

THE PRODUCTION OF BONE BROTH: A STUDY IN NUTRITIONAL EXPLOITATION

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Summary

This paper will present the logistics, results and interpretation of experiments on producing soup from animal bones, an often neglected aspect of prehistoric diet and use of caloric resources. Bone grease is an important component of traditional diets of North American Natives. It is produced by fracturing and boiling certain (especially cervid) bones. Fats skimmed from bone broth vary in quality and it is this nutritional aspect of the soup production which is analysed through experiments and ethnographic work.

Résumé

La fabrication de bouillon d'os : une étude d'exploitation nutritionnelle.

Le bouillon d'os est un élément important de l'alimentation traditionnelle des Amérindiens d'Amérique du Nord. Il est obtenu en fracturant et en faisant bouillir certains os, en particulier ceux de cervidés, ce qui permet d'obtenir une certaine quantité de gras. Dans le cadre de notre recherche, des bouillons d'os ont été préparés et analysés pour en établir la valeur nutritive. À partir des résultats de notre expérimentation, nous nous proposons ici d'explorer brièvement l'intérêt de cet aliment comme source de gras, nutriment essentiel de survie.

Zusammenfassung

Die Herstellung von Knochenbrühe: Eine Studie zu Nahrungsausnutzung.

In diesem Beitrag werden Versuchsaufbauten, Ergebnisse und Interpretationen von Experimenten zur Herstellung von Knochenbrühe vorgestellt, die als Bestandteil prähistorischer Ernährung häufig zu wenig Berücksichtigung findet.

Knochenfett ist ein wichtiger Bestandteil der traditionellen Ernährung nordamerikanischer Ureinwohner. Es wird durch das Zerschlagen und anschließendes Kochen bestimmter Knochen, besonders denen von Cerviden, gewonnen.

Das von der Brühe abgeschöpfte Fett variiert in den experimentellen und ethnographischen Untersuchungen in Qualität und Nährwert.

Key Words

Native culinary traditions, Sub-arctic, Experiments, Bone grease, Nutritive value.

Mots clés

Traditions culinaires autochtones, Sub-arctique, Expérimentation, Graisse osseuse, Valeur nutritive.

Schlüsselworte

Einheimische Ernährungstraditionen, Sub-Arktis, Experimente, Knochenfett, Nährwert.

Presentation

Bone broth is a widely known food source among the culinary traditions of native people in North America. The preparing of this broth is the final stage from carcass to table. After stripping the bone of meat the fat content is extracted.

Several names are used to describe the fat obtained from boiled bones. In the archaeological literature we find bone grease, bone butter, bone soup (Kehoe, 1967: 70) or bone tallow (Stefansson in Nagy, 1990: 49). In 1672, in New France, Nicolas Denys called it "beurre d'Orignac" or "Cacamo" (Denys, 1672: 592). Napoléon Comeau in 1945

called it "pain de suif" (Comeau, 1945: 144). In Montagnais, a language spoken by natives of the North Shore of the St-Lawrence River, caribou fat is called "atikupimi" (Dominique, 1989: 26) or "atikwupmi mak muhkamyatthk*" which means caribou fat and broth (Pahin, 1973: 43).

References consulted

I've found several references to bone broth in accounts from the 17th century. The accounts of the first ethnographers contain precious information as well. There is a recipe for caribou bone broth in a cookbook called "Ethnocuisine montagnaise" (Pahin, 1973).

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In the archaeological literature bone grease rendering is rarely mentioned while bone fracturing for marrow extraction is well documented. Some others, like Leechman (1951), Kehoe (1967), Vehik (1977), Binford (1978), Yesner and Bonnichsen (1979), Bonnichsen and Will (1980) and Nagy (1990), have, however consecrated part of their research to the study of archaeological recognition of bone grease preparation. These studies attempt to hone in on the type of detritus produced by this activity by studying present-day populations of hunters.

The first researcher who attracted attention to the archaeological evidence of this behavior is Douglas Leechman (1951). In his article entitled "Bone Grease", he attributes to this behaviour the enormous quantity of bone flakes found recurrently near bison butchering sites on the Prairies. He also had a verbal description of broth preparation by a member of the Loucheux tribe in Old Crow of the Northern Yukon in north-western Canada.

Synthesis of the information from the references

The bones most often used are the long bones, meaning those containing white marrow. Vehik (1977) mentions that only the diaphyses of limb bones are used, while Binford (1978) and Rogers (1973) speak of the use of epiphyses or articular extremities. Binford has observed that the diaphyses are only used in extreme cases. Other elements mentioned are vertebrae (Rogers, 1973; Vehik, 1977; Nagy, 1990), ribs (Vehik, 1977; Nagy, 1990), pelvis and scapula (Vehik, 1977). Rogers (1973) specifies that vertebrae were once used by the Cree but with commercial suet easily accessible they are no longer used. Kehoe (1967) writes that humeri and femurs were preferred by the Blood Indians on the Prairies and Comeau (1945) mentions that all moose elements, especially feet, were used by the Montagnais.

The fracturing technique is similar throughout the literature I consulted. Before starting, the bones can be left to dry for a short time (one to several days) or frozen and stored. They are scraped and cleaned of all residue of flesh and tendons including the periostum. This operation allows for better control of the breakage. The bones are set on a stone anvil or a wood log in order to be split with a hammerstone, the blunt side of an axe, a knife or a hammer. The bone fragments should be small to increase the exposed bone surface and therefore the releasing of quantities of nutrients. The marrow is almost always extracted before the preparation of the bone broth since these two components are used independently.

The bones are always boiled in clear water. I have found no mention of any other ingredient added except perhaps salt in modern recipes. The water is never brought to a rolling boil. If it boils too much, the fat cannot rise to the surface. In order to facilitate the removal of the fat as it rises to the top, snow or cold water is continually added to solidify the grease. Boiling time varies from a few hours to a whole day, as the operation lasts as long as grease continues to float to the top.

Data concerning quantities are imprecise. Nicolas Denys (1672) speaks of a loaf of white fat of 5 to 6 pounds (~2.5 kg) produced from unspecified moose bones. Schoolcraft cited by Leechman (1951) mentions that a bladder of 12 pounds (5.4 kg) was produced from marrow bones of 2 bison, which means 24 bones (excluding carpals, tarsals, phalanges and probably the axial skeleton). Comeau (1945) mentions a loaf, firm and white as snow, weighing 10 to 15 pounds produced from the bones of several caribou (81 animals were butchered but he doesn't specify how many were used). Binford (1978) speaks of a small 7 ounce cake (0.44 lb or 198.45 g) produced with 5 gallons (22.73 litres) of pulverized bone.

Concerning the seasonality of bone broth, it can be prepared at any time of year but emphasis is usually put on fall and winter when the animals are fattest and group hunts of big game provide a lot of bone.

The fat obtained is reputed for its conservation, its whiteness and purity. According to Leechman (1951) it can be kept two to three years. The texture can vary from firm to malleable.

There are multiple uses for bone fat. It is most often mixed in with dried meat to prepare pemmican. It can be used as kitchen grease or eaten alone. Since it can be stored for long periods, the fat can be kept for emergency use during periods of reduced supplies or for long voyages. According to the texture obtained, the fat can be used as hair grease (Kehoe, 1967) or tanning oil for animal skins (Vehik, 1977; Turner, 1979), to waterproof boots, treat bow strings (Binford, 1978), and even according to Turner (1979) for trade as a product for barter (he speaks specifically of fat extracted from marrow and bones). The nuance introduced by Binford (1978) between bone grease prepared for storing and bone juice for immediate consumption is already found in the papers of the Jesuit LeJeune (1634, in Laflèche, 1973) and Nicolas Denys (1672) in New France. When the bouillon is eaten hot other nutrients such as proteins (gelatine) and salts are obtained.

Experimenting the preparation of bone broth

Although it seems to be quite simple to obtain bone grease, it is in fact more complex than it appears. At least, that is what I found out from my experiments.

I prepared ten batches of broth with the femurs and tibias of four moose and two caribou hunted in the fall of 1991. Eight batches were prepared with the diaphyses and two with the epiphyses. The former (that is the soup made from the diaphyses) was analysed for its nutritive value at the Nutrition Laboratory at the University of Montreal by nine students who also helped a lot for the breakage of the bones.

Only the elements most likely to be found in the broth were analysed, that is proteins, lipids, mineral salts and calcium. The fat obtained from the broth prepared with the diaphyses was analysed for its fatty acid content.

The experiment attempted to reproduce as precisely as possible the way it is prepared by native people in accordance with the experimental requirements of the laboratory.

Results of the experiment

To break up 17 diaphyses (which is about 9 and a half pounds or 4.5 kg) it took five hours. The 7 epiphyses (6 and a half pounds or 3 kg) took 2.5 hours of hard work. If you add on the time it took to clean the bones (about 5 hours), to boil them (3 hours) and to collect the grease from each boiling, it makes a total of 20 hours work.

Of course this was done by an inexperienced person, me, who had never attempted to make bone broth before. So it would surely take less time in actual practise. In fact, it shows that experience is required!

All this work to finally end up with 160 g or 0.35 lb of fat and de-greased broth which provides very few nutrients. The water content is about 99.5% and the remaining 0.5% includes proteins, minerals and traces of glucides. The most surprising conclusion of my experiment is that this operating requires a major output of energy (cleaning the carcass, breaking down the bones, and traditionally cutting the firewood, tending the fire over a long period of time, skimming of the fat and putting it aside) for a small rendering. In other words bone broth is an expensive commodity!

Why then, did the native people of North America and more particularly those of the Sub-arctic prepared, and still do to some extent today, bone broth? Different hypotheses come together.

What you don't get in quantity, you get in the quality of the fat. The results for the fatty acid composition of the fat have revealed that oleic acid is the main component followed by stearic and palmitic acids. It is interesting to note that Binford (1978) observed among the Nunamiut Eskimos that oleic acid was the key-element in the distinction made

by them between the "yellow" and the "white" fat, the latter ("white" fat) being more desirable. Fat is sought after for its long-term storage if properly kept. Prepared during times of abundance the fat becomes a precious reserve of emergency food. Prepared during periods of famine, it constitutes a last resort food source that allows for maximum extraction of fatty substance hidden in the bones of a carcass.

During the annual cycle, the state of health of game animals varies from one season to another. Undernourished animals, males exhausted from the rutting season, females after dropping their young, will see their fat reserves greatly depleted. Since the fat content of the meat is the most variable factor in this, it is important to develop a way to regulate the variability over a yearly period. The preparing and storing of fat allows for the continual consumption of animal fat throughout the year even when the animals being hunted can't supply it.

Diverse ethnographic observations, supported by certain modern concepts of nutrition, demonstrate the risks in a diet based exclusively on lean meat. The intake of fats and sugars safe-guards the body's protein and avoids the sickness called by Stefansson "rabbit starvation" (Speth, 1987). Speth (1983) considers bone broth production a strategy adopted by hunters and gatherers to obtain energy nutrients other than proteins during periods of deprivation.

Finally, the fat takes on different roles in the body's organism. One of these is to make up a concentrated reserve of energy that is efficient and economical for the body. Fat is also important for the psychological effect of satiability. It helps you feel full and it smells good too. It is fat that gives meat its characteristic taste.

Conclusion

I would like to quote from the Montagnais recipe book by M. H. Pahin (1973) "Ethnocuisine montagnaise":

"(...), la graisse (dont le prototype est la graisse de caribou, fabriquée avec les os longs et leur moelle) constitue le produit de la cuisine par excellence. Plus fortement marquée dans le sens "animal" que la viande elle-même, plus fortement identifiée à "indien" que tout autre mets et occupant une place privilégiée dans l'échelle gustative, on la trouve au coeur de la Fête du nomadisme et de la chasse chez les Montagnais." (p. VII).

So, fat has a prominent place in the culinary world of Sub-arctic native people of North America from both a nutritive and a pleasurable point of view. This is in line with their vision of health and could not be excluded from their cuisine.

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