

The Incidence of Dental Caries of Pre-Historic and Historic Indian Groups

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In the consideration of the etiology of dental caries which occur in high incidence in present day populations, research workers have regarded diet as a possible contributing factor. In order to test the role of diet in caries formation, a number of prehistoric and historic American Indian groups under varying dietary conditions have been examined. The data on comparative Indian dental pathology have revealed significant correlations which are rather intriguing.

Because the time factor has been controlled through the utilization of Carbon-14 dates for various populations, and the recovery of camp refuse gives one a fairly accurate estimate of the diet of these groups, the present study lends itself to a more precise assessment of this question than previous studies.

Although an earlier investigator, R. W. Leigh (1) states that his four series represented tribes that existed at different time levels, actually three of the series—Arikara, Sioux, and Zuñi—were contemporaneous historic groups. In his conclusions he accepted Hrdlička's identification of the Archaic Kentucky series as probably representing an Algonquian group such as the Miami, attributing the marked dental attrition to grit which was included in the corn meal ground in stone mortars.

It is obvious that Leigh's studies involve more diverse diets than that of the groups considered in this paper; yet the same trends that he noted, prevail in the Middle Western area as one proceeds from the oldest inhabitants to historic Indian tribal groups. In other words, the present study employs a chronological rather than a geographical approach to the question.

The observations on the series compared in this paper were made by G. K. Neumann on crania in the collections of the Department of Anthropology of the University of Wisconsin (Northern Archaic); the U. S. National Museum (Southern Archaic); Indiana University and the Dickson Mound (Spoon River Focus); the Indiana Historical Society (Angel Mounds); and the Archaeological Survey of Illinois (Sauk).

The number of crania on which observations were made is 167 with the average ages ranging from 39.4 to 59 years for the individual series. Only males are represented in this study.

The incidence of dental caries has varied significantly among differing Indian groups. Several factors merit consideration. Two factors that can be correlated with caries are: the type of diet and the methods of food preparation.

The groups assessed for caries, their antiquity, and their types of economy, are as follows:

1. Northern Archaic (Old Copper) 5600 B. C. Hunting economy
2. Southern Archaic (Indian Knoll) 3000 B. C. Hunting and gathering
3. Middle Mississippi (Spoon River) 1200-1400 Horticulture and hunting
4. Middle Mississippi (Angel Village Site) 1200-1400 Horticulture and hunting (sedentary village dwellers, farmers)

5. Upper Mississippi (Oakwood Mound) 1600-1650 Hunting and horticulture
6. Upper Mississippi (Sauk) 1790-1810 Hunting and horticulture (semi-nomadic hunters and gardeners)

Animals identified, which were utilized to differing degrees for food by all six groups, are as follows:

Virginia deer	lynx	fox squirrel
elk	coyote (possibly)	gray squirrel
dog	skunk	woodchuck
black bear	cotton tail rabbit	muskrat
raccoon	opossum	
cougar	beaver	

The diet of the different groups underwent a change with varying climatic conditions. It may be briefly summarized as follows:

The Northern Archaic group subsisted mainly on larger game, such as elk, moose and bear. The Southern Archaic group depended on mussels for a major portion of their diet, supplemented with wild seeds, small game, and fish. The diets of the two Middle Mississippi groups were quite similar. Corn and game made up the major portion with fish of less importance. The fauna of the Spoon River Focus sites closely resembles the list of animals given above, except for a lack of: cougar, lynx, and coyote; and the addition of badger, red fox, timber wolk, and bison. The two Upper Mississippi groups from the Oakwood Mound and the Sauk village site, subsisted mainly on mixed game and some corn.

As one proceeds from archaic to historic times, one can notice a gradual change in the types of economy of these groups. The Archaic Indians were hunters and gatherers, depending wholly on what they could bag or find for their existence. The Indians of the Middle Mississippi culture, however, were semisedentary and had a mixed diet, utilizing horticultural products and game. Since the Upper Mississippi region was rich in game, the semi-nomadic groups of this area depended primarily on hunting for food supply. Gardening supplemented their diet. The trend toward an increasing frequency of dental caries with a change in economy is best expressed in the following summary:

1. Northern Archaic (Old Copper) average age, 45.7 years. 1 carious tooth of 232 teeth present or .4% of teeth carious.
2. Southern Archaic (Indian Knoll) average age, 39.4 years. 4 carious teeth of 912 teeth present or .4% of teeth carious.
3. Middle Mississippi (Spoon River Focus) average age, 42 years. 68 carious teeth of 868 teeth present or 7.4% of teeth carious.
4. Middle Mississippi (Angel Village site) average age, 44.7 years. 53 carious teeth of 513 teeth present or 10.3% of teeth carious.
5. Upper Mississippi (Oakwood Mound) average age, 59 years. 15 carious teeth of 182 present or 8.2% of teeth carious.
6. Upper Mississippi (Sauk) average age, 40 years. 11 carious teeth of 434 teeth present or 2.6% of teeth carious.

These six series are comparable in that we utilize the crania of adult males. Since there is a twenty year difference in the average age at the time of death between the Indian Knoll and Oakwood Mound people, one would expect the incidence of caries to be somewhat higher because of the greater average age of the Oakwood series. In this comparison it is note-

worthy that the average incidence of caries of the two archaic groups that subsisted almost entirely on game and mussels is less than 1%.

In the Upper Mississippi groups whose diet consisted predominantly of game with a small portion of horticultural products, the average incidence of caries rises to 5.4%.

Finally, the diet of the Middle Mississippi groups, who as a whole were sedentary village dwellers, was principally corn with game animals as a supplement. In these series the average incidence of caries stands highest, 8.67%.

Four Indian groups studied by Leigh can be utilized for broader comparisons. They comprise a series of Sioux, Arikara, Zuñi, and a series of California Indians from the Great Valley.

The Sioux were bison hunters, subsisting almost entirely on bison and other game animals. Meat was cured by drying. A minor portion of their diet was supplied by wild cherries, plums, strawberries, and the prairie turnip. A transportable mixture, pemmican, consisted of dried, pounded bison meat mixed with berries. Leigh states that caries were almost negligible; of 92 crania there are but 10 with carious lesions and concludes that the Sioux are peculiarly free from dental and paradental lesions.

In the Arikara, village Indians, who were semi-sedentary and rather appropriately described in Indian sign language as "corn-eaters," one finds a mixed diet. The Arikara raised maize, beans, and squashes, bartering some of the crop for meat. Hunting bison in winter and fishing with basket traps supplemented their diet. Corn was prepared in stone mortars which inevitably added stone particles to the meal. This had a wearing effect on the teeth. The coarseness of the hulls of the kernels is also a factor meriting consideration in abrasion of the teeth. Leigh finds that the incidence of caries in the Arikara is considerably higher than in the teeth of the Sioux proper: 28% of the crania exhibit one or more carious lesions. Therefore, caries occurred quite frequently in the teeth of the Arikara.

The third group for comparison is the Zuñi. This group, which dates from late pre-Columbian to early post-Columbian times, had a farming economy. Corn was the principal crop, with beans, and squashes adding to their primarily vegetarian diet. Deer, rabbit, and turkey formed only a small dietary supplement. The Zuñi, too, ground the corn in stone mortars, thus some pulverized stone was mixed with the meal. Leigh finds that caries occur in 75% of the Zuñia crania, that no tooth in the series was immune and that many teeth were lost from caries. Incidentally, Leigh observes that the mode of life and food of the Zuñi are more closely related to our own civilization than that of the other tribes here considered.

Indians of the Great Valley of California, also studied by Leigh (2) are the fourth and last group to be considered. The acorn was the predominant staple, constituting a larger part of the diet than any other food. Many other seeds, roots, fish, and mammals—ranging from deer to gophers—supplemented the acorn diet. Pulverization of the seeds was either by pounding in a mortar or rubbing on an oval grinding slab. The acorns were leached to remove tannic acid and cooking methods resulted in abrasives in the flour. In this group, which had a very high ratio of

plant to animal food, 25% evidenced dental caries. Eighteen caries were present in 50 crania or 36% of the population had caries.

In summary it may be stated that the results of the present study based on chronologically documental local populations as well as Leigh's earlier studies based on geographically widely spread groups with diversified diets, definitely indicate that diet and food preparation constitute important factors in the relative incidence of dental caries.

Literature Cited

1. LEIGH, R. W. 1925. Dental Pathology of Indian Tribes of Varied Environmental and Food Conditions. *American Journal of Physical Anthropology* 8:179-195.
2. —————, 1928. Dental Pathology of Aboriginal California. University of California Publication in American Archaeology and Ethnology 23:399-440.