

W202

WHY DENTAL CARIES WITH MODERN CIVILIZATIONS? IX. FIELD STUDIES AMONG PRIMITIVE INDIANS IN NORTHERN CANADA

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WHEN one undertakes to find a colony of people living in any part of North America beyond the reach of modern commerce with all its efficient and varied means of transportation one may expect that only physical conditions can have made possible so distinct an isolation as to have sheltered these people from enforced modernization.

In my effort to locate groups of Indians living inside the Rocky Mountain watershed in the cradle of the Arctic waters I had the assistance of the officials of the Canadian government and the Hudson Bay Company and I am indebted to them for valuable aid. Throughout most of Canada the Indians have made treaty with the Canadian government or with its provinces and these Indians are receiving annual bounty. This has required them to come to certain places specified by the government on a certain date each year to receive this treaty money. Since this is a per capita income for the Indian he brings all his family, and this makes possible a registration and a regular official contact for matters of census and a record of health conditions. The Indians of British Columbia and the Yukon territory however, are not in the treaty and accordingly are not regularly in contact with government officials. In the northern part of British Columbia and the Yukon territory communication with the outside world is extremely difficult and the Indians live as nomadic tribes; they follow the game and have an independent, isolated existence.

The backbone or watershed of the North American continent is provided by the Rocky Mountain range. It is flanked all the way up the Pacific coast by the Coast and Cascade ranges of mountains. Even in southern British Columbia these ranges carry snow throughout the year. The snow line rapidly decreases in altitude as one goes northward with the result that glaciers weave their way through the rugged crags to feed the many streams with icy water. These glaciers are the birthplace of icebergs, the home of the chilly air that precipitates the moisture laden breezes from off the Pacific causing torrential rains in the summer and in the

winter blankets of snow 20 feet in depth for a single season. This ice laden country is the cradle of our northwestern storms. The running salmon like these icy waters. The Pacific slope dwellers, whether Eskimos, Indians, or the white newcomers could, if they would, and if the fisheries restrictions did not prevent it, harvest almost inexhaustible supplies of the varieties of fish that wend their way up these streams for the spawning season.

Our quest was for people who were beyond reach of these Pacific sea foods. When we look at a map of North America we note that there is a large district between the valley of the MacKenzie River as it flows to the Arctic and the Rocky Mountain

Divide which is sometimes spoken of as the "blind spot" of the North American continent as it can only be reached by overcoming great physical difficulties. It is practically impossible to enter by way of the MacKenzie River and its tributaries and get out the same season. This district cannot readily be entered by airplane because there are no bases for fuel. The most feasible approach proved to be from Alaska through the two coast ranges of mountains and then over the Rocky Mountain range to a waterway draining toward the Arctic. This was accomplished by going up the Stikine River to Telegraph Creek where the telegraph line crosses going to Dawson City and other mining districts on the upper Yukon River. This line was built at the time of the gold rush to that country. The trip up through the Coast and Cascade ranges of mountains is one of the most scenic trips on the North American continent.

Beyond Telegraph Creek a trail is the only route over the Rocky Mountains into the vast interior. This is the home of the moose and the grizzly bear. It is where the long cold winters make our finest furs. The Hudson Bay Company has established three posts inside the Divide in order to furnish an outlet for the furs of this district. This has made it necessary for this trail to be opened across the Divide from Telegraph Creek to the inland waterway. It cannot be called a road since roads have bottoms. At Telegraph Creek we en-

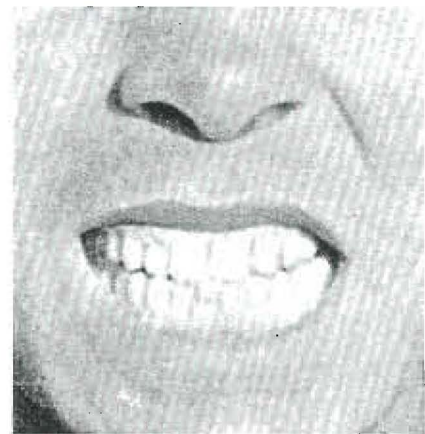


Fig. 1—This splendid Indian boy is the product of the natural foods of wild game. His physical and dental development are superb. He has no dental caries or gingival infection.

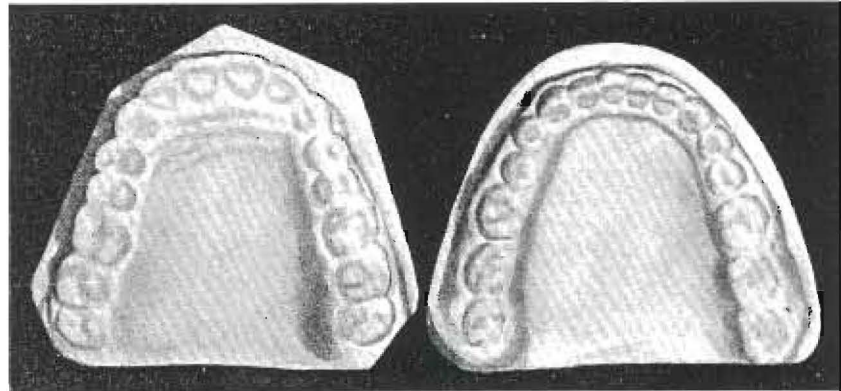


Fig. 2—Note the symmetry of the arches of the last figure. At 21 the third molars are nearly erupted and in excellent position.

gaged a truck to take us over the Divide. My esteem for the hardihood of a modern truck has been increased since I took this trip. Sometimes the trail led along the edge of the precipice cut in the side of the cliff in the shale where if the roadbed gave way we would be sent hurtling to the torrent in the gorge below. We had two drivers who took short turns and they kept us interested by pointing to places where parties had tumbled down the bank where the road collapsed. At times we would go a half mile on the road cut in the edge of the cliff without reaching a place where two conveyances could pass. Since there were only two conveyances available for running each driver knew where the other was supposed to be. We were beginning to understand why the districts to which we were going had been referred to as the "impenetrable north."

We found that there were only two white women inside the Divide, one the wife of the manager of the Hudson Bay Post at the landing at Diese Lake and the other the wife of a mining prospector.

At Diese Lake (number 26 on the map) we engaged two guides and a powered scow large enough to place a tent on the bow to protect our bedding from the frequent rains. Going down stream was easy though dangerous since the river had many treacherous and sudden rapids. We would sometimes sail for an entire day without seeing a sign of human life. We were pushing on to the farthest north Hudson Bay Post of this system to which the Indians had trekked with their furs for hundreds of miles from several directions. We were again in the zone of the long twilights where the light is sufficient for photographing until a late hour. We were now in a country where most of the Indians had never seen a white woman until they saw Mrs. Price. It is of interest that although we slept on boughs that were damp and in blankets that could not be dried sometimes for days, we did not once catch cold.

At the second to the last post, McDames, number 27 on my itinerary map, there were large numbers of Indians who had come to trade their furs for traps and ammunition and such other supplies as they could carry to their hunting grounds several hundred miles away. We were with people who were living almost entirely on game, most of which consisted of moose, caribou, bear, mountain goat, and mountain sheep. At Liard, number 28 on the itinerary map, the last Hudson Bay Post, we met Indian families that had come from several hundred miles to the north; others

from their hunting grounds to the east and west. Not one of them had ever spent a day in school of any kind except the school of the forest. We were among people where I found it necessary to examine a thousand sound teeth for each tooth that had been attacked by tooth decay. Practically every dental arch was symmetrical with no teeth malposed. The nostrils were uniformly broad and the air passages clear. I did not see one single child among these relatively primitive people with bow legs, or evidence of past or present rickets.

In the winter these people live largely in the cabins built of logs banked high with moss and dirt and located in heavy forests usually near a river or lake. Trees are girdled in advance in order to provide dry fuel. A quantity of moose meat is dried in the summer and stored for times of food scarcity or emergency. It is of interest that when the meat has hung for an hour in the bright sunshine the outside becomes sufficiently waterproof so as not to need to be brought in out of the rain and will not be attacked by flies.

In milder weather if the moose cannot be killed near at hand the family may move to set up camp beside a recently killed moose which may supply the wants of the household and dogs for several weeks; however, they do not select the meat that modern civilization does. It seems to be an inherent part of their conception of life that in order for a man, woman, or child to have a perfect body he must eat some of every part of the moose. This, of course does not include such structures as are indigestible, as hide, hair, hoof, and bones. They do, however, break all large bones to remove the marrow. Each cabin is supplied with a food cache, built about 1 foot high and reached by means of a ladder, and it is so constructed that wild animals cannot climb the four posts on which it stands to reach the stored furs and foods.

Through an interpreter I asked an elderly Indian what they would do for food when moose became scarce. He replied that they were usually plentiful. Then I asked him what he would do if he and his family were starving and after a long chase he succeeded in killing a moose. He said the first thing he would do would be to take a drink of the blood which would make him strong. He would then lie down beside the warm moose and go to sleep for a little while, after which he would get up and remove from the moose a large part of the liver and a large bone to take home to the hungry family. When I asked what the bone was for he said for the marrow to use for food for

the baby. When I asked why he would take the liver he said that the liver was full of life. The Indian explained how the moose eats buds of trees which were strong foods. The strength goes from the buds into the wall of the stomach and he explained that the Indians clean the stomach and pound the wall up fine to make a milk for the baby. They also know the various parts of a moose to use for correcting various disturbances. For example, they use the adrenal glands for curing scurvy which is caused by an insufficiency of vitamin C. Science has just recently discovered that this gland is the richest known source of vitamin C. Similarly they know that the tissues forming the back part of the eye is good for food. Science has recently demonstrated that the retina of the eye is one of the rich sources of vitamin A.

When I pressed the question as to what they would do for food if they could not find any moose the old Indian named other animals and said that the livers of all animals were good food. I asked what they would do if they could not find any animals and asked whether they would starve. The Indian replied that there are many foods, as the buds of trees and the inner bark of certain trees which they could eat. Later he brought samples of bark of the trees they could use.

The grizzly bear constitutes one of their greatest dangers. But they know his habits and plan to leave him alone. The bears are in the higher ranges in the summer and are denned in from October to early May. Sometimes, however, the grizzly follows the scent of meat down the mountain as it is dragged to a cabin. But his fear of fire generally protects the natives since they keep an open fire when in danger. We were served mountain goat, and were told that on a previous occasion when a mountain goat had been dragged to the cabin a grizzly bear had trailed the catch and was heard clawing at the door. He was shot through the cabin door, and we were shown the bullet hole. The bear's enormous hide was spread upon the cabin floor.

During their brief sojourn near the Hudson Bay Post the Indians would celebrate by exchanging furs for such modern foods as could be obtained, particularly tea, sugar, and white flour, and some canned foods. Of course, dairy cattle are out of the question since they cannot be kept where winters are so severe. Almost no vegetables or fruits are grown by the native Indians and few wild fruits are available. Samples of their various foods were obtained and brought back to my laboratory for

chemical analysis.

At McDames, the second to the last Post toward the north, seventy-one Indians were examined with a total of 2,004 teeth. Thirty-seven of these Indians had lived almost exclusively on native foods except when they came to the Post. Of the 1,028 teeth, all of which I examined, not a single tooth had ever been attacked by tooth decay. Twenty persons had obtained "store grub" more frequently and among their 810 teeth only one tooth was found to have ever been attacked by tooth decay, or 0.1 per cent, or 0.05 per cent for these two groups combined: one in 2,000. There were six in the family of the manager of the Hudson Bay Post. The mother was an Indian. She and her children had in their 166 teeth, forty with dental caries, or 24.7 per cent. They were living on food taken from the shelves of the Post—the foods of modern civilization which had been shipped into the interior. This increase is 494-fold.

At Liard, the farthest north Hudson Bay Post of this interior system, fifty-eight Indians were examined with 1,642 teeth. Thirty of these Indians had been living almost exclusively on native foods and of their 876 teeth not a single tooth was found that had ever been attacked by tooth decay. Nineteen were occasionally using "store grub" and of their 546 teeth, six were found to have been attacked by tooth decay, or 1 per cent. There were nine persons either connected with the Post or remaining near it who were living largely on "store grub"; of their 248 teeth, sixty-seven had been attacked by dental caries, or 27 per cent.

For all the people who were living on the game of the country the dental arches were symmetrical, and the third molars were in normal position in practically all persons more than 21 years of age. Not a single case of malposed or irregular teeth was found among the most primitive. The teeth were often considerably worn but no overload was sufficient to destroy the immunity to tooth decay. Apparently the bodies of mothers of large families were as strong as any others of the group; their dentitions were also as perfect. Their custom provided that the women and children accompany the men on their expeditions to the Post to dispose of their furs. When the journey is overland each carries a share of the camp outfit. The poles for the shelter for the camp are always easily secured at any camp site. The roof of the shelter is sometimes made of bark which is carried with them and which is peeled thin. When the journey lay along a waterway they pile into a large dug-out canoe

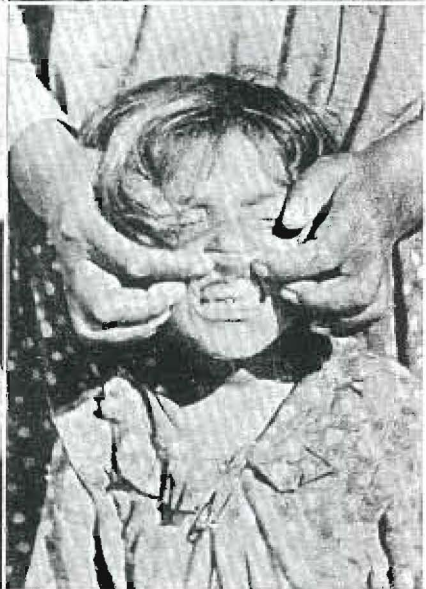


Fig. 3—Upper left—In some Indian families the incisors are concave from side to side on the labial surface instead of convex, as in this case. No caries or gingival infection is present.

Fig. 4—Upper right—Mothers and infants among these more primitive Indians have excellent health and even child-bearing does not destroy immunity to dental caries.

Fig. 5—Lower left—The growing boys and girls who are receiving the available modern foods usually suffer from rampant tooth decay as in this case.

Fig. 6—Lower right—Dental caries begins early; it often is rampant at 3 years of age, as in this case in which the crowns of the deciduous teeth are decayed to the gum line.

and paddle with skill through the rapids. These waters draining toward the Arctic do not have the running salmon of the Pacific coast rivers but do have pike and white fish. The Indians spear some of these through the ice in the winter. They are difficult to catch in the summer with their meager equipment, for white fish cannot be caught with a hook and line. They make a nutritious milk for the babies by grinding and squeezing the juice of the fish muscles. In a later installment I will discuss the results of the chemical analysis of the foods including the milk made from fish and the stomach wall of the

moose. They do not dry and store fish as do the Indians and Eskimos of the Pacific watershed since the fish are not available in sufficient quantity.

We are now chiefly concerned to observe these people of extraordinary physical perfection and high immunity to dental caries and degenerative diseases, living at the point of contact with modern foods. We are at the extreme fringe of modern civilization as expressed in the farthest north Hudson Bay Post of this part of the interior. If mail were to reach this Post for Christmas we were advised it would have to come a thousand miles by dog team. It is only

this extreme isolation that has protected these people against the inroads of modern commerce since provisions entering this country must come by way of the Stikine River to Telegraph Creek and then, in limited quantities, over the Rocky Mountain Divide.

At Dease Lake, the first Post inside the Divide, twenty-five Indians were studied in two groups; 9.6 per cent of all teeth examined had caries. Nine of these Indians were relatively primitive nomads and of their 240 teeth none was found attacked by dental caries. The others were using in part modern foods and in part native foods, and in this group 14.9 per cent of all teeth had dental caries.

At Tahltan, an Indian settlement near Telegraph Creek and with year round contact with it, thirty-seven Indians were studied with a total of 936 teeth, of which 163 or 16.3 per cent had been attacked by tooth decay. All but one had been using chiefly modern foods. When, therefore, we arrange the data in the order of contact with civilization, Wrangell, at the mouth of the Stikine River, studied in the last installment, with year round frequent service from the coast steamships, showed caries in 39 per cent of all teeth. At Telegraph Creek and Tahltan with summer boat service up the Stikine River to the former, at the end of navigation, showed caries in 14.9 per cent of all teeth. At Dease Lake over the Divide which is in contact with the Dease Lake Hudson Bay Post, 9.6 per cent had caries; while at McDames and Liard, the two Hudson Bay Posts farthest in the interior, only 3.1 per cent of all teeth examined had dental caries. On the basis of modern or primitive foods these figures for dental caries are for an average of seven Indian coast settlements using modern foods 40.8 per cent and for the Indians in the interior or beyond reach of modern foods, 0 per cent.

At Telegraph Creek, therefore, we had an opportunity to study Indians that are of the same or similar tribes but who are in contact with the foods of modern civilization. Many of them live, however, in the typical shelters of that country. A number of Indian homes were found where the parents had grown up under the primitive conditions but who are raising their families partly on modern foods as shipped into that country. At Telegraph Creek the percentage of teeth with dental caries when compared with the primitive districts we have just been studying increased from 3.1 for all groups to 13.9 for all groups. For eleven persons still living on native foods only four of 320 teeth examined, or 1.2 per cent, had been attacked by tooth decay. Seventeen with

416 teeth living on both native foods and "store grub" had thirty-seven teeth, or 8.8 per cent, attacked by dental caries. Eighteen living on modern foods with 528 teeth had 135, or 25.7 per cent, already carious. Indian families, however, that bring their furs to Telegraph Creek for barter but who live at a distance and only have access to the modern foods during their few days or weeks at the Post once or twice a year, still maintain their high immunity; their being only 1.2 per cent of teeth with dental caries. While some provisions are carried over the Divide and become available for Indians living in the vicinity of the first Post on Dease Lake, the elderly people of these families had the typical perfection of physical development and tooth structure of the primitives farther north. Their families, however, often had active tooth decay.

As serious, however, as the problem of dental caries has become for these people it was exceeded by the development of other degenerative processes. I have referred to the fact that one of the leading Indian scholars of the western coast informed me that the primitive Indian languages did not have words for "rheumatism" or "arthritis" in any of their various forms. He said these diseases were unknown to the primitive Indians. At the point of contact with modern civilization where the only apparent important change has been the displacement of the native foods with the foods of modern commerce, I found arthritis and tuberculosis were common. In a group of twenty homes at Telegraph Creek and its vicinity I found ten bedridden cripples. Many of these cases were so hopelessly advanced that nothing could be done.

We assisted the Indian agent at Telegraph Creek by bringing out three Indians who were in desperate need of help; one was a youth of 19 so crippled with arthritis that he could not wait on himself or feed himself; another was a girl, aged 18, whose condition was almost as serious; the third was a man, aged 30, who had walked and ridden his horse a distance of two hundred miles seeking help for his crushed shoulder. We took charge of these three in the journey down the Stikine to Wrangell and transferred them after a couple of days' rest to the coast steamer and conducted them to a government hospital at Prince Rupert where they received medical and surgical assistance. The man's shoulder was crushed in May and it was about the tenth of August when he reached the hospital. Fortunately, all three were able to be returned to their homes before river navigation closed. The arthritic pa-

tients were well on the road to recovery. The man with the broken shoulder was doubtless one of the proudest and happiest Indians on the continent, for I was advised that he insisted on showing to every one whom he could interest what the "white doctors" had been able to do for him.

But what of those who did not have the good fortune of these three? It is a sad scene, the calamity that befalls these people when suddenly they lose their immunity to dental caries and to other degenerative processes and rapidly become victims of the modern degenerative diseases. We can imagine what the plight of our various communities would be if there was suddenly taken from them every physician, dentist, nurse, hospital, drug store, and first aid station leaving every one to suffer without the possibility of obtaining the relief as provided by modern science. Such is the plight of these people on the fringe of civilization. Occasionally, one would see a running fistula on the outside of the face of a boy or girl which had already made a lasting scar. An abscessed tooth had broken externally. Perhaps the picture that most persistently haunts one who has seen it is the widespread distress due to tuberculosis. Scarcely a home in some modernized districts would be found where some member of the family had not already been taken by the white plague or was at present sick with it. In many districts from 20 to 30 per cent of the children were already dead as the result of this disease. One of the important phases of these investigations is the new light that is being thrown on the factors that contribute directly to the lowering of immunity to this and other degenerative processes. This will be discussed in a special report at the conclusion of this series.

These investigations are revealing evidence of an important relationship between physical development of the face and dental arches and dental caries as different expressions of nutritional deficiencies. We will, accordingly, keep in mind facial contours and relationship between dental arches as well as symmetry of the arches. It is of evident significance that in modern clinical practice in a so-called civilized community one will nor see for many weeks and months a single pair of dental arches of such fine symmetry as even the average among these primitive Indians of the interior. A fine example of this symmetry is that of the young man shown in Fig. 1. He is 21 years of age and entirely free from dental caries. His gums are healthy and the symmetry of the arches excellent. Impressions

were taken under difficult conditions; the models are shown in Fig. 2. The third molars are just erupting. There is no dentist within hundreds of miles. The young man is a little more than 6 feet tall, straight, and weighs about 180 pounds. It will be recognized that he was asked to close his teeth so as to make contact on the anterior teeth.

Many of these groups of Indians of the interior of northwestern Canada present teeth of an unusual anatomic design in that the upper centrals instead of being convex from side to side are slightly concave. This will be seen in Fig. 3. The teeth of this elderly woman show some wear but are free from dental caries.

It is of particular importance to note and emphasize that the factor of safety against dental caries of these more primitive Indians was so great that even child-bearing did not constitute a sufficient overload to endanger the teeth. The health of the children of all ages was exceptionally fine so long as they were on the natural diet of the district. A typical

case is shown in Fig. 4, and it will be noted at once that this mother has exceptionally good teeth and symmetry of the dental arches. An example of the rampant tooth decay of growing boys and girls when on modern foods is shown in Fig. 5. At an early age the crowns of many of the teeth may have been lost by caries as shown in Fig. 6.

One can never forget the profound impressions produced by seeing two groups within sight of each other, one a band of nomads who have come in from the wilderness with their furs to trade for modern ammunition, clothing and traps but whose lives will be spent entirely in the seclusion of the big timber, companions of the wild life and sharing their physical perfection; the other, a band that is lingering perhaps the year round within reach of a Hudson Bay Post though still spending some time on the trap-line to secure furs for trading for white flour, sugar, and canned goods. They are infatuated by the touch of modern civilization. The first group has perfect dentition and

is excellent physically; the second group is scourged with modern degenerations, which I believe are preventable. Certainly, something should be done to help them, yet how can we help them until we have learned how to help ourselves? We go reverently and humbly to the first group and ask them for the secrets of their more sound bodies and their happy and carefree lives. However, we have not glimpsed as yet at the real contrast between these two groups and cannot until we study in more detail the tragic plight of the latter owing to our modern degenerative diseases. These we will review in the last communication of this series.

(End of Ninth Installment)

COMING

- X. Field Studies Among Modernized and Primitive Eskimos of Alaska.
- XI. New Light on Loss of Immunity to Some Degenerative Processes Including Dental Caries.

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