*: Oxford University Press Oxford, 2001.
14. Speth JD, Spielmann KA; Energy source, protein metabolism, and hunter-gatherer subsistence strategies. *Journal of Anthropological Archaeology* 1983;**2**:1-31. doi: 10.1016/0278-4165(83)90006-5.
15. Ben-Dor M, Gopher A, Hershkovitz I, et al.; Man the fat hunter: the demise of Homo erectus and the emergence of a new hominin lineage in the Middle Pleistocene (ca. 400 kyr) Levant. *PLoS One* 2011;**6**(12):e28689. doi: 10.1371/journal.pone.0028689.
16. Stiner MC, Kuhn SL; Paleolithic diet and the division of labor in Mediterranean Eurasia. *The Evolution of Hominin Diets*: Springer, 2009, 157-169.
17. Pryor AJE; Following the fat: food and mobility in the European Upper Palaeolithic 45,000 to 18,000 BP. *Archaeological Review from Cambridge* 2008;**23**:161-179.
18. Speth JD. *Paleoanthropology and Archaeology of Big-game Hunting*: Springer, 2012.
19. Gaudzinski S, Roebroeks W; Adults only. Reindeer hunting at the Middle Palaeolithic site Salzgitter Lebenstedt, Northern Germany. *Journal of Human Evolution* 2000;**38**:497-521. doi: 10.1006/jhev.1999.0359.
20. Stiner MC; An Unshakable Middle Paleolithic? Trends versus Conservatism in the Predatory Niche and Their Social Ramifications. *Current Anthropology* 2013;**54**:S288-S304. doi: 10.1086/673285.
21. Lindstedt SL, Boyce MS; Seasonality, Fasting, Endurance, and body size in mammals. *American Naturalist* 1985;**125**:873-878. doi: 10.1086/284385.
22. Bar-Oz G, Munro ND; Gazelle bone marrow yields and Epipalaeolithic carcass exploitation strategies in the southern Levant. *Journal of Archaeological Science* 2007;**34**(6):946-956. doi: DOI 10.1016/j.jas.2006.09.006.
23. Blasco R, Rosell J, Dominguez-Rodrigo M, et al.; Learning by Heart: Cultural Patterns in the Faunal Processing Sequence during the Middle Pleistocene. *Plos One* 2013;**8**(2). doi: ARTN e55863
DOI 10.1371/journal.pone.0055863.
24. Dominguez-Rodrigo M, Bunn HT, Mabulla AZP, et al.; On meat eating and human evolution: A taphonomic analysis of BK4b (Upper Bed II, Olduvai Gorge, Tanzania), and its bearing on hominin megafaunal consumption. *Quaternary International* 2014;**322**:129-152. doi: 10.1016/j.quaint.2013.08.015.
25. Outram AK; A new approach to identifying bone marrow and grease exploitation: Why the 'indeterminate' fragments should not be ignored. *Journal of Archaeological Science* 2001;**28**(4):401-410. doi: DOI 10.1006/jasc.2000.0619.
26. Brink J. *Imagining Head-Smashed-In: Aboriginal Buffalo Hunting on the Northern Plains*: Athabasca University Press, 2008.
27. Costamagno S; Bone Grease Rendering in Mousterian Contexts: The Case of Noisetier Cave (Frechet-Aure, Hautes-Pyrenees, France). In:Clark JD, Speth Js (eds). *Zooarchaeology and Modern Human Origins*: Springer, 2013, 209-225.
28. Manne T; Early Upper Paleolithic bone processing and insights into small-scale storage of fats at Vale Boi, southern Iberia. *Journal of Archaeological Science* 2014;**43**:111-123.
29. Munro ND, Bar-Oz G; Gazelle bone fat processing in the Levantine Epipalaeolithic. *Journal of Archaeological Science* 2005;**32**(2):223-239.

30. Saint-Germain C; Animal fat in the cultural world of the Native Peoples of Northeastern America. *The zooarchaeology of fats, oils, milk and dairying* 2005:107-113.
31. Kelly RL. *The lifeways of hunter-gatherers: The foraging spectrum*: Cambridge University Press, 2013.
32. Lee RB. *The! Kung San: men, women, and work in a foraging society*: Cambridge University Press Cambridge, 1979.
33. Rockwell D. *Giving Voice to Bear: Native American Indian Myths, Rituals and Images of the Bear*: Roberts Reinhardt Publishing, 1993.
34. Tindale NB; The Pitjandjara. In: Bicchieri MGs (ed). *Hunters and gatherers today*. New York: Holt, Rinehart and Winston, 1972, 217-268.
35. Coote J, Shelton A. *Anthropology, Art, and Aesthetics*: Clarendon Press, 1992.
36. Eco U. *A theory of semiotics*: Indiana University Press, 1976.
37. Lexilogos. <http://www.lexilogos.com/english/> (Date Accessed, date last accessed)
38. Geertz C. *The interpretation of cultures: Selected essays*. New York: Basic books, 1973.
39. Meneley A; Oleo-Signs and Quali-Signs: The Qualities of Olive Oil. *Ethnos* 2008;**73**(3):303-326.
40. Stewart P, Strathern A. *Gender, Song, and Sensibility: Folktales and folksongs in the highlands of New Guinea*: Greenwood Publishing Group, 2002.
41. Salomon A. *Symbols and Images in the Constitution of Society*, 1955.
42. Taubes G. *Good calories, bad calories: fats, carbs, and the controversial science of diet and health*: Anchor Books, 2008.
43. Teicholtz N. *The Big Fat Surprise*
Why Butter, Meat & Cheese Belong in a Healthy Diet: Simon & Schuster, 2014.
44. Eckel RH, Jakicic JM, Ard JD, et al.; 2013 AHA/ACC guideline on lifestyle management to reduce cardiovascular risk: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Journal of the American College of Cardiology* 2014;**63**(25_PA):2960-2984.
45. Dildy T; Evidence For and Against Dietary Recommendations to Prevent Cardiovascular Disease. *Texas Heart Institute Journal* 2015;**42**(3):234-236.
46. Linton R; The Thunder Ceremony of the Pawnee. *Leaflet* 1922:1-19.
47. Dorsey GA. *The Mythology of the Wichita*: University of Oklahoma Press, 1904.
48. Armitage P; The Religious Significance of Animals in Innu Culture. *Native Issues* 1984;**4**:50-56.
49. Pisteolak P, Eber DH. *People from Our Side: A Life Story with Photographs and Oral Biography*: McGill-Queen's University Press., 1993.
50. Oosten J, Laugrand F; The bringer of light: the raven in Inuit tradition. *Polar Record* 2006;**42**(03):187-204.
51. Walker J. *Lakota belief and ritual*: U of Nebraska Press, 1980.
52. Spencer B, Gillen FJ. *The native tribes of Central Australia*: ebook@Adelaide <http://ebooks.adelaide.edu.au/s/spencer/baldwin/s74n/> 2014.
53. Baldwin S, Gillen FJ; The Northern Tribes of Central Australia. *London: McMillan* 1904.
54. Spencer B. *Native tribes of the Northern Territory of Australia*: Cambridge University Press, 2010.
55. Roth W, Etheridge R. *Ethnological studies among the north-west-central Queensland Aborigines*: Government Printer, South Africa, 1897.
56. Mathews RH; Phallic rites and initiation ceremonies of the South Australian aborigines. *Proceedings of the American Philosophical Society* 1900:622-638.
57. Berndt R; A Curlew and Owl Legend from the Narunga Tribe. *South Australia, ibid* 1940.
58. Rigby P; The Symbolic role of Cattle in Cogo Ritual. In: Beidelman TOs (ed). *The translation of culture: essays to EE Evans-Pritchard*: Routledge, 2013.

59. Janowski M, Walker H; Masculinity, potency and pig fat: the Kelabit of Sarawak. *The Fat of the Land: Proceedings of the Oxford Symposium on Food and Cooking 2002*: Oxford Symposium, 2003.
60. Strathern A; Witchcraft, greed, cannibalism and death: some related themes from the New Guinea Highlands. In: Bloch M, Perry Js (eds). *Death and the Regeneration of Life*: Cambridge University Press, 1982, 111-133.
61. Stewart P, Strathern A; Politics and poetics mirrored in indigenous stone objects from Papua New Guinea. *The Journal of the Polynesian Society* 1999:69-90.
62. Molinowski B; Magic, Science and religion. In: Robben ACs (ed). *Death, mourning, and burial: a cross-cultural reader.*: John Wiley & Sons, 2009, 19-22.
63. Koch K-F; Sociogenic and Psychogenic Models in Anthropology: The Functions of Jale Initiation. *Man* 1974:397-422.
64. Herdt GH. *Fetish and Fantasy in Sambia Initiation*: University of California Press, 1982.
65. Koss-Chioino J, Leatherman TL, Greenway C. *Medical Pluralism in the Andes*: Psychology Press, 2003.
66. Sandweiss D, Wing E; Ritual rodents: the guinea pigs of Chinchu, Peru. *Journal of Field Archaeology* 1997;**24**:47-58.
67. Conklin B; "Thus Are Our Bodies, Thus Was Our Custom": Mortuary Cannibalism in an Amazonian Society. *American Ethnologist* 1995;**22**(1):75-101.
68. Marlowe F. *The Hadza: Hunter-gatherers of Tanzania*: University of California Press, 2010.
69. Woodburn J; Social dimensions of death in four African hunting and gathering societies. In: Bloch M, Parry J, Jonathans (eds). *Death and the Regeneration of Life*: Cambridge University Press, 1982, 187-210.
70. Woodburn J; Egalitarian societies. *Man* 1982:431-451.
71. Power C, Watts I; The woman with the zebra's penis: gender, mutability and performance. *Journal of the Royal Anthropological Institute* 1997;**3**:537-560.
72. Willoughby WC; Notes on the Initiation Ceremonies of the Becwana. *The Journal of the Royal Anthropological Institute of Great Britain and Ireland* 1909;**39**:228-245.
73. Peristiany JG; The Age-Set System of the Pastoral Pokot. The "Sapana" Initiation Ceremony. *Africa* 1951:188-206.
74. de Garine I; Meat: Between ritual and gastronomy. *Estudios del hombre* 2004(19):73-89.
75. Houseman M; The interactive basis of ritual effectiveness in a male initiation rite. . In: Boyer Ps (ed). *Cognitive Aspects of Religious Symbolism*, 1993.
76. Joiris DV; 10 A comparative approach to hunting rituals among Baka Pygmies (southeastern Cameroon). In: Kent Ss (ed). *Cultural diversity among twentieth-century foragers: an African perspective*: Cambridge University Press., 1996, 245.
77. *People of Africa*. <http://www.africanholocaust.net/peopleofafrica.htm> (Date Accessed, date last accessed)
78. Spencer P; The Transfiguration of Samburu Religion. 2011.
79. Spencer P. *The Maasai of Matapato: A study of rituals of rebellion*. London: Routledge, 2004.
80. Pritchard EE; 49. A Note on Rain-Makers Among the Moro. *Man* 1938:53-56.
81. Carstens P; The socio-economic context of initiation ceremonies among two Southern African peoples. *Canadian Journal of African Studies/La Revue ...* 1982.
82. Buhrmann M; Initiation of Xhosa Indigenous Healers (Amagqira). In: Mahdi LC, Foster S, Little Ms (eds). *Betwixt & Between: Patterns of Masculine and Feminine Initiation*, 1987, 439-456.
83. Turner VW. *The forest of symbols: Aspects of Ndembu ritual*: Cornell University Press, 1967.
84. Sleptsov PA; Marriage Customs of the Yakuts (Sakha). *Culture incarnate: native anthropology from Russia* 1995:173.
85. Siimets Ü; The Sun, the Moon and firmament in Chukchi mythology and on the relations of celestial bodies and sacrifices. *Folklore: Electronic Journal of Folklore* 2006;**32**:129-156.

86. Raudvere C, Schjodt J. *More Than Mythology: Narratives, Ritual Practices and Regional Distribution in Pre-Christian Scandinavian Religions*: Nordic Academic Press., 2012.
87. Bonnefoy Y, Doniger W. *Asian mythologies*: University of Chicago Press, 1993.
88. West H; Blackfoot Country. *Montana: The Magazine of Western History* 1960.
89. Ewers JC; The medicine rock of the Marias: A blackfoot shrine beside the whoop-up trail. *The Montana Magazine of History* 1952:51-55.
90. Leeming DA. *Mythology: The Voyage of the Hero*: Oxford University Press, 1998.
91. McGhee R; Ivory for the sea woman: The symbolic attributes of a prehistoric technology. *Canadian Journal of Archaeology/Journal Canadien d'Archéologie* 1977:141-149.
92. Dorsey GA. *The Pawnee: Mythology*: Carnegie institution of Washington, 1906.
93. Dorsey GA. *Traditions of the Osage*: Field Columbian Museum, 1912.
94. Piddington R; Karadjeri initiation. *Oceania* 1932;3(1):46-87.
95. Gregor T, Tuzin DF. *Gender in Amazonia and Melanesia: an exploration of the comparative method*: Univ of California Press, 2001.
96. Steele PR. *Handbook of Inca mythology*: ABC-CLIO, 2004.
97. Rink H. *Tales and Traditions of the Eskimo: With a Sketch of Their Habits, Religion, Language and Other Peculiarities*: Courier Corporation, 1875.
98. Tein T, Shimkin D, Kan S; Shamans of the Siberian Eskimos. *Arctic anthropology* 1994:117-125.
99. Helfman G, Collette B. *Fishes: the animal answer guide*: JHU Press, 2011.
100. Grayson J. *Myths and legends from Korea: an annotated compendium of ancient and modern materials*: Routledge, 2012.
101. Colarusso J. *Nart sagas from the Caucasus: Myths and legends from the Circassians, Abazas, Abkhaz, and Ubykhs*: Princeton University Press, 2014.
102. Strathern A, Bloch M, Parry J. *Witchcraft, greed, cannibalism and death: some related themes from the New Guinea Highlands*: Cambridge University Press, 1982.
103. Evelyn-White HG. *Hesiod, the Homeric hymns, and Homeric*: W. Heinemann, 1920.
104. Hansen WF. *Handbook of Classical Mythology*: ABC-CLIO, 2004.
105. Li S, Luckert KW. *Mythology and Folklore of the Hui, A Muslim Chinese People*: SUNY Press, 1994.
106. Yang L, An D, Anderson Turner J. *Handbook of Chinese Mythology*: Oxford University Press, 2008.
107. Miura K. *Yukara epos of the Ainus*. <http://www.sacred-texts.com/shi/ainu/yukara.htm> (Date Accessed, date last accessed)
108. Batchelor J. *The Ainu and their Folk-lore*: Religious Tract Society, 1901.
109. Beckwith MW. *Hawaiian mythology*: University of Hawaii Press, 1940.
110. Kramer SN. *Sumerian Mythology*: University of Pennsylvania Press, 1972.
111. Dowson J. *A classical dictionary of Hindu mythology and religion, geography, history, and literature Vol. 6*: Trübner & Company, 1879.
112. Williams G. *Handbook of Hindu mythology*: ABC-CLIO, 2003.
113. Jones R, White N; Point blank: stone tool manufacture at the Ngilipitji Quarry, Arnhem Land, 1981. In: Meehan B, Jones Rs (eds). *Archaeology with ethnography: An Australian perspective*, 1988, 51-87.
114. Griffiths G, Trigger D. *Disputed territories: land, culture and identity in settler societies*: Hong Kong University Press., 2003.
115. Biesele M. *Women like meat: the folklore and foraging ideology of the Kalahari Ju/'hoan*: Witwatersrand University Press, 1993.
116. Goldman L, Ballard C. *Fluid Ontologies: Myth, Ritual, and Philosophy in the Highlands of Papua New Guinea*: Greenwood Publishing Group, 1998.
117. Rival L; The growth of family trees: understanding Huaorani perceptions of the forest. *Man* 1993:635-652.

Bibliography

1. DGAC; Scientific Report of the 2015 Dietary Guidelines Advisory Committee. 2015.
2. Elmadfa I, Kornsteiner M; Fats and fatty acid requirements for adults. *Annals of Nutrition and Metabolism* 2009;**55**(1-3):56-75.
3. Lamarche B, Couture P; It is time to revisit current dietary recommendations for saturated fat. *Applied Physiology, Nutrition, and Metabolism* 2014;**39**(12):1409-1411.
4. Harcombe Z, Baker JS, Cooper SM, et al.; Evidence from randomised controlled trials did not support the introduction of dietary fat guidelines in 1977 and 1983: a systematic review and meta-analysis. *Open heart* 2015;**2**(1):e000196.
5. Chowdhury R, Warnakula S, Kunutsor S, et al.; Association of dietary, circulating, and supplement fatty acids with coronary risk: a systematic review and meta-analysis. *Annals of internal medicine* 2014;**160**(6):398-406.
6. Willet WC, Stampfer Mj, Sacks FM; Association of Dietary, Circulating, and Supplement Fatty Acids With Coronary Risk. *Annals of Internal Medicine* 2014;**161**(6). doi: 10.7326/L14-5018.
7. Hooper L, Martin N, Abdelhamid A, et al.; Reduction in saturated fat intake for cardiovascular disease. *Cochrane Database Syst Rev* 2015;**6**.
8. Ahrens EH; Nutritional factors and serum lipid levels. *The American journal of medicine* 1957;**23**(6):928-952.
9. Cordain L, Watkins BA, Florant G, et al.; Fatty acid analysis of wild ruminant tissues: evolutionary implications for reducing diet-related chronic disease. *European Journal of Clinical Nutrition* 2002;**56**(3):181-191.
10. Eaton SB, Konner M; Paleolithic Nutrition - A Consideration of Its Nature and Current Implications. *New England Journal of Medicine* 1985;**312**(5):283-289. doi: 10.1056/nejm198501313120505.
11. Cordain L, Miller JB, Eaton SB, et al.; Plant-animal subsistence ratios and macronutrient energy estimations in worldwide hunter-gatherer diets 1 , 2. *The American journal of clinical nutrition* 2000;**71**(3):682-692.
12. Cordain L; Saturated fat consumption in ancestral human diets: implications for contemporary intakes. *CRC Press (Taylor & Francis Group)* 2006:115-126.
13. Gurven M, Kaplan H; Longevity among hunter-gatherers: a cross-cultural examination. *Population and Development Review* 2007;**33**(2):321-365.
14. Stanford CB, Bunn HT. *Meat-eating & human evolution*: Oxford University Press Oxford, 2001.
15. Speth JD, Spielmann KA; Energy source, protein metabolism, and hunter-gatherer subsistence strategies. *Journal of Anthropological Archaeology* 1983;**2**:1-31. doi: 10.1016/0278-4165(83)90006-5.
16. Ben-Dor M, Gopher A, Hershkovitz I, et al.; Man the fat hunter: the demise of Homo erectus and the emergence of a new hominin lineage in the Middle Pleistocene (ca. 400 kyr) Levant. *PLoS One* 2011;**6**(12):e28689. doi: 10.1371/journal.pone.0028689.
17. Stiner MC, Kuhn SL; Paleolithic diet and the division of labor in Mediterranean Eurasia. *The Evolution of Hominin Diets*: Springer, 2009, 157-169.
18. Pryor AJE; Following the fat: food and mobility in the European Upper Palaeolithic 45,000 to 18,000 BP. *Archaeological Review from Cambridge* 2008;**23**:161-179.
19. Speth JD. *Paleoanthropology and Archaeology of Big-game Hunting*: Springer, 2012.
20. Gaudzinski S, Roebroeks W; Adults only. Reindeer hunting at the Middle Palaeolithic site Salzgitter Lebenstedt, Northern Germany. *Journal of Human Evolution* 2000;**38**:497-521. doi: 10.1006/jhev.1999.0359.
21. Stiner MC; An Unshakable Middle Paleolithic? Trends versus Conservatism in the Predatory Niche and Their Social Ramifications. *Current Anthropology* 2013;**54**:S288-S304. doi: 10.1086/673285.
22. Lindstedt SL, Boyce MS; Seasonality, Fasting, Endurance, and body size in mammals. *American Naturalist* 1985;**125**:873-878. doi: 10.1086/284385.

23. Bar-Oz G, Munro ND; Gazelle bone marrow yields and Epipalaeolithic carcass exploitation strategies in the southern Levant. *Journal of Archaeological Science* 2007;**34**(6):946-956. doi: DOI 10.1016/j.jas.2006.09.006.
24. Blasco R, Rosell J, Dominguez-Rodrigo M, et al.; Learning by Heart: Cultural Patterns in the Faunal Processing Sequence during the Middle Pleistocene. *Plos One* 2013;**8**(2). doi: ARTN e55863
DOI 10.1371/journal.pone.0055863.
25. Dominguez-Rodrigo M, Bunn HT, Mabulla AZP, et al.; On meat eating and human evolution: A taphonomic analysis of BK4b (Upper Bed II, Olduvai Gorge, Tanzania), and its bearing on hominin megafaunal consumption. *Quaternary International* 2014;**322**:129-152. doi: 10.1016/j.quaint.2013.08.015.
26. Outram AK; A new approach to identifying bone marrow and grease exploitation: Why the 'indeterminate' fragments should not be ignored. *Journal of Archaeological Science* 2001;**28**(4):401-410. doi: DOI 10.1006/jasc.2000.0619.
27. Brink J. *Imagining Head-Smashed-In: Aboriginal Buffalo Hunting on the Northern Plains*: Athabasca University Press, 2008.
28. Costamagno S; Bone Grease Rendering in Mousterian Contexts: The Case of Noisetier Cave (Frechet-Aure, Hautes-Pyrenees, France). In:Clark JD, Speth Js (eds). *Zooarchaeology and Modern Human Origins*: Springer, 2013, 209-225.
29. Manne T; Early Upper Paleolithic bone processing and insights into small-scale storage of fats at Vale Boi, southern Iberia. *Journal of Archaeological Science* 2014;**43**:111-123.
30. Munro ND, Bar-Oz G; Gazelle bone fat processing in the Levantine Epipalaeolithic. *Journal of Archaeological Science* 2005;**32**(2):223-239.
31. Saint-Germain C; Animal fat in the cultural world of the Native Peoples of Northeastern America. *The zooarchaeology of fats, oils, milk and dairying* 2005:107-113.
32. Kelly RL. *The lifeways of hunter-gatherers: The foraging spectrum*: Cambridge University Press, 2013.
33. Lee RB. *The! Kung San: men, women, and work in a foraging society*: Cambridge University Press Cambridge, 1979.
34. Rockwell D. *Giving Voice to Bear: Native American Indian Myths, Rituals and Images of the Bear*: Roberts Reinhardt Publishing, 1993.
35. Tindale NB; The Pitjandjara. In:Bicchieri MGs (ed). *Hunters and gatherers today*. New York: Holt, Rinehart and Winston, 1972, 217-268.
36. Coote J, Shelton A. *Anthropology, Art, and Aesthetics*: Clarendon Press, 1992.
37. Eco U. *A theory of semiotics*: Indiana University Press, 1976.
38. *Lexilogos*. <http://www.lexilogos.com/english/> (Date Accessed, date last accessed)
39. Geertz C. *The interpretation of cultures: Selected essays*. New York: Basic books, 1973.
40. Meneley A; Oleo-Signs and Quali-Signs: The Qualities of Olive Oil. *Ethnos* 2008;**73**(3):303-326.
41. Stewart P, Strathern A. *Gender, Song, and Sensibility: Folktales and folksongs in the highlands of New Guinea*: Greenwood Publishing Group, 2002.
42. Forth CE; The qualities of fat: Bodies, history, and materiality. *Journal of Material Culture* 2013;**18**(2):135-154. doi: Doi 10.1177/1359183513489496.
43. Forth CE, Leitch A. *Fat: culture and materiality*: A&C Black, 2014.
44. Forth CE; Thinking through Fat: The Materiality of Ancient and Modern Stereotypes. *Fat: Culture and Materiality* Kindle edition: Bloomsbury Publishing, 2014.
45. Salomon A. *Symbols and Images in the Constitution of Society*, 1955.
46. Taubes G. *Good calories, bad calories: fats, carbs, and the controversial science of diet and health*: Anchor Books, 2008.
47. Teicholtz N. *The Big Fat Surprise*

Why Butter, Meat & Cheese Belong in a Healthy Diet: Simon & Schuster, 2014.

48. Eckel RH, Jakicic JM, Ard JD, et al.; 2013 AHA/ACC guideline on lifestyle management to reduce cardiovascular risk: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Journal of the American College of Cardiology* 2014;**63**(25_PA):2960-2984.
49. Dildy T; Evidence For and Against Dietary Recommendations to Prevent Cardiovascular Disease. *Texas Heart Institute Journal* 2015;**42**(3):234-236.
50. Linton R; The Thunder Ceremony of the Pawnee. *Leaflet* 1922:1-19.
51. Dorsey GA. *The Mythology of the Wichita*: University of Oklahoma Press, 1904.
52. Armitage P; The Religious Significance of Animals in Innu Culture. *Native Issues* 1984;**4**:50-56.
53. Pisteolak P, Eber DH. *People from Our Side: A Life Story with Photographs and Oral Biography*: McGill-Queen's University Press., 1993.
54. Oosten J, Laugrand F; The bringer of light: the raven in Inuit tradition. *Polar Record* 2006;**42**(03):187-204.
55. Walker J. *Lakota belief and ritual*: U of Nebraska Press, 1980.
56. Spencer B, Gillen FJ. *The native tribes of Central Australia*: ebook@Adelaide <http://ebooks.adelaide.edu.au/s/spencer/baldwin/s74n/> 2014.
57. Baldwin S, Gillen FJ; The Northern Tribes of Central Australia. *London: McMillan* 1904.
58. Spencer B. *Native tribes of the Northern Territory of Australia*: Cambridge University Press, 2010.
59. Roth W, Etheridge R. *Ethnological studies among the north-west-central Queensland Aborigines*: Government Printer, South Africa, 1897.
60. Mathews RH; Phallic rites and initiation ceremonies of the South Australian aborigines. *Proceedings of the American Philosophical Society* 1900:622-638.
61. Berndt R; A Curlew and Owl Legend from the Narunga Tribe. *South Australia, ibid* 1940.
62. Rigby P; The Symbolic role of Cattle in Cogo Ritual. In:Beidelman TOs (ed). *The translation of culture: essays to EE Evans-Pritchard*: Routledge, 2013.
63. Janowski M, Walker H; Masculinity, potency and pig fat: the Kelabit of Sarawak. *The Fat of the Land: Proceedings of the Oxford Symposium on Food and Cooking 2002*: Oxford Symposium, 2003.
64. Strathern A; Witchcraft, greed, cannibalism and death: some related themes from the New Guinea Highlands. In: Bloch M, Parry Js (eds). *Death and the Regeneration of Life*: Cambridge University Pre, 1982, 111-133.
65. Stewart P, Strathern A; Politics and poetics mirrored in indigenous stone objects from Papua New Guinea. *The Journal of the Polynesian Society* 1999:69-90.
66. Molinowski B; Magic, Science and religion. In:Robben ACs (ed). *Death, mourning, and burial: a cross-cultural reader.*: John Wiley & Sons, 2009, 19-22.
67. Koch K-F; Sociogenic and Psychogenic Models in Anthropology: The Functions of Jale Initiation. *Man* 1974:397-422.
68. Herdt GH. *Fetish and Fantasy in Sambia Iitiation*: University of California Press, 1982.
69. Koss-Chioino J, Leatherman TL, Greenway C. *Medical Pluralism in the Andes*: Psychology Press, 2003.
70. Sandweiss D, Wing E; Ritual rodents: the guinea pigs of Chinchu, Peru. *Journal of Field Archaeology* 1997;**24**:47-58.
71. Conklin B; "Thus Are Our Bodies, Thus Was Our Custom": Mortuary Cannibalism in an Amazonian Society. *American Ethnologist* 1995;**22**(1):75-101.
72. Marlowe F. *The Hadza: Hunter-gatherers of Tanzania*: University of California Press, 2010.
73. Woodburn J; Social dimensions of death in four African hunting and gathering societies. In: Bloch M, Parry J, Jonathans (eds). *Death and the Regeneration of Life*: Cambridge University Press, 1982, 187-210.
74. Woodburn J; Egalitarian societies. *Man* 1982:431-451.

75. Power C, Watts I; The woman with the zebra's penis: gender, mutability and performance. *Journal of the Royal Anthropological Institute* 1997;**3**:537-560.
76. Willoughby WC; Notes on the Initiation Ceremonies of the Becwana. *The Journal of the Royal Anthropological Institute of Great Britain and Ireland* 1909;**39**:228-245.
77. Peristiany JG; The Age-Set System of the Pastoral Pokot. The " Sapana" Initiation Ceremony. *Africa* 1951:188-206.
78. de Garine I; Meat: Between ritual and gastronomy. *Estudios del hombre* 2004(19):73-89.
79. Houseman M; The interactive basis of ritual effectiveness in a male initiation rite. . In: Boyer Ps (ed). *Cognitive Aspects of Religious Symbolism*, 1993.
80. Joiris DV; 10 A comparative approach to hunting rituals among Baka Pygmies (southeastern Cameroon). In: Kent Ss (ed). *Cultural diversity among twentieth-century foragers: an African perspective*: Cambridge University Press., 1996, 245.
81. *People of Africa*. <http://www.africanholocaust.net/peopleofafrica.htm> (Date Accessed, date last accessed)
82. Spencer P; The Transfiguration of Samburu Religion. 2011.
83. Spencer P. *The Maasai of Matapato: A study of rituals of rebellion*. London: Routledge, 2004.
84. Pritchard EE; 49. A Note on Rain-Makers Among the Moro. *Man* 1938:53-56.
85. Carstens P; The socio-economic context of initiation ceremonies among two Southern African peoples. *Canadian Journal of African Studies/La Revue ...* 1982.
86. Buhrmann M; Initiation of Xhosa Indigenous Healers (Amagqira). In: Mahdi LC, Foster S, Little Ms (eds). *Between & Between: Patterns of Masculine and Feminine Initiation*, 1987, 439-456.
87. Turner VW. *The forest of symbols: Aspects of Ndembu ritual*: Cornell University Press, 1967.
88. Sleptsov PA; Marriage Customs of the Yakuts (Sakha). *Culture incarnate: native anthropology from Russia* 1995:173.
89. Siimets Ü; The Sun, the Moon and firmament in Chukchi mythology and on the relations of celestial bodies and sacrifices. *Folklore: Electronic Journal of Folklore* 2006;**32**:129-156.
90. Raudvere C, Schjodt J. *More Than Mythology: Narratives, Ritual Practices and Regional Distribution in Pre-Christian Scandinavian Religions*: Nordic Academic Press., 2012.
91. Bonnefoy Y, Doniger W. *Asian mythologies*: University of Chicago Press, 1993.
92. West H; Blackfoot Country. *Montana: The Magazine of Western History* 1960.
93. Ewers JC; The medicine rock of the Marias: A blackfoot shrine beside the whoop-up trail. *The Montana Magazine of History* 1952:51-55.
94. Leeming DA. *Mythology: The Voyage of the Hero*: Oxford University Press, 1998.
95. McGhee R; Ivory for the sea woman: The symbolic attributes of a prehistoric technology. *Canadian Journal of Archaeology/Journal Canadien d'Archéologie* 1977:141-149.
96. Dorsey GA. *The Pawnee: Mythology*: Carnegie institution of Washington, 1906.
97. Dorsey GA. *Traditions of the Osage*: Field Columbian Museum, 1912.
98. Piddington R; Karadjeri initiation. *Oceania* 1932;**3**(1):46-87.
99. Gregor T, Tuzin DF. *Gender in Amazonia and Melanesia: an exploration of the comparative method*: Univ of California Press, 2001.
100. Steele PR. *Handbook of Inca mythology*: ABC-CLIO, 2004.
101. Rink H. *Tales and Traditions of the Eskimo: With a Sketch of Their Habits, Religion, Language and Other Peculiarities*: Courier Corporation, 1875.
102. Tein T, Shimkin D, Kan S; Shamans of the Siberian Eskimos. *Arctic anthropology* 1994:117-125.
103. Helfman G, Collette B. *Fishes: the animal answer guide*: JHU Press, 2011.
104. Grayson J. *Myths and legends from Korea: an annotated compendium of ancient and modern materials*: Routledge, 2012.
105. Colarusso J. *Nart sagas from the Caucasus: Myths and legends from the Circassians, Abazas, Abkhaz, and Ubykhs*: Princeton University Press, 2014.

106. Strathern A, Bloch M, Parry J. *Witchcraft, greed, cannibalism and death: some related themes from the New Guinea Highlands*: Cambridge University Press, 1982.
107. Evelyn-White HG. *Hesiod, the Homeric hymns, and Homeric*: W. Heinemann, 1920.
108. Hansen WF. *Handbook of Classical Mythology*: ABC-CLIO, 2004.
109. Li S, Luckert KW. *Mythology and Folklore of the Hui, A Muslim Chinese People*: SUNY Press, 1994.
110. Yang L, An D, Anderson Turner J. *Handbook of Chinese Mythology*: Oxford University Press, 2008.
111. Miura K. *Yukara epos of the Ainu*. <http://www.sacred-texts.com/shi/ainu/yukara.htm> (Date Accessed, date last accessed)
112. Batchelor J. *The Ainu and their Folk-lore*: Religious Tract Society, 1901.
113. Beckwith MW. *Hawaiian mythology*: University of Hawaii Press, 1940.
114. Kramer SN. *Sumerian Mythology*: University of Pennsylvania Press, 1972.
115. Dowson J. *A classical dictionary of Hindu mythology and religion, geography, history, and literature Vol. 6*: Trübner & Company, 1879.
116. Williams G. *Handbook of Hindu mythology*: ABC-CLIO, 2003.
117. Jones R, White N; Point blank: stone tool manufacture at the Ngilipitji Quarry, Arnhem Land, 1981. In: Meehan B, Jones Rs (eds). *Archaeology with ethnography: An Australian perspective*, 1988, 51-87.
118. Griffiths G, Trigger D. *Disputed territories: land, culture and identity in settler societies*: Hong Kong University Press., 2003.
119. Biesele M. *Women like meat: the folklore and foraging ideology of the Kalahari Ju/'hoan*: Witwatersrand University Press, 1993.
120. Goldman L, Ballard C. *Fluid Ontologies: Myth, Ritual, and Philosophy in the Highlands of Papua New Guinea*: Greenwood Publishing Group, 1998.
121. Rival L; The growth of family trees: understanding Huaorani perceptions of the forest. *Man* 1993:635-652.

