

which at that time of year comes at 3.30 a.m. We got away at 4 o'clock. At 7 o'clock that night I was still 10 miles from the Hudson Bay Railway, but that 10 miles was over a muskeg portage, no road, just muskeg, which had thawed out. I set off with three Indians. Never will I forget that night. Every step you sank to your hips, and the only thing holding you up was the ice in the bottom. At last, at 7 in the morning, we walked into the small settlement soaked to the waist. I had been going 27 hours, and was ready to drop. My canoeman flopped in some shack and slept until noon, and then they were to start back, and meet me at the end of the portage sometime that night. I went to the hotel, got cleaned up a bit, and then got on a phone as soon as the telegraph office opened at 8 a.m. I phoned our office in The Pas. As luck had it, a gas car was ready to leave, and come up the railroad the 150 miles. I had him bring all the antitoxin available. I then expressed the throat swabs to Winnipeg, and prepared to await the antitoxin. I could not sleep. Around 5 o'clock, the antitoxin arrived. I had supper, and then hired a horse and guide and set off to meet my canoeman. There was a 17 mile portage, over which I was told I could ride. It was some ride. We had to swim our horses over one river, and jump two creeks. Most of the road was on high ground through the bush, but a lot of it was through swamps. However, we arrived at 4 a.m., just as my boys were getting up. We had breakfast, and then away. I slept a bit in the canoe. I needed it. Finally we arrived back at Cross Lake at 10 p.m. It was just dark. I had been on the road 66 hours with hardly a wink of sleep, and was all in. However, I went to see the cases of diphtheria. As I expected, the one child had died that afternoon. I gave the other child antitoxin and all the others prophylactic doses. There was no more diphtheria, and the one child got better. When I arrived home, there was a wire stating that the throat swabs were positive for diphtheria, and I felt my trip was justified.

It is time enough to answer questions when they are asked.—Emerson.

MEDICAL SURVEY OF NUTRITION AMONG THE NORTHERN MANITOBA INDIANS

By

P. E. Moore, M.D.

*Acting Superintendent, Medical Service,
Indian Affairs Branch*

H. D. Kruse, M.D.

Milbank Memorial Fund, New York City

F. F. Tisdall, M.D.

*Consultant on Nutrition, Medical Branch,
R.C.A.F.*

R. S. C. Corrigan, M.D.

Medical Superintendent, Norway House Agency

ECONOMIC ASPECTS OF INDIAN LIFE

AT the present time there are approximately 126,000 Indians in Canada whose health and welfare come under the jurisdiction of the Indian Affairs Branch of the Federal Department of Mines and Resources.* These people constitute no less than 1% of the total population of Canada. This 1%, however, presents a national problem in health and welfare out of all proportion to their numbers.

From the economic and occupational stand-points the Indian may be divided into four main groups. Even before the coming of the white man the Iroquois and associated tribes who lived in Ontario, Quebec and the adjacent areas of the United States were agriculturists to a degree. They lived in small villages and, in addition to hunting, grew corn. Today descendants of these Indians are largely settled in the populated districts of Ontario and Quebec, and make an important contribution to the agricultural life of these provinces. One of these tribes has become famous as structural steel workers, namely, the Caughnawagas. The second main group of Indians are the Plain Indians, descendants of the Blackfeet, Sioux, Assiniboine and Plain Cree tribes. These were the buffalo hunters. Today they have become ranchers and raise horses and cattle. They do not show great interest in other agricultural pursuits and cannot be regarded as "tillers of the soil". It is

* Since this report was written the Medical Service of the Indian Affairs Branch has been transferred from the Department of Mines and Resources and is now known as the "Indian Health Services, Department of National Health and Welfare".

even difficult to get them to raise dairy cattle, which observation is significant in view of their aboriginal habits of being meat eaters and hunters of buffalo. The third main group are the Coast Indians of British Columbia who were in the time of Captain Vancouver, and are today, fishermen. Their ability as fishermen is great. Unfortunately, before World War II their economic status was reduced by the unscrupulous encroachment of the Japanese. The fourth, and by far the largest group, occupies the hinterland of Canada. They are the descendants of many tribes, such as the Nascopies, Montaignais, Tête de Boules, Chippewas, Saulteaux, Swampy Crees, Chipewyans and Siccannies. These Indians, frequently referred to as "Bush Indians", constitute roughly one-half of the total Indian population and obtain their livelihood largely through hunting, trapping and fishing. The present investigation is limited to a study of a typical group of these Bush Indians.

There was a time when the Indian hunted for food. The skins and fur were used for clothing and covering for his wigwam. Today, however, he hunts and traps primarily for fur which is traded for food, clothing, and other articles, the products of modern civilization. Frequently he does not buy intelligently and a considerable portion of his income may be squandered on such things as radios, gramophones, guitars, trinkets and even—in isolated districts—motor cars. As an example, on a remote island in the Gulf of St. Lawrence, with a trail only three-quarters of a mile long, an Indian after paying his debt at the trading post had sufficient money left to buy and have shipped to the island a motor car. This he drove up and down the trail at all hours during the remainder of the summer. At freeze-up he left the car at the side of the trail without even draining the radiator and returned to his trap lines a hundred miles or more inland. The next year, due to the



Fig. 1.—Typical Indian hut.

vicissitudes of the trap line, the same Indian might be destitute and dependent on Government aid for himself and family.

The economic status of the Bush Indians depends almost entirely on the quantity of game, fur and fish available, and the market price of the fur and fish. During the present war many of these Indians have enlisted in the Armed Services and others have made an important

contribution to the war as labourers in the harvest fields and lumber camps. This has temporarily augmented their income. While it is impossible to estimate the average income of all the Bush Indians, the yearly income of the adult male before the war in the area where the present study was undertaken averaged \$200 to \$300. This has now been increased to approximately \$400.



Fig. 2.—Interior of Indian hut.

Formerly the Indians lived in wigwams and still do in some areas. Today the Indian is copying the white man and lives during the winter months in small one-roomed shacks (Fig. 1). Frequently the conditions are almost unbelievable—as many as 10 to 12 people living in a shack 12 feet square. The only furniture may consist of a stove in the centre and a small table or stool (Fig. 2). Sometimes there may be one broken-down single bed, but the majority sleep on the floor. The door is seldom more than 5 feet high and is covered by a blanket or old piece of canvas to keep out the wind. Two small windows let in the light, and the sole source of ventilation is the stove and the fairly large hole in the flat roof for the stove-pipe. Their sanitary habits are very primitive. Refuse and excreta litter the snow in the immediate vicinity of the house. With the advent of spring the whole family moves to tents, which they set up a few hundred feet away, and trust to the spring and summer rains to wash away the refuse. During the summer months they frequently change the location of the tents as they move about in their quest for food.

HEALTH CONDITIONS

As is to be expected from their housing conditions, epidemics occur most frequently during the winter months. Influenza, measles, whooping cough and other infectious diseases all take their toll. The infant mortality rate among the Indians studied reached the astounding figure in 1942 of slightly under 400 per 1,000 live births, with a comparable figure for the white population of Canada of 52. The crude mortality rate for 1942 was 39.04 per 1,000, in contrast with a rate of 8.3 for the white population in Manitoba. In Table I is presented the ten leading causes of death with the mortality rates.

TABLE I.
TEN LEADING CAUSES OF DEATH AMONG
CANADIAN INDIANS

	<i>Per 100,000</i>
Tuberculosis.....	761
Pneumonia.....	383
Diseases peculiar to the first year of life.....	177
Violent or accidental deaths.....	174
Diseases of the heart.....	172
Influenza.....	126
Diarrhoea and enteritis.....	110
Cancer.....	94
Senility.....	74
Whooping cough.....	66

Tuberculosis is the greatest single cause of death, with a death rate 14 times higher than that among the white population. In 1942, the death rate for Indians from tuberculosis for all of Canada was 732 per 100,000, with a comparable death rate among the white population of 51.4. However, in certain farming areas, where the Indians are well established, with a higher economic status and comparatively good nutrition, the death rate from tuberculosis is only slightly higher than in the surrounding white population. Among the Northern Indians death rates from 1,000 to 3,000 per 100,000 are encountered. In the area studied the death rate from tuberculosis in 1942 was 1,400 per 100,000. The comparable figure for the white population of Manitoba was 27.1.

Many factors influence this increase in mortality. Poor housing, inadequate sanitation and rigours of climate probably all play their part. Also studies conducted in many parts of the world have demonstrated that poor nutrition is accompanied by excessively high morbidity and mortality rates.

The articles of food most commonly purchased by the Bush Indians are white flour, lard, sugar, tea and a small amount of oatmeal. The Indians living in the remote areas only visit the trading posts once or twice a year to trade their furs for food and other articles. They usually stay in the neighbourhood of the post for three or four weeks before they depart again in their canoes for another year's hunting. The difficulties of preservation and transportation severely restrict both the amount and the kind of food purchased. As a result of this these Indians of necessity live on what flour, lard and sugar they can transport and the berries, game and fish that they obtain. The Indians living in the neighbourhood of the trading posts depend to a much greater extent on "store food" than on food obtained from the country. While these Indians purchase a somewhat greater variety of food, their chief purchases are still flour, lard, sugar and tea (Table II). In some sections a limited amount of potatoes is grown. It would seem to be difficult under these circumstances for the diet of the Indian to be other than deficient in many respects.

The diet of the Bush Indian has deteriorated in the past 40 years. Records kindly furnished by the Hudson's Bay Company, through Mr. D. H. Learmonth, the present factor at one of the Company's posts in Northern Manitoba, who

TABLE II.
 FOODS PURCHASED BY THE NORWAY HOUSE
 INDIAN IN 1941

Food	Amount per person per day, oz.	Calories per person per day
Flour.....	8.77	885
Lard.....	0.96	246
Sugar and jam.....	1.17	127
Bacon and dried salt pork.....	0.19	39
Rolled oats.....	0.32	36
Baker's bread.....	0.44	33
Butter.....	0.13	27
Beans.....	0.42	23
Milk—evaporated.....	0.42	17
Rice.....	0.11	10
Other foods.....	0.41	27
Total calories.....		1,470

was also associated with the Company in the same area nearly 40 years ago, bears this out. At that time an Indian family consisting of the man, his wife and 2 or 3 children, would set out in October for a period of 7 months with about 100 pounds of flour, a small amount of lard and beef suet, and a few pounds of tea and sugar which were considered luxuries. The main portion of the food was obtained "off the land", caribou, moose, beaver, muskrat, rabbit and fish. Today a typical example from the records is that of an Indian trapper of a better type than average who set off in October with his wife and no children taking with him no less than 600 pounds of white flour, 130 pounds of lard, 50 pounds of sugar and 25 pounds of tea. Today

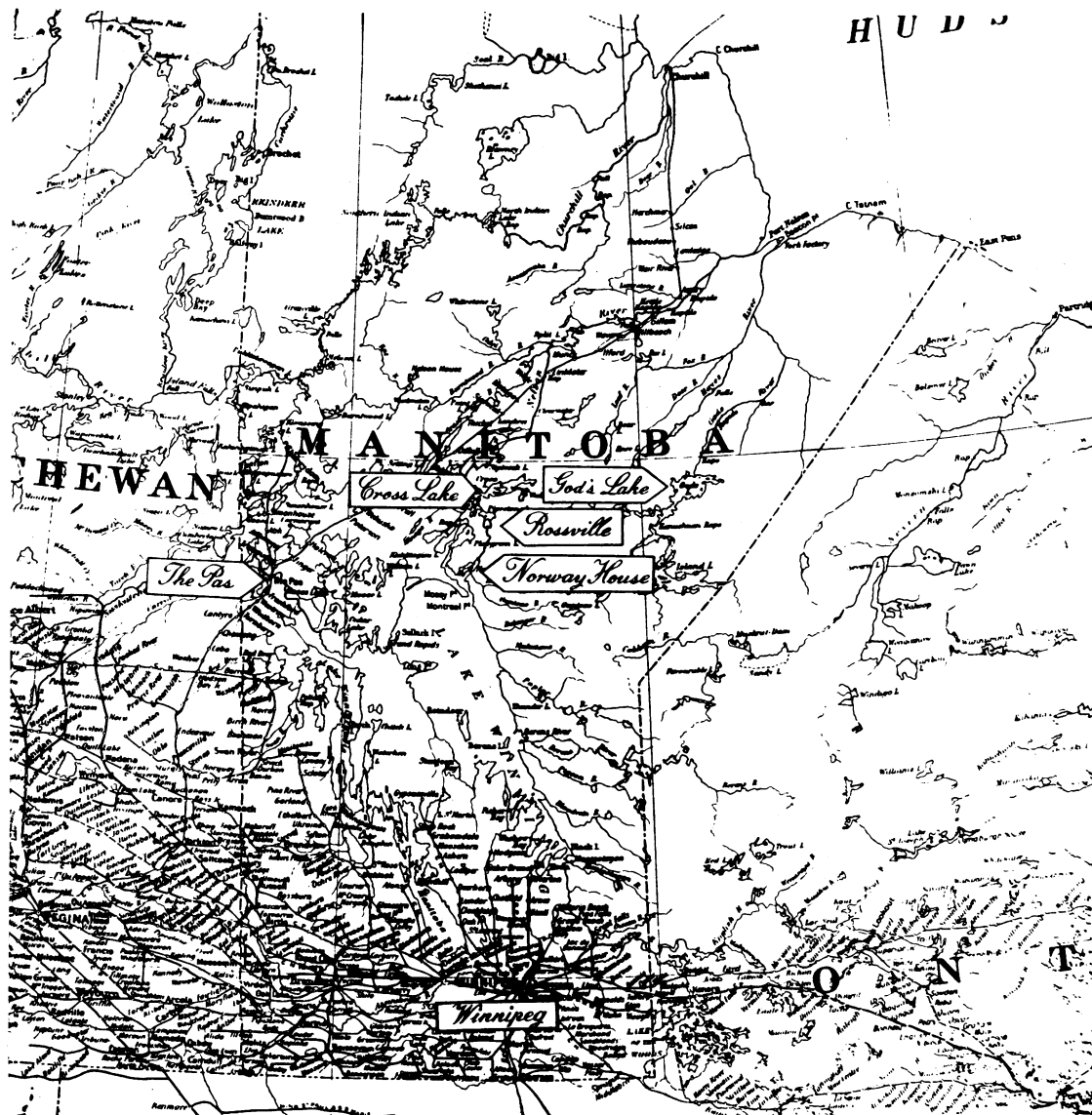


Fig. 3.—Map of area surveyed.

too the Indian "cleans" his fish and animals and discards highly nutritious organs that were formerly eaten.

It can be stated that without exception in those areas where the dietary habits of the Indian have changed from the consumption of foods from the country itself to "store food", which is largely white flour, lard and sugar, the physical condition of the Indian has markedly deteriorated in recent years.

The Medical Division of the Indian Affairs Branch has long been aware of the poor dietary habits of the Indian and their probable relation to his poor physical condition and high susceptibility to infection. Accordingly it appeared highly desirable to obtain further information on the part that malnutrition plays in the health of the Bush Indian.

SCOPE OF SURVEY

In March, 1942, a survey was organized by the Medical Division of the Indian Affairs Branch with the assistance of the Hudson's Bay Company, the Milbank Memorial Fund of New York City, and the Medical Branch of the Royal Canadian Air Force. The area chosen was in Northern Manitoba, approximately 350 miles north of Winnipeg (Fig. 3). The area is readily accessible by air. The places visited were God's Lake, Cross Lake, Norway House and The Pas. The Indians in this area are representative of the Bush Indians across Canada. The total Indian population of the area is 2,449.

For several reasons the survey was concentrated at Norway House. Here information could be obtained on the food supply. Also Indians were available in large numbers for examination at one site because a band is situated around the post and the local Indian hospital provided excellent facilities for the operation of special instruments and cameras.

Although a dietary survey was not conducted, special circumstances provided reliable evidence on the dietary habits of the Indians studied. All of their staple foods are imported and the trading post is the sole source of them. Through the Hudson's Bay Company records were obtained of the food purchased during the year 1941 by several hundred Indians in the area studied. The basic diet was supplemented by a small quantity of berries in season and what fish and game they could obtain.

More than 400 Indians of both sexes and all ages were examined; records were kept on 215.

Of the latter number, 187 were seen at Norway House and 28 at God's Lake.

In addition to a search for the advanced stages of nutritional deficiencies, such as keratomalacia, beri-beri, pellagra, scurvy and rickets, certain tissue changes which have been attributed by one of the authors (H.D.K.) to nutritional deficiencies were sought.^{1 to 6} These changes involve the conjunctivæ, the blood vessels at the corneal scleral junction, the gums and the tongue and have been ascribed by him to avitaminosis A, ariboflavinosis, avitaminosis C, and aniacinosis respectively. Examination was made for gross changes and in approximately half of the subjects the conjunctivæ and the ocular limbic blood vessels were also viewed through a biomicroscope. As a basis of appraising thiamine status an abridged neurological examination included: palpation of calf muscles; tests for triceps and patellar reflexes and vibratory sense.

Considerable difference of opinion exists concerning the specificity of these signs but most workers agree that they are found with greater frequency among malnourished than well nourished population groups.

RESULTS

Available food supply.—The food purchased by the Indians in the Norway House area is recorded in Table II. It is to be noted that of the 1,470 calories purchased per person per day, no less than 1,258, or 85% of the total, were supplied by the white flour, lard, sugar and jam. All these foods are either devoid of or extremely low in vitamins and minerals. A number of the nutritional factors in the foods purchased were calculated. The values are set out in Table III. It is impossible to estimate how much additional food was obtained by fishing and

TABLE III.
NUTRIENTS AVAILABLE PER PERSON PER DAY
FROM FOOD PURCHASED IN 1941

Nutrient	Amount per person per day in food purchased	Weighted recommended daily allowance per capita calculated for Canada
Calories.....	1,470	2,544
Protein.....	34 gm.	66.1 gm.
Fat.....	40 gm.
Calcium.....	103 mgm.	960 mgm.
Phosphorus.....	372 mgm.
Iron.....	9 mgm.	11.8 mgm.
Vitamin A.....	238 I.U.	4,590 I.U.
Thiamine.....	0.35 mgm.	1.45 mgm.
Riboflavin.....	0.25 mgm.	2.10 mgm.
Niacin.....	3.8 mgm.	14.5 mgm.
Ascorbic acid.....	1.0 mgm.	71.3 mgm.

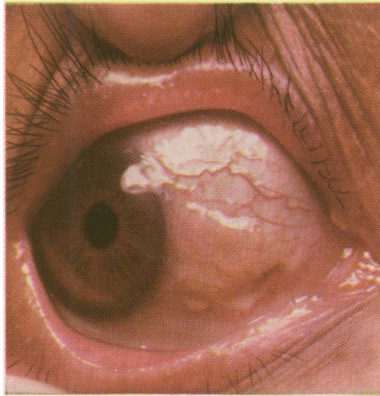


Fig. 4. — Conjunctival changes — male aged 32. Marked thickening and yellowish brown discoloration of conjunctiva.

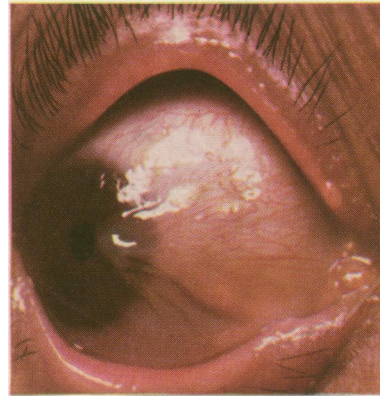


Fig. 5.—Pterygium—male aged 51. Marked thickening of conjunctiva with pterygium extending on to cornea almost to the pupil.

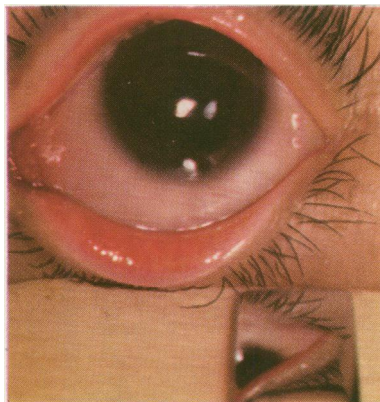


Fig. 6.—Snow blindness—male aged 12. Marked hyperæmia of vessels in conjunctiva. Œdema, cloudiness and lack of clarity of cornea and conjunctiva.

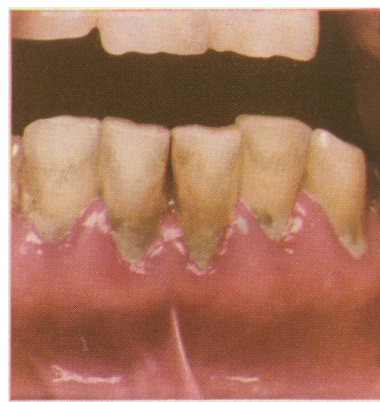


Fig. 7. — Gingival changes — male aged 27. Swelling of gingival tissues with recession and detachment from teeth.

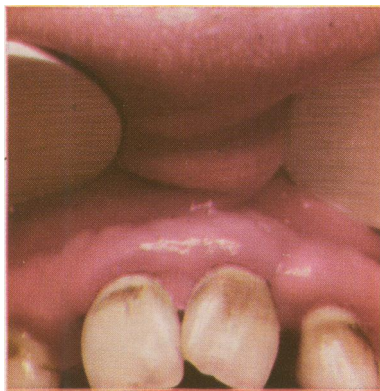


Fig. 8. — Gingival changes — male aged 57. Marked thickening of gingival tissues with loss of interdental papillæ.

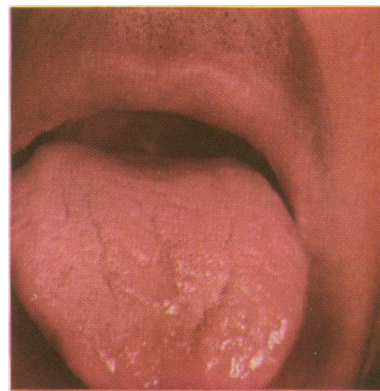


Fig. 9.—Tongue changes—male aged 43. Multiple fissuring with atrophy of papillæ at tip and lateral margins.

hunting, but due to the depletion of the fish and animals in the area, the amount must have been relatively small.

Physical measurements of the Indians were not taken. The Indian today however is smaller than 40 years ago. The shirts sold then were sizes 16 to 17, now the common sizes are 15½ to 16; the pants were sizes 38 to 44, now 34 to 38. Furthermore, in the past the Indians are said to have been energetic and accounts of their remarkable vigour have been perpetuated by both legend and record. In contrast, at present they generally show listlessness, indolence and inactivity. There is no doubt in the opinion of the older white inhabitants that there has been in the past 40 years a marked deterioration in the physical condition of the Norway House Indian.

No single classical deficiency disease was seen. However, every Indian observed had some abnormality of the conjunctivæ, ocular limbic blood vessels, tongue or gums. The most marked changes were in the conjunctivæ, ocular limbic blood vessels and gums.

Conjunctival changes.—As the changes which have been ascribed by one of the authors (H.D.K.) to a lack of vitamin A develop in the conjunctiva it becomes over-vascularized, thickened, at first translucent, then opaque, discoloured or even pigmented. Of 194 adult Indians whose conjunctival examination was recorded, all had advanced changes in their conjunctivæ characterized by thickness, opacity and discoloration (Fig. 4). The thickening was first obvious in children between 10 and 15 years of age, and became progressively more marked with increasing age. In 11% pterygia were also present (Fig. 5).

Neurological signs.—It is generally recognized that the early signs of beri-beri include calf tenderness, diminution or loss of vibratory sense, and modification of reflexes, such as hyperactivity, hypoactivity or complete loss. It is obvious that each of these individual signs can occur in conditions other than beri-beri. Nineteen per cent of the persons examined showed neurological signs, chiefly modified or lost reflexes. Because of language difficulties the test for vibratory sense could not be reliably conducted.

Changes in the blood vessels at the corneal scleral junction.—Normally the blood vessels of the ocular limbic plexus do not extend into the cornea. It has been reported^{2, 3} that a lack of riboflavin in the diet results in the engorgement

of the limbic plexus and vascular proliferation with invasion of the cornea. Coincident with this there may be tiredness of the eyes, sandy sensation under the lids, lachrymation and photophobia.

The only voluntary symptomatic complaints obtained from the Indians were referable to the eyes. The ocular symptoms were distinctly troublesome. Many complained of lachrymation and photophobia and lack of sharpness of vision. Prominent amongst the complaints were a burning sensation and a gritty feeling in the eyes. Considering that the ground everywhere for several months had been and was covered with several feet of snow, the presence of sand or any other foreign body in the eyes was most unlikely.

The symptoms of snow blindness are essentially the same as those just described but of greater intensity. The condition usually develops in February, March and April, when the days are beginning to lengthen and the amount of light reflected from the snow is becoming very great. The patient has usually been exposed to this bright light for some days. Suddenly, without warning, usually on a day when the sky is a little hazy, he develops in a matter of one to two hours intense pain in the eyes, described by some as a burning sensation, by others as a stabbing sensation, a gritty feeling under the eyelids with swelling, headache, extreme lachrymation and photophobia. In severe cases the conjunctivæ become intensely red due to congestion of the blood vessels. The condition may develop so suddenly that the individual has difficulty in getting back to his shelter or habitation. The treatment employed is simply to lie in a dark room with cold compresses over the eyes. In the course of one to two days the symptoms subside. It is recognized that the development of the condition is associated with exposure to intense light. A preliminary report⁷ has already been given, drawing attention to the similarity of the symptoms to those produced by a lack of riboflavin.

Four per cent of the Indians examined had congestion of the ocular limbic plexus which was seen grossly as a circumcorneal injection sometimes extending over most of the conjunctivæ (Fig. 6). Lachrymation and photophobia were very marked. Almost all of these subjects volunteered the opinion that they were suffering from snow blindness. Examination by one of the authors (H.D.K.) with the biomicroscope showed extension of injected blood vessels into

the cornea. Of the remaining subjects examined with the biomicroscope all showed proliferation of the blood vessels into the cornea but with no marked congestion. Lachrymation and photophobia were present in a large percentage of these.

Gum changes.—Recently in animal studies, on monkeys,⁸ redness, swelling, bleeding and tenderness of the gingivæ have been produced by a chronic lack of ascorbic acid. Studies⁹ conducted on Royal Canadian Air Force personnel have shown that gingivitis which had been treated locally recurred more frequently when the diet was low in ascorbic acid than when it contained the recommended allowance of 75 mgm. per day. Kruse⁴ in 1942 reported that changes of the gingivæ characterized by redness, swelling, bleeding and tenderness responded to large amounts of ascorbic acid when administered over a period of one year or longer.

In the present survey the gingival tissues were examined for redness and swelling. In addition other changes of a more chronic nature, particularly thickening, loss of interdental papillæ and recession of gum tissue so that a greater length of the tooth surface was exposed, were noted. Ten per cent of the Indians examined had evidences of acute inflammation of the gingivæ; 81% had subacute signs (Fig. 7) and all of those examined had chronic changes in the gingival tissues, most of which were marked (Fig. 8).

No cases of scurvy were seen.*

Tongue changes.—None of the Indians examined showed the severe red, swollen tongue characteristic of pellagra, but most of them exhibited some redness and swelling of the lingual papillæ. Almost all showed atrophic papillæ and fissures (Fig. 9). These changes were not of a severe nature.

DISCUSSION

It is obvious that the basic food of the Norway House Indian was deficient in practically every nutritional factor studied. The supplemental game provided some additional protein and due to the habit of the Indian of eating the small bones, some calcium. It also probably provided an appreciable amount of niacin, due to the relatively high concentration of this vitamin in meat and fish. But the entire diet provided little vitamin A, B₂ (riboflavin) and vitamin C

(ascorbic acid). The supply of thiamine while greater than that of vitamins A, B₂ and C was still quite inadequate. It should be borne in mind that the above comments refer to average conditions and the amounts actually consumed by many families were even less satisfactory.

It has recently been pointed out that dietary requirements are relative to many environmental as well as endogenous conditions.¹⁰ It has become increasingly evident that light belongs in the list of conditioning factors and that prolonged exposure to it greatly increases the requirements for certain dietary essentials. The extremely intense glare in the region surveyed due to reflection from the snow and the necessary prolonged exposure of the Indians to it because of their occupation, places them in need of much higher riboflavin intake than is usually regarded as adequate for unexposed persons in regions of less illumination. Thus in the face of increased need, the Indians are receiving only a small amount of riboflavin. Nor is this the only unusually heavy stress to which the Indian is exposed. The rigorous climatic conditions, the physical labour associated with gaining a livelihood and the almost constant high prevalence of active infectious disease impose extreme stress upon the Indian and conduce to the deterioration of his nutritional status.

It is recognized that there is a diversity of opinion as to the relationship of the tissue changes here observed to nutritional deficiencies. However, if the signs are taken as indicative of nutritional deficiency states, namely, the conjunctival changes as indicative of a lack of vitamin A, the ocular blood vessel changes of a lack of riboflavin, the gum and tongue changes of a lack of ascorbic acid and niacin respectively, the parallel between the prevalence and the severity of these signs and the nature of the deficiencies in the diet is striking.

Although the survey was limited to Northern Manitoba, one of the authors (P.E.M.) has observed similar tissue changes occurring with high frequency and severity in other bands and reservations. The occurrence of tissue changes in such frequency and severity is not peculiar to Indians. Similar conditions in another group have been reported. After a survey of Eskimos in the Canadian Eastern Arctic, Rabinowitch¹¹ reported that in the vast majority of eyes examined there was intense congestion of the conjunctivæ; pterygium was very common; and snow blindness occurred very frequently during the winter months. He stated that the blephari-

* In 1944 one of the authors (R.S.C.C.) observed an Indian woman with classical signs and symptoms of scurvy which responded to the administration of ascorbic acid.

tis, the dryness of the conjunctivæ, and the sticky shreds of Meibomian secretions on the lid margins were suggestive of vitamin A deficiency. His mention of the occurrence of pyorrhœa indicates that he saw gum conditions comparable to those seen in the Indian in the present survey.

Once again poor nutrition has been found to accompany excessively high morbidity and mortality rates. Voluminous evidence from experiments with animals attests that nutritional status influences these rates. The relatively few human studies on the subject point in that direction. It is not unlikely that poor nutrition is responsible in part at least for many characteristics of the Indian, such as shiftlessness, indolence and inertia which have long been regarded as inherent or hereditary traits. Furthermore, it is probable that their great susceptibility to many diseases, paramount amongst which is tuberculosis, may be attributable among other causes to their high degree of malnutrition arising from the lack of proper foods.

SUMMARY

1. A survey was made of the dietary habits and the nutritional status of more than 400 Canadian Bush Indians.

2. The dietary intake failed to meet the recommended daily allowances for most nutrients. For a number of the nutrients the margin was so far under the recommended levels that it is obvious the diet was markedly deficient. The most pronounced vitamin deficiencies were vitamin A, vitamin B₂ (riboflavin) and vitamin C (ascorbic acid).

3. Multiple and marked tissue changes were encountered in practically every Indian examined, the most marked changes being in the conjunctivæ, the blood vessels at the corneal scleral junction and the gums. These changes have been attributed by one of the authors (H.D.K.) to a lack of vitamin A, vitamin B₂ and vitamin C respectively.

4. The parallel between the prevalence and the severity of these signs and the degree of the deficiencies in the food supply is striking.

5. The Indian infant mortality rate, the crude mortality rate and the death rate from tuberculosis are many times higher than in the white population. All these conditions present a national problem in health and welfare far in excess of the numerical proportion of the Indian to the white population.

6. In common with the results of studies done in many parts of the world, poor nutrition has

been found in a population group with excessively high morbidity and mortality rates.

7. It is not unlikely that many characteristics, such as shiftlessness, indolence, improvidence and inertia, so long regarded as inherent or hereditary traits in the Indian race, may, at the root, be really the manifestations of malnutrition. Furthermore, it is probable that the Indians' great susceptibility to many diseases, paramount amongst which is tuberculosis, may be attributable among other causes to their high degree of malnutrition arising from lack of proper foods.

ADDENDUM

While this paper was in press the attention of the authors was directed to a monograph "C-Hypovitaminose" by Johns. Hagtvet, Norway, in which the author found that the average vitamin C food supply in Northern Norway was 5, 10 to 15 mgm. of ascorbic acid daily. He reports the marked prevalence of chronic gingivitis, and states, "This under-feeding with respect to vitamin C seems to have as a regular consequence chronic gingivitis, marginal osteitis and a tendency towards spontaneous bleedings."

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RÉSUMÉ

400 Indiens du nord du Manitoba ont été observés au double point de vue de leurs habitudes alimentaires et de leur état général. Les déficiences vitaminiques sont la règle, notamment, les déficiences en vitamines A, B₂ et C. Les altérations de leurs conjonctives, de leur cornée et de leurs gencives traduisent assez nettement les carences précitées. La mortalité infantile est très élevée, notamment, la mortalité due à la tuberculose. L'indolence, l'inertie et l'apathie de ces sujets n'est pas un trait racial,—comme on l'a cru trop longtemps,—mais provient plutôt de troubles profonds dus à une mauvaise alimentation; cette même étiologie est également à la base de leur manque de résistance à l'égard des infections, et plus particulièrement de la tuberculose.

JEAN SAUCIER