Meat Is Good to Taboo*

Dietary Proscriptions as a Product of the Interaction of Psychological Mechanisms and Social Processes

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ABSTRACT

Comparing food taboos across 78 cultures, this paper demonstrates that meat, though a prized food, is also the principal target of proscriptions. Reviewing existing explanations of taboos, we find that both functionalist and symbolic approaches fail to account for meat's cross-cultural centrality and do not reflect experience-near aspects of food taboos, principal among which is disgust. Adopting an evolutionary approach to the mind, this paper presents an alternative to existing explanations of food taboos. Consistent with the attendant risk of pathogen transmission, meat has special salience as a stimulus for humans, as animal products are stronger elicitors of disgust and aversion than plant products. We identify three psychosocial processes, *socially-mediated ingestive conditioning*, *egocentric empathy*, and *normative moralization*, each of which likely plays a role in transforming individual disgust responses and conditioned food aversions into institutionalized food taboos.

Introduction

Cultural understandings concerning food, edibility, contamination, and related topics exhibit enormous variation across groups (Barer-Stein 1999; Rozin 2000; Simoons 1994). However, despite such evident heterogeneity, investigators (e.g., Rozin 1987; Haidt et al. 1997; Simoons 1994; Tambiah 1969) have offhandedly suggested that animals and animal products seem especially likely to be the focus of food taboos. The possibility of uniformity

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in a domain subject to substantial variation is of great interest, for such patterns cry out for explanation (Brown 1991). We have therefore conducted the first systematic ethnological investigation of food prohibitions designed to evaluate the relative prominence of animal products as a focus of taboos. After describing the methods used in our investigation we present results demonstrating that meat is indeed disproportionately represented in food taboos. Reviewing the two principal existing explanations of food taboos, we find that neither functionalist nor symbolic approaches provides a compelling account. We therefore consider a variety of psychosocial processes that may contribute to taboo formation, highlighting the role of emotions in each process. Arguing that meat, while nutritious, is also potentially dangerous, we propose that natural selection has produced an ambivalence toward meat such that, compared to other foods, meat is more likely to become the target of disgust. We then show how this predisposition can articulate with the psychosocial processes that generate taboos, thereby accounting for the prominence of meat in food proscriptions.

A Cross-Cultural Study of the Targets of Food Taboos

The Sample of Food Taboos and the Problem of Non-independence

Anthropologists often subsume proscriptions of markedly differing types under the rubric of 'taboo' (Valeri 2000:43-6). While this practice eliminates distinctions that are vital for understanding the details of any given cultural system, because our goal is to investigate patterns of human belief at their broadest, we adopt an extreme version of this approach, treating all food proscriptions as equivalent regardless of whether they apply to all or part of society, all or part of a species or food item, or all or part of the calendar or life span. To collect data on taboos we conducted an extended survey of print and electronic ethnographies and studies in related fields. We also contacted investigators known to have worked on taboos, and employed a snowball strategy to learn of others possessing relevant data. So as not to weight the study toward heavily-investigated societies, we avoided using many sources on the same culture. While our search was, to our knowledge, the most extensive ever undertaken, we make no claim that it was exhaustive. However, although there are doubtlessly numerous sources that we did not encounter, there is no reason to believe that our methods biased the nature of the data collected. Our search produced information

on food prohibitions (henceforth used interchangeably with 'taboos') in seventy-eight cultures. For each culture, the first five taboos encountered in the text(s) were noted (if fewer than five taboos were listed in the source, all were noted). Limiting the number of taboos per culture provided an initial constraint on the disproportionate influence of societies having a large number of taboos; we selected five as the cut-off because inspection suggested that this was slightly above the average number of taboos reported. Because we had previously demonstrated that taboos imposed on pregnant women focus primarily on meat (Fessler 2002), pregnancy taboos were excluded in order to avoid prejudicing the results. Using food groups commonly employed in the nutrition literature, the number of taboos was tallied for the following categories: meat, vegetables, fruit, sweets, dairy products, and starches. Because our work on pregnancy taboos suggested that spicy foods have special salience as the target of taboos, we included this as a seventh category. Results are displayed in the Appendix. For illustrative purposes, Table 1 presents the average number of taboos on meat versus taboos on all non-meat foods. Note that, in each region, meat taboos are more frequent than non-meat taboos, and, with the exception of Southeast Asia, this difference is quite marked.

If all ethnographies were independent sources of data, simple statistical tests could be performed on the Appendix. However, such an approach risks committing Galton's error, the assumption of independence among societies that do not constitute independent data points. The possibility of i) the diffusion of cultural traits between neighboring societies, and ii) the recent splintering of once homogeneous groups makes any such test problematic. Previous attempts to solve this problem employ autocorrelation techniques to recalibrate inflated sample sizes (Naroll 1976) or contingency tables that collapse matrices by the amount of excess to balance the number of cells in each independent category (Strauss & Orans 1975). These techniques underestimate the variance of data points within independent samples and may skew confidence intervals in favor of the null hypothesis. However, these problems can be managed using bootstrapping techniques. Standard bootstrapping involves the sampling of the original data (with replacement), and the execution of some formula of interest to create a sampling distribution of the statistic of interest on which hypothesis tests can be performed (Fox 1997). Although this method solves the

Table 1

Average number of meat and non-meat taboos per society by geographic region

Region	Meat	non-Meat
Australia	4.44	0.33
C. America	2	0
East Asia	3	1.33
Europe	5	0
Mid. East	5	0
N. Africa	2.4	1.4
N. America	3.2	0.1
Oceania	2	0.85
S. Africa	3.33	0.58
S. America	3.5	0.1
S. Asia	2.6	0.4
S. E. Asia	1.88	1.63
Totals	38.35	6.72
Total Mean	3.2	0.56
S.D.	1.59	0.13

problem of non-normally distributed error, it does not solve the problem of non-independence, as bootstrapping too assumes that the original set is composed of independent data points. We therefore devised a novel bootstrapping technique that corresponds to a *z*-test for proportions, uses all available data, does not underestimate variances by averaging out data points into contingency tables, and minimizes Galton's problem of non-independence.

Methods of Statistical Analysis

We organized all of the societies in our sample into twelve geographic/cultural regions that we treat as roughly independent areas. This approach is conservative in that, by clustering societies in categories larger than commonly-recognized culture areas, we decreased the likelihood that, if we compared two societies from different categories, they would share substantive historical links. We wrote software that randomly chose a geographical region and then randomly selected one culture from within that

region.[1] The program repeated this process with replacement until the number of samples equaled the number of geographic regions ($n = 12$). The frequencies of taboos for each food category (e.g. meat, fruit, etc.) were then converted to proportions that describe the relative occurrence of taboos in the meat category versus the relative occurrence of taboos in each non-meat category, resulting in a total of seven tests of differences of proportions. The process was repeated 10,000 times to create, for each comparison, a distribution of differences. p-values were established by calculating the percentage of cases (out of 10,000) in which the value differences for each comparison was less than or equal to zero.

One might argue that each non-meat taboo does not represent a category for a specific tabooed food, as some societies might define food taboos simply with regard to meat versus non-meat. A test of differences in proportions was therefore also performed for the difference between meat taboos and all other food taboos combined. The argument could also be made that multiple meat taboos should not be treated as independent entities, as they may simply represent one taboo against meat, with the diversity regarding different kinds of meat being merely a by-product of a general meat taboo. A more stringent test was therefore performed as well. The number of taboos was collapsed into binary categories signifying the presence or absence of a given taboo type. If there was *any* instance of a taboo for a particular food-category in a given culture, then this was recorded as a "success" for that food-category; *total* absence of taboos in a given food-category for a particular culture resulted in that category being given a "failure." The bootstrap sampling technique described above was employed to create a sample distribution of the proportional differences between meat taboos and each non-meat food taboo. A test of the proportional difference between meat and all non-meat taboos combined was performed as well. The method for testing null hypotheses was identical to that described above.[2]

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[1]Software used in this analysis was written in Microsoft©Visual Basic 6.0. A free copy of the software can be obtained from the authors.

[2]This procedure also addresses the problem that, for each culture, our original five or fewer taboos were cataloged without reference to the relative abundance of each food type in the given environment, information that is frequently absent in ethnographic accounts.

Results of Statistical Analyses

All of the tests generated statistically significant results for each comparison. In 10,000 sample iterations, not one case ever returned a difference in proportions that was not in favor of meat taboos. Since the value zero never occurred in our frequency distribution, and *p*-values can be estimated as the proportion of times the differences are less than or equal to zero out of the total number of replicates, *p*-values were estimated as a number less than 1 out of 10,000.

The results of the analysis of the differences in the proportion of general meat taboos present versus the presence of other food taboos yielded statistically significant results (Table 2). After 10,000 replicates, no cases ever returned a difference between the two proportions not in favor of meat taboos. The test of the comparison of the difference between the presence of any meat taboo and the presence of any non-meat taboo combined also revealed a difference that was statistically significant. Out of 10,000 replicates, the difference between the two proportions was equal to or biased toward non-meat taboos in only 13 cases, revealing a *p*-value of 0.0013. We therefore conclude that, *compared to all other substances, meat is vastly more likely to be the target of food taboos.*

The Puzzle: Why are Animals a Central Focus of Taboos and Dietary Avoidances?

The pervasive centrality of meat in food taboos is surprising. Consistent with their nutritional value as a concentrated source of protein and fat, meat and other animal products (hereafter generically referred to as 'meat') are highly valued in the majority of the world's societies regardless of their actual dietary significance (Jochim 1981; Harris 1985; Abrams 1987; Fiddes 1991; Stanford 1999). It thus appears paradoxical that the same category should contain both the most prized and the most proscribed foods. In addition, most societies seem not to exploit the full range of animal products available to them (Haidt et al. 1997; Rozin & Fallon 1987; Simoons 1994; Whitehead 2000) – many animals are 'unconsciously tabooed' (Leach 1964) in that, while not explicitly proscribed, they are simply not considered food (cf. Tambiah 1969). Two principal theoretical perspectives on proscriptions, the functionalist school and the symbolic school, have dominated discussions of food taboos to date. Below we

Table 2

Proportions of food taboos

	Meat	Vegetable	Fruit	Dairy	Sweets	Sour	Spicy	Starches	All non-Meat
Proportion of All Taboos	0.8514	0.0303	0.0440	0.0214	0.0149	0.0000	0.0019	0.0361	0.1486
Mean Difference vs. Meat	N/A	0.8211	0.8073	0.8300	0.8364	0.8514	0.8494	0.8153	0.7027
p-value (one-tailed)	N/A	$p < 0.0001$	$p < 0.0001$	$p < 0.0001$	$p < 0.0001$	$p < 0.0001$	$p < 0.0001$	$p < 0.0001$	$p < 0.0001$

First row shows the proportion of each tabooed category of food out of 10,000 samples. Second row shows the difference between taboos on meat and taboos on each of the other food categories. Third row shows the probability that these differences are equal to zero.

evaluate these perspectives with particular attention to their ability to explain the centrality of meat in food taboos.

Functionalist Explanations of Animal Taboos

Indirect Benefit Explanations of Food Taboos

Functionalist perspectives argue that proscriptions are explicable in terms of their utility. In general, little attention is paid to the details of emic perspectives, or the processes whereby they come about, as these are seen as incidental to the long-term question of the survival of a given practice over time. Functionalist views can be divided into those that postulate indirect benefits stemming from taboos and those purporting direct benefits.

Prominent among positions based on indirect benefits is the idea that meat taboos promote sustainable and/or efficient resource utilization, either by precluding husbandry of locally ecologically destructive or uneconomical species (e.g. Harris 1985), by preventing disruptive overexploitation of some facet of the local ecology, or by precluding inefficient use of available resources (e.g. Colding and Folke 1997; Mcdonald 1977; Reichel-Dolmatoff 1979; Ross 1978). Group-functional understandings of this type could conceivably be shaped by cultural group selection, and could persist if developed in conjunction with enforcement practices (Boyd and Richerson, in press). However, in a number of prominent cases, the purported ecological benefits of food taboos have not held up under careful examination (Alvard 1995; Nietschmann 1978; Simoons 1994), and computer models do not support these propositions (Colding 1998). Arguments based on indirect benefit also have difficulty accounting for the existence of proscriptions and 'unconscious taboos' on animals the consumption of which would actually *improve* resource availability, such as snails, locusts, etc. in agricultural North America. Likewise, many indirect benefit perspectives cannot easily explain taboos which focus on animals that are peripheral to the means of production – why should agriculturalists such as the Navajo, or pastoralists such as the Maasai, proscribe the consumption of fish (Simoons 1994), when the maintenance of fish populations is irrelevant to the sustainability of agriculture or pastoralism?

One indirect benefit hypothesis that addresses some of the above features yet has been largely overlooked to date is Moore's (1983) pro-

posal that the inefficiency of culturally constructed diets is itself functional. Moore suggests that, by artificially constricting the diet, taboos and cultural constructions of edibility limit population growth during periods of abundance (cf. Rosenberg 1980), thereby keeping population levels below the ecologically-defined carrying capacity. As a result, during periods of scarcity an adequate supply of resources continues to exist in the form of normally-avoided items. This argument can be extended to account for the prevalence of meat as a target of taboos by recognizing meat's nutritional value – proscribing some animals may be a means of maintaining an emergency supply of high-quality foodstuffs (cf. Evans-Pritchard 1940:70).

Although Moore's proposal may account for puzzling cases such as the Navajo and the Maasai, it is bedeviled by several problems. First, unless territories are wholly exclusive and trade does not occur, the hypothesized advantages of dietary constriction disappear if longtime neighbors exploit the tabooed foods. In the African case, relations between fish-eating and fish-avoiding societies are long-standing (Simoons 1994:263-265). Second, restriction of group size is a liability if it makes the group vulnerable to hostile neighboring groups (Soltis et al. 1995); history does not reveal a shifting interaction between smaller taboo-possessing societies and expansionist taboo-free societies.

The question of history is central to weak versions of indirect benefit explanations. For example, Carnerio (1978) argues that Amazonian Indian taboos on large game originally allowed for the continuation of settlements near fish-rich lakes and rivers even after game was depleted due to hunting; later, as game populations rebounded, the taboo continued due to "an inertia of its own," (1978:20; cf. Braukamper 1988-1989). The difficulty with such arguments, however, is that they suppose that the forces generating functionality operated only in the distant past – if indirect benefit factors sufficed to produce the taboo originally, why have they failed to eliminate the proscription now that it has become unnecessary or, even worse, costly?

Direct Benefit Explanations of Food Taboos

In contrast to the ecological arguments typical of indirect benefit positions, direct benefit functionalist explanations generally stress the health-promoting aspects of meat taboos. Most famous is the explanation of the

Hebrew pork taboo as a means of avoiding trichinosis (reviewed in Douglas 1966; Simoons 1994). Taboos might also benefit specific portions of the population whose special characteristics change the cost/benefit ratio of meat-eating. For example, Speth (1991) argues that taboos on meat-eating by pregnant women protect this at-risk group from the hazards of excessive protein consumption, while Rappaport (1967) argues that Tsembaga taboos channel beneficial protein to individuals facing psychological stress.

Several problems plague direct benefit explanations of food taboos. First, it is not clear that the benefits outweigh the costs – if pork consumption is more harmful than helpful, why is it so common cross-culturally? Second, purported benefits must explain all relevant practices – if Tsembaga men facing psychosocial stress benefit by eating meat, why, during the period that they have privileged access to pork, is marsupial meat taboo to them? Third, even if benefits outweigh costs, it is not obvious why this ratio should pervasively characterize relations with animals but not plants. Fourth, as Whitehead (2000:78) notes regarding the Seltaman of New Guinea, people use common sense and avoid foods that are bad for them. Accordingly, direct benefits may explain avoidance, but, except in cases where the benefit is unrecognizable to participants, they do not by themselves explain taboos.

Symbolic Explanations of Animal Taboos

Eschewing questions of utility, symbolic approaches attempt to explain food taboos in terms of the meanings that their targets hold for actors. From this perspective, the centrality of animal products can be seen as stemming from the network of ideational associations that surround animals, while the ubiquity of this pattern cross-culturally can be seen as a reflection of the importance of animals in human thinking.

As has long been discussed in anthropology, many taboos revolve around issues of purity and pollution (Douglas 1966; Durkheim 1926; Frazer 1927; Smith 1894). Emic explanations of food taboos thus often fall into two broad categories, objects which the actor defiles (the sacred), and objects which defile the actor (the profane). Many potential food sources are proscribed because they are seen as having special supernatural powers, as occupying a high position in a cosmology, or both. Prototypical of this

class are totemic entities. Consistent with the pattern evident in the larger class of taboos, totemic beliefs are dominated by ideas about animals. One plausible explanation for this pattern is that totemism revolves around notions of a shared essence associated with a specific pattern of attributes. Because animals are animate, they possess a far greater number of attributes that are potentially relevant to actors in a social world (cf. Lévi-Strauss 1963; Willis 1990). Likewise, by virtue of being animate, animals are more likely than plants to figure prominently in origin myths involving dynamic events.

Magical thinking wherein the consumer is thought to acquire the properties of the object consumed appears to be pervasive, and this may contribute to many beliefs about food (Frazer 1927; Rozin 1999). As in totemism, animals may be a more prominent target for taboos resulting from magical thinking because, being animate, they have a wider range of attributes from which parallels to human behavior and character can be drawn (cf. Johnson & Baksh 1987:401-402; Schieffelin 1990:67-68; Valeri 2000:162). However, both the totemic explanation and the sympathetic magic explanation, while doubtlessly capturing a portion of all taboos, are nonetheless insufficient to account for the pervasive centrality of animal products in food taboos since many prohibitions do not overtly involve either totemic or sympathetic magical reasoning (cf. Valeri 2000:95-96).

A prominent class of symbolic explanations of food taboos emphasizes the categorical ambiguity of the target substance. For example, Douglas (1966) argues that the Hebrew proscription on pork revolves around the fact that, while pigs have cloven hoofs like ungulates, they do not chew their cud. Likewise, amphibians are at once aquatic and terrestrial, while water fowl both fly and dive, and hence these creatures are proscribed (cf. Radcliff-Brown 1922). In a similar vein, Leach (1964) proposes that taboos focus on entities classed at the periphery of categories, the antitheses of prototypicality. By virtue of their branching phylogenetic trees and ensuing patterns of similarity, species lend themselves to systems of categorization based on prototype resemblance (cf. Mervis & Rosch 1981). Leach suggests that species that are poor exemplars of their category arouse a negative response in observers. This response can result in 'unconscious tabooing,' classification of certain species as 'not food,' or it can set the stage for

symbolic elaboration and justification that culminates in taboo formation. Tambiah (1969), following Leach, draws attention to the importance of the human/animal divide in taboo generation, and the role of place in conceptualizing animals (see also Bulmer 1967). Animals that live in close association with humans are often identified with humans such that eating them becomes linked to either cannibalism or animality, or both (Fiddes 1991:132-143; cf. Whitehead 2000:111; but compare with Powers & Powers 1986). Viewed in terms of prototypicality, such animals occupy a marginal space, for they have been drawn by their association with humans away from the defining features of animals, namely that, as evidenced by their amoral behavior, animals are the antithesis of humans.

Sperber (1996b) argues that, because prototypicality plays an important role in human categorical reasoning, anomalous animals are intrinsically intriguing. As a consequence, anomalous animals invite symbolic loading, and such ideas are likely to spread due to their ability to grab people's attention. It is plausible that a fascination with prototype-violating exceptions underlies those aspects of food taboos identified by Douglas, Leach, Tambiah, and others. However, simply being fascinated by something does not inherently lead one to conclude that the object is dangerous and must be avoided, or that it is sacred and must not be eaten. Accordingly, although prototype-violation may sometimes explain why some ideas about animals spread and persist while others do not, it does not explain why these ideas should take the form of taboos. Moreover, it is not clear that questions of prototypicality and its violation fully explain the special salience of animals. Granted, by virtue of being animate, animals may exhibit a wider range of salient criteria that facilitate categorization, and this may then lead to a larger number of categorically ambiguous cases, and hence (via unspecified processes) to a larger number of animal product taboos. However, as Valeri (2000:74-83) points out in criticizing Douglas, the classificatory criteria by which anomalous animals are defined are highly variable, and are sometimes inconsistent within a given culture. If flexibility is easily exercised, it is no longer clear that the taxonomic affordances of vertebrates can account for animals' greater centrality. Moreover, the classificatory perspective alone cannot explain why people seem largely oblivious to categorical ambiguities in the plant domain. Is a tomato a fruit? Is a peanut a legume? These are not issues that have led to traditions that cause actors

to recoil in revulsion at the prospect of eating a plant food, yet they are no less logically problematic than the fact that pigs have cloven hooves but do not chew their cud. Likewise, the much-heralded 'matter-out-of-place' issue is of little concern in the case of plants – most edible plants grow on land, yet, despite growing in water, rice and water cress are not tabooed as dangerous and disgustingly impure substances, nor are they defined as outside the domain of foods. Similarly, in the West people commonly grow herbs in pots in the kitchen, yet herbs are not then associated with the 'human/house' domain such that it would be unthinkable to eat them.

It is clear that symbolic processes underlie the web of meaning within which explicit food taboos exist, and that the meaning of an object importantly shapes individuals' reactions to the prospect of eating it (cf. Rozin 1999; Whitehead 2000). However, while many features of animals lend themselves to symbolism, the above objections indicate that, like functionalist approaches, purely symbolic perspectives are ultimately unable to account for the pervasive centrality of meat in proscriptions.

Etic Psychologies and the Investigation of Taboos

Taboos, like other elements of culture, constitute information that is created, transmitted, and held by human minds (Aunger 2002). When similar ideas occur in markedly disparate cultures it is likely that these ideas are a product of either 1) features of panhuman psychology, 2) recurrent features of the environment, or 3) the interaction of (1) and (2). Accordingly, any attempt to explain pervasive features of taboos must be grounded in an understanding of the workings of the human mind and its relationship with the physical world. Functionalist approaches to taboos essentially ignore human psychology. The functionalist portrait is one in which useful practices come to predominate through poorly-specified processes of cultural evolution – little or no attention is paid to the processes whereby ideas are created, promulgated, and perpetuated by individual actors. Symbolic approaches, though premised on psychological assumptions, typically fail to provide any explanation linking individual experience and shared belief. It is assumed, for example, that humans employ categorical prototypes, and that violations of prototypes attract our attention, but no explanation is provided as to why actors work to prevent others from consuming foods

marked by such salience. Traditional symbolic approaches are based on a portrait of human psychology that operates in a social vacuum. More compelling are applications of symbolic perspectives which explore how meanings shape emotional experience and ensuing behavior (e.g., how meat becomes disgusting for proselytizing vegetarians – Rozin et al. 1997; see also Whitehead 2000). However, such approaches still fail to fully account for the processes whereby individuals generate, acquire, and perpetuate those meanings. A theoretically-grounded model of the human mind is needed, one that includes an explanation of the forces underlying the creation and enforcement of proscriptions.

Despite anthropology's long-standing interest in human evolution, to the extent that anthropologists have attended to the structure of the human mind, they have largely failed to ask why any particular features of mind should exist, or how they could have evolved. In contrast, the growing field of evolutionary psychology analyzes the mind in light of the adaptive challenges that confronted our ancestors. In the sections that follow we describe a number of likely avenues for taboo genesis; in each case, we seek to ground our description in evolutionarily plausible explanations of human psychology.

Some Processes Whereby Taboos May Arise, Persist, and Spread

Normative Moralization

In response to a common environment, a shared predisposition often leads to patterned behavior across members of a group. Observers may then note the prevailing pattern and imbue it with rectitude, a process we term *normative moralization.* Motivated by moral sentiments, actors then proscribe violations of the pattern. For example, right-handedness predominates in all populations and, in disparate cultures, the right hand is associated with purity, politeness, etc., while antithetical associations attend the left hand (Corballis 1980).

The human propensity to attribute moral weight to prevailing patterns of behavior is explicable with reference to the benefits to be reaped by inclusion in cooperative ventures. Complex human cooperation is predicated on adherence to shared standards for behavior. Once such cooperation evolved, it therefore became important to both identify and conform to

many shared standards, since conformity across domains advertises the actor's predictability, thus increasing the likelihood of recruitment to cooperative ventures (Fessler 1999). Cooperation can only evolve when free-riding noncooperators are punished. However, because inflicting punishment is costly, actors are tempted to let others bear such costs, with the result that punishment fails to occur, leading to the collapse of cooperation. This situation is precluded by third-order punishment, i.e., punishing individuals who fail to punish noncooperators (Boyd & Richerson 1992). Once punishment for noncooperation exists, knowing the nature of shared standards is doubly important, since this allows the individual to both reap the benefits of cooperation and avoid being punished; moreover, once third-order punishment exists, assigning moral weight to standards is of increased importance, since this leads the individual to negatively sanction nonconformists, thereby avoiding third-order punishment. Because many standards are tacit, ancestral individuals who were predisposed to both attend to prevailing patterns of behavior and moralize them would have had an advantage, as they would have both readily inferred the nature of standards and readily punished nonconformists. We therefore propose that all humans possess a propensity for normative moralization and attendant sanctioning behaviors. We thus expect normative moralization to have played a role in the genesis of any taboos that reflect spontaneously-occurring patterns of behavior (cf. Bateson 1983).

Egocentric Empathy

A second process that may contribute to taboo formation concerns the evocative power of others' behavior. Witnessing another's actions and imagining oneself in the other's position can lead to two types of subjective response. In true empathy, the observer vicariously experiences the *state* of the observed other. In contrast, in what we term *egocentric empathy,* individuals experience others' *behavior* as if it were their own, yet ignore others' subjective states, relying on their own dispositions instead. For example, adults experience disgust when watching a toddler consume his own feces even though the child displays no signs of revulsion. A clue to the possible evolutionary origins of egocentric empathy lies in the observation that disgust and fear seem to be the principal emotions associated with it (for example, try to generate a scenario in which you would egocentrically

empathically experience happiness). Disgust and fear relate to the prospect of harm. In ancestral environments individuals who placed themselves at risk often endangered those around them – contracting disease or attracting predators threatens not merely the actor, but the actor's neighbors as well. The capacity to egocentrically empathically experience disgust and fear may therefore have been advantageous in that it led individuals to either distance themselves from others engaging in potentially dangerous actions or seek to prevent such actions from occurring. If, as we suggest, this propensity is panhuman, then it is only a small step to institutionalization – when a significant fraction of a group experiences the same aversive response to a given action, egocentric empathy can contribute to the formation of taboos, as observers seek to prohibit actors from doing things that cause the observers pain (cf. Westermarck 1906:116-117).

Socially Mediated Ingestive Conditioning

One of the keys to our species' success is omnivory, as dietary flexibility has allowed us to exploit widely varying habitats. However, omnivory also carries the liability of exposing the organism to a wider range of toxins than is true of more restricted diets (Rozin 1976). Apparently in response to this dilemma, omnivores rely upon social information in responding to novel foods (Strum 1983; Visalberghi et al. 1998), as attention to adverse reactions by conspecifics allows the individual to identify toxic substances without paying the costs associated with ingestion. Social transmission of dietary avoidances has been documented in a number of omnivorous species (Hikami et al. 1990; Mason et al. 1984; but see also Galef et al. 1990).

Many creatures, including humans, possess the ability to rapidly learn to avoid substances that induce nausea (Bernstein 1999). Humans often experience nausea and disgust when witnessing another's vomiting. While the ability to manipulate both a theory of mind and symbolic representations doubtlessly affects our reactions in such circumstances, the nonhuman data suggest that, beneath these complex apparati, we likely share with other omnivores a mechanism whereby vicarious learning of toxicity takes place. By making the sight of toxicosis nauseogenic, natural selection has bootstrapped an existing mechanism to serve a new purpose. We refer to the vicarious acquisition of food aversions

as *socially mediated ingestive conditioning*. Because the experiences of a few actors can be observed by a large audience, a few cases of toxicosis can contribute to the generation of widespread avoidances. In humans, such widespread avoidances can function as precursors to food taboos since, once an avoidance is common, both normative moralization and egocentric empathy may come into play, i.e., widespread avoidances may be imbued with moral rectitude, and actors may seek to prohibit actions that they find aversive.

Biased Transmission, Direct Observation, and Self-Serving Manipulation

Socially mediated ingestive conditioning allows individuals to exploit the experiences of others. While humans apparently share this domain-specific mechanism with many species, we are unique in the extent to which we rely on conspecifics as a source of information. Moreover, the food domain is one in which cultural transmission can be expected to be particularly important given the high costs of erroneous selections during individual experimentation (Aunger 2002). However, this reliance is not unproblematic since, in a world of heterogeneous social actors, the individual must decide which role model to imitate.[3] Boyd and Richerson (1985) have shown that two strategies allow individuals to choose effectively from a smorgasboard of imitatable social models. First, because locally successful behaviors often persist while unsuccessful behaviors often disappear, actions that are common in the local population frequently possess high adaptive value. Accordingly, one useful strategy is 'When in Rome, do as the Romans do.' The uniquely human emotions *shame* and *pride* motivate an awareness of, and a conformity to, prevailing patterns of behavior (Fessler 1999), thereby actualizing what Boyd and Richerson term *conformist transmission*. Second, because, for the majority of our species' history, social position was achieved rather than ascribed, in ancestral populations prestige was often an accurate index of the utility of a given actor's behaviors. In such circumstances an effective strategy is *prestige-biased transmission*, imitating the

[3]Aunger (2002) recently demonstrated that, in one society, an actor's adherence to specific food taboos is explicable primarily in terms of the individual's social roles, i.e., individuals imitate those whom they view as possessing a similar culturally constructed identity.

beliefs and practices of high-status individuals (typically of the same gender as, and sometimes of similar age to, the imitator). *Admiration* forms the core of a cluster of attitudes and motivational states crafted by natural selection that underlie this pattern of information acquisition (Henrich & Gil-White 2001). Hence, if a critical mass of individuals avoids a given food item or (later in the process) subscribes to a proscription, individual experiences of shame and pride may enhance the spread and perpetuation of this behavior (see Whitehead 2000 for examples). Likewise, if high-status individuals avoid a food item or subscribe to the taboo, the same results may be produced via experiences of admiration (see Aunger 2000; Kelly 1993; Whitehead 2000).

In addition to our dependence on socially transmitted information, humans seek out causal relationships between events. Associated with this propensity is a tendency to classify, particularly in the social world. Accordingly, witnessing another's nausea and vomiting following the consumption of a particular food item is likely to often lead people to conclude that a) the given individual should not consume the given item, and b) people similar to the given individual should not consume the given item. For example, a number of food taboos associated with pregnancy are emically justified with reference to the vomiting that follows ingestion during pregnancy (see Fessler 2002). Finally, patriarchy and other power disparities probably interact with direct observation, as arbiters of tradition are more likely to seize on observations that, when generalized, lead to proscriptions that benefit them at others' expense.

Experience-Distant Versus Experience-Near in Emic and Etic Accounts

We believe that emotions hold the key to understanding taboos. Simoons (1994:299) cites disparate ethnographic and historical examples in claiming that, while violations of plant food taboos may lead to loss of status, powerful feelings of revulsion accompany violations of animal food taboos (cf. Whitehead 2000:107). Functionalist explanations offer no reason why actors should associate particular emotions with food taboos. Symbolic explanations are no more experience-near, since emic accounts often fail to foreground the reasoning processes that symbolists claim underlie taboos. For example, when Moslem Bengkulu informants are asked why

they avoid pork, they first state that it is forbidden, then remark on the repugnant eating habits of the animal (first author's field notes).[4] Like the ancient Greeks (Simoons 1994:310), they respond likewise with regard to dog, as do Seltaman (Whitehead 2000:89) and Matsigenka (Johnson & Baksh 1987) informants. Hindus (Simoons 1994:150-151) and Matsigenka (Johnson & Baksh 1987:402) have the same response regarding chickens, as do Kafirs and Tibetans (Simoons 1994:280, 289) regarding fish. In general, it appears that informants' initial explanations as to why some animal is not eaten is often simply "It's disgusting!" The underlying logics discovered by symbolists may in fact exist, and some informants may be able to articulate some portion thereof. However, these concepts seem unlikely to be foremost in informants' minds when reacting to the prospect of eating a tabooed or avoided food (see also Whitehead 2000:94; cf. Bulmer 1967:21). Matter out of place or categorical anomalies may well be tied to contagion ideation and disgust reactions, but, contrary to prevailing perspectives, *it is not clear that the former causes, or even precedes, the latter*. To explain the link between disgust and the centrality of meat in food taboos, we return to the premise that each feature of the human mind is a response to an adaptive challenge faced by our ancestors.

An Evolutionary Psychological Explanation of the Special Salience of Meat

Meat is Dangerous

As a class, animal food products pose unique threats. Animals harbor a wide range of bacteria and protozoans, either as parasitized hosts or as symbionts (cf. Schantz & McAuley 1991). Because all animal tissues share a common biochemical makeup, organisms that exploit features of one species' tissue are often able to do likewise with the tissue of another species. Furthermore, when an animal dies, its immune defenses die with it, allowing for the proliferation of pathogens, whether they are present in the animal at death or simply ubiquitous in the environment. Granted, meat is not the only ingestible source of danger in the environment,

[4]This explanation of the Hebrew pork taboo is ancient (see Simoons 1994:65-66); although Douglas (1966) initially rejected this argument, she later conceded that the pig's diet was a contributing factor (Douglas 1975:272).

as many plants are poisonous. However, many hazardous plants have highly detectable properties (Hladik & Simmen 1996). This is likely not accidental, as most plant toxins are secondary compounds produced to prevent or discourage consumption by vertebrates and insects, hence natural selection has favored the use of clear signals of toxicity that warn potential consumers. In contrast, in the case of pathogens, depending upon the mode of transmission, natural selection is either neutral with regard to detectability or else favors crypsis. Although bacteria produce detectable odors when proliferating on meat, detection is generally not possible with regard to pathogens (particularly protozoa) present at death. Lastly, although cooking meat can greatly reduce the risk of pathogen transmission, this is only true when meat is cooked thoroughly and hands and implements are disinfected prior to consumption. For most of human history, neither criterion is likely to have been consistently met, hence cooking will not have eliminated the dangers of meat eating. Animal foods have thus posed a distinct risk of pathogen transmission. In the evolution of nonhuman and human alike, this risk appears to have selected for psychological mechanisms generating particular caution toward meat.

Meat as a Stimulus in Nonhuman Animals

In rhesus macaques, a species that generally does not eat meat, experimental lesions of the amygdala lead to increases in exploration, coprophagia, and meat-eating, suggesting that all three behaviors are normally restricted by an inhibiting mechanism that has been destroyed (Aggleton and Passingham 1981). In the domestic cat, a carnivore, stimulation of the amygdala results in strong aversions to meat, in contrast to more muted reductions in milk and cereal consumption (Lewinska 1968). Protein deprivation in rhesus macaques leads to increased consumption of many otherwise unpalatable foods, yet, despite its high protein content, consumption of meat remains depressed relative to most foods (Hill & Riopelle 1975). Common chimpanzees, white-faced capuchins, and baboons are all avid hunters yet, with few exceptions, none of these animals scavenge, apparently viewing found carcasses as largely inedible (S. Perry, personal communication; Muller et al. 1995; Stanford 1999:121; Strum 1983). Although olive baboons readily consume novel vegetable foods, meat consumption, partic-

ularly of novel prey species, is highly dependent on social cues (Strum 1983) – indeed, even domestic cats may display neophobia towards raw meat (Bradshaw et al. 2000). Lastly, rats develop conditioned aversions more readily to high-protein foods than to high-carbohydrate foods (Bernstein et al. 1984). Meat is thus treated in a uniquely circumspect manner by many nonhuman species.

Meat as a Stimulus in Humans

Like olive baboons, Western experimental subjects are more likely to reject novel foods of animal origin than other novel foods (Pliner & Pelchat 1991). Persuasive arguments can overcome such neophobia with regard to other food types, but have no effect with regard to foods of animal origin (Martins et al. 1997). Simoons, who suggests that neophobia may lie behind many taboos on meat, cites examples of neophobia towards foods of animal origin among the Guiana Indians, Carib Indians, and ancient Assyrians (1994:305-307). In North American, Japanese, Dutch, and Sumatran subjects (Angyal 1941; Fallon & Rozin 1983; J. Haidt, personal communication; Rozin & Fallon 1980; first author's field notes), animal products are prototypical elicitors of disgust.

As in the rat, meat has special salience as a target of conditioned aversions in humans. Mattes (1991), Rodin and Radke-Sharpe (1991), and Logue (cited in Midkiff and Bernstein 1985) report that, in North American samples, meat accounts for more than 1/3 of all acquired aversions, triple the proportion of any other category. Midkiff and Bernstein (1985) obtained a similar result, then compared the salience of each food type with its frequency in subjects' diets, finding that meat is significantly over-represented as a target of aversions. Data provided by de Silva and Rachman (1987) indicate that animal protein constitutes 29% of acquired aversions among Londoners, while Fessler and Arguello (n.d.) found that, at 26% of aversions, meat and related animal products were the most common target among Californian students. Flaxman and Sherman (2000) conducted a meta-analysis of 20 studies of food aversions developed during pregnancy. Sampling 5,432 women across both Western and non-Western societies, they found that meat is the single most prominent target of aversions, being nearly as frequent as all other targeted foods combined (see also Fessler 2002). Meat is similarly central in aversions resulting from

nausea and/or vomiting induced by medical procedures: Among clinically obese patients who undergo gastric bypass surgery, meat is the principal target of aversions (Burge et al. 1995), and meat is likewise prominent in conditioned aversions stemming from chemotherapy (Boakes et al. 1993).

The Interplay of Evolved Predispositions Toward Meat and Processes of Taboo Formation

There is substantial evidence that, like other omnivores, humans possess a psychological mechanism that heightens the salience of meat as a target for disgust and conditioned aversions. In light of this, how well do the taboo-generating processes discussed earlier account for the existence of taboos on meat? First, although normative moralization probably plays a central role in the genesis of many proscriptions, it is unlikely to account for the origins of taboos on the consumption of particular animals. While evolved mechanisms appear to predispose individuals to caution and aversion learning in response to meat, at the same time, meat is of enormous importance to *Homo sapiens*. Paleoanthropological and morphological data support the conclusion that meat has constituted a significant part of the diet of our species since its inception. Although portions of some societies today are vegetarian, all available evidence indicates that meat was a critical part of the diet of every member of our species prior to the advent of agriculture (Cordain et al. 2000; Mann 2000), and, while agriculture may have diminished the importance of meat, it has not eliminated it. Correspondingly, as noted, in most societies meat is valued very highly. Hence, while humans are cautious about novel animal foods and quick to develop aversions to meat, they are also generally attracted to meat consumption. Accordingly, while a given individual may, as a result of idiosyncratic experiences, avoid a particular type of meat, it is unlikely that a significant proportion of that individual's group would spontaneously avoid exactly the same type of meat, hence normative moralization is probably not the first step in the process of meat taboo genesis. Similarly, egocentric empathy alone cannot explain the origins of food taboos on particular animals – given that humans are both attracted to and potentially repulsed by meat, there is no reason to suppose that a significant number of individuals in a group would experience a negative reaction upon seeing someone eat a given type of animal.

In contrast to normative moralization and egocentric empathy, socially mediated ingestive conditioning dovetails well with the special salience of meat: Because poisoned individuals and witnesses share a common propensity to learn aversive associations with meat, avoidance of meat is more likely to occur, and more likely to spread, than is avoidance of other foods. Once a pattern of meat avoidance is common in a population, normative moralization may lead many individuals to seek to institutionalize the avoidance, justifying their perspective through the creation of cosmological or other explanatory schemas. Egocentric empathy may likewise lead to institutionalization, as individuals may seek to prevent others from engaging in behaviors that elicit an aversive response in themselves. In turn, socially mediated ingestive conditioning may then contribute to the spread and perpetuation of taboos and avoidances, as observers may acquire the responses of those who are nauseated at the prospect of violating the taboo or eating something that 'is not food.'

Conformist transmission and prestige-biased transmission are both congruent with the special salience of meat, as the latter can provide an initial bias in the targets of avoidances, thus increasing the likelihood that taboos that ultimately result from these processes will focus on meat.[5] Likewise, direct observation may augment other processes in generating taboos and, given both a) the hazards entailed by meat-eating, and b) the special salience (for both sufferer and observer) of meat as a stimulus, there are likely to be plenty of opportunities to observe negative reactions and outcomes in association with meat. Finally, self-serving behavior on the part of the arbiters of culture can further reinforce the salience of meat as a target of proscriptions since, being a highly valued food, the arbiters of culture are more likely to erect taboos that allow them to monopolize meat than they are to do the same with regard to other foodstuffs (O'Laughlin 1974).

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[5]While the special salience of meat makes it likely that many prestige-based avoidances will focus on animals, compared to the other processes discussed, prestige-biased transmission potentially introduces greater cross-population heterogeneity in the target of taboos. This is because the number of individuals contributing to the content of taboos is smaller, and hence idiosyncratic inclinations achieve greater prominence due to an incomplete sampling of the population (R. Boyd, personal communication).

Emotion and the Direction of Causality in the Generation of Beliefs

While both functionalists and symbolists suppose that emotions are recruited by cultural traditions, we propose that emotions, the products of evolved psychological mechanisms, often both precede cultural traditions and importantly shape them. A growing movement views complex propositional reasoning as frequently the consequence, rather than the cause, of emotional responses to the world (cf. Damasio 1994; Haidt 2001; also Cosmides & Tooby 2000; Greene et al. 2001). Highly intelligent, symbol-reliant humans are capable of, and inclined towards, the generation of elaborate cosmologies and intricate chains of explanation. While we agree that much understanding can be gained from the explication of these schemas, investigators would do well to pause before assuming that such cultural rationales are the principal factor motivating the generation, acquisition, and perpetuation of attitudes and behaviors – they are as likely, if not more likely, to be justifications rather than causes. Likewise, while evolved predispositions may sometimes lead to cultural practices with considerable utility, many cultural practices may arise, spread, and persist not because they benefit the holders or their groups, but because they elicit or are congruent with intuitions generated by panhuman features of mind. Hence, to refine one of the symbolists' under-specified explanations, *some ideas are 'good to think' precisely because they interdigitate well with evolved psychological mechanisms, the outputs of which are often experienced as emotions, and it is this that accounts for the widespread distribution of a small number of concepts across disparate cultures* (cf. Boyer 2000; Sperber 1996a; compare with Barkow 1989; Tooby & Cosmides 1992).[6] Thus, because all humans possess evolved psychological mechanisms that predispose them to view meat as potentially disgusting, taboos and avoidance practices that focus on animals are not

[6]Theorists who conceptualize socially-transmitted information as gene-like 'memes' (e.g., Brodie 1996; Blackmore 1999) have noted that ideas concerning food, sex, and power are likely to spread because they elicit attention by activating evolved psychological mechanisms. However, such observations are too broad to be analytically useful – evolved psychological mechanisms deal not with general domains, but with specific inputs and outputs (Tooby & Cosmides 1992), and it is these which must be specified if we are to understand the relative frequency of different ideas.

only more likely to arise, they are also more likely to be maintained, and to diffuse.

Conclusion

As Radcliff-Brown (1922) notes in describing the beliefs of the Andaman Islanders, eating is a potentially dangerous activity. From an etic perspective, across populations, some categories of ingestibles have consistently constituted more significant threats than others. Natural selection, exquisitely sensitive to such differences, has equipped humans with an intrinsic ambivalence towards meat, privileging it as the target of acquired conditioned aversions. Processes of socially-mediated ingestive conditioning, evident in nonhuman animals, correspond with human aversive responses to others' nausea. Together, these patterns suggest that, for many taboos, disgust was the spark that initiated a cascade phenomenon in which normative moralization and egocentric empathy then played later roles. In addition, animals' animate nature makes them an attractive source of symbols and a focus of sympathetic magical reasoning, providing additional starting points for the same processes. These various routes of taboo formation create opportunities for the exercising of other propensities, including flexible attention to both categorical ambiguity and causal relationships (cf. Laderman 1981); taboo delineation also provides an avenue for the exercise of power by self-interested parties. In turn, the resulting practices and beliefs are subject to cultural evolution. The survival and spread of ideas are fundamentally shaped by the degree to which they are congruent with propensities shared by prospective adherents, including a readiness to accept that specified animal products are disgusting.

It is likely that processes similar to those described above apply in many domains. Valeri notes that taboos seem "to concern preponderantly the body in its exchanges with other bodies (through eating, reproduction, bleeding, excreting, decomposing) and to define certain basic social rules involved in those bodily exchanges or symbolized by them" (2000:48). These are precisely the fields in which we find the stimuli most likely to elicit disgust (Fallon & Rozin 1983; Curtis & Biran 2001), a constellation that is unlikely to be accidental given the risk of microbial contamination that such objects and relations have posed throughout human history (Curtis & Biran 2001). We therefore conclude that the type of explication

employed here may usefully contribute to the understanding of a variety of taboos. More generally, we suggest that anthropologists would do well to consider the contribution of evolved psychological mechanisms and predispositions to the generation, perpetuation, and diffusion of a wide range of cultural beliefs and practices (cf. Whitehead 2000:6-10; Barkow 1989).

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Appendix – Food Taboo Data & References from 78 Societies

Table A

The first 5 or fewer food taboos collected for 78 societies, by region and target

Culture	Region	Meat	Veg's	Fruits	Dairy	Sweets	Sour	Spicy	Starches
Aranda[1]	Australia	5	0	0	0	0	0	0	0
Arakurta*[2]	Australia	5	0	0	0	0	0	0	0
Murngin[3]	Australia	5	0	0	0	0	0	0	0
Larrekiya[4]	Australia	2	0	0	0	0	0	0	1
Maung[5]	Australia	4	1	0	0	0	0	0	0
Binbinga[6]	Australia	5	0	0	0	0	0	0	0
Kaitish[7]	Australia	5	0	0	0	0	0	0	0
Warramunga[8]	Australia	5	0	0	0	0	0	0	0
Euahlayi[9]	Australia	4	0	0	0	1	0	0	0
Kuna[10]	C. America	2	0	0	0	0	0	0	0
China[11]	E. Asia	2	1	0	0	1	0	0	1
Chukchee[12]	E. Asia	5	0	0	0	0	0	0	0
Taiwan Hokkien[13]	E. Asia	2	0	1	0	0	0	0	0
Russia[14]	Europe	5	0	0	0	0	0	0	0
Hasidic Jews[15]	Mid. East	5	0	0	0	0	0	0	0
Amhara[16]	N. Africa	1	0	0	2	0	0	0	0
Dogon[17]	N. Africa	0	0	0	0	0	0	0	1
Tiv[18]	N. Africa	2	0	3	0	0	0	0	0
Falasha[19]	N. Africa	4	0	0	1	0	0	0	0
Mambila[20]	N. Africa	5	0	0	0	0	0	0	0
Netsilik[21]	N. America	2	0	0	0	0	0	0	0
Tlingit[22]	N. America	3	0	0	0	0	0	0	1
Blackfoot[23]	N. America	3	0	0	0	0	0	0	0
Ojibwa[24]	N. America	4	0	0	0	0	0	0	0
Hopi[25]	N. America	1	0	0	0	0	0	0	0
Copper Inuit[26]	N. America	2	0	0	0	0	0	0	0
Yoruk[27]	N. America	2	0	0	0	0	0	0	0

Table A

(Continued)

Culture	Region	Meat	Veg's	Fruits	Dairy	Sweets	Sour	Spicy	Starches
Maidu[28]	N. America	5	0	0	0	0	0	0	0
Yokuts[29]	N. America	5	0	0	0	0	0	0	0
Nomlaki[30]	N. America	5	0	0	0	0	0	0	0
Trobriands[31]	Oceania	1	0	2	0	0	0	1	1
Tikopia[32]	Oceania	2	0	0	0	0	0	0	0
Kaluli[33]	Oceania	5	0	0	0	0	0	0	0
Bimin-Kukusmin[34]	Oceania	1	0	0	0	0	0	0	0
Ndumba[35]	Oceania	1	0	0	0	0	0	0	0
Awa[36]	Oceania	5	0	0	0	0	0	0	0
Tsambunwuro[37]	Oceania	1	0	0	0	0	0	0	0
Tambaran[38]	Oceania	0	0	1	0	1	0	0	3
Vanatinai[39]	Oceania	5	0	0	0	0	0	0	0
Maori[40]	Oceania	2	0	0	0	0	0	0	1
Nissan[41]	Oceania	1	0	0	0	0	0	0	0
Ndreketi[42]	Oceania	1	1	0	0	0	0	0	0
Tokelau[43]	Oceania	1	0	0	0	0	0	0	0
Swazi[44]	S. Africa	4	0	0	1	0	0	0	0
Azande[45]	S. Africa	5	0	0	0	0	0	0	0
Beni Amer[46]	S. Africa	5	0	0	0	0	0	0	0
Gurage[47]	S. Africa	1	0	0	0	0	0	0	0
Suk[48]	S. Africa	4	0	0	1	0	0	0	0
Ekoi[49]	S. Africa	5	0	0	0	0	0	0	0
Timne[50]	S. Africa	3	0	1	0	0	0	0	0
Koranko Kuruma[51]	S. Africa	3	0	0	0	0	0	0	0
Bhaca[52]	S. Africa	0	1	0	1	0	0	0	0
Bomvana[53]	S. Africa	3	0	0	1	0	0	0	1
Lango[54]	S. Africa	5	0	0	0	0	0	0	0
Nandi[55]	S. Africa	2	0	0	0	0	0	0	0
Kogi[56]	S. America	1	0	0	0	0	0	0	0
Mataco[57]	S. America	1	0	0	0	0	0	0	0
Bororo[58]	S. America	1	0	0	0	0	0	0	0
Tukano[59]	S. America	5	0	0	0	0	0	0	0
Shokleng[60]	S. America	5	0	0	0	0	0	0	0
Kagwahiv[61]	S. America	5	0	0	0	0	0	0	0
Shipibo[62]	S. America	3	0	0	0	0	0	0	0
Achuara[63]	S. America	4	1	0	0	0	0	0	0
Cashinahua[64]	S. America	5	0	0	0	0	0	0	0
Matsigenka[65]	S. America	5	0	0	0	0	0	0	0
Sinhalese[66]	S. Asia	1	0	0	0	0	0	0	0
Alor[67]	S. Asia	4	1	0	0	0	0	0	0

Table A

(Continued)

Culture	Region	Meat	Veg's	Fruits	Dairy	Sweets	Sour	Spicy	Starches
Garo[68]	S. Asia	0	0	1	0	0	0	0	0
Arunachal Pradesh[69]	S. Asia	3	0	0	0	0	0	0	0
Havik[70]	S. Asia	5	0	0	0	0	0	0	0
Dayak[71]	S. E. Asia	1	0	0	0	0	0	0	0
Ifugao[72]	S. E. Asia	1	1	1	0	0	0	0	0
S. Toraja[73]	S. E. Asia	0	0	0	0	0	0	0	3
E. Toraja [74]	S. E. Asia	0	1	1	0	0	0	0	1
Kapauku[75]	S. E. Asia	1	1	2	0	1	0	0	0
Andaman[76]	S. E. Asia	5	0	0	0	0	0	0	0
Huaulu[77]	S. E. Asia	4	0	1	0	0	0	0	0
Agta[78]	S. E. Asia	3	0	0	0	0	0	0	0

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