The Canadian
Medical Association Journal

Vol. 34 TORONTO, MAY, 1936 No. 5

CLINICAL AND OTHER OBSERVATIONS ON CANADIAN ESKIMOS IN THE EASTERN ARCTIC*

BY I. M. RABINOWITCH,

Montreal

THE purpose of this communication is to summarize briefly the clinical and metabolic findings of an investigation of Eskimos in the Canadian Eastern Arctic made during the Canadian Government Eastern Arctic Patrol of 1935. The metabolic findings, in detail, form the subject-matter of another report (in press).

Two different interests prompted this investigation. The purpose of the Canadian Government was to determine the general health of the Eskimos; whether contact with civilization is causing their deterioration; and, if so, the causes. Quite frankly, this was not the writer's interest. If there was a serious health problem amongst the Eskimos he was not aware of it. His interest was primarily in the alleged absence of diabetes, cancer, and arteriosclerosis, and the possible relationship between such absence and the peculiar dietary habits of these people. However, as will be seen, the necessary methods of investigation were essentially the same.

The data include general physical examinations; routine urinalyses (albumin, sugar, acetone, etc.); red and white blood cell counts; hæmoglobin determinations and blood smear studies; Wassermann and Kahn tests, and x-ray examinations of the lower extremities for calcification of the arteries. The metabolic data include general blood chemistry (non-protein nitrogen, urea, creatinine, uric acid, amino-acids, sugar, chloride, lipoids, etc.); blood sugar time curves following ingestion of glucose; analysis of blood lipoids; basal metabolism tests, and respiratory quotients obtained before and after administration of fat meals. The chemical examinations of the urine include chloride and nitrogen determinations and analyses of inorganic constituents (lead, copper, etc.). Urines were also examined spectrographically by the Physics Department of McGill University. The food analyses include determinations of food values and of inorganic constituents (copper, lead, etc.). Chemical analyses were also made of sea water collected at 25 different points at sea and in port. X-ray films were obtained of skulls for Dr. Mortimer, of the Department of Biochemistry, McGill University, for his endocrine studies.

The findings should be reasonably representative of the health conditions in the Eastern Arctic. The areas of four of the islands which we visited — Southampton, Baffin, Devon and Ellesmere — account for approximately 70 per cent of the total area of the principal islands in the Eastern Arctic. The population is also well represented. The combined statistics of the Royal Canadian Mounted Police, traders, medical officers, and missionaries, show that there are approximately 2,400 Eskimo in the Eastern Arctic, and, in the four islands I have just mentioned there are about 950 natives. Therefore, the Eskimos of these four islands account for about 40 per cent of the total Eskimo population in the Eastern Arctic. In all 389 Eskimos were examined, 267 of whom, or approximately 68 per cent, were in these four islands. In Baffin Island alone, which accounts for almost one-half of the total area of the principal islands in the Eastern Arctic and about one-third of the total population, the writer visited five ports—Cape Dorset, Lake Harbour, Pangnirtung, Pond Inlet and Clyde River—and examined 203 natives, or approximately 25 per cent of the total population. The natives found at Dundas and Craig Harbours represented the total population of Devon and Ellesmere Islands, which in area account for

* A portion of the material on the investigation of which this report is based was collected by Dr. C. C. Birchard in Hudson Strait and on Quebec shores of Hudson's Bay.

approximately 95,000 square miles, or slightly over one-fifth of the total area of the principal islands in the Eastern Arctic north of Hudson's Bay.

It is necessary, however, to point out the limitations of the data. In order not to get caught in the ice and be forced to winter in the Arctic, the ship, which carries the annual supplies for the Hudson's Bay Company's posts, the police, and the missionaries to these regions of Canada, must travel approximately 10,000 miles at an average speed of about 9 knots only; must discharge cargo at about 20 ports and depend upon tides to enter and leave each port, and all of this must be accomplished within the short period of about two months. Actually, in 1935, allowing for the time it took the *Nascopie* to reach Port Burwell, the eastern entrance to Hudson's Bay, from Montreal, the duration of the voyage was two months. The *Nascopie* first reached Port Burwell on July 23rd, and on its return journey again docked at Port Burwell on September 22nd. It is obvious, therefore, that the time we could possibly have spent at any one port must have been very short. It is failure to recognize this fact which has, in my opinion, led to so much misinformation regarding not only the Eskimo but also those who, directly or indirectly, were responsible for his welfare.

The difficulties in obtaining information were not the same in every port. Not all the Eskimos are dependent upon the annual fleeting visit of physicians who accompany the patrol ship. At Chesterfield Inlet, on the northwest shore of Hudson's Bay, there is the Catholic Mission hospital, and at Pangnirtung, in Cumberland Sound, on Baffin Island, there is the Anglican Mission hospital. Both of these hospitals were built and equipped by the missionaries, and are supported by the Dominion Government, which, I was told, contributes not only towards the maintenance of physicians and nursing staffs but also towards indigent patients. The hospital at Chesterfield, a three-storey structure with accommodation for 40 to 50 beds, is under the direction of Bishop A. Turquetil. The staff here consists of Dr. L. D. Livingstone and two Sisters. The hospital is very well organized. Some idea of the organization may be gained from experiences with some of the metabolism tests. The intention was to obtain 5 blood sugar time curves. When I arrived on the morning the tests were to be made the Eskimos had been properly prepared for the tests (fasting, etc.), and were in bed, and all of the 5 tests, which involved collection of 25 blood samples, were done in the one morning.

The Pangnirtung hospital is under the direction of Right Rev. A. L. Fleming, Anglican Bishop of the Arctic, and the staff consists of Dr. A. G. MacKinnon, a nurse, and a matron. This hospital is very well equipped for x-ray work. In one short morning, with the assistance of Dr. MacKinnon, Rev. A. G. Turner, the Missioner, the matron and the nurse, 24 Eskimos were collected and films were obtained of their lower extremities for examination for calcification of the arteries.

In order to determine whether contact with civilization is causing deterioration of the Eskimo, consideration had to be given to a variety of factors, and one of these was the mode of life. Conditions of life are so varied in the Eastern Arctic that the influence of civilization should, theoretically, be a simple matter to determine. Practically, however, there are many difficulties, and experiences with Eskimos elsewhere are of very limited value, since it is obvious from the literature alone that, though ethnologically there is much in common between all Eskimos, those of the Eastern Arctic differ in mode of life and customs from those of Coronation Gulf, and the Eskimos of Coronation Gulf differ appreciably from those of the Western Arctic. The problem, however, is simplified to some extent by the fact that in the Eastern Arctic alone the conditions under which the Eskimos live are many. The conditions which obtain in Hudson's Bay and Straits differ quite appreciably from those of the more northern parts of Baffin Island and Devon Island; and, though one would expect, theoretically, that the Eskimos at the latitude of Craig Harbour on Ellesmere Island would live under the most primitive conditions, this is not so. These Eskimos are employed by the Police, and live in huts for a great part of the year. Their food and clothing are also to some extent the products of civilization, but the conditions under which they live are exceptionally good. The Police rigidly supervise the cleanliness of the huts and laziness is not permitted. The food supplied by the Police

Fig. 1.—*R.M.S. Nascopie* on July 24, 1935, in Hudson Strait.
Photo by Dr. C. C. Birchard (courtesy of the *McGill News*).
Temperature on same day in Montreal, maximum 85.5 deg.; minimum, 71 deg.

must be supplemented by the natural foods of their environment — seal, etc. These Eskimos still spend much time hunting.

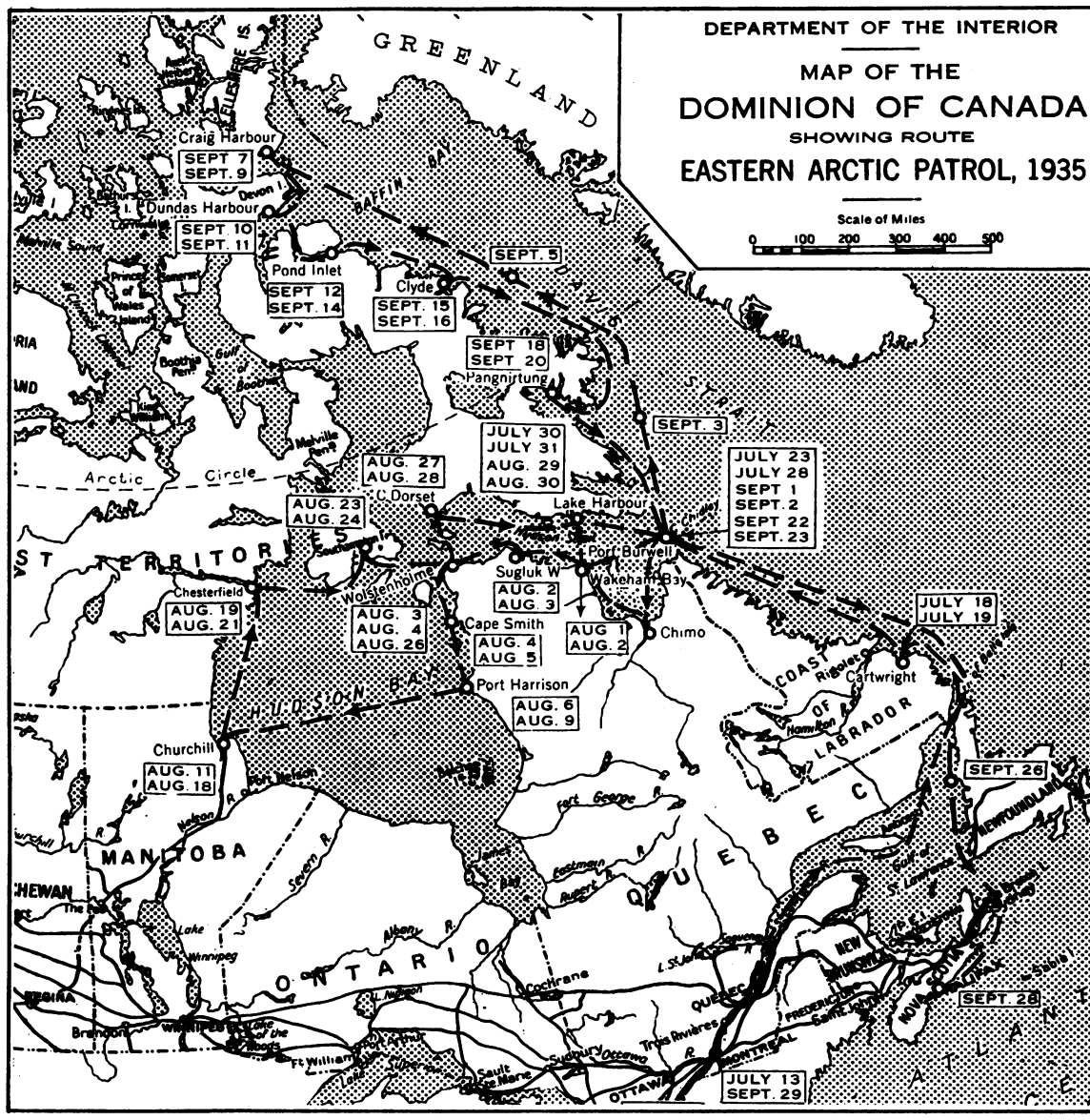
An example of the difficulties of correlating living conditions with health may be seen in the writer's attempt to relate the latter to the various proportions of skin and canvas tents, of motor boats and kyaks, of fur clothes and those made of cotton, etc. The tents found at the Posts when the ship arrived were, with extremely few exceptions, not permanent structures. Except for the few native employees of the Hudson's Bay Company, police, and missionaries, the great majority of Eskimos lead a nomadic life; some trap, others hunt, and few only ordinarily live at the Post. For example, at Clyde River on Baffin Island, though the Canadian Government statistics give the Eskimo population as 32, the writer saw 11 only of the natives; and at Pond Inlet, though the population is recorded as 131, there were 31 only.

Interpretation of clothes is no less difficult. Thus, though some of the natives may wear cloth materials on festive occasions, such as on the arrival of a ship, these, I was told, are, as a rule, soon discarded when the ship leaves. Weather is also an important factor. An example of this was met with at Pangnirtung. On the first day, the majority of the natives were dressed in cloth materials; with the change in the weather the following day—with the decrease of temperature and rain—the cloth materials practically disappeared and the great majority of the natives appeared in their native seal-skin clothes. At Lake Harbour there was a cold drizzle all day, and, with one exception only, all of the natives were dressed in seal-skin.

Food afforded a better indication of the living conditions. In Hudson's Bay, for example, at Chesterfield Inlet, hunting conditions are poor and flour was very common; it was found in eight of nineteen tents visited; whereas, in the same Bay, at Coral Harbour on Southampton Island, where seal hunting is good near the Post, though the natives must go a little farther for walrus, flour was found in one only of the eight tents visited. At Wolstenholme, the

western entrance to the Bay, the natives must hunt quite a distance from the Post and, here, of nine tents, four contained flour. The same conditions were met with in the Straits. Thus, at Cape Dorset on Baffin Island hunting is very good close to the Post, and Salisbury Island, a very good place for walrus, is not very distant. Here, of fourteen tents visited, flour was found in two only. At Lake Harbour, seals, I was told, are found in abundance about eight miles from the Post; walrus are also available within a short distance, and, here, of twenty-six tents, flour was found in one only; whereas, at Port Burwell, where, aside from very intimate contact with white men throughout the year, hunting conditions are poor for seal and walrus, flour was found in all of the nine tents visited. Data with regard to flour alone are, however, not entirely satisfactory. Thus, although flour was found in one tent only at Lake Harbour, the average annual consumption at this Post, I was told, is about 130 pounds for an average family of three people. This, however, it will be noted, corresponds to less than two ounces per day per person. At Dundas Harbour, the two natives who were selected to test the influence of fat meals (soya bean oil) upon the respiratory quotient had had, according to the interpreter, no flour whatever for three weeks before the tests. Meat was found in all of the tents at Pond Inlet and in nearly all at Pangnirtung.

In general, the men were found to be healthier than the women; but the majority of men were at work outside of the tents, whereas the ma-



jority of the women were found in the tents. As a rule, the men found at the shores were in better health than those found about the tents; and when the hunters were separated from the trappers the former were, in general, healthier than the latter. Here, food is obviously an important factor. The food of the hunter is generally seal, walrus, whale, birds, etc.; whereas, I was told, the trapper must rely to an appreciable extent upon such foods as caribou, dried buffalo meat, etc., with an occasional supply of seal.

DISEASES AMONGST ESKIMOS

A very striking example of the influence of contact with civilized man is seen when the diseases met with in Hudson's Bay and Straits are compared with those of the more northerly regions of the Eastern Arctic. Chesterfield and Port Burwell are the Port Said and Bombay of the Eastern Arctic. The majority of the natives at these posts were pale (according to the hæmatological findings there is reason to suspect that one of them had pernicious anæmia), whereas in the northern parts of Baffin Island, Devon and Ellesmere Islands, the colours of the skins and mucous membranes were not only good but many of the natives looked plethoric. A number had epistaxis, which in a number of cases was subsequently found to be due to polycythæmia. This polycythæmia appears to be "symptomatic", since, though there were the usual features — suggestive cyanosis, high red cell counts, high hæmoglobin values, high cell-plasma ratios, hypertension and occasional headache — none of the spleens was palpable nor enlarged to percussion. It would appear that polycythæmia is also common amongst Greenland Eskimos. Mrs. J. O. B. Petersen has told the writer that she has often seen "rings of blood" about the nostrils of the natives. It is also of interest to note that venesection, a common procedure for the relief of polycythæmia vera, is also practised by the Eskimos. They perform the operation upon one another in the ante-cubital area; the writer saw a number of what appeared to be the tell-tale scars.

There were 38 cases of epistaxis, but, unfortunately, the cause was not suspected for some time; also conditions did not permit collection of complete data in all of the known cases. The following, however, is a summary of the blood pressures, hæmoglobin determinations, and cell-plasma ratios in 8 of the cases with epistaxis in which all examinations were made.

	Maximum	*Minimum*	*Average*
Blood pressure: systolic	172	132	140
diastolic	90	74	83
Hæmoglobin (per cent)	165	135	145
Cell-plasma ratio	2.21	1.45	1.85

Aside from their clinical interest, these cases are of interest from the point of view of the physiology of the formation of hæmoglobin. Is the excess production of hæmoglobin due to copper? In general, as is well known, marine life is richer in this element than land animals. It is for this reason that analyses of foods and urines for copper contents were included in the metabolic studies. It is of interest to note that, compared with the findings at Pangnirtung and the more northerly posts, signs of polycythæmia were very uncommon in the Straits and Bay; and this fits in with the urinary excretion of copper.

Tuberculosis was common in the Straits and Bay. At Chesterfield Inlet, of 62 persons examined 22 had some respiratory disturbance; and of these 12 had coughs with no detectable adventitious sounds in the lungs; 2 had what appeared to be bronchitis only; and 8 had active pulmonary tuberculosis. In addition to these 8 cases, active glandular tuberculosis (cervical) was found in 4 children. At Port Burwell, of 31 natives examined 8 had coughs with no detectable adventitious sounds; 2 had what appeared to be bronchitis; and 5 adults had active pulmonary tuberculosis. Two children had masses of confluent glands in the neck. There was one case of tuberculosis of bone (phalanx); there was no reason to suspect lues in this case. At Coral Harbour there was a child with tuberculosis of a knee joint. Two cases of active pulmonary tuberculosis were found at Lake Harbour. At Wolstenholme one child was found with a mass of confluent glands in the neck. No clinical tuberculosis was found at Cape Dorset. As we travelled north, a number of cases of pulmonary tuberculosis in adults and enlarged cervical lymph-glands in children were found at Pangnirtung, on lower Baffin Island. This fitted in with the experiences of Dr. MacKinnon. Among an excellent collection of 100 case reports which Dr.

MacKinnon showed the writer there were 7 cases of pulmonary tuberculosis, and in 13 of this group there was a family history of the disease. No evidence, however, was found of the disease at Clyde River; Pond Inlet and Dundas Harbour on Devon Island. At Craig Harbour on Ellesmere Island, the natives were exceptionally healthy.

The teeth afford further proof of the harmful effects of civilization. They very strikingly differentiate the Eskimos of the Straits and Bay from those of the more northerly regions. In the Bay and Straits many were quite clean, and the reason was obvious; they had been brushed. At Port Burwell I found a tooth brush resting on a boulder about 20 feet in front of a tent. Cleanliness is, however, not necessarily synonymous with healthy teeth; the highest incidence of caries and pyorrhœa was found at Chesterfield and Port Burwell. At the latter Post, of 31 natives examined 16 had very poor teeth. Dr. A. L. Richard, the ship's physician, told the writer that he had extracted 32 teeth in one afternoon at Chimo, and that, in all, he extracted 50. As we travelled north the teeth were found in a much filthier state, but they were very much healthier. The only disturbing finding in these regions was the severity of the abrasions, particularly in the women, with many teeth worn to the gum-lines. This condition will be referred to again.

Our data, I believe, definitely disprove the alleged absence of arteriosclerosis amongst the Eskimo, at least in the Eastern Arctic. According to Dr. J. G. Townsend, Director of Health of the Department of the Interior of the United States, the Eskimo in Alaska is apparently free of arteriosclerosis (personal communication). Dr. J. A. Urquhart, at Aklavik, N.W.T., also has the impression it is rare amongst the Eskimo in the Western Arctic of Canada (personal communication) and, in his paper (this *Journal*, 1935, **33**: 193) he states that chronic nephritis is very rare. This certainly does not apply to the Eastern Arctic. Again, the experiences in the Bay and Straits differed from those of the more northerly regions; in the former I saw 1 case of hemiplegia and 6 of marked retinal arteriosclerosis. Thickened radial and tortuous temporal vessels were common, and in 34 cases the blood pressures were greater than 150 mm. Hg.; whereas, aside from increase of blood pressure in 5 of the cases of polycythæmia, clinical evidence of arteriosclerosis was found in 6 cases only amongst all of the Eskimos examined at Pangnirtung, and no evidence of the disease was found at Clyde River, Pond Inlet, Dundas and Craig Harbours.

The above findings fit in with the x-ray examinations. Of 39 films of Eskimos taken in Hudson's Bay and Straits by Dr. Birchard 19 showed definite calcification of the arteries, an incidence of 48.7 per cent; whereas, of 24 films on Baffin Island, 4 only showed calcification, an incidence of 16.6 per cent, in spite of the fact that the average age of the Hudson's Bay and Straits group was 44.6 years, whereas, that of the Baffin Island group was 50.0 years. These findings, incidentally, fit in with experiences with albuminuria. Of 75 urines examined for albumin, 37 were of Eskimos in Hudson's Bay and Straits and 38 in the more northerly regions. Nine, in all, had albuminuria, and of these 9 all, with one exception, were from Hudson's Bay and Straits.

The Eskimo is of interest from the point of view of the etiology of arteriosclerosis. As will presently be seen, venereal disease appears to be rare. Syphilis, therefore, can hardly be a very important factor. Diabetes, as will presently be seen, is also excluded, and, though chemical composition of blood does not alone exclude gout, it is of interest to note that all of the uric acid values were within the normal limits. The Eskimo disturbs our ideas about the importance of strenuous life, in view of the fact that no arteriosclerosis was found at Clyde River, Pond Inlet and Dundas Harbour. The Eskimo also disturbs our ideas about high protein diets. When food is abundant a healthy Eskimo living under primitive conditions will eat 5 to 10 pounds of meat or more a day; and the greatest meat eaters are at Pangnirtung, Clyde River, Pond Inlet and Dundas Harbour.

Is lead a factor? As is well known, disease of the vascular system is the outstanding pathological lesion in chronic lead poisoning, and lead is almost invariably found in the urine of normal people; we pay very little attention to as much as 0.1 mg. per litre. The examinations of the Eskimo urine are, therefore, of more than academic interest. No lead whatever was found in 24 specimens examined spectrographically by Dr. John S. Foster, of the

Physics Department of McGill University, in spite of the fact that, with the method used, as little as 0.0000005 g. of lead per c.c. of urine may be detected with very little difficulty. It would appear, therefore, that lead is not the explanation of the high incidence of arteriosclerosis which was found in Hudson's Bay and Straits.

A variety of illnesses were met with, in isolated instances. There was one case of pituitary disease with exophthalmos; one of rheumatoid arthritis, and one of hydrocephalus in a child; there were 4 cases of cataract, 1 of epilepsy, and 1 of insanity. There were no signs of any heart disease, though in one case, at Dundas Harbour I found an apical systolic murmur. There was no evidence of tonsillitis. All the tonsils had healthy pink surfaces, and no pus was found with the ordinary pressure with a tongue depressor.

In the Western Arctic Dr. Urquhart has as yet not met with a single case of cancer in the seven years of his practice. Cancer must be extremely rare in the Eastern Arctic also. I saw one suspicious case only, in a male aged approximately 60 years, at Cape Dorset. According to the interpreter the lesion (lower lip) was about two years old. It bled rather easily, and there was some induration about it. There was, however, no enlargement of the glands in the neck, in spite of the duration of the lesion. The man did not smoke a pipe.

There was no clinical evidence of diabetes mellitus, and, of all of the urines examined, 3 only contained reducing substances, but the latter were subsequently found to be non-fermentable. One of the natives at Pond Inlet had a carbuncle on his neck, but there was no glycosuria. Nor were there any acetone bodies in any of the urines. This, however, in my opinion, is no mystery. These people do not live upon as pure a fat-protein diet as is generally believed. The Eskimo has some carbohydrates for approximately two months in the year, in the form of blueberries. He also relishes the stomach contents of the caribou, which, throughout the year, contain carbohydrates, though the greater part is probably not utilizable as far as the human being is concerned (celluloses, hemicelluloses, hexosans, pentosans, etc.). (The stomach contents are often eaten with seal oil — a salad!) When an Eskimo catches a walrus he immediately opens the stomach and eats all of the clams, which have some glycogen. He also relishes the skin of the whale and narwhal, both of which are rich in glycogen, and he eats enormous quanties of meat. The Eskimos eat the livers of practically all animals, except that of the white bear. These are rich in glycogen. As stated above, when food is abundant a healthy adult will eat 5 to 10 or more pounds of meat a day, and, only when in need does he consume very large quanties of fat. Blubber is not regarded as a delicacy. It is also of interest to note that, though whale, walrus and seal have enormous layers of blubber, the accumulations of fat in the musculature seen in some land animals are practically unknown; the meat is, therefore, lean. When consideration is given to these facts and to the additional fact that about 58 per cent of protein is convertible into sugar, it is obvious that the ratio of fatty-acid to glucose is well below the generally accepted level of ketogenesis. I estimate that when food is abundant, the average daily diet of the adult Eskimo consists approximately of 30 to 40 grams of carbohydrate (which includes glycogen), 250 to 300 grams of protein, and about 150 grams of fat (FA/G=1.2). These amounts of meat are apparently not heroic, for it has been alleged that the Yakuts, on the Low Steppe, east of the Lena, eat as much as 25 and 30 pounds of meat a day. Parenthetically, it may be observed that, from the metabolic point of view, it would appear that many of the Eskimos are now in greater danger of alkalosis than acidosis, because of their practices with flour. The "bannock", which some eat in large quantities when finances permit, is essentially a mixture of flour and baking soda, and the Eskimo, according to the amounts which I saw used, has no sense whatever of the necessary relative proportions of flour and baking soda for the preparation of this food.

No definite evidence of clinical syphilis was found anywhere. There were 5 suspicious cases at Pangnirtung, on Baffin Island, and one at Dundas Harbour, on Devon Island. Of the former, a positive Wassermann reaction was found in one only; in the case at Dundas Harbour the reaction was positive. Of 26 other samples of blood collected at random, none was

positive. Nor was there any evidence at least of active gonorrhœa.

My observations on sterility are of interest here. It has been alleged that sterility is common amongst the Eskimo and that it is on the increase. Limited significance must be attached to the data, in view of the smallness of the numbers. It is, however, of interest to note that of 107 women, selected at random, but with husbands alive, 8 only had no children, and, of these 8, three had not as yet reached the menopause. The incidence of sterility, therefore, does not appear to be greater than amongst civilized peoples.* Combining all of the data, venereal disease, therefore, must be rare amongst the Eskimo, and this is undoubtedly due to the rigid police regulations with regard to their own men and the rigid and very wise policy of the Hudson's Bay Company with regard to the permission of the ship's crew to go ashore. It is of interest to note that, according to Dr. Urquhart, venereal disease is practically non-existent in the Western Arctic. Parenthetically, experiences in this investigation afford a good example of the importance not only of expert interpreters but also of a knowledge of the customs of the people. No cases whatever of sterility would have been discovered had the questions merely been— Are you married? and— Have you any children? Whenever the replies to both questions were in the affirmative, the next question had to be— Are these children your own? —since the practice of adopting children is very common; of the 107 families, selected at random, 24 had adopted children.

The hæmatological data are of interest. From reports of the Institute of Parasitology of McGill University by Drs. T. W. M. Cameron and I. W. Parnell it is obvious that the Eskimo is exposed to a variety of parasitic infections. These authors have found that at least three-quarters of all of the animals examined, birds, duck, geese, etc., harboured parasites. The polar bear, walrus, and weasel were found free, but most of the seals examined were infected with Ascarides and intestinal flukes. The Eskimo lives in intimate contact with his dogs, and carcasses and fæces of these animals are heavily parasitized with hookworm, Ascarides, flukes, and tape worms. Ascarides, tænia and hookworm were found as far north as Craig Harbour, and hares from Ellesmere Island were heavily infected with worms. Nail scrapings of Eskimos were found high in content of *Oxyuris vermicularis*. Our hæmatological findings are, therefore, as one would expect. Hæmatological studies of 35 blood smears by our hæmatologist, Dr. E. S. Mills, revealed nothing abnormal, except for the above-mentioned suspected case of pernicious anæmia and 3 cases of eosinophilia (5 per cent or more of eosinophiles). Our pathologist, Dr. L. J. Rhea, in his search for parasites found 6 cases of eosinophilia amongst 34 blood smears.

There was no definite evidence of rickets either in the Straits and Bay or in the more northerly regions (there were 3 suspicious cases at Pangnirtung). The absence, or, at least, rarity, of this condition, especially at the latitudes of Clyde River (70°26′), Pond Inlet (72°40′), Dundas Harbour (74°35′), and Craig Harbour (76°12′) is instructive when we appreciate the fact that the effectiveness of the sun's rays in the production of vitamin D-like substances decreases towards the Pole. Furthermore, the Eskimo's skin is quite pigmented. This tends to interfere with penetration of the little of the sun's rays which are effective. The reason, however, for the failure to find rickets at the above-mentioned places appears to be that infants are nursed for as much as two years and more, and the fact that the vitamin D-content of seal oil is equal to that of the best cod-liver oil. According to Dr. Urquhart, infants are nursed for very long periods of time amongst the Western Arctic Eskimos also. One of the mothers demonstrated to me that her milk supply was still plentiful, though she was still nursing her child who, according to the interpreter, was now 2½ years old.

The birth of a child at Lake Harbour was an interesting experience. The practice of tying a bed-sheet to the foot of the bed dates back apparently to the Stone Age, for here, a few feet in front of the woman, a huge boulder held down a piece of skin which she pulled at with each attack of pain. From another experience, if I may suggest it, our obstetricians have something to learn from the Eskimo about the mechanics of labour. The child is born with

* In view of the small number of the women questioned these data are, as stated, of limited significance. At Pangnirtung, for example, the majority of natives were away from the Post when the ship arrived, and Dr. MacKinnon told the writer that he knew of a number of cases of sterility. However, it was Dr. MacKinnon's impression that the sterility was due to displacement of the uterus rather than to venereal disease.

the mother in a squatting position. She is supported in this position by three women. One sits in the knee position behind her with both arms over the shoulders of the patient; on each side the other two women sit in the ordinary sitting position and support the shoulders of the patient in front. Birth apparently is not a very painful matter, judging from the expression of this woman as I watched her for some time. Incidentally, though a primipara, the os was fully dilated, though, according to the interpreter, she was in labour for about twelve hours only. Except for the administration of some castor oil and 1 c.c. of pituitrin, my activities, as obstetrician, consisted, as the word implies, in standing-by. The child was born ten minutes after the pituitrin was given, and ten minutes later, all in the tent — 11 women, the patient, and the writer—enjoyed cigarettes. Mr. J. A. Thom, one of the Hudson's Bay Company's officials, who has been in the Arctic for sixteen years, told the writer that, according to pagan practice, only women past the menopause are permitted to attend the birth of a child; that things of any appreciable value are removed from the tent before labour commences, in order that they may not be defiled; that all men leave the neighbourhood and go "hunting"; and that the placenta and the menstrual pad of fur are taken some distance from the tent by a group of women and buried under rocks with some ceremony. According to the above observations, these people still retained some of their former beliefs, since no men were about the tent and the tent was practically empty; there were a few cooking utensils and just enough fur to cover the expectant mother; but of the 11 women in the tent a number were obviously still within the child-bearing age. The placenta was tied by one of the women in two places with part of a dog-line and the cord was cut between the ligatures with a knife. As I was told that the mother was a Christian I expected the placenta would be thrown away immediately. It was, however, placed at the back of the tent and covered with a piece of skin; and though I waited in the tent for some time I never saw its ultimate disposal. When the *attataga* (father) learned that his offspring was an *arg-na* (girl) and not an *ung-oon* (boy), he seemed quite disappointed. Mr. George Watson, the Hudson's Bay Company representative on the voyage, was also disappointed in that I failed to produce a trapper!

Amongst the more primitive Eskimos (Pangnirtung, Clyde River, Pond Inlet, on Baffin Island, and Dundas Harbour, on Devon Island) the three most important health problems are the conditions of the eyes and teeth, and the poor resistance to infection.

In the vast majority of eyes examined there was intense congestion of the conjunctivæ, and this, with the marked wrinkling of the forehead, would appear to be due to constant strain. Pterygium was very common, and in a number of cases was bilateral. This also appeared to be due either to strain or dust, but there is apparently another factor since it was found much more frequently in the women. Since the women spend much more of their time in the tents, spasmodic exposure may be a factor. From missionaries, Hudson's Bay officials, and police I learned that snow-blindness was very common during the winter months. Errors of refraction were very common; but particularly of interest was the relative insensitivity to foreign bodies in the eyes. In some of these cases I found foreign bodies as large as a pinhead and in 9 of the 13 cases with foreign bodies the persons concerned were not even aware of them, though in each case these bodies moved about freely and were very easily removed. In a few cases there had been some secondary reactions at an earlier date, since the foreign substances were encysted. In three cases of blindness the foreign bodies were found deeply encysted, and, as the blindness followed attacks of snow-blindness, it would appear that the combined disturbances led to a panophthalmitis. In the Straits and Bay there was good reason to suspect that this relative insensitivity to foreign bodies may be due, in part, to vitamin A deficiency as a result of insufficient fat in the food. The blepharitis, with œdema of the eyelids, the dryness of the conjunctivæ, and the sticky shreds of Meibomian secretions on the lid margins were certainly suggestive. The eyes alone, in my opinion, warrant periodic visits by an opthalmologist. Correction of errors of refraction would improve the sight, and thus the hunting capacity, of an appreciable number of these people.

Equally important is the condition of the teeth, namely, the marked abrasion. In a letter to the writer, Dr. M. A. Pleasure stated that in the American Museum of Natural History, in New York, amongst the 12,000 skulls there are several hundreds of Eskimos, and that the most interesting of the distinctive features is the extent of the abrasion of the teeth. In asking the writer to seek for the possible cause, Dr. Pleasure pointed out that it is difficult to attribute this condition to the food itself, since

Fig. 2.—Eskimo women softening leather by twisting skins and chewing the twists.

meat tends to be a lubricant rather than an abrasive. There is also the observation that the Indians of the southwestern parts of the United States eat corn ground in sand-stone apparatus. Their food is, therefore, notoriously sandy, and though there is some abrasion it is not nearly so marked as in the skulls of the Eskimo. The food of the Eskimo in the Eastern Arctic is undoubtedly rich in sand. Seals, when caught, are not carried but dragged into the tents. All seal meat, whale, and the other foods which I saw in the tents were on the floor in direct contact with the earth. It is obvious, however, that there are two other contributing factors. Firstly, the Eskimo, at least in the Eastern Arctic, has a prosharmotic (edge to edge) occlusion of his teeth. This alone would account for some abrasion, but the aggravating factor is the practice of chewing leather, and, for this reason, the abrasions are much more marked in the women than in the men. The men apparently confine this practice to the chewing of dog lines; whereas the women have the leather of the entire household to contend with. Our dentist, Dr. W. G. Leahy, sectioned some of these teeth and demonstrated an interesting phenomena; though these teeth were worn down to the gumline they were otherwise in very good condition, because of a secondary reaction to the abrasion as the result of which there was a new formation of dentine that not only filled the greater part of the root canals but also the pulp cavities. Mrs. Petersen put it very aptly when she referred to this secondary reaction as a "God-sent dentist"!! The writer was told that an attempt had been made to supply the natives with a mechanical leather softener, but the experiment did not prove very successful. The Eskimos certainly do not relish this chewing process, but from experience have learned that their teeth are better fitted for the purpose intended. Saliva may be a factor. The discovery of a method which would soften the leather but not impair its water-proof or durable qualities would be well worth the effort. Much is known of the chemistry and physics of leather in general, and there is no reason to believe that this knowledge does not also apply to seal.

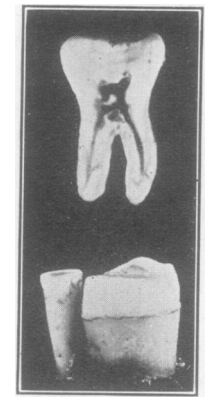


Fig. 3.—Tooth worn to within 1 to 3 mm. of gumline, with secondary dentine projecting into the pulp cavity partially obliterating the root canal.

The Eskimos are a very primitive people with a very primitive culture. Many of their implements, domestic and otherwise, are still those of the Stone Age; and the Eskimo has no sense whatever of sanitation. Food, as I have stated, is placed carelessly on the earthen floor of the tent, and is exposed to innumerable sources of contamination. Refuse is simply thrown out of the tent. The Eskimo also lives in intimate contact with his dogs, which roam about or are leashed near the tent; the excreta of these animals about the tent does not worry these people. I visited a tent during a meal of seal. There were, of course, no in-

dividual knives or forks; everything was eaten by hand. Here, as elsewhere, the seal was on the earthen floor, and the knife, handle as well as blade, was in the abdominal cavity. During the meal some of the meat was cut and the blood soaked knife was again carelessly thrown on to the seal, and, by gravity, again found its way into the abdominal cavity. By the time the meal was finished, the hands and face of all were well covered with blood and blubber. To remove the latter, one of the boys took a handful of water from the common water supply in a stone vessel, rinsed his mouth with it, and then used this rinse-water for his hands and face.

In spite of the above-mentioned practices, however, the Eskimo is remarkably free of infection. This suggests absence of pathogenic organisms, and experiences with decomposed food are further suggestive. When food is plentiful it is cached under rocks for many months. In spite, however, of its highly decomposed state the Eskimo eats it, and apparently with no impairment of health. This cannot be due to immunity of the Eskimo against the Salmonella group of organisms, because I had been told by Mr. Thom that he had to eat such meat a number of times and never suffered any ill-health.* Opposed, however, to absence of pathogenic organisms, with respect to infections in general, are the findings of Wells and Heinbecker[1] and Wells.[2] These authors have shown by means of cultures and smears from throats that the respiratory flora of the Eskimo is, in general, very similar to that of persons living elsewhere. It would thus appear that infection is a function of virulence rather than of absence of pathogenic organism. Unfortunately, however, the virulence of organisms which visitors to the Arctic carry is greater than that of the organisms to which the Eskimo is ordinarily exposed, and though he can tolerate pain, extreme cold and fatigue, his resistance to infection is very poor. Whole communities have thus been wiped out by epidemics which, in milder form, occur almost invariably after the arrival of ships.

Two examples met with demonstrate different reactions to infection.

One was a case of gangrene of a frozen foot in a man at Pond Inlet, on Baffin Island. The gangrene had extended to the dorsum of the foot, and, impatient at the delay in healing, he amputated the gangrenous portion himself, and the incision was not through the gangrenous area but through the healthy tissue beyond!!

Except for some granulation, the wound was in good condition when I saw it; and the man, with the aid of a cane, assisted at the unloading of the cargo.

The other case was that of a young boy at Coral Harbour, on Southampton Island. He had injured his ankle about a week before we arrived, and had developed an extensive cellulitis which involved the whole leg, and the lymphangitis had spread to the middle of the thigh. There was marked fluctuation which was obviously due to pus in the subcutaneous tissues, but the immediate response to treatment was very good. Before the operation, at 10.30 a.m., the temperature was 103.2° and the pulse rate was 124. The skin was incised under light ether anæsthesia and approximately 8 ounces of pus were withdrawn. A gauze drain was inserted, and at 3.30 p.m., the temperature was 99.2°, and pulse 100; at 8.30 p.m. the same day the temperature was 98.6° and the pulse rate 92. The following morning, the temperature and pulse rate were normal. Clinically, the boy looked very well; and he was hungry. The dressing was changed, and the officials at the Post were given instructions with regard to dressings, etc.

The operation had to be done outside of the tent and the behaviour of the dogs was interesting. The blood and pus disappeared from the swabs as rapidly as they were discarded; and, as the child could not be moved for some hours, his brother had to stand guard. These animals, though very playful otherwise, apparently show their wolfish instinct when a man is down. The writer was told of a woman who, in 1924, was eaten alive at Chesterfield when she fell and hurt herself. Since then it has been the practice at Chesterfield to leash all of the animals except the pups.

Is the Eskimo disappearing? It is quite possible that the above-mentioned data do not properly reflect the true conditions with respect to sterility. In addition to this, there is the high infant mortality and the small families (2 to 3 children). Of degeneration in parts of Hudson's Bay and Straits there is no doubt; but there is equally no doubt that where the habits of the Eskimos are still largely native the population is not decreasing but is increasing. This statement is based upon data kindly supplied to me by police, Hudson's Bay officials. and missionaries. The following may be taken as an example. For these vital statistics (a consensus of data from the above-mentioned sources) I am indebted to Dr. A. G. MacKinnon,

* In the few epidemics of "ptomaine" poisoning, Dr. Parnell suspects that the outbreaks were due to *Trichina* (*Can. Field-Nat.*, 1934, **48:** 111).

medical officer at Pangnirtung, on Baffin Island:

VITAL STATISTICS OF NATIVE POPULATION
(Trading District of Pangnirtung, Baffin Island)

Total population, July, 1931		423
Left district since July, 1931	17	
Deaths in district since July, 1931	30	
Total decrease	47	
Births since July, 1931	71	
New natives	12	
Total increase	83	
Excess of increase over decrease		36
Total population, 1935		459

These statistics are of interest also from the point of view of consanguineous union which must be common, though, in many cases, because of the sex life of these people, unwittingly. Since the populations amongst those who are confining themselves largely to their native life are not only not decreasing but increasing, the Eskimo affords further proof that union of near relatives is, in general, not harmful, providing undesirable recessive traits are excluded. Amongst the Eskimo many of the hereditary forms of illness must have been largely eliminated centuries ago. The Eskimos, by eliminating the misfits through the ages, have become a very healthy people, and it should be noted that though consanguineous marriage may increase the chances of appearance of recessive traits, the latter include desirable as well as undesirable attributes. My impression is that elimination is the explanation of the absence of diabetes mellitus.

Finally, a word about the desirability of keeping the Eskimo alive. For reasons which cannot be appropriately dealt with here, there appears to be no doubt that survival of these inhabitants of the Arctic will benefit the Canadian Government. There is also no doubt that the Eskimo is essential to the fur trader. It has been alleged that the white man could, with very little training, even excel the Eskimo in the art of trapping. There is, however, the time-worn analogy of the camel and his water requirements; it is possible that civilized man might excel the Eskimo — I do not know — but there is the practical problem of the willingness of civilized men to live in the Arctic throughout the year. Proof of the indispensability of the Eskimo to the fur industry is seen in the relationship which exists between the trader and the trapper. With many millions invested in the Arctic, the Hudson's Bay Company must be alert to conditions, and this Company has another reason to keep the Eskimo alive and healthy. It is, perhaps, not generally known that where there is no competition in the fur industry in the Canadian Arctic the Canadian Government has ruled that the trader must care for the indigent and helpless native. A sick trapper, therefore, means not only a smaller supply of furs but also that the trader must support the family as well as the trapper. A dead trapper means support of the family for an indefinite period, with no prospects whatever of any compensation.

I have referred to the above-mentioned responsibility for the purpose of pointing out that, with this responsibility, the Company must always be alert to the best means of keeping the Eskimo healthy, and our data clearly show that, from the many experiments of trial and error, its policy has been, and still is, a very wise one. It is its policy to encourage the Eskimo to live as much as possible in his native state; he is encouraged to live in tents, to confine his diet to the animal food of his environment and to clothe himself with the furs of these animals. Unfortunately, the unrelenting laws of evolution apply to the Eskimo as elsewhere, and, it is obvious that this practice must, with time, become more and more difficult. As the motor boat is replacing the kyak, and the gun the harpoon, so must habits of diet change. Civilized man's foods are more palatable than the native foods, and the Eskimo not only knows of their existence, but he has also tasted them. In my opinion, however, this change is not incompatible with health.

It would be very unwise from limited experience and the fragmentary data to formulate a definite plan. Some of the steps which must be taken are obvious; others will require further study. I have referred to the importance of periodic examination of the eyes, and suggested an investigation into the possibility of a less harmful method of softening leather. If the police continue their rigid policy as in the past with regard to their own men, and the Hudson's Bay Company maintain the discipline of their ships' crews, venereal disease should not be any more difficult to control in the future than it has been in the past. If I may be permitted to suggest it, more care might be taken on the part of all

concerned in the examination of officers and passengers of ships with regard to illness, and particularly upper respiratory diseases, before permission is granted these people to land on shore and intermingle with the natives. Consideration might also be given to preventive measures now available with respect to epidemic diseases — sera, vaccines, etc. With regard to the housing of the natives there is little or no problem in the case of those who hunt or trap. Their nomadic life tends to protect them against too long exposure to filth. The chief problem is with those natives who, as employees of the police, Hudson's Bay Company, and missionaries, live for the greater part of the year at the Posts. Until they can be taught the elementary principles of hygiene, and unless those concerned can maintain rigid discipline in the matter of cleanliness, as at Pangnirtung and at Craig Harbour, there is no doubt that it is in the best interest of the Eskimo to encourage him to live in his tents rather than in huts. Tent life is, at least, an open-air life. As a further precaution the natives might be encouraged to move their tents about periodically. This might seem a hardship to us but it is not so with the Eskimo. At Lake Harbour, for example, when the ship arrived on August 29th and I first approached the shore at 3.30 p.m., there were five tents only; at 7.30 p.m., four hours later, there were 32 of them. From his experiences in the Western Arctic, Dr. Urquhart also stresses the importance of shifting tents. Though he attributes the lower incidence of tuberculosis amongst the Eskimos than amongst the Indians to some extent to diet he also believes that the nomadic life of the Eskimo is a factor.

Solution of the food problem is a more difficult matter, but, in my opinion, it is not insurmountable. This is suggested from experiences at Craig Harbour, the most northerly Post in the Eastern Arctic. Here, as stated, there are two families and both men are employed by the police. For the greater part of the year these natives are housed in huts; they eat approximately the same food as the police; but they are under very rigid supervision, and one cannot speak too highly of the efforts of these officers. The huts, when I saw them, were immaculately clean. Equally important, however, is the fact that, though these natives eat appreciable quantities of white men's food, they are still Eskimos, and, therefore, like raw meat; though they live in comfort, are well paid and, therefore, have every good reason not to hunt, they regard hunting as a privilege, and I saw a large cache of walrus. All of these Eskimos were very healthy, and one child, one month old, appeared to be exceptionally so. Contact with civilized man is thus obviously compatible with good health. The problem of food on the much larger scale, however, is a problem of metabolism, and should, in my opinion, be approached by carefully planned and properly conducted experiments on nutrition. For example, mention was made of the fact that because of his residence near the Pole and the pigmentation of the skin the Eskimo is deprived of the sun as a source of vitamin D. Since food is the chief source of this vitamin near the Pole, consideration will have to be given to this factor also in the substitution of civilized man's foods for those to which the Eskimo has been accustomed through the ages. There seems to be little doubt that should the Canadian Government decide to undertake these experiments in nutrition, it would have the full cooperation of all concerned—Hudson's Bay Company officials, the police, the missionaries, and, not the least important, the Eskimos themselves. The choice of site is important. Pond Inlet seems to me to be the best location for test-subjects. Pangnirtung, however, has the advantage of a well-equipped hospital.

The dog, indispensable in the life of the Eskimo, is, aside from the matter of hygiene, no less a problem, and there is a remarkable similarity in the variables. As the Eskimo, the half-breed dog is not a very good specimen. Experiments, such as breeding the "husky" with the St. Bernard, I was told, have been proven to be failures. As in man, there also is a relationship between food supply and health. A fifty-pound seal, though it may suffice to keep a team of twelve to fifteen dogs healthy, is not exactly a banquet, and there is also the problem of the type of food. Walrus, according to Mr. Thom, is the best food, though it tends towards laziness at times; with it there is the greatest pulling power, and the pups grow large. Fish yields a fine hair but poor pulling power. Seal is fairly good but leads to loss of weight as it has a purgative action similar to that noted in man. Caribou appears to be the worst of all;

the animals lose weight, and become irritable and unmanageable. For these reasons, the best dogs are bred on Southampton, Devon and Ellesmere Islands where walrus is abundant. Baffin Island has much seal, whereas, salmon is the chief food supply in the Ungava district. As in man, no ill effects have been observed in the dog because of the eating of putrefied meats. To keep maggots from consuming walrus, seal and whale during the warmer weather, the cached food is covered with seal oil. This, however, does not prevent putrefaction.

An experiment with respect to putrefaction is worthy of mention here. Mr. Thom again comes into the picture, and this experiment is an example of his keen sense of observation in matters biological. The purpose of this experiment was to determine the relative rates at which such foods as seal, whale, and walrus disintegrate. With no knowledge whatever of chemistry and no means of measuring rate of liquefaction by measurement of water content, Mr. Thom took, of the different types of meat, strips of approximately equal weight and equal length, suspended each strip on a separate nail, observed the rate at which the punctured portions elongated, and measured the elongations! He thus found that, of the samples tested, whale meat undergoes liquefaction the most and walrus meat the least rapidly.

The metabolism data, as stated, form the subject-matter of a separate report and contain a number of interesting observations. Of particular interest are the high non-protein values of the blood (urea, amino-acids) in the absence of renal disease and due apparently to the high protein diets. The high blood chlorides, in spite of the fact that the only source of salt is the natural salt content of the food materials, chiefly animal, the very low concentrations of sodium chloride in the urine and the high renal thresholds for sodium chloride, afford an interesting speculation in biology. Since life is incompatible without salt, it would appear that, in order to keep the concentrations of this salt in the blood constant, the renal threshold is raised. Also of interest in the metabolic data is the inability to tolerate large doses of glucose, judging from the blood sugar time curves. Of interest also, as stated, from the point of view of hæmoglobin formation is the polycythæmia and the findings with respect to the copper contents of the materials examined. From the respiration data, it would appear that the basal metabolism of the Eskimo is higher than in more temperate climates, and, from the respiratory quotients, there is good reason to believe that in the Eskimo may be found the solution to the question as to the conversion of fat to sugar. The food analyses (seal, whale, walrus, etc.), aside from their metabolic value, are of interest from the point of view of therapeutics, especially the purgative action of seal. This action applies to man as well as to the dogs. Bishop Fleming told me that constipation, though no problem in the Eskimo, is common amongst the missionaries, and he has found seal meat, which he recommends for this purpose, very effective. Aside from their metabolic interest, the analyses of the sea water, the writer hopes, will prove of interest also in studies of oceanography, geology and fisheries.

ACKNOWLEDGMENTS

From the different types of examinations which we made, those familiar with laboratory work will appreciate the mass and variety of equipment which was necessary, though the work was meant to be of a preliminary nature only; and some idea of the generosity of those who assisted us may be gained from the fact that, though the equipment, if purchased, would have represented an expenditure of many thousands of dollars, and, to complete our studies, it will still require additional thousands of dollars, the actual expenditures on the part of the Canadian Government were practically negligible, having amounted to a few hundred dollars only.

Through the kind offices of Mr. J. S. Norris, of Montreal, the Montreal Light, Heat and Power Consolidated constructed a special apparatus for tests of basal metabolism suitable for work in the Arctic, and I should here like to thank Mr. E. J. Turley, Mechanical Superintendent of the Company, who was responsible for the details of its manufacture. For the x-ray examinations the Victor X-ray Corporation supplied us with a complete portable x-ray equipment with accessories by Siemens-Reiniger (Canada) Limited. The Fisher Scientific Company, of Montreal, generously donated all of the chemical equipment. To the Canadian Fairbanks-Morse Company Limited we owe thanks for scales; and, through the kind offices of Col. W. A. Grant, we had the assistance of the Associated Screen News of Montreal in our photography. One of our experiments in nutrition with the soya bean will require approximately one year for completion. This experiment is being carried out at Pangnirtung, on Baffin Island; and for the necessary supplies of the soya bean products we are indebted to the Dominion Soya Bean Industries of Montreal.

During the voyage, any one who could possibly render any assistance did so; and I should here like to acknowledge the hearty cooperation of Bishop A. Turquetil, of the Roman Catholic Hospital at Chesterfield Inlet, and that of Right Rev. A. L. Fleming, Anglican Bishop of the Arctic, for similar cooperation at the Anglican Hospital at Pangnirtung, Baffin Island. With the assistance of Dr. L. D. Livingstone at the Hospital at Chesterfield Inlet, and with that of Dr. A. G. MacKinnon at the Hospital at Pangnirtung, and the efficient nursing staffs of both hospitals, much was accomplished which could not have been otherwise.

In no small measure are we indebted to the Royal Canadian Mounted Police for their assistance at all of the Posts, and for this we have to thank Supt. Sandys-Wunsch who accompanied the *Nascopie* throughout the voyage.

Comparisons are always invidious, but too much cannot be said of the cooperation of the Hudson's Bay Company. From the little we knew of conditions in the Eastern Arctic before we undertook this study we believed that the cooperation of the Hudson's Bay Company would be indispensable, and this we found to be so. Much of the information which we hoped to obtain in our medical examinations, we knew, would depend not only upon the willingness of the natives to cooperate, but, also, upon proper interpretation of the questions we were to put to the natives and of their replies to these questions. The willingness of the natives to cooperate would depend upon their relationship with the interpreters, and I am pleased to say that this cooperation was excellent. This alone, if I may be permitted to say so, reflects the excellent relationship which exists between the trader and the trapper, and which can have no other basis than square-dealing on the part of the officials of the Hudson's Bay Company during its long period of occupancy and former ownership. As expert

interpreters, we have to thank Mr. W. E. Lyall, who, I was told, was born amongst the Eskimos and who has been with the Hudson's Bay Company practically all of his life; and also Mr. J. A. Thom, mentioned previously, another official of the Company who has had sixteen years of experience in the Arctic. We are also indebted to Mr. Alfred Copland, Hudson's Bay Company Section Manager and to all of the Post managers of the Company; and for all of this we have to thank Mr. George Watson, District Manager of the St. Lawrence and Ungava District, who accompanied the *Nascopie* throughout its voyage.

Nor does our indebtedness end here. Aside from the medical examinations, our work during the voyage was largely confined to the collection of materials for chemical and physical analysis. Such analyses require well-equipped metabolism laboratories. Material was brought back for thousands of tests, and all of these are now being made in the Metabolism Laboratories of the Montreal General Hospital. I, therefore, wish to take this opportunity of thanking the Board of Management and the Superintendent of the Montreal General Hospital, Dr. J. C. Mackenzie, for their cooperation.

Owing to shore and tide conditions, the *Nascopie* was frequently forced to anchor anywhere from one to three or more miles from shore. There was, therefore, frequently the problem of transportation to and from the shore; and if we had to depend upon the cargo boats alone, much of our work would not have been done. Here again we have to thank the Police and also the Hudson's Bay Company's post officials. Through the kind offices of Captain T. F. Smellie, we also had the cooperation of every officer and man on the *Nascopie,* and our requests were many.

Lastly, I should like to express my personal appreciation to Mr. Julian C. Smith, of Montreal, and a Governor of the Montreal General Hospital. Mr. Smith has, for a number of years, been a generous contributor to the Metabolism Department of our Hospital; it is very largely his contributions which are making possible the continuation of the Arctic work; and it was Mr. Julian C. Smith's assistance which also made it possible to have with us during the greater part of our voyage an expert chemist, Miss Florence Smith.

REFERENCES

1. WELLS AND HEINBECKER: *J. Inf. Dis.*, 1932, **50**: 281.
2. WELLS: *Am. J. Hyg.*, 1933, **18**: 656.

PRIMARY APLASTIC ANÆMIA*

(A CASE WITH APPARENT RECOVERY)

BY E. B. ASTWOOD, B.SC., M.D., C.M.,

Montreal

OBSCURE in its etiology, rapid in its course, and almost invariably fatal, aplastic anæmia stands alone as one of the primary anæmias unconquered by modern treatment. Recovery being most unusual, the case which is the subject of this article would seem to be of sufficient interest to warrant adequate description.

Since Ehrlich[1] first described aplastic anæmia in 1888 considerable confusion has arisen regarding the nature of the condition. Hirschfield,[2] in 1911, reviewed the literature to that date and more clearly defined the disease, but not until 1915, when Frank[3] published his paper, was there a clear distinction between this and other severe anæmias. For many years there was no exact separation between aplastic anæmia and pernicious anæmia, the term "aplastic pernicious anæmia" being used as late as 1922.[4] Since the development of the liver treatment for Addisonian anæmia, the differentiation of the two diseases became easy and much more important. Although primary aplastic anæmia is universally known, and is usually correctly diagnosed, the condition in reality is extremely rare. In 1908 Cabot[5] was able to collect 24 cases, 11 of which he discarded as unproved. Hirschfield[2] collected 44 cases in 1911, of which 3 had been rejected and 12 accepted by Cabot. Musser[6] in 1914 found 3 more, estimating that 59 cases had been reported in 26 years. In 1918 Schneider[7] could find only 60 cases in the literature of this form of anæmia, and the next year Smith discovered but 4 more. Sheard recorded 125 authentic cases in 1924, and Carey and Taylor added 20 between 1921 and 1931, setting the total at 150 cases. Greenwald in 1934 was able to find but 15 cases presenting both clinical and autopsy evidence of the disease.

The cause of the condition is unknown, but it is believed to be due to an unidentified toxin acting upon the bone marrow, impeding its activity, and causing its eventual atrophy. A secondary or symptomatic form occurs from over-exposure to x-rays or radium, the toxic effects of benzol and other coal-tar derivatives, from the excessive use of gold salts and the salts of other heavy metals, notably arsenic, and as a terminal manifestation in overwhelming septic states. To this category belong those cases of hæmolytic jaundice, pernicious anæmia, and prolonged hæmorrhage which present an aplastic marrow *post mortem,* presumably due to a final

* From the Department of Medicine, McGill University Clinic, Royal Victoria Hospital, Montreal.