DET KONGELIGE INDUSTRI-, HÅNDVERK-
OG SKIPSFARTSDEPARTEMENT

NORSK POLARINSTITUTT

SKRIFTER

Nr. 99

ESKIMO METABOLISM

A STUDY OF RACIAL FACTORS IN BASAL METABOLISM

BY
KÅRE RODAHL

I KOMMISJON HOS
BRØGGERS BOKTRYKKERIS FORLAG
OSLO 1954

NORSK POLARINSTITUTT

(Formerly Norges Svalbard- og Ishavs-undersøkelser.)

Observatoriegaten 1, Oslo

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A. W. BRØGGERS BOKTRYKKERI A/S

Contents.

Preface.

This study has been carried out at the Arctic Aeromedical Laboratory, Alaska, during the period 1950—52.

The author is greatly indebted to Lt. Colonel A. I. Karstens, Commanding Officer, and Colonel J. Bollerud, formerly Commanding Officer of the Arctic Aeromedical Laboratory, for their interest and valuable support in this study. He is also indebted to the members of the Department of Physiology, Arctic Aeromedical Laboratory, who have aided this study in one way or another, in particular Mrs. J. Rodahl, T/Sgt J. Edwards jr., S/Sgt R. A. Blakely, T/Sgt L. Wilson and Captain H. Drury for their valuable assistance in the field and in the laboratory.

The kind help and valuable co-operation of Dr. E. S. Rabeau and Miss A. Connolly of the Alaska Native Service Hospital at Kotzebue is gratefully acknowledged. Above all, the author is indebted to the 73 Eskimo subjects for their patience and co-operation, which has been essential for the completion of this study.

Finally, the author wishes to extend his sincere thanks to Dr. E. F. DuBois, Professor Emeritus of Physiology, Cornell University Medical College, New York, for his kind interest and valuable criticism and advice throughout this study.

This paper has been completed with the aid of a grant from Norsk Polarinstitutt, for which the author expresses his sincere thanks. He is also indebted to the head of that institute, Professor dr. philos. H. U. Sverdrup, and to Professor dr. med. Fredrik Leegaard, Institute of Physiology, Oslo University, for their never failing interest and help in the completion of this work.

I. Introduction.

The significance of racial factors in basal metabolism has been emphasized by a number of workers, who, on the basis of different metabolism studies of various races of man, have concluded that there are distinct racial differences in basal metabolism, apart from the effects of climate (Wilson, 1945). No satisfactory explanation has been offered for these differences, and the question has been the subject for much dispute among eminent authorities in the field of metabolism in recent years.

According to Wilson (1945), the concept of a racial factor in metabolism originated from the work of Eijkman (1896), followed by the studies of Almeida (1921, 1924). Since that time, metabolism studies on normal subjects have been carried out in different races in various parts of the world (MacLeod et al., 1925; Okada et al., 1926; Earle, 1928; Heinbecker, 1928; Van Berkhout, 1929; Necheles, 1932; Wilson, 1950, and others), including a series of studies by Benedict and his co-workers who have strongly emphasized the rôle played by race itself (Benedict, 1938). Williams and Benedict (1928) even suggest that there may be some correlation between the purity of the racial mixture and the metabolism.

Contrary to this, Lusk wrote in 1928 with regard to this question: "Evidently life at the equator has the same basal metabolism as in temperate climes. All this is not surprising, for our stock presumably arose in tropical waters many millions of years ago, and we have preserved our heritage. In the future the same level of basal metabolism may be established for man in a laboratory at the North Pole."

When reviewing the studies on racial metabolism in 1930, DuBois concluded: "After all, one gets the impression that the racial differences are so slight that they are almost entirely obscured by the factors of repose, physical training, and nutrition."

The claim that race is a factor in basal metabolism is based upon the findings that the basal metabolism of different races in various parts of the world deviate from the standards established for normal Whites, even when individuals of some of these races are living in a temperate climate on a regime similar to that of the Whites, — and finally, that the basal metabolism of Whites living in the tropics shows no appreciable deviation from the normal standards.

On the basis of some studies made on Europeans in their native environment followed by subsequent studies after residence for varying periods in the tropics, it has been suggested, on the other hand, that climate rather than race may be an explanation of the varying results observed (Wilson, 1945).

Keys (1949—1950), in reviewing the available information regarding the effect of climate on basal metabolism, points out that the more recent studies on white people are in agreement that the basal metabolism is depressed in warm climates, and that it may be presumed, from all sources of evidence, that protracted exposure of man to a cold climate generally results in a significant but small elevation in the basal metabolism.

Quenouille et al. (1951) have made a statistical analysis of the records of basal metabolism of over 8600 subjects. This analysis distinguishes differences due to sex, race, stature and climate. According to these authors the analysis distinguishes two main groups of people, subjects from the United States and Northern Europe forming one group, Indians, Chinese and Japanese forming the second group. They state that the Eskimo and the American Indian accord in type with the Asiatic group but exceed it in mean basal metabolism. With regard to the effect of climate the mentioned authors have prepared prediction tables for metabolism in relation to height and weight for a mean annual temperature of 70° F and mean annual relative humidity of 75 per cent. Starting from these points, metabolism for 24 hours changes inversely with temperature at the rate of 4 calories for 1° F in men, and changes with humidity by 3 calories for 1 per cent in men.

Albagli (1939), on the other hand, found no difference in basal metabolism between 97 natives of Brazil and 11 foreigners, and concludes: "Basal metabolism of normal individuals properly nourished is independent of climate; of race; of biotype; corresponds in Rio de Janeiro as all other parts to the classical standards used in the U. S. A. or in Europe."

It has been suggested by a number of authors that prolonged exposure to cold causes increased basal metabolic rates. Daniels et al. (1951), however, found no change in basal metabolism in men during prolonged exposure. Ames and Goldthwait (1948) measured the basal metabolic rates of 11 subjects during the fall at Lawrence, Massachusetts, and at intervals during the winter at Churchill, Manitoba, Canada. Ten of the 11 subjects were not apparently affected by the change in environment, while the basal metabolic rate of one of the subjects, who received more exposure than any of the other ten, increased during the winter at Churchill.

In some races, such as Eskimos and American Indians, basal metabolic rates significantly higher than the figures considered normal for Whites, have been consistently observed. In the case of Eskimos, figures between 13 per cent and 33 per cent over the DuBois standard have been reported by the greater majority of previous investigators. Heinbecker (1928) found that the resting metabolism of three full-blooded Eskimos (one male and two females 25—30 years old) at Cape Dorset situated at the southwest end of Hudson Straits, was about 33 per cent greater than the normal values for the temperate zone. Rabinowitch and Smith (1936) report an average basal metabolic rate of 26 per cent higher than the DuBois standard in 10 Eskimo subjects from the Canadian Eastern Arctic. In 5 Eskimo subjects Levine (1937) found values 19—30 per cent higher than in normal Whites.

Crile and Quiring (1939) examined 30 male and 33 female Eskimos living in the vicinity of Chesterfield Inlet in the Canadian Arctic. They found the basal metabolism to be 16 per cent higher in the males and 29 per cent higher in the females than the normal Mayo standard. In 20 East Greenland Eskimos Høygaard (1941) found the basal metabolism to be on an average 13 per cent higher than predicted by the DuBois standard. Bollerud et al. (1950) examined a group of Eskimos at Gambell, St. Lawrence Island in Alaska, during two periods in the winter of two successive years, and found values 17 and 14 per cent higher than the DuBois standard.

The reason for this higher basal metabolic rate in the Eskimos, apart from the possible effect of race itself, has been discussed by a number of writers.

In a recent paper, Levine (1949) has claimed that the basal metabolic rates of the Eskimo reported in the literature is too high to be considered physiological. He examined 23 Eskimos and states that the tests gave a normal figure for 19 natives, but a high figure for 4, which he assumes to be due to apprehensiveness. Unfortunately, he did not publish the actual figures on which he bases his conclusions.

Heinbecker (1928), on the basis of a comparison between his results in the Eskimo and the low figures found by Almeida in Whites who were acclimatized to the tropical climate, suggested that the high metabolic rate of the Eskimos might in part be due to their native domicile. In a later paper (Heinbecker, 1931) he emphasized the rôle of the high protein diet as a possible cause for this higher basal metabolism of the Eskimo. Rabinowitch and Smith (1936) mention the possibility that the Eskimo's carnivorous habits in combination with the cold climate tend toward an increase of the basal metabolism. Crile and Quiring (1939) found that the basal metabolism of Chippewa Indians living near Hudson Bay was 18 per cent higher than the Mayo standard. They were of the opinion that the relatively higher metabolism in these Indians, compared with that of the Eskimos living at Hudson Bay, was due to the fact that the Indians do not have the Eskimos' facilities for protecting themselves against cold. On the other hand, according to Odin (1937), the basal metabolic rates of Whites living in Northern Sweden are lower than the DuBois standard. Furthermore, as already pointed out by Stefansson (1932, 1937) and Høygaard (1941), the Eskimos' exposure to cold has been greatly exaggerated. Their warm houses and suitable clothing offer such effective protection against cold that they are probably only seldom exposed to significantly lower temperature than some outdoor workers in the temperate zone. Crile and Quiring (1939) point out that the high basal metabolism of Eskimos can hardly be a specific Mongolian feature, since a number of investigators have shown that more southerly Mongols have a lower basal metabolism than the Eskimo.

II. Problem.

In a series of studies carried out at the Arctic Aeromedical Laboratory in Alaska, it has been endeavoured to establish what physiological changes take place in man during exposure to cold, or the different types of arctic environment, and what part these changes may play in the protection against the effect of environmental stress. A considerable interest has been devoted to the study of possible evidence of human adaptation to cold. Although at present the available evidence, as far as human acclimatization to cold is concerned, is small and far from convincing, this problem is one of great importance.

It seems logical that if such an acclimatization exists, it should be evident in the Eskimo who spends his entire life in the arctic or subarctic environment, and whose forefathers have survived along the arctic shores for thousands of years, and who, as judged by general observation, gets on better than he white man in the arctic environment.

In connection with these studies on human adaptation to cold, it was considered desirable to examine, under carefully controlled conditions, whether there are any differences in the basal heat production in Eskimos as compared with Whites, and if so, how such a difference may be explained. In a broader aspect, the problem to be studied was briefly this: Are there any racial or climatic differences in basal metabolism? If so, one would expect to find these differences among the Eskimos where conditions may be extreme.

On this basis, a series of comprehensive studies of basal metabolism were carried out from 1950 to 1952 in a large number of Eskimos from various native settlements in Alaska. The purpose of this report is to present the main results of these studies.

III. Plan for the Investigation.

In view of the unfavourable field conditions under which many of the previous studies reported in the literature were conducted, it was considered necessary first of all to examine, under very carefully controlled conditions, the basal metabolic rates of representative groups of Eskimos, of known racial origin. For this reason four different Eskimo settlements were selected, where in each case a complete laboratory could be established with adequate facilities and the best possible working conditions in order to eliminate errors caused by inferior technique.

These four settlements would represent different climatic conditions, and by conducting the same studies in the same subjects both in winter and in summer, additional data pertaining to the effect of climate upon the basal metabolism would be obtained. The four groups selected would represent different living conditions, eating habits, and nutritional conditions. Strict and continuous control would have to be exercised during the period of fasting, since previous experience has shown that one cannot entirely rely on the Eskimo's statements in this respect.

In order to exclude any pathological conditions which might influence the results, it would be essential to select normal Eskimo subjects on the basis of a thorough and complete medical examination. Great care would have to be taken in the handling of the subjects to avoid the effect of apprehension or tension. For this reason, repeated metabolism tests had to be made on successive days. In order to correlate the metabolism with the degree of muscular activity, records of the type of activity and energy expenditure would be collected. To avoid possible errors in the calculation of the results caused by deviation from the white standard in body type, the body surface area of the Eskimo subjects would be actually measured. A sufficiently large number of normal white controls would be examined by the same investigators by the same technique to show reliable comparison. Finally, representative groups of Eskimos would be examined while living on the white man's diet in order to determine the significance of the factor of the diet on their basal metabolism.

IV. Material and Methods.

On the basis of the general plan outlined above, a total of 340 basal metabolism tests were made in 73 healthy Eskimos from 4 different locations in Alaska, representing different climatic conditions, living habits and diets. The first group at Barter Island on the north coast of Alaska live on a diet consisting of approximately 50 per cent sea mammals and fish, and 50 per cent land mammals. The second group at Anaktuvuk Pass in the middle of the Brooks Range, 3000

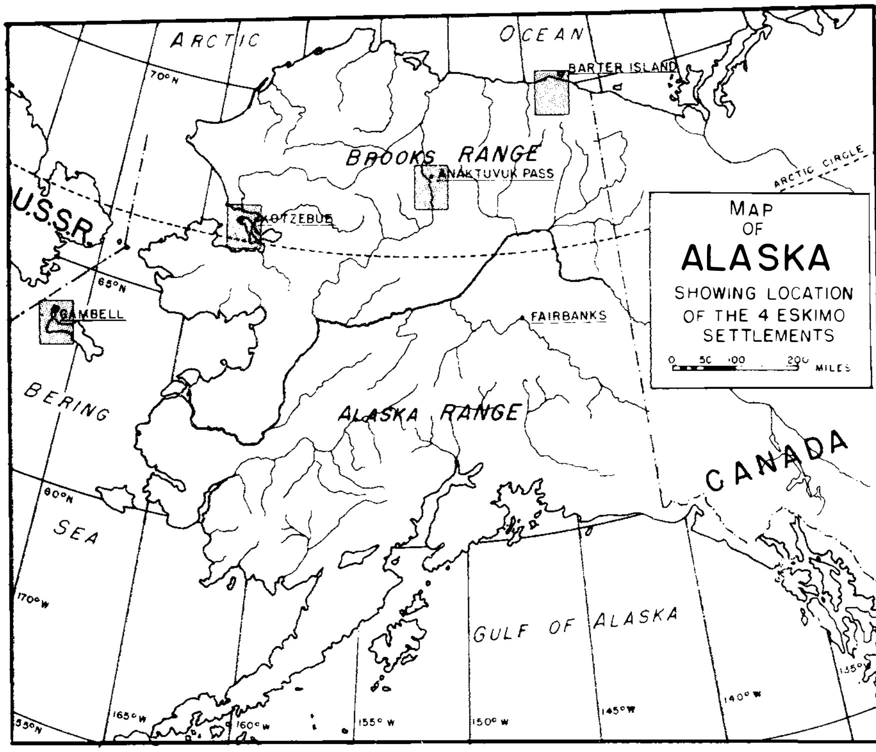

Fig. 1.

feet above sea level, live almost exclusively on land mammals, and especially caribou meat. The third group at Kotzebue on the west coast of Alaska live to a considerable extent on white man's food, and their living habits are more affected by civilization than any of the other groups. The fourth group at Gambell, St. Lawrence Island, live almost exclusively on sea mammals, and especially walrus meat. Of these groups, the Anaktuvuk Pass group had the most limited access to white man's food. The location of these four Eskimo settlements is indicated in fig. 1.

These four groups were examined both in the winter and in the summer. In addition to the field studies, representative subjects of each group have been studied under carefully controlled conditions in our laboratory at Ladd Air Force Base while living on the white man's diet. These studies have included environmental surveys, measurements of body surface area (Rodahl and Edwards, 1952), nutritional surveys with particular reference to protein intake, and urinary nitrogen elimination. In some cases, the respiratory quotient was determined.

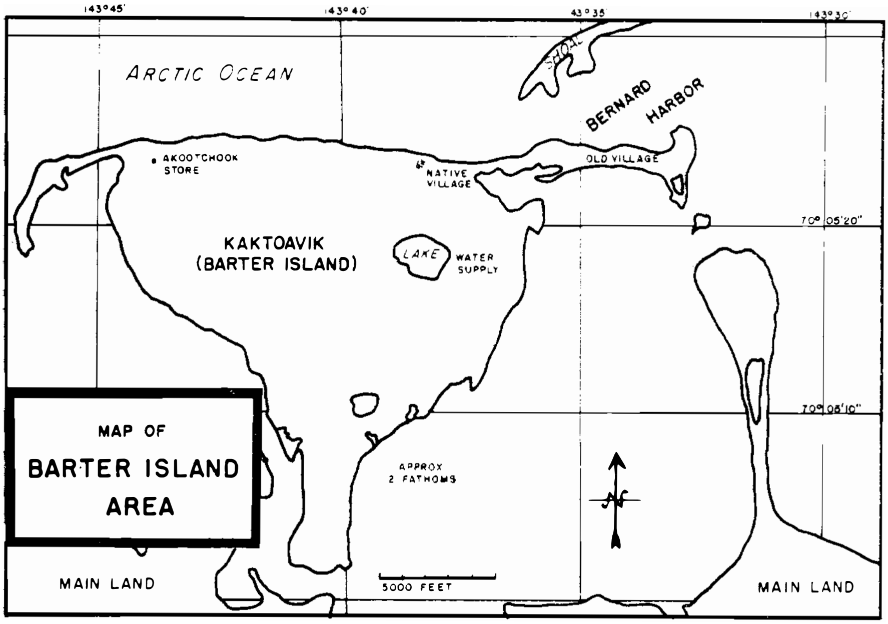

Fig. 2.

1. The Settlements.

In the following a description is given of each of the four settlements, including a brief description of the historical background, the environmental and climatic conditions, living conditions, food sources, eating habits, and the diet. No record of the present Barter Island settlement has been published previously. For this reason, this group has been dealt with in some detail.

a. *Barter Island.* (lat. 70° N. long. 143° 30′ W.) Eskimo name: Kaktoavik.

Historical background: The ancient Eskimo village of Kaktoavik was located on the sandspit at the eastern corner of the triangular island close to the mainland (fig. 2). Remnants of the old sod-and-driftwood igloos can still be seen. The present village, consisting of 5 inhabited houses, is located further to the west on the north side of the island (fig. 3). At low tide it is possible to walk from the mainland to the island. To the south the tundra stretches for 40 miles to the foothills of the Endicott Mountains.

According to Leffingwell (1919), there were no permanent native settlements between Herschel Island and Point Barrow in 1906. At that time approximately 50 Eskimos lived permanently at Herschel Island and 300 at Point Barrow. Between these two places two or three Eskimo families were encountered along the coast. He states, however, that there

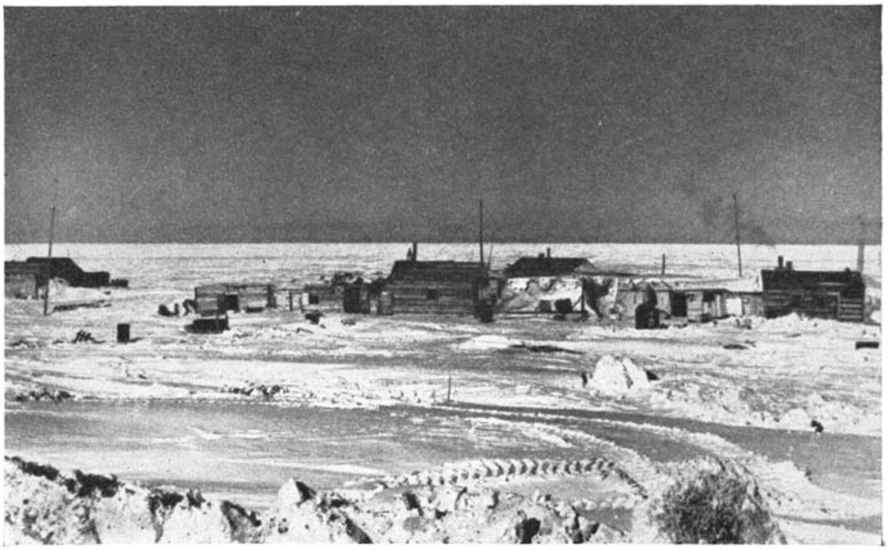

Fig. 3. Eskimo village at Barter Island.

were many ancient native houses at the coast. In 1914 Jenness of the Canadian Expedition examined the two large abandoned village sites near Barter Island. Leffingwell (1919) writes with regard to this: "On the spit running east from Barter Island between 30 and 40 old house sites were counted, and there are perhaps as many on Arey Island, 5 miles to the west."

When Andrew Akootchook, the chief of the present tribe, arrived at Barter Island for the first time in 1916 he found all the old houses abandoned. The houses were made of driftwood covered with sod. The remnants found at the old village site, including needles and knives of copper, indicated to him that the original inhabitants had come from Arctic Canada. He found many whale bones and bones of seals and caribou. He saw many seals and whales in the sea and a few caribou on the tundra.

When he returned to Point Barrow by umiak in the fall and reported the abundance of game he had seen, many of the Barrow Eskimos moved east to the area around Barter Island the following summer. Some of them were originally inland Eskimos who had come down to the coast from the headwaters of the Colville, including Anaktuvuk Pass, during a period of famine in 1907. In the following year many of these people went on into Canada, while others returned to Anaktuvuk Pass after 1935.

The present settlement was established in 1921 when Andrew Akootchook and his family, together with his sister's family, settled at the old village site. The village was moved to its present site in 1947 when the runway was built on the sandspit and the Air Force sub-base was established.

Table 1.

Barter Island: Meteorological Data for 1950.

Month	Temperature, °F: Averages: Daily maximum	Daily minimum	Monthly	Extremes: Highest	Lowest	Precipitation, inches: Total	Snow, sleet, hail	Wind: Average hourly speed, m. p. h.	Prevailing direction	Greatest speed	Sky cover, average from sunrise to sunset (0—10)	Relative humidity, %
January	— 8	—20	—14	17	—35	1.17	11.7	18	W	-	0	82
February	—25	—41	—33	18	—59	0.16	1.6	16	W	-	9	75
March	— 2	—16	— 9	14	—30	0.01	0.7	12	E	-	1	78
April	10	— 2	4	28	—21	0.12	1.2	13	ENE	-	2	80
May	27	19	23	38	— 7	0.65	6.5	14	ENE	-	1	89
June	40	32	36	60	25	0.76	1.4	11	ENE	-	0	92
July	43	36	39	52	33	0.16	0.0	14	ENE	-	0	95
August	44	35	39	60	30	0.95	0.0	15	E	-	1	92
September	37	30	34	64	19	0.30	1.8	14	E	-	0	89
October	24	12	18	35	— 8	1.13	1.1	16	E	-	0	90
November	18	3	11	37	—13	1.50	14.9	20	WSW	-	0	84
December	— 5	—15	—10	22	—32	0.16	1.6	12	ENE	-	0	72
Year	17	6	12	64	—59	7.07	4.25	15	ENE	-	1.2	85

The climate is very windy in winter; there is mostly easterly or westerly wind that sweeps across the tundra between the mountain ridge and the coast, where the country is exceedingly flat and exposed. The summers are generally quite warm but windy. There is usually some rain in the fall. The meteorological data are given in tables 1 and 2.

The sea ice along the coast is broken during the latter part of the summer, from late June to late September when travel by boat is usually possible. In the winter they travel by dog team along the shore ice, over the tundra and up the rivers to the mountains. The sledging conditions are very good from October to June or even the first part of July, on the ice. There is usually hard packed snow so that a man can walk on foot without using snowshoes. They also use dog teams on the tundra for transportation in the summer. In the spring or early summer they pull the kajak on the sledge over the ice.

Hunting: In the fall, particularly during November, they may hunt caribou on the tundra or sheep in the mountains, or they may hunt seal if there is open water. They go out to the edge of the ice where they sit down to wait for the seal to appear. Often they may scratch on the ice and whistle, and the inquisitive seal is attracted towards the edge of the ice, and he is shot in the water. The seal will float in the fall and in the winter when he is fat, but not in the summer.

Table 2.

Mean Daily Meteorological Data from Barter Island During the Two Periods of the Study.

Date	Wind		Temperature, °F			Bar. pressure in.	Precipitation		Depth of snow, in.	Relative humidity, %
	Mean knots	Prev. direction	Maximum	Minimum	Mean		H_2O equivalent, inches.	Type		
1950										
17 November	8.2	W	27.0	19.0	22.4	29.790	0.00	-	18	75
18 »	13.9	E	20.0	5 0	13.7	29.919	0.00	-	18	80
19 »	8.5	E	7.0	— 7.0	1.7	30.018	0.00	-	17	74
20 »	10.9	S	18.0	1.0	8 8	29.983	0.07	snow	18	77
21 »	9.0	SW	19.0	— 3.0	8.4	29.972	0.00	»	21	84
22 »	24.0	W	7.0	— 5.0	2.4	30.089	0.10	»	21	83
23 »	21.5	W	4.0	— 2.0	1.2	30.309	0.00	-	22	80
24 »	11.9	SW	6.0	—13.0	— 0.7	30.144	0.01	snow	22	79
25 »	7.2	E	11.0	—13.0	— 6.4	30.108	0.02	»	22	74
26 »	23.3	SW	22.2	10.1	17.3	30.106	0.07	»	23	87
27 »	36.9	W	37.0	17.0	25.0	29.611	0.06	rain & snow	-	83
1951										
16 May	8.0	NE	16.0	12.0	14.1	30.063	0.04	snow	5	86
17 »	11.3	E	18.0	11.0	14.0	30.071	0.04	»	5	83
18 »	27.5	E	21.0	11.0	16.1	29.954	trace	-	5	91
19 »	23.3	E	28.0	19.0	22.7	29.893	»	-	5	93
20 »	17.8	E	33.0	23.0	27.2	29.790	»	-	5	95
21 »	20.3	E	34.0	24.0	29.4	29.435	»	-	5	93
22 »	5.6	N	32.0	28.0	30.3	29.450	»	-	4	97
23 »	12.1	E	31.0	19.0	26.3	29.677	0.04	snow	3	97
24 »	16.1	E	22.0	17.0	19.1	29.863	trace	-	3	92
25 »	12.4	E	25.0	19.0	21.7	30.059	»	-	3	91

In December the trapping of fox begins, after the sites suitable for the traps have been located in November. They use steel traps, and as a bait they may use almost anything such as meat, seal blubber, or rotten fish. They use their dog teams and drive from trap to trap, inspecting each trap every other day or once a week, depending on the amount of game.

During March they hunt seals and polar bear on the ice along the coast. In the months of April and May they usually go by dog team to hunt caribou and sheep in the mountains, where they may stay for several weeks, living in willow shelters. The caribou, and especially the males, are fat in the winter and the spring, according to the Eskimo chief Akootchook. Sometimes the subcutaneous fat layer is 10 cm. thick.

During the summer they fish grayling and trout in the river or in the Arctic Ocean, using hooks in the rivers and nets in the sea. There is no salmon in this area.

Foods, and the eating habits: The following animals are killed for food in the Barter Island district: caribou, sheep, common seal and bearded seal, balooga (white whale), polar bears occasionally, and large numbers of ptarmigan. In addition they catch grayling and trout in the river, and white fish and trout in the ocean.

Plants as food: The Barter Island Eskimos eat some wild plants in the summer. They consume them raw or dipped in seal oil. Sometimes they eat them boiled in water and they drink the broth. Among the plants eaten are sorrel and arctic willow. They also eat the buds of the willow, which they chew to get the juice and spit out the rest. They also peel off the outside bark of the willow and chew the inner bark for the juice.

Salt: Today the Barter Island Eskimos consume quite large quantities of salt, although on the whole, the salt consumption appears to be less than in the case of the white man. They boil the meat and potatoes in water to which salt is added.

Stored food: Frozen meat and fish; seal poke containing: dried seal meat and seal oil produced from seal blubber; rotten fish prepared in the following way: in the summer the fish is piled together in a heap and left covered up to protect it from the sun for a week or less; dried fish.

Poisonous food: The liver of polar bear, wolf, fox and dogs. Akootchook was told by an old woman, when he was a boy, that the liver of young polar bear is good and non-poisonous.

Children's food: They give meat to the children after they are more than one year old. When only a few months old the children are given meat or blubber to suck on; a stick is put through the meat or blubber to prevent the piece from being swallowed.

Starvation: In 1943 there was a period of starvation in the district, and some of the people starved to death. There were days when the people of Barter Island had to go without any food whatsoever. Since that time starvation has not occurred at Barter Island.

Food consumption: Nutritional surveys with individual food weighing were carried out in three families in the winter, and in one family in the summer. Generally speaking, the Barter Island Eskimos eat largely the same type of food both in the winter and in the summer. Approximately 50 per cent of the native food came from sea mammals, and 50 per cent from land mammals. The native food represented the greater part of the caloric intake. During the winter the average consumption of calories was 3100 calories, and in the summer 2200 calories per person per day. The average caloric expenditure was 3000 in the winter and about 2500 in the summer. The results of this nutritional survey will be reported in detail in a separate report.

In the winter 1.5 hours were spent outdoors per person per day on an average (6 % of the time). In the summer an average of 6 hours was spent outdoors per person (25 % of the time).

On an average, the adults slept 9 hours in every 24 hours in the winter and 8 hours in every 24 hours in the summer.

Living conditions: In November 1950 the village consisted of 5 inhabited houses, totalling 9 rooms, with a total population of 30 persons, including one White and one newly born baby. There was an average of approximately two rooms per house, or 4—5 persons per room, yielding an average of 55 square feet of floor space per person. In May 1951 there was an average of 4 persons per house, with an average of 78 square feet of floor space per person. The houses were less crowded in May 1951 as two persons had died, and some families had moved to the west for the summer.

Generally speaking, the houses were crowded, with fairly inadequate ventilation and light. Although they were highly primitively constructed, they were very warm, the heat being supplied by regular iron cookstoves, using wood and coal as fuel.

In one of the houses 4 adults and 5 children slept in one room with a total floor space of 160 square feet, during the winter.

Temperature and relative humidity were recorded in two houses during the November period and in two houses during the May period.

During the November survey the mean temperature in house No. 1 was 40° F, varying between 35° and 65° F in the day and 10° to 15° F in the night. The mean relative humidity was 40 %. In house No. 2 the mean temperature was 65° F, varying between 25° and 50° in the night, and 60° to 75° in the day.

During the May survey the mean temperature in house No. 1 was 40° F, varying between 20° and 30° F in the night and 45° to 75° F in the day. The relative humidity was 75 %. In house No. 2 the mean temperature was 60° F varying between 50° and 55° F in the night and 65° to 75° in the day. The mean relative humidity was 40 %.

As a comparison, it may be mentioned that in the barracks at Ladd Field the mean temperature was approximately 75° F and the relative humidity 25 %.

The Barter Island Eskimo: The population consisted of 28 Eskimos in November 1950; 13 males and 15 females. Eleven were under 16 years, and two were over 60 years, one of whom was 75 years old. One was a half-breed. The remainder were believed to be full-blooded Eskimos. In addition to this, there was one White school teacher who was married to an Eskimo girl.

b. *Anaktuvuk Pass* (lat. 68° N, long. 152° W.) is a mountain passage 2—4 miles wide across the Brooks Range, 3000 feet above the sea level. The pass represents the dividing line between two rivers: To the south John River enters the main valley north of Bettles. To the north the Anaktuvuk River enters the main broader valley and

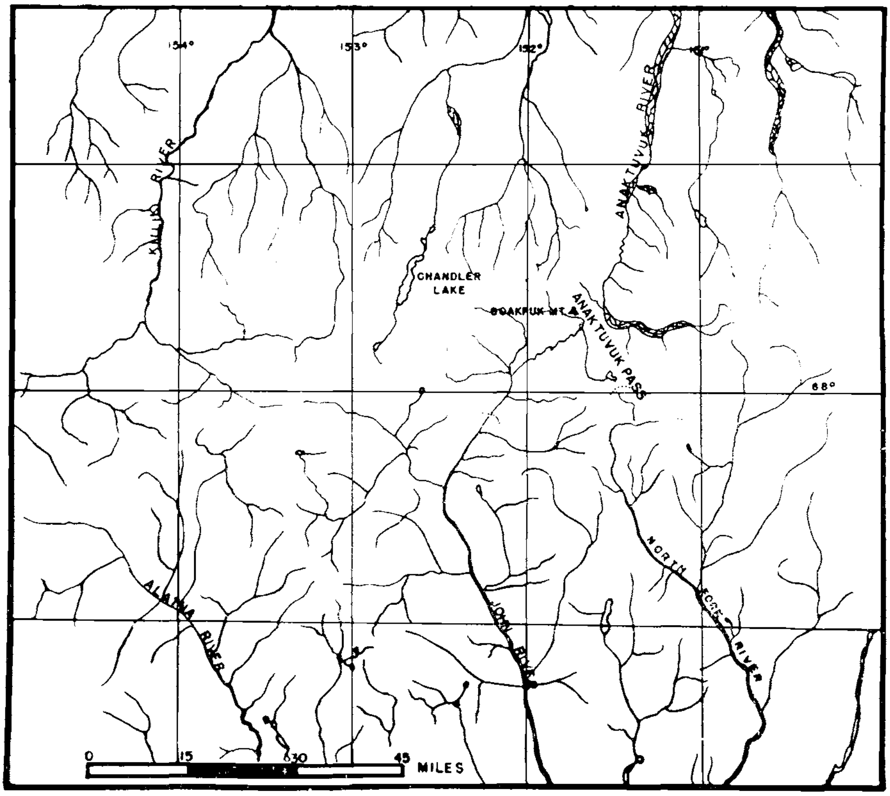

Fig. 4. Sketch map of the Anaktuvuk Pass Region (after Rausch 1951).

flows northward over the Arctic Slope to the Colville, which in turn empties into the Arctic Ocean (figs. 4 and 5). A description of this region has been published by Rausch (1951).

Climate: As no regular meteorological data are available from the Anaktuvuk Pass, the meteorological data for 1950 from Umiat, a little more than 100 miles to the north, are presented in table 3. Some meteorological data for August 1951 are given in table 4.

Generally speaking, the spring and summer weather is quite pleasant, with cool and clear days. In the winter the temperature rarely falls below — 50° F, but severe and bitterly cold winds from the north are quite frequent. The annual precipitation is only a few inches.

During the winter the snow is firmly packed by the strong winds, and produces favourable conditions for travel by dog team, and snowshoes are rarely necessary.

The vegetation is quite luxuriant. A summary of the flora of this region has been published by Rausch (1951). On the Arctic Slope to the north the vegetation consists of tundra plants with some low willow growth along watercourses. In the pass itself, the vegetation consists of tundra species with sedges predominating. The river banks are covered

Table 3.

Umiat: Meteorological Data for 1950.

Month	Temperature °F					Precipitation		Wind			Sky cover average from sunrise to sunset (0—10)	Relative humidity, %
	Averages			Extremes								
	Daily maximum	Daily maximum	Monthly	Highest	Lowest	Total, inches	Snow, sleet, hail, in.	Average hourly speed, m. p. h.	Prevailing direction	Greatest speed, m. p. h.		
January ..	9.6	—13.6	— 2.0	30	—48	0.88	9.2	11.1	W	58	9 2	80
February .	—21.3	—38.2	—29.8	14	—57	0.16	1.7	9.4	W	55	5.0	73
March....	— 4.4	—21.1	—12.8	15	—36	0.13	1.4	6.0	W	24	7.1	77
April.....	10.8	— 6.0	2.4	34	—37	0.10	1.2	8.3	NE	28	7.5	83
May	30.9	20 0	25.5	53	1	0.14	0.9	7.9	E	25	8.1	87
June	55.1	39.2	47.2	69	31	0.20	0.0	8.2	E	25	8.2	81
July......	67.2	44.4	55.8	79	36	0.14	0.0	7.6	E	30	5.6	83
August ...	61.0	39.8	50.4	77	29	0.88	0.0	6.3	E	28	7.1	84
September	42.1	28.1	35.1	63	14	0.64	0.2	6.3	E	22	9.1	87
October ..	21.7	8.0	14.9	36	—13	0.56	4.6	4.1	E	29	8.3	87
November	18.1	1.4	9.8	41	—27	1.07	10.7	10.4	WSW	58	8.7	79
December	—11.7	—26.7	—19.2	24	—50	0.61	6.2	6.3	W	30	-	74
Year	23.3	6.3	14.8	79	—57	5.51	36.1	7.7	E	58	7.5	81

Table 4.

Meteorological Data, Anaktuvuk Pass.

Date 1951	Mean temperature °F	Mean relative humidity, %	Mean wind velocity miles per hour	Sky
3 Aug.	48.0	47	13	broken clouds
4 »	58.0	45	18	low overcast
5 »	55.0	69	13	fog
6 »	58.0	76	11	cloudy
7 »	58 0	76	4	rain
8 »	56.0	91	7	rain

by heavy willow growth, which in some places, such as to the south of Summit Lake, are up to 10 feet high with a varied undergrowth of mosses and lichens, as well as a variety of vascular plants. To the south at Hunters Fork, spruce trees gradually occur.

The important mammals are: caribou, mountain sheep, ground squirrels. A large quantity of wolves are killed, which form the main source of income. Some bears and foxes are also killed, as well as large quantities of ptarmigan.

The people: The inhabitants of Anaktuvuk Pass, who are nomadic caribou hunters, call themselves Nunamiut ("The People of the Land",

Fig. 5. Eskimo settlement at Anaktuvuk Pass.

"Inland People"). In the early days inland Eskimos, presumably attracted into the mountain regions from the coast by the abundance of game, particularly caribou, inhabited the area around the Colville River and its tributaries and around Utukok River in the west. They made definite seasonal migration, spending the winters in the mountains and on the tundra, hunting caribou and travelling by skin boats down the rivers to the coast in summer to trade with the coastal people, and to hunt and fish.

In 1907 starvation, due to disappearance of game, forced practically all of the Nunamiuts down to the coast. Most of them went to Point Barrow, while others went further along the coast to the east.

In 1935 seven or eight families of the coastal Eskimos from the area between Barter Island and the Canadian Arctic, including some of the original Nunamiuts, returned to the mountains by way of the Colville to Kilik, and eventually came to Anaktuvuk Pass in 1941, where they have lived since that time.

At present the group at Anaktuvuk Pass is the only tribe of inland Eskimos in Alaska. They no longer migrate to the coast, but remain at or near Anaktuvuk Pass all year round. In appearance, the majority of the Eskimos at Anaktuvuk Pass differ from the coastal Eskimo, being taller, with longer legs and arms. They have a narrow face with a thin, high bridged nose, suggesting the presence of considerable Indian blood (see fig. 6).

In August 1951 the entire group consisted of 69 Eskimos, in 12 separate families. 38 were males, 31 females. Twenty-nine were under 16 years, and eight were over 50 years old.

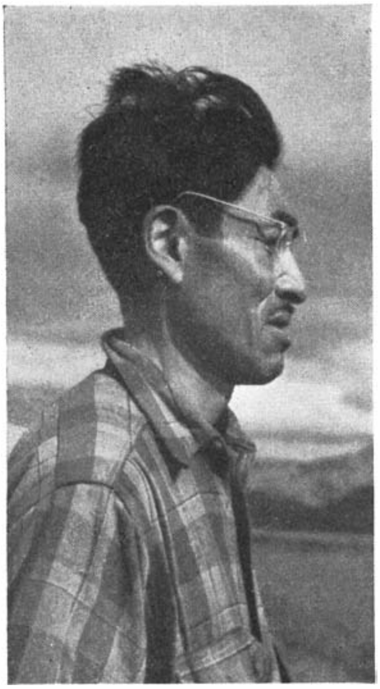

Fig. 6. Inland Eskimo (left) and Coastal Eskimo (right).

Dwellings: The typical dwelling is a hemispherical or oval tent made of caribou hides stretched over a willow frame (figs. 7, 8). Bearded seal intestine is used as a window, and a bear skin covers the door opening. Approximately 20 caribou hides are used in each tent. Some cloth material, and especially parachute canopies are used as an additional cover, which is also used as a mosquito netting when sleeping in the summer. In the summer ventilation is provided by raising the wall hides facing the wind. The floor is covered with a mat of willow and sedge. Caribou hides are used as bedding and are rolled up into bundles around the walls in the daytime, and used as seats. Iron stoves placed near the center of the tent provide heat and facilities for cooking and baking.

In August 1951 the main village consisted of 14 tents by Summit Lake. Eight of these were regular square white man's tents, whilst 6 were of the old native construction. The size of the hemispherical tents was usually 12 feet broad, 14 feet long, and 6 feet high at the center. The canvas tents were on an average 10 feet by 10 feet high. The average floor space was approximately 40 square feet per person.

In April 1951 the temperature was recorded inside one of the tents for a period of one week. During the day the temperature ranged between 40° and 60° F, falling to about 35° F in the night. The relative humidity was approximately 30 %.

Fig. 7. Typical Nunamiut home.

Fig. 8. Inside the igloo.

In August 1951 temperature and humidity were recorded in the same tent. During the day the mean temperature was 70° F, and 55° F during the night. The relative humidity varied between 40 and 80 %.

In the winter the camp is established in the high willow brush approximately one mile south of Summit Lake. In the summer the camp is moved closer to the lake on the bank of a small river.

The clothing is a mixture of skin clothing and white man's clothing, while the caribou boots (mukluks) are still used to a great extent.

Food: Meat, and especially caribou meat, is their main food. While the meat is now considered the greatest delicacy, some internal organs are also used. The meat as well as the internal organs were eaten cooked, usually boiled. Three of the families consumed considerable quantities of fish.

A complete nutritional survey with individual food weighing was carried out over a period of one week in August 1951 in one family. The average daily caloric intake was 3200 calories per person per day and the protein intake was approximately 200 g per day. The average daily caloric expenditure was approximately 3000.

c. *Kotzebue* is the largest native village in Alaska, lat. 68° N, long. 163° W, on the northwest corner of a flat sandy peninsula in the Kotzebue Sound (fig. 9). It has been an important barter and fishing place where Eskimos gathered in large numbers during the summer from the earliest times. It became a permanent settlement at the end of the last century when missionaries and traders arrived. Since then the village has gradually increased in size, and the natives have become thoroughly affected by civilization and the white man's way of living. However, due to difference in financial status, one can still find both extremes, from the poorest family who almost exclusively has to subsist off the land, to the more wealthy Eskimos with a steady income who have a diet almost identical to that of the white population of Alaska.

In addition to an Eskimo population of 578 (107 families), a large number of white people live permanently in Kotzebue, associated with the school, the native hospital, the native administration, fish and wild life service, various privately owned airlines and non-scheduled air services. There are also several white traders.

The climate is typical for the Arctic Coast, with fairly warm and pleasant summers and winds and moderately cold temperatures in the winters.

The meteorological data for 1950 are given in table 5, and for the two periods of the study in table 6.

The vegetation is typical for the Arctic Coast.

Of the animals hunted for food, the seal is of considerable importance. It is hunted on the ice in the winter and spring. Occasionally

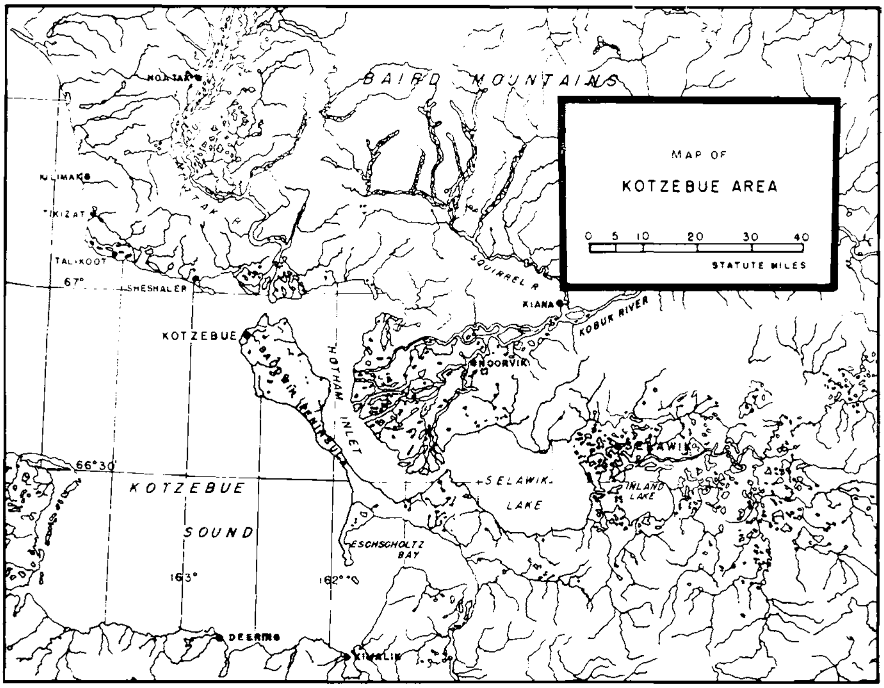

Fig. 9.

Table 5.

Kotzebue: Meteorological Data for 1950.

Month	Temperature, °F					Precipitation		Wind			Sky cover, average from sunrise to sunset (0—10)	Relative humidity, %
	Averages			Extremes								
	Daily maximum	Daily minimum	Monthly	Highest	Lowest	Total, inches	Snow, sleet, hail, in.	Average hourly speed, m. p. h.	Prevailing direction	Greatest speed, m. p. h.		
January	5.7	— 8.5	— 1.4	29	—36	0.48	4.8	16.7	ESE	50	7.0	81
February	1.8	—13.0	— 5.6	18	—34	0.33	3.3	15.8	ESE	57	6.3	70
March	18.7	3.8	11.2	34	—26	0.56	5.7	13.8	ESE	45	6.8	77
April	14.1	— 7.6	3.2	33	—22	0.18	1.8	8.4	NE	36	4.8	80
May	32.4	18.9	25.6	51	—12	0.80	0.9	7.6	W	35	7.5	86
June	40.4	31.9	36.2	49	25	0.78	0.0	14.4	W	42	7.8	84
July	59.2	46.2	52.7	77	36	0.65	0.0	13.3	W	30	7.5	81
August	56.0	46.9	51.4	68	41	2.21	0.0	15.3	SE	40	9.5	84
September ..	52.0	40.9	46.6	61	33	1.07	0.0	13.6	ESE	28	8.4	85
October	32.0	22.3	27.2	40	12	0.33	2.1	16.9	ESE	45	6.9	83
November ..	20.9	11.8	16.4	38	—21	0.76	8.2	17.3	ESE	50	8.9	81
December ...	2.6	— 9.0	— 3.2	26	—28	0.27	2.7	16.6	ESE	65	8.3	78
Year	28.0	15.4	21.7	77	—36	8.42	29.5	14.1	ESE	65	7.5	81

Table 6.

Mean Daily Meteorological Data from Kotzebue During the Two Periods of the Study.

Date	Wind		Temperature °F			Bar. pressure in.	Precipitation		Depth of snow in.	Relative humidity, %
	Mean m. p. h.	Prev. direction	Maximum	Minimum	Mean		H_2O equivalent, in.	Type		
1950										
3 December	20.5	N	— 2	—13	— 7.6	30.253	0.00	-	6	66
4 »	20.5	E	—10	—20	—16.1	30.137	0.00	-	6	71
5 »	15.2	E	—10	—19	—12.7	29.845	0.00	-	6	77
6 »	9.0	E	— 17	—22	—19.4	29.665	0.00	-	6	75
7 »	8.0	E	—17	—23	—19.6	29 913	0.00	-	6	74
8 »	30.7	E	— 2	—25	—13.4	29.773	0.03	snow	6	74
9 »	45.4	E	17	— 3	0.0	29.266	0.16	»	7	78
10 »	23.6	S	25	11	16.9	29.534	0.06	»	9	86
11 »	32.6	E	20	10	15.1	29.414	0.12	»	10	82
12 »	25.0	E	29	20	23.8	29.195	0.01	»	11	90
13 »	22.4	S	29	23	26.6	29.587	0.01	»	11	90
14 »	21.0	SE	24	7	13.1	29.923	trace	»	11	82
15 »	25.5	SE	13	9	10.9	29.986	»	»	11	77
16 »	15.8	E	12	— 5	4.3	30.088	0.00	-	11	74
17 »	11.9	NE	— 1	—12	— 5.8	30.114	0.00	-	11	75
18 »	10.1	E	— 7	—16	—12.4	30.234	0.00	-	11	74
1951										
27 June	11.7	W	-	-	66.1	29.873	0 00	-	0	68
28 »	11.7	W	58.8	49.7	52.1	29.860	0.00	-	0	86
29 »	9.5	W	61.4	49.3	56.8	29.886	0.00	-	0	80
30 »	5.7	W	67.0	58.0	61.2	30.013	0 00	-	0	74
1 July	22.6	W	59.9	51.6	55.5	29.966	0.04	rain	0	87
2 »	16.2	SW	59.2	51.4	54.8	30.043	0.00	-	0	79
3 »	9.2	S	62.4	52.2	56.3	29.934	0.01	rain	0	74
4 »	20.0	S	54.0	48.8	51.4	29 773	0.01	»	0	80
5 »	18.8	S	52.6	47.2	50.0	29.420	0.35	»	0	92
6 »	11.5	S	55.8	47.8	51.3	29.728	trace	»	0	80
7 »	21.9	SE	57.3	46.9	52.7	29.798	0.35	»	0	88
8 »	15.5	W	55.0	46.0	49.5	29.919	0.01	»	0	82

caribou is hunted on the mainland. Some reindeer meat from the herds at the Kobuk River is consumed. In the early summer a considerable amount of balooga, white whale, is caught on the Kotzebue Sound. During the winter, fishing takes place through holes in the ice, and in the summer large quantities of salmon are caught in the surrounding district. Modern equipment is used to a great extent, such as wooden boats with outboard motors, and larger fishing vessels.

Most families live in wooden houses of modern construction (fig.10), although a few live in tents all the year round (fig. 11). In the winter the mean temperature in 3 houses was 80° F in the day and 65° F in

Table 7.

	Family 1		Family 2		Family 3		Family 4	
	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer
Caloric consumption.	2030	1990	2660	-	2400	-	2300	1750
Caloric expenditure .	2400	2500	2700	-	2500	-	2600	2400
Total hours outdoors in 24 hrs.......	4	9	1.5	-	1	-	2	9
Total hours sleep in 24 hrs.	11	10	9	-	11	-	9	10

the night. In one of the tents it was about 70° F in the day and went down to 20° F in the night. The relative humidity varied between 30 and 70 % in the houses and between 40 and 60 % in the tent. In the summer the temperature varied between 60° F and 80° F in the houses and 50° to 90° F in the tent. The relative humidity varied between 30 and 70 % in the houses and between 20 and 80 % in the tent. There was an average of 2 rooms per house, 4 persons per room, and 50 square feet of floor space per person.

The diet of the Kotzebue Eskimo consists in most families to a large extent of white man's food. A nutritional survey in December 1950 and in June—July 1951 of 4 different families, representing different categories from the most primitive (family 4) to the most highly civilized groups (family 1) showed that the average daily protein intake was approximately 98 g per person. Further details are given in table 7.

The people: Of a total permanent population of 578, 370 claimed to be full-blooded Eskimos. The remainder represented different degrees of mixture between White and Eskimo.

The living habits of the Kotzebue Eskimos are greatly influenced by civilization. There are regular movies; there appears to be considerable access to liquor, and occasional jobs which supply fair amounts of cash.

d. *Gambell,* lat. 63° 50′ N, long. 171° 30′ W, Eskimo name: "Sevoukuk".

The village of Gambell is situated on the northwest corner of St. Lawrence Island in the Bering Sea, approximately 100 miles west of the mainland of Alaska, and 40 miles east of Indian Point in Siberia (fig. 12).

Gambell has been the site of a series of ancient villages prior to the establishment of Gambell as we know it today. The last of these

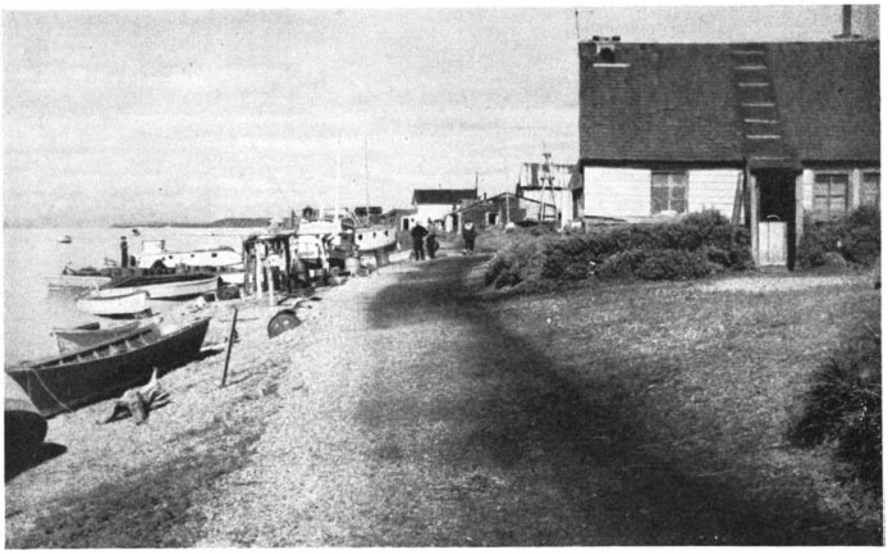

Fig. 10. Eskimo village at Kotzebue.

Fig. 11. Tent house at Kotzebue.

settlements were inhabited as late as 50—60 years ago, and the earliest site, the Hillside site, was established and abandoned during the period of the Old Bering Sea Culture, when this old Eskimo culture was flourishing around Bering Strait more than 1000 years ago (Collins 1937).

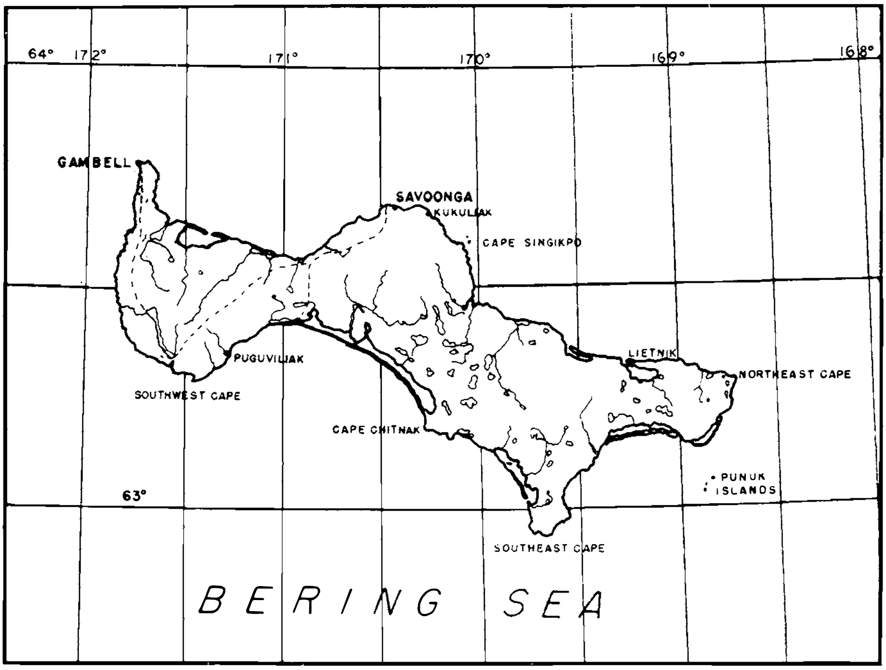

Fig. 12. Saint Lawrence Island.

The inland, which is mainly of volcanic origin, is partly rugged and mountainous, with extensive stretches of marshy tundra covered with innumerable lakes and a network of streams. The coastline is bleak with cliffs of basalt descending steeply to the rocky beach or to low foreland of gravel. For the greater part of the year, the island is locked in ice, which does not finally leave the shores until late in June or July.

The vegetation is of the usual Arctic variety, with mosses and lichens in the higher parts, and an abundant growth of dwarf willow, mosses, grasses and flowering plants on the lower portions of the island.

To the St. Lawrence Eskimo the walrus is the most important source of food supply. At Gambell alone, between three and four hundred walrus are killed annually. Occasionally a whale is killed, and a large number of seals. In the summer months many of the Gambell Eskimos move to the fish camps on the east side of the island. Some 50 years ago reindeer were introduced for the use of the Eskimos, but the herds now only count a very small number of animals.

The birds that are of economic importance to the Eskimos are mainly the ducks, geese, cormorants, auklets, gulls, and murres, all of which are eaten.

Climate: Situated in the low pressure area characteristic of the entire Bering Sea region, severe storms and gales are frequent, both in

Table 8.

Gambell: Meteorological Data for 1950.

Month	Temperature, °F: Averages: Daily maximum	Daily minimum	Monthly	Extremes: Highest	Lowest	Precipitation: Total, inches	Snow, sleet, hail, in.	Wind: Average hourly speed m. p. h.	Prevailing direction	Greatest speed, m. p. h.	Sky cover, average from sunrise to sunset (1—10)	Relative humidity, %
January......	27.1	18.8	23.0	32	0	3.28	32.1	17.6	SSW	57	8.6	92
February.....	16.0	5.5	10.8	33	— 3	0.59	5.9	20.4	NNE	65	6.9	78
March.......	10.2	0.9	5.6	30	—12	4.85	48.5	20.4	NNE	56	7.8	85
April........	22.5	12.2	17.4	34	0	5.86	55.1	18.1	NNE	63	7.7	89
May.........	29.9	23.9	26.9	35	11	0.63	5.7	15.5	NNE	37	9.1	91
June........	39.5	34.0	36.8	49	31	0.68	trace	12.2	SSW	40	9.8	96
July.........	48.3	40.9	44.8	58	38	3.20	0.0	14.7	SSE	48	9.7	94
August.......	50.1	42.6	46.4	58	37	2.22	0.0	12.8	SSW	49	9.2	93
September...	43.3	37.7	40.5	49	33	3.23	trace	18.4	NNE	67	9.4	89
October......	37.2	32.3	34.8	44	22	2.21	1.8	18.1	SSW	53	8.8	88
November...	32.8	25.3	29.1	38	17	1.22	10.8	22.2	SSW	79	8.7	88
December....	23.8	15.3	19.6	33	— 1	3.13	31.3	24.8	NNE	88	9.4	88
Year.........	31.7	24.1	28.0	58	—12	31.10	191.2	17.9	NNE	88	8.8	89

the winter and in the summer. Fog and rain are prevalent during the summer, and there are heavy snowfalls during the winter. The winter weather is tempered to some extent due to the warm ocean currents from the south. On the other hand, the pack ice surrounds the island for about 8 months of the year. The meteorological data for 1950 are presented in table 8, and the data for the two periods of the study are given in table 9.

Due to its location at the extreme north and west corner of the island, with the local current situation, there is almost constantly open water close to Gambell, which greatly facilitates the walrus hunting.

The people: The Eskimos inhabiting the St. Lawrence Island belong to the *Yuit* or Siberian group, according to Collins (1937). At present they number some 500 individuals, but in earlier time there was a considerably larger population, which was greatly reduced by a severe epidemic and famine in the winter of 1878—79.

Shelter: The ancient semi-subterranean homes no longer exist on the island except as ruins, nor are the Siberian type of houses made from walrus hides stretched over a framework of wood or whalebone used any longer. The present type of houses, which were introduced by the missionaries at the beginning of this century, are regular wooden frame houses which are occupied both in the winter and in the summer (figs.

Table 9.

Mean Daily Meteorological Data from Gambell During the Two Periods of the Study.

Date	Wind		Temperature °F			Bar. Pressure in.	Precipitation		Depth of snow in.	Relative humidity, %
	Mean, m. p. h.	Prevailing direction	Maximum	Minimum	Mean		H_2O epuivalent, inches	Type		
1951 (1)										
1 March	12 0	N	—20	—25	—22.8	30.662	0.00	-	13	51
2 »	8.8	N	— 3	—26	—13.3	30.815	0 00	-	13	54
3 »	17.5	NE	— 4	—14	— 9.3	30.812	0.00	-	13	65
4 »	19 8	NE	9	— 4	3.6	30.277	0.03	snow	13	69
5 »	20.7	SE	25	6	17.0	30.321	0.27	»	14	86
6 »	28.8	E	19	11	14.7	30.273	0 03	»	13	71
7 »	32.3	SE	25	13	17.5	30.143	0.02	»	12	82
8 »	14.0	W	25	12	17.8	30.438	0.00	-	12	78
9 »	13.1	E	20	10	16.7	30.617	0.00	-	12	78
10 »	13.5	NE	15	7	10.0	30.570	0.00	-	12	76
11 »	20.6	NE	10	0	7.1	30.205	0.00	-	12	74
12 »	8 5	NE	5	— 5	3.9	30.073	0 02	snow	12	62
13 »	8.3	E	10	— 2	2.9	30.266	0 00	-	12	68
14 »	21.6	SE	25	8	19.2	29.977	0 50	snow	13	90
15 »	26.4	NE	21	10	14.4	30 045	0.46	»	13	86
16 »	27.3	N	10	— 6	3.0	30.276	0 00	-	14	71
17 »	35.4	N	— 4	— 8	— 5.3	30.120	0.00	-	13	67
18 »	24.9	N	7	— 7	— 3 1	29.843	0.08	snow	13	71
19 »	10.1	S	9	— 5	3.0	29 922	0.02	»	13	70
20 »	11.9	N	14	2	6.9	29.847	0.00	-	13	74
21 »	19 2	N	7	— 4	2.7	30.042	0.06	snow	13	71
1951 (2)										
15 August	16 0	SW	49	44	47.7	30.006	0.00	-	0	94
16 »	9 6	W	54	45	49.0	30.018	0.00	-	0	93
17 »	9.7	NE	51	43	47.5	30 128	0.06	rain	0	85
18 »	10.3	E	48	43	45.9	29.977	0.09	»	0	98
19 »	16.2	SW	49	46	47.9	29 628	0.35	»	0	96
20 »	11.5	S	50	46	48.3	29.456	0.17	»	0	96
21 »	25.6	N	46	38	42.2	29.186	0.79	»	0	94
22 »	11.9	NW	47	39	41.9	29.518	0.03	»	0	83

13, 14). The houses usually have two storeys and consist of several rooms, but very often only one room is inhabited, the remainder being used for storage etc. The houses are all made in the same box-like manner with slanting roofs and a storm shed over the door.

Usually the living quarters are on the upper floor which is reached by narrow vertical stairs. The floor still serves as a table in many houses. In the poorer houses, close to a dozen persons may live in one room.

A survey revealed that on an average 4 persons lived in each room, or 7 persons in each house, with an average floor space of 40 square feet per person.

Fig. 13. Gambell village in the winter.

In the winter the temperature in the houses ranged between 50° and 90° F in the day and between 20° and 65° F in the night. The relative humidity varied between 20 and 90 %. In the summer the temperature ranged between 60° and 100° F in the day and between 45° and 70° F in the night.

Clothing: The superior Eskimo fur clothing is still largely used by the natives, although some items of white man's clothing are gradually being adopted in lieu of their own, particularly by the young people. Most of their fur clothing is made of seal skins, some of reindeer, and parkas of bird skins. Windbreakers are used to a great extent. It is interesting to note that the clothing is very nearly the same in winter as in summer. Generally speaking, their clothing offers excellent protection against the cold.

Food: The Gambell Eskimos are meat-eating people who subsist mainly on sea mammals such as the walrus, bowheaded whale, and several species of seal, the walrus being by far the most important item of their diet. In the summer birds such as auklets, cormorants, gulls, eider ducks, and geese are killed for food. Fish such as cod and occasionally trout and salmon are secured from the inland rivers or at the fishing camps. Bird's eggs and young birds taken from the nests are considered as delicacies, as is the skin of the whale, muktuk. While hunting, clams

Fig. 14. Gambell village in the summer.

from the stomach of the killed walrus are often eaten raw by the hunters. The skin, meat, blubber, and almost all internal organs, including the small intestines are all considered edible.

In March the average daily caloric intake in two families was approximately 2300 calories, while the expenditure was estimated to be 2500 calories. Similar figures were obtained during the summer period. In the winter approximately 4 hours were spent outside daily by each subject as against 5 hours in the summer. The average amount of sleep was 8 hours in the winter and 7 hours in the summer per 24 hours.

2. The Subjects.

The subjects, usually between 20 and 40 years old, were carefully selected on the basis of complete and thorough medical examination, including medical histories, physical examination with x-ray examination of the chest and long bones, as well as urine and blood examination, in order to rule out any pathological conditions. Whenever possible, previous medical records were also examined. As a result of the medical examination, a few of the originally selected subjects were excluded, showing evidence of pathology. In addition, every subject with elevated body temperature at the time of the test has also been excluded, regardless

Table 10. *Eskimo Subjects.*

	Subj. No.	Name	Sex	Age	Race	Remarks
A.						
Barter Island:	A-1	Putugook, Donald....	M	21	Halfbreed	
	A-2	Akootchook, Isaac ...	M	28	Full-blooded Eskimo	
	A-3	Akootchook, Daniel ..	M	17	» » »	
	A-4	Nageak, Vincent.....	M	47	» » »	
	A-5	Akootchook, Perry ...	M	31	» » »	1)
	A-6	Akootchook, Andrew .	M	61	» » »	
	A-7	Akootchook, George..	M	18	» » »	2)
	A-8	Rexford, Herman	M	36	» » »	
	A-9	Apayaok, John.......	M	15	» » »	
	A-10	Akootchook, Mary ...	F	29	» » »	
	A-11	Putugook, Annie.....	F	32	» » »	3)
	A-12	Rexford, Mildred	F	34	» » »	
	A-13	Akootchook, Elizabeth	F	21	» » »	
	A-14	Nageak, Rhoda	F	36	» » »	
	A-15	Akootchook, Maggie ..	F	22	» » »	
	A-16	Apayaok, Leah	F	24	» » »	4)
B.						
Anaktuvuk Pass:	B-1	Hugo, Zacharis......	M	20	» » »	
	B-2	Rullund, Johnny.....	M	22	» » »	
	B-3	Mekiana, Justus	M	22	» » »	
	B-4	Mekiana, Homer.....	M	47	» » »	
	B-5	Ahgook, Bob	M	21	» » »	
	B-6	Hugo, John	M	30	» » »	
	B-7	Morry, Amos	M	22	» » »	
	B-8	Ahgook, Ben	M	29	» » »	
	B-9	Morry, Billy.........	M	36	» » »	
	B-10	Morry, John....... .	M	40	» » »	
	B-11	Ahgook, Jonas	M	31	» » »	
C.						
Kotzebue:	C-1	Curtis, John.........	M	35	Halfbreed	
	C-2	Sours, Marion	M	36	Full-blooded Eskimo	
	C-3	Goodwin, Willie	M	36	» » »	
	C-4	Curtis, Dick.........	M	31	» » »	
	C-5	Jones, Charlie	M	27	Halfbreed	
	C-6	Victor, Roy	M	13	Three-quarter Eskimo	2)
	C-7	Arnold, Clarence	M	20	Full-blooded Eskimo	
	C-8	Smith, Irvin	M	58	» » »	
	C-9	Ticket, Herman......	M	49	Three-quarter Eskimo	
	C-10	Sours, Eugene.......	M	40	Full-blooded Eskimo	2)
	C-11	Barr, Charlie........	M	18	» » »	
	C-12	Ballod, Oscar	M	25	» » »	
	C-13	Jones, Jack	M	23	» » »	
	C-14	Ramoth, Ralph	M	19	» » »	
	C-15	Mitchell, Charlie.....	M	22	Three-quarter Eskimo	
	C-16	Vestal, Dolly	F	52	Full-blooded Eskimo	
	C-17	Vestal, May	F	21	» » »	
	C-18	Kagoona, Janet	F	23	» » »	
	C-19	Analoak, Mabel	F	23	» » »	
	C-20	Tikik, Magdaline	F	31	» » »	
	C-21	Norton, Lydia	F	30	» » »	
	C-22	Mills, Annie	F	44	Half-breed	
	C-23	Sours, Belle.........	F	38	Full-blooded Eskimo	
	C-24	Barr, Evelyn	F	22	» » »	
	C-25	Otton, Irene.........	F	30	» » »	

Table 10. (Cont).

	Subj. No.	Name	Sex	Age	Race	Remarks
D. Gambell:	D-1	Slwooko, Vernon	M	33	Full-blooded Eskimo	
	D-2	James, Winfred	M	27	» » »	
	D-3	Chauncy, Woodrow ..	M	19	» » »	
	D-4	Iyakitan, Lane	M	21	» » »	
	D-5	Walunga, Willis	M	24	» » »	
	D-6	Iyakitan, Daniel	M	30	» » »	
	D-7	Iyakitan, Carl	M	39	» » »	
	D-8	Slwooko, Joseph	M	24	» » »	
	D-9	Harry, Don	M	30	» » »	
	D-10	Aningayou, John	M	35	» » »	
	D-11	Slwooko, Roger	M	18	» » »	
	D-12	Slwooko, Howard	M	31	» » »	
	D-13	Oozevoseuk, Conrad .	M	25	» » »	
	D-14	Appassingok, Herbert	M	24	» » »	
	D-15	Silook, Nolan	M	35	» » »	2)
	D-16	Silook, Roger........	M	27	» » »	
	D-17	Antaghame, Jack	M	39	» » »	
	D-18	Iyakitan, Lewis	M	24	» » »	
	D-19	Nawpokuhok, Leonard	M	19	» » »	
	D-20	Aningayou, Norman ..	M	39	» » »	
	D-21	Konahok, Howard....	M	38	» » »	
	D-22	Iknokinok, Clifford ...	M	24	» » »	
	D-23	Malegoohtik, Florence	F	44	» » »	
	D-24	Nawpokuhok, Gail ...	F	23	» » »	*
	D-25	Slwooko, Beda	F	32	» » »	*
	D-26	Iyakitan, Vivian	F	24	» » »	
	D-27	Omwari, Pansy	F	25	» » »	
	D-28	Oyaghok, Marcella ...	F	21	» » »	*

* Apprehensive.
[1] Excluded for medical reasons.
[2] Excluded because of abnormal breathing pattern.
[3] Excluded on account of unreliable fasting.
[4] Excluded on account of active pulmonary tuberculosis.

of the cause. All the Eskimo subjects included in this paper may therefore be considered as normal subjects.

The Eskimo subjects are listed in table 10. A summary of the medical histories and the results of physical examination are given on pages 36—43. Some data from the physical examination are listed in tables 11, 12, 13 and 14. The results of blood examination are given in tables 15—18, and the results of the urine examination are given in tables 19—22.

BRIEF SUMMARIES OF MEDICAL HISTORIES AND THE RESULTS OF PHYSICAL EXAMINATION

A. Barter Island Group:

Subject A-1. Putugook, Donald. Born 7 July 1929 at Demarkation Point. Race: "Half-breed". Occupation: Hunter and trapper. His father (White) 61 years old. Mother dead, cause of death unknown. He has apparently no brothers or sisters. Single. Apart from "flu" in the winter of 1949, he has had no previous illness, and has no complaints at present. Physical examination in November 1950 and again in May 1951 revealed: slight furunculosis in the face, otherwise no pathological findings.

Subject A-2. Akootchook, Isaac. Born 31 March 1922 at Arey Island. "Full-blooded" Eskimo. Occupation: Laborer and carpenter at Barter Island AFB. His father (subject No. A-6) 61 years old. Mother died in 1950 from malignant tumor of the liver. Three sisters and five brothers living, three sisters and one brother died as small children. The subject is married and has four children. The subject states that he has had no previous illness, and has no present complaints. Physical examination in November 1950 and May 1951 revealed nothing abnormal, except a slight case of Herpes simplex in May 1951.

Subject A-3. Akootchook, Daniel. Born 7 February 1933 at Point Barrow. "Full-blooded" Eskimo, hunter. He is the brother of subject A-2. Unmarried. The subject states that he has had no previous illness, which is confirmed by his father. Physical examination revealed nothing pathological.

Subject A-4. Nageak, Vincent. Born 15 April 1903 at Barrow. "Full-blooded" Eskimo. Occupation: hunter and trapper, and occasional summer employment by U. S. Coast and Geodetic Survey. Both parents dead. He had had multiple complaints: "Fever" of unknown origin as a boy, "bad eye" and "headaches" as a result of an accident 22 years ago. Fractured ox coxae during fall on ice when 19 years old. Four years ago "flu" with pain in left side of chest when breathing; admitted to hospital. *Skin abnormality* — Leucodermia, which occurred 6 years ago when he noticed whitening of the skin on small areas of abdomen after a bath; since then, gradually spreading over large areas. Medical examination in November 1950 revealed nothing pathological, apart from the leucodermia.

Subject A-6. Akootchook, Andrew. Born 15 October 1889 at Utukok River. "Full-blooded" Eskimo, Chief of the tribe, hunter and trapper. Both parents died when he was a young boy. He has had two brothers and two sisters, one sister living. Of 13 children, 9 are living. As a child, severe nosebleeding. Bleeding from rectum (hemorrhoids) 7 years ago. Since, then, continual symptoms of hemorrhoids. Symptoms of cystitis 8 years ago. He states that as the result of an accident 30 years ago while sheep hunting, when he fell and hit his head against the sheep antlers he has suffered from frequent headaches and "noise in left ear", with dizziness. He also complains about pains in abdomen and chest. He has been examined at St. Joseph's Hospital in Fairbanks, where reposition of hernia was performed, but no organic diseases were detected. He has symptoms resembling angina pectoris. Medical examination in November 1950 revealed no significant pathological findings.

Subject A-8. Rexford, Herman. Born 30 Sept. 1914 at Point Barrow. "Full-blooded" Eskimo. Occupation: Laborer and carpenter at Barter Island Air Force Base. His father — 60 years old. Mother and stepmother both dead. Two sisters and two brothers. Married to subject A-12. One child died from "flu" as a baby, one adopted daughter living. The subject states that he has had no previous illness, and he has no complaints at present. Medical examination in November 1950 and again in May 1951 showed no pathological conditions.

Subject A-9. Apayaok, John. Born 20 August 1935 in the Canadian Arctic. "Full-blooded" Eskimo. Hunter and trapper. His father died from tuberculosis; his mother is alive. He lives with his grandmother, as does also his sister, who was found to suffer from active pulmonary tuberculosis (subject A-16). The subject states that he has always been healthy. He has no present complaints. Physical examination in November 1950 and in May 1951 revealed nothing pathological.

Subject A-10. Akootchook, Mary. Born 12 September 1921 near Barter Island. "Full-blooded" Eskimo; housewife. Her father is alive, mother dead. Three sisters, one of whom is subject A-15. She has 4 children. The subject occasionally suffers from indigestion and pains in the right groin, but at present no complaints. Physical examination in November 1950 and in May 1951 revealed no pathological findings. Blood examination revealed anemia in May 1951 (see table 15).

Subject A-12. Rexford, Mildred. Born 10 April 1916 at Point Barrow. "Full-blooded" Eskimo. Occupation: housewife. She is the daughter of subject A-6. She is married to subject A-8. The subject states that she occasionally has had "flu" and bad colds. She is otherwise healthy and has no complaints at present. Physical examination in November 1950 and in May 1951 revealed negative findings.

Subject A-13. Akootchook, Elizabeth. Born 22 October 1925 at Barter Island. "Full-blooded" Eskimo. Unmarried. She is the daughter of subject A-6. The subject states that she has no serious illness, and that she has no present complaints. Physical examination revealed no abnormal findings.

Subject A-14. Nageak, Rhoda. Born 11 February 1914 on the Arctic Coast. "Full-blooded" Eskimo. Housewife. (Married to subject A-4). She is the daughter of subject A-6. She had measles as a child; she occasionally suffers from constipation. At the time of examination no complaints. Physical examination revealed no significant pathological findings.

Subject A-15. Akootchook, Maggie. Born 7 September 1928 on the Arctic Coast. "Full-blooded" Eskimo, married to the son of subject A-6. She is the sister of subject A-10. Apart from "sickness" of unknown nature as a child, and occasional fainting spells, she states that she has always been healthy. Physical examination revealed no significant pathological findings.

B. Anaktuvuk Pass Group:

Subject B-1. Hugo, Zacharias. Born 15 September 1931 at Oliktuk. "Full-blooded" Eskimo, hunter. Unmarried. Father died in 1949. Mother alive. Severe "flu" in 1948. No other previous illness or complaints. Physical examination revealed no pathological findings.

Subject B-2. Rullund, Johnnie. Born 4 June 1939 at Sheenjik River. "Full-blooded" Eskimo, hunter. Both parents alive. Four sisters and three brothers living. Several years ago pain in right hip associated with backache which lasted a few days. At present no complaints, and physical examination revealed nothing abnormal except reduced intelligence.

Subject B-3. Mekiana, Justus. Born 23 July 1928 at Sheenjik River. "Full-blooded" Eskimo, hunter. Severe "flu" in 1949. At present no complaints except headaches in the morning when out hunting, which improve in the course of the day. Physical examination revealed no pathological findings.

Subject B-4. Mekiana, Homer. Born 5 May 1904, at Point Barrow. "Full-blooded" Eskimo, hunter and postmaster. Both parents dead. One brother and one sister living. Married twice; his first wife died from chest injury. Five children. No history of any serious illness. At present no complants, and physical examination showed no pathological findings.

Subject B-5. Ahgook, Bob. Born 18 September 1929 at Colville River. "Full-blooded" Eskimo, hunter. Parents both living. Three brothers, one sister. Smallpox as a child in Fairbanks; otherwise he has always been healthy. Physical examination revealed negative findings.

Subject B-6. Hugo, John. Born 15 April 1921 at Colville River. "Full-blooded" Eskimo, hunter. Father living, mother dead. Severe "flu" at Kilik in 1943, when he "nearly died". Otherwise, no serious illness. Physical examination showed normal findings.

Subject B-7. Morry, Amos. Born 1 March 1929 at Coheen River. "Full-blooded" Eskimo, hunter. Father alive, mother dead. Occasional backaches in the lumbar region and occasionally pains in ankles when walking. Severe "flu" at

Kilik in 1948, when he was confined to bed for one month with high fever, pains in chest, headache, coryza, reduced appetite and aneuria. Otherwise, no severe illness, and physical examination showed normal findings.

Subject B-8. Ahgook, Ben. Born 10 January 1922 at Cross Island. "Full-blooded" Eskimo. The subject is the brother of subject B-5. Married. Has one child. According to his parents he was severely ill as a small child. Since then no serious illness. Physical examination revealed no pathological findings.

Subject B-9. Morry, Billy. Born 10 October 1914 at Demarkation Point. "Full-blooded" Eskimo, hunter and chief (president of the council). Father alive, mother dead. According to parents, severely ill as a small child. Nature of illness unknown. Occasionally tonsillitis. At present no complaints. Physical examination revealed no pathological findings which would be expected to affect the metabolism.

Subject B-10. Morry, John. Born 25 December 1911 at Colville River. "Full-blooded" Eskimo. Hunter. Brother of subject B-9. Occasional toothaches and colds; otherwise, always healthy. At present no complaints. Physical examination revealed nothing abnormal except deep scars on the chest as the results of the tribe's traditional method of treating boils by making deep cuts in the skin.

Subject B-11. Ahgook, Jonas. Born 15 April 1920 at Point Barrow. "Full-blooded" Eskimo. Hunter. Brother of subject B-5. The subject states that there is no tuberculosis in the family. When 18 years old he was "ill" for one year, nature of illness unknown. At present no complaints, and physical examination revealed no significant pathological findings.

C. Kotzebue Group:

Subject C-1. Curtis, John. Born 11 February 1915 at Kotzebue. "Half-breed". Hunter and laborer. Both parents living. Three sisters living, two dead; two brothers living, one dead. Married. Three children. "Paralysis" of both legs as a child, lasted two months. Pleurisy in 1938. At present no complaints, and physical examination revealed no pathological findings.

Subject C-2. Sours, Marion. Born 12 February 1914 at Selavik. "Full-blooded" Eskimo. Laborer and hunter. Both parents living. Four sisters living, one dead; one brother living, one dead. Married, three children living, one dead. Appendectomy, common colds occasionally. Otherwise, no previous illness. At present no complaints, and physical examination showed negative findings.

Subject C-3. Goodwin, Willie. Born 27 October 1914 in a skin boat on Selavik Lake. "Full-blooded" Eskimo. Hunter and trapper. Both parents living. Two sisters and one brother dead. Married, six children, one dead. No serious illness in the past, at present no complaints. Physical examination revealed nothing pathological.

Subject C-4. Curtis, Dick. Born 22 February 1919, at Nervik "Full-blooded" Eskimo, hunter and trapper. Half-brother of subject C-1. Single. "Blood poison" twice, "spekk-finger" in 1946. No other illness. At present, no complaints, and physical examination revealed no pathological findings.

Subject C-5. Jones, Charlie. Born 1923 at Kotzebue. "Half-breed". Both parents dead. Fisherman, hunter, occasional labor. Married. No record of previous illness; no present complaints. Physical examination revealed negative findings.

Subject C-7. Arnold, Clarence. Born 31 March 1930, at Noatak. "Full-blooded" Eskimo. Hunter and trapper. Both parents deceased. One sister living, one dead. Single .Appendectomy 1950. At present no complaints. Physical examination revealed no pathological findings.

Subject C-8. Smith, Irvin. Born 20 May 1892 at Kotzebue. Both parents dead, one brother and one sister living. Married, four children, does not know how many of his children died. No serious illnes previously. At present no complaints. Physical examination revealed normal findings.

Subject C-9. Ticket, Herman. Born April 1901 at Kobuk River. Three-quarter Eskimo, one-quarter Indian. Carpenter. Father dead. Two sisters and two brothers living. Married, two children. Measles as a child, and dogbite in leg. No present complaints, and physical examination revealed normal findings.

Subject C-11. Barr, Charlie. Born 11 April 1932 at Kotzebue. "Full-blooded" Eskimo. Hunter, miner etc. Both parents dead, mother died from tuberculosis. Three brothers and one sister all died as young babies. No previous illness, and no present complaints. No abnormal physical findings.

Subject C-12. Ballod, Oscar. Born 16 December 1925 at Selavik. "Full-blooded" Eskimo. Hunter and fisherman. Mother, two sisters, three brothers living. Single. No previous illness, no present complaints, and no abnormal physical findings.

Subject C-13. Jones, Jack. Born 17 September 1927 at Selavik. "Full-blooded" Eskimo. Hunter and trapper. Both parents living. Single. "Never ill in his life", no present complaints, and no abnormal physical findings.

Subject C-14. Ramoth, Ralph. Born 8 June 1931 at Selavik. "Full-blooded" Eskimo. Hunter and fisherman. Mother, two sisters, and one brother living. Tonsillectomy as child. No present complaints and no abnormal physical findings.

Subject C-15. Mitchell, Charlie. Born 21 May 1928 at Selavik. Three-quarter Eskimo. Hunter and fisherman. Both parents, four sisters, one brother living. Single. No previous illness, no present complaints, no abnormal physical findings.

Subject C-16. Vestal, Dolly. Born 1898 at Shishmaref. "Full-blooded" Eskimo. Housewife. Mother, three sisters, one brother alive. Married, two children. Appendectomy "long ago". No present complaints, no abnormal physical findings.

Subject C-17. Vestal, May. Born 21 April 1929. "Full-blooded" Eskimo. Daughter of subject C-16. Single. Nurse. No previous illness, and physical examination revealed no abnormal findings.

Subject C-18. Kagoona, Janet. Born 21 January 1927. "Full-blooded" Eskimo. Nurse. Both parents living. One sister living, three dead; two brothers living, five dead. Single. Admitted to hospital on three occasions for: tonsillectomy, appendectomy, sore throat. At present no complaints. No abnormal physical findings.

Subject C-19. Analoak, Mabel. Born 16 March 1927. "Full-blooded" Eskimo. Nurse. Both parents, two sisters, brother living. Married (husband being treated for pulmonary tuberculosis). Dyspepsia in 1949. At present no complaints. Physical examination revealed nothing pathological.

Subject C-20. Tikik, Magdeline. Born 3 April 1919. "Full-blooded" Eskimo. Nurse and housewife. Both parents dead. Two sisters living, one dead; one brother living, two dead. Married, two children living, two dead. Furunculosis repeatedly, tonsillectomy and appendectomy. At present no complaints, and no abnormal physical findings.

Subject C-21. Norton, Lydia. Born 30 November 1921, at Shishmaref. "Full-blooded" Eskimo. Housewife. Both parents living. Three sisters living, one dead. One brother living. Married. Shoulder pain as the result of accident "long ago". At present pains in right side of abdomen; physical examination revealed nothing pathological.

Subject C-22. Mills, Annie. Born 1 July 1906. "Half-breed". Postmaster at Deering. Mother dead; one sister living, one dead, two brothers living. Married. No history of tuberculosis. Eight normal pregnancies. 1929, smallpox. 1947, appendectomy. 1950, removal of carvical polyp. Physical examination revealed no pathological findings.

Subject C-23. Sours, Belle. Born 3 July 1912. "Full-blooded" Eskimo. Housewife. Both parents living. Five sisters living, one dead; two brothers living. Married to subject C-2. Occasional backaches and headaches. Carbon monoxide poisoning many years ago. No present complaints. No pathological physical findings.

Subject C-24. Barr, Evelyn. Born March 26, 1928. "Full-blooded" Eskimo. Housewife. Both parents living; six sisters and two brothers living. Married; one child living, two dead. Previously no serious illness, no present complaints, and no abnormal physical findings.

Subject C-25. Otton, Irene. Born 14 August 1919. "Full-blooded" Eskimo. Housewife. Both parents living; three sisters and two brothers living. Married; three children living, two dead. Appendectomy in 1950. No present complaints; no abnormal physical findings.

D. Gambell Group:

Subject D-1. Slwooko, Vernon. 1939: neurasthenia. 1940: pains lumbar region; conjunctivitis; coryza. 1941: "rheumatic knee", tonsillitis. 1943: "flu". 1946: diphtheria. 1950: "non-functioning gall bladder", on low fat diet, later on bile extract. Negative chest x-ray July 1950. At present no complaints, negative physical findings.

Subject D-2. James, Winfred. 1943: "flu". 1944: coryza. 1950: "lumbago". 1950: chest x-ray negative. At present no complaints, no abnormal physical findings.

Subject D-3. Chauncy, Woodrow. 1939: coryza. 1941: chest pain. 1942: gastrointestinal disturbance. 1943: "flu". 1944: nervousness and excitability. 1944: coryza. 1946: chest pains. 1949: infected finger with lymphangitis. 1950: chest x-ray negative. At present no complaints. Negative physical findings.

Subject D-4. Iyakitan, Lane. 1943: "flu". 1944: coryza. 1945: slight anemia. 1950: chest x-ray showed calcification. At present no complaints; physical examination revealed no pathological findings.

Subject D-5. Walunga, Willis. 1943: "flu". 1950: had tuberculosis contacts, no symptoms, negative chest x-ray. At present no complaints. Negative physical findings.

Subject D-6. Iyakitan, Daniel. Congenital deformity both hands. Frostbite both hands 1941. 1943: "flu". 1944: coryza. 1950: negative chest x-ray. At present no complaints; negative physical findings.

Subject D-7. Iyakitan, Carl. 1947: "flu"; otherwise no serious illness. At present no complaints. Physical examination revealed no significant pathological findings.

Subject D-8. Slwooko, Joseph. 1940: "pulmonary tuberculosis". 1941: sore throat, nausea, diarrhea. 1942: hemoptysis as the result of chest injury; cystic growth left elbow. 1943: "flu". 1945: back injury. 1950: chest x-ray negative. At present the subject has just recovered from slight cold with pains in chest. Physical examination revealed no significant pathological findings.

Subject D-9. Harry, Don. The subject states he has never had any illness except common colds. At present, headache and slight cold. Otherwise negative findings.

Subject D-10. Aningayou, John. 1942: measles. Otherwise, no serious illness. At present no complaints. Negative physical findings.

Subject D-11. Slwooko, Roger. 1940: dermatitis. 1943: "flu". 1945: third degree burn left arm. 1950: shot himself at right temple during hunting accident, hospitalized at Nome. Chest x-ray negative July 1950. At present no complaints. Physical examination revealed no significant pathological findings.

Subject D-12. Slwooko, Howard. Appendectomy. 1947: chest x-ray showed healed primary tuberculosis.

Subject D-13. Oozevoseuk, Conrad. Pneumonia as a child. 1942: "flu". 1944: earache, coryza. Negative chest x-ray July 1950. At present recovered from sore throat and common cold. Physical examination revealed no pathological findings.

Subject D-14. Appassingok, Herbert. 1939: sore on lip, earache. 1941: severe conjunctivitis both eyes, 1941: earache. 1942: otitis media. 1944: otitis media; coryza. 1949: "paralysis" of face muscles. 1950: chest x-ray showed calcification. At present no complaints; negative physical findings.

Subject D-16. Silook, Roger. 1943: "flu". 1944: coryza. 1950: lumbago; chest x-ray negative. At present no complaints. Negative physical findings.

Subject D-17. Antaghame, Jack. 1942: common cold. 1943: "flu". 1944: earache, chest pains. 1946: extensive "paralysis". 1950: chest x-ray negative. At present no complaints. Negative physical findings.

Subject D-18. Iyakitan, Lewis. 1941: Frostbite in face. 1943: "flu". 1944: common cold. 1950: chest x-ray negative. At present no complaints. Negative physical findings.

Subject D-19. Nawpokuhok, Leonard. Subject's mother has advanced pulmonary tuberculosis. 1944: chest x-ray suspicious. 1948: sputum negative. 1943 "flu". 1945: shot through left arm with shotgun. 1946: sprained ankle. 1947: "appendicitis". 1949: Nasal polyp removed. 1950: chest x-ray negative. At present recovering from slight cold. Negative physical findings.

Subject D-20. Aningayou, Norman. 1940: chest pains. 1941: frostbite two toes on left foot. 1941: indigestion. 1943: "flu". 1950: chest x-ray negative. At present no complaints. Physical examination showed negative findings.

Subject D-21. Konahok, Howard. History suspect of pulmonary tuberculosis, but x-rays stated to be negative. 1944: common cold, with chest pains, coughing, streaks of "color" in the sputum. 1944: chest x-ray showed possible evidence of active tuberculosis. 1949: chest x-ray negative. 1950: "flu", hemorrhoids. At present no complaints, and physical examination revealed no significant pathological findings.

Subject D-22. Iknokinok, Clifford. 1939: severe epistaxis. 1941: swollen gums, bled easily. 1943: "flu". 1944: common cold. 1945: tonsillectomy. 1943: back injury. 1945: cystitis? 1950: negative chest x-ray. The subject frequently has coryza and coughing. At present no complaints. Physical examination negative.

Subject D-23. Malegoohtik, Florence. 1940: "rheumatism". 1941: heart palpitation. 1942: conjunctival hemorrhage. 1943: "flu". 1944: coryza. 1949: chest x-ray showed healed primary tuberculosis. No present complaints, and negative physical findings.

Subject D-24. Nawpokuhok, Gail. 1948: sputum negative. 1943: "flu". 1944: otitis media. 1946: "flu". 1950: chest x-ray negative. At present no complaints; negative physical findings. The subject appears to be apprehensive.

Subject D-25. Slwooko, Beda. 1940: hemoptysis. 1941: adenitis on neck. Loss of weight; otitis media — hemoptysis, July 1941 and April 1942. 1950: chest x-ray showed evidence of healed lesion. 1950: malignant infection middle finger. Functiones naturales: the subject does not sleep well. Physical examination revealed tendovaginitis left arm. The subject appears apprehensive.

Subject D-26. Iyakitan, Vivian. 1944: chest x-ray negative. 1941: chest pains. At present recovering from common cold. Physical examination revealed no significant pathological findings.

Subject D-27. Omwari, Pansy. 1943: "flu". 1944: "appendicitis". 1945: chickenpox. 1949: appendectomy. 1950: chest x-ray negative. At present no complaints. Physical examination: restless, tremor of the fingers, soft swelling on neck over sternum.

Subject D-28. Oyaghok, Marcella. Tuberculosis contact; mother died from tuberculosis. 1940: conjunctivitis and corneal hemorrhage. 1941: tonsillitis. 1943: "flu". 1950: chest x-ray negative. At present no complaints, and physical examination revealed no pathological findings.

Results of Chest X-rays.

Subj.	No.	A-1	Putugook, D. . .	*No evidence of active tuberculosis.*
»	»	A-2	Akootchook, I.	First x-ray showed small diffuse calcified areas, suspect of old tubercular process, right lower lobe. Repeated x-ray revealed: Pleural adhesions both sides. *There is no evidence of active pulmonary disease.*
»	»	A-3	Akootchook, D.	Calcified primary complex right lung. *No evidence of active tuberculosis.*
»	»	A-4	Nageak, V.	*Negative findings.*
»	»	A-6	Akootchook, A.	Lung markings are generally increased. The left costophrenic angle is partially obliterated with adhesions and calcified areas lower lobe. *Pulmonary scars*, but *no evidence of active pulmonary disease.*
»	»	A-8	Rexford, H. . . .	*Negative.*
»	»	A-9	Apayaok, J. . . .	*Negative.*
»	»	A-10	Akootchook, M.	*Negative.*
»	»	A-12	Rexford, M. . . .	*Negative.*
»	»	A-13	Akootchook, E.	*Negative.*
»	»	A-14	Nageak, R.	Calcification is present in the left hilar region; old fibrotic changes in the left apex and in both infraclavicular regions. *Pulmonary scars.*
»	»	A-15	Akootchook, M.	Diffuse adhesions but *no evidence of active pulmonary disease.*
»	»	B-1	Hugo, Z.	*Negative.*
»	»	B-2	Rullund, J.	*Negative.*
»	»	B-3	Mekiana, J. . . .	*Negative.*
»	»	B-4	Mekiana, H. . . .	*Negative.*
»	»	C-1	Curtis, J.	Pleural adhesions right costophrenic junction.
»	»	C-2	Sours, M.	*Negative.*
»	»	C-3	Goodwin, W. . .	*Negative.*
»	»	C-4	Curtis, D.	*Negative.*
»	»	C-5	Jones, C.	*Negative.*
»	»	C-7	Arnold, C.	*Negative.*
»	»	C-8	Smith, I.	Old pleural lesion left side calcification left apex.
»	»	C-9	Ticket, H.	*Negative.*
»	»	C-11	Barr, C	*Negative.*
»	»	C-12	Ballod, O.	*Negative.*
»	»	C-13	Jones, J.	*Negative.*
»	»	C-14	Ramoth, R.	*Negative.*
»	»	C-15	Mitchell, C. . . .	*Negative.*
»	»	C-16	Vestal, D.	*Negative.*
»	»	C-17	Vestal, M.	Circumscribed irregular calcified densities at the base of right lung. *No evidence of active tuberculosis.*
»	»	C-18	Kagoona, J. . . .	*Negative.*
»	»	C-19	Analoak, M. . . .	*Negative.*
»	»	C-20	Tikik, M.	Calcified primary complex.
»	»	C-21	Norton, L.	*Negative.*
»	»	C-22	Mills, A.	*Negative.*
»	»	C-23	Sours, B.	*No evidence of active tuberculosis.*
»	»	C-24	Barr, E.	*Negative.*
»	»	C-25	Otton, I.	Calcification.
»	»	D-1	Slwooko, V. . . .	Calcified nodules.
»	»	D-2	James, W.	Irregular, defined calcification.
»	»	D-3	Chauncy, W. . .	*Negative.*
»	»	D-4	Iyakitan, L. . . .	*Negative.*
»	»	D-5	Walunga, W. . .	Calcification.
»	»	D-6	Iyakitan, D. . . .	Calcification.
»	»	D-7	Iyakitan, C. . . .	*Negative.*
»	»	D-8	Slwooko, J.	*Negative.*
»	»	D-9	Harry, D.	*Negative.*
»	»	D-10	Aningayou, J. . .	*Negative.*

Results of Chest X-rays. (Cont.).

Subj. No.	D-11 Slwooko, R. . . .	*Negative.*
» »	D-12 Slwooko, H. . . .	*Negative.*
» »	D-13 Oozevoseuk, C.	*Negative.*
» »	D-14 Appassingok, H.	Calcification, pleuro-pericardial adhesions.
» »	D-16 Silook, R.	*Negative.*
» »	D-17 Antaghame, J. .	Pleural adhesions left side.
» »	D-18 Iyakitan, L.	Calcification.
» »	D-19 Nawpokuhok, L.	*Negative.*
» »	D-20 Aningayou, N. .	*Negative*
» »	D-21 Konahok, H. . .	*Negative.*
» »	D-22 Iknokinok, C. .	*Negative.*
» »	D-23 Malegoohtik, F.	*Negative.*
» »	D-24 Nawpokuhok, G.	Pleural adhesions right side.
» »	D-25 Slwooko, B. . . .	*Negative.*
» »	D-26 Iyakitan, V. . . .	*Negative.*
» »	D-27 Omvari, P.	*Negative.*
» »	D-28 Oyaghok, M. . .	*Negative.*

Table 11.

Showing the Results of Physical Examination of the Barter Island Group.

Subj. No.	Name	Sex	Age	Height, inches	Weight, pounds	Vital Capacity	Respiration Rate	Oral Temp. °F		Pulse Rate		Blood Pressure	
								Morning	Evening	Sitting	Lying	Sitting	Lying
November 1950													
A-1	Putugook, D. . . .	M	21	67.50	133.75	4600	18	98.4	98.6	80	66	125/75	130/80
A-2	Akootchook, I. .	M	28	66.00	153.00	3750	16	96.0	98.5	70	52	120/85	118/78
A-3	Akootchook, D. .	M	17	64.50	118.00	2800	22	97.9	99.1	76	76	112/78	108/70
A-4	Nageak, V.	M	47	64.25	181.75	3200	18	97.3	98.6	80	68	116/90	112/79
A-6	Akootchook. A. .	M	61	66.75	151.25	2600	20	97.0	97.7	65	56	120/70	115/70
A-8	Rexford, H.	M	36	64.00	138.25	4650	16	97.0	98.2	72	64	115/74	119/77
A-9	Apayaok, J.	M	15	58.75	87.75	2500	22	98.3	98.6	80	68	120/86	106/66
A-10	Akootchook, M. .	F	29	61.25	116.00	3500	16	98 5	99.6	82	66	100/65	100/68
A-12	Rexford, M.	F	34	63.00	182.50	3500	20	97.6	98.3	80	60	110/70	114/72
A-13	Akootchook, E. .	F	21	62.50	111.50	3700	20	98.8	99.3	60	74	120/80	120/76
A-14	Nageak, R.	F	36	62.00	142.50	2900	16	98.5	99.5	72	54	100/65	97/62
A-15	Akootchook, M. .	F	22	60.00	103.00	2800	16	98.1	98.9	72	58	110/75	110/75
May 1951													
A-1	Putugook, D. . . .	M	21	68.25	135.00	4500	13	97.7	98.5	62	60	117/70	105/70
A-2	Akootchook, I. .	M	29	66.00	155.50	4050	14	97.9	98.3	68	52	102/68	110/73
A-3	Akootchook, D. .	M	18	65.00	117.00	3450	23	97.9	99.1	80	63	112/69	105/66
A-8	Rexford, H.	M	36	63.75	138.00	4450	17	97.7	98.4	72	69	114/72	109/77
A-9	Apayaok, J.	M	15	60.00	91.00	2900	17	97.8	98.2	66	64	100/72	99/66
A-10	Akootchook, M. .	F	29	61.00	115.00	3650	12	97.2	97.7	69	58	100/68	90/60
A-12	Rexford, M.	F	34	62.50	181.50	3300	14	97.9	97.9	60	54	109/72	97/68
A-13	Akootchook, E. .	F	21	62.00	111.00	3400	13	98.0	98.8	61	50	118/77	106/72

Table 12.

Showing the Results of Physical Examination of the Anaktuvuk Pass Group.

Subj. No.	Name	Sex	Age	Height, inches	Weight, lbs.	Vital Capacity	Respiration Rate	Oral Temp.°F Morning	Oral Temp.°F Evening	Pulse Rate Sitting	Pulse Rate Lying	Blood Pressure Sitting	Blood Pressure Lying
April 1951													
B-1	Hugo, Z.	M	20	65.5	130.5	4090	18	98.3	98.4	80	55	120/70	119/76
B-2	Rullund, J.	M	22	63.2	130.8	4050	14	97.4	97.7	72	52	110/60	108/73
B-3	Mekiana, J.	M	22	66.0	133.2	5400	16	97.7	98.1	80	52	120/85	118/79
B-4	Mekiana, H.	M	47	67.0	158.8	4340	14	97.5	97.8	100	61	105/75	115/83
August 1951													
B-1	Hugo, Z.	M	20	65.2	126.0	4025	18	97.1	98.5	72	46	114/78	95/70
B-2	Rullund, J.	M	22	63.2	124.8	4000	16	96.3	97.9	64	43	108/70	100/67
B-3	Mekiana, J.	M	22	65.5	129.5	5300	14	97.8	98.5	91	64	135/88	105/69
B-5	Ahgook, Bob	M	21	68.0	140.2	4400	14	97.7	98.8	99	73	120/78	106/64
B-6	Hugo, J.	M	30	67.5	140.2	4900	14	96.8	97.8	77	54	123/78	110/70
B-7	Morry, A.	M	22	66.0	137.5	4825	14	97.3	98.6	90	60	154/98	120/87
B 8	Ahgook, Ben	M	29	67.2	146.0	4625	18	97.7	98.9	102	70	128/94	112/76
B-9	Morry, B.	M	36	66.7	140.5	4900	20	96.8	98.9	84	56	144/94	110/74
B-10	Morry, J.	M	40	66.0	120.2	4500	11	97.1	98.8	79	60	145/85	112/76
B-11	Ahgook, J.	M	31	65.0	128.0	3300	17	97.1	97.7	95	69	135/75	105/65

Table 13.

Showing the Results of Physical Examination of the Kotzebue Group.

Subj. No.	Name	Sex	Age	Height, inches	Weight, lbs.	Vital Capacity	Respiration Rate	Oral Temp.°F Morning	Oral Temp.°F Evening	Pulse Rate Sitting	Pulse Rate Lying	Blood Pressure Sitting	Blood Pressure Lying
December 1950													
C-1	Curtis, J.	M	35	70.5	161.0	5350	19	97.6	99.4	74	72	103/57	110/60
C-2	Sours, M.	M	36	66.7	135.7	4000	22	98.0	98.5	73	66	118/75	117/75
C-3	Goodwin, W.	M	36	65.0	149.0	3850	20	98.2	99.2	80	60	112/80	113/82
C-4	Curtis, D.	M	31	66.2	146.2	4300	16	98.2	99.4	104	96	123/73	115/65
C-5	Jones, C.	M	27	68.0	167.0	-	18	97.8	98.2	78	82	123/75	108/65
C-7	Arnold, C.	M	20	66.5	138.0	-	16	97.8	98.4	68	64	-	110/65
C-8	Smith, I.	M	58	66.0	161.0	3100	16	97.6	98.0	64	64	132/84	120/80
C-9	Ticket, H.	M	49	61.5	115.0	3050	22	97.6	98.6	76	80	117/80	120/74
C-11	Barr, C.	M	18	64.7	142.5	4800	18	97.6	-	60	58	140/80	140/80
C-16	Vestal, D.	F	52	64.0	194.5	3400	16	98.0	96.5	80	72	130/80	130/80
C-17	Vestal, M.	F	21	62.2	132.0	3700	16	97.5	-	68	60	118/65	118/65
C-18	Kagoona, J.	F	23	64.0	158.5	3700	21	98.0	97.6	82	74	120/88	116/70
C-19	Analoak, M.	F	23	61.0	126.0	3100	24	98.6	-	108	72	124/76	120/78
C-20	Tikik, M.	F	31	63.2	116.0	2900	16	98.5	98.6	84	88	118/73	118/70
C-21	Norton, L.	F	30	61.2	160.5	3850	20	98.5	-	100	80	130/80	130/80
C-22	Mills, A.	F	44	61.7	113.0	-	18	97.8	-	84	82	110/75	110/75
C-23	Sours, B.	F	38	62.0	147.0	3500	18	98.7	98.5	98	92	122/70	122/65
C-24	Barr, E.	F	22	64.0	140.0	3700	18	98.0	-	80	69	125/80	125/80
C-25	Otton, I.	F	30	62.0	160.0	-	18	97.8	98.4	74	76	112/78	110/65
June—July 1951													
C-3	Goodwin, W.	M	36	64.5	137.2	3800	12	97.3	98.7	74	54	107/78	97/63
C-12	Ballod, O.	M	25	66.2	156.0	4500	17	97.0	99.2	90	62	113/70	110/65
C-13	Jones, J.	M	23	65.2	133.0	5100	13	94.0	98.8	78	53	100/65	90/60
C-14	Ramoth, R.	M	19	68.0	148.5	5100	14	97.6	98.8	84	60	109/75	95/60
C-15	Mitchell, C.	M	22	66.5	143.2	4300	16	98.0	99.2	87	54	115/70	108/65
C-16	Vestal, D.	F	53	64.0	194.5	2800	21	97.9	99.0	79	67	112/80	105/70
C-17	Vestal, M.	F	22	62.0	131.5	3500	11	97.4	98.8	82	60	120/80	95/68
C 18	Kagoona, J.	F	23	64.0	151.5	3550	9	98.6	98.7	84	66	110/80	102/68
C-19	Analoak, M.	F	24	61.5	130.5	2800	18	98.1	98.1	76	62	128/80	112/78

Table 14.

Showing the Results of Physical Examination of the Gambell Group.

Subj. No.	Name	Sex	Age	Height, inches	Weight, pounds	Vital Capacity	Respiration Rate	Oral Temp. °F		Pulse Rate		Blood Pressure	
								Morning	Evening	Sitting	Lying	Sitting	Lying
March 1951													
D-1	Slwooko, V.	M	33	67.5	152.5	4800	13	97.7	99.2	60	60	105/65	115/70
D-2	James, W.	M	27	66.7	147.0	4100	13	97.9	98.8	80	57	105/65	92/60
D-3	Chauncy, W.	M	19	65.5	130 5	3650	13	97.8	98.0	80	66	110/60	104/68
D-4	Iyakitan, Lane ...	M	21	66.0	130.7	3700	16	97.7	99.0	80	54	115/70	95/65
D-5	Walunga, W.	M	24	66.2	143.1	4650	14	98.2	98.3	80	62	105/60	106/64
D-6	Iyakitan, D.	M	30	65.0	134.4	3800	16	97.9	98.4	60	45	110/60	92/68
D-8	Slwooko, J.	M	24	67.0	144.0	4800	16	97.0	98.0	62	62	110/70	110/70
D-9	Harry, D.	M	30	66.0	140.0	3100	20	97.9	97.4	62	62	110/70	117/60
D-11	Slwooko, R.	M	18	67.7	148.0	4500	26	98.0	99.0	64	64	115/70	115/70
D-12	Slwooko, H.	M	31	67.0	163.3	4700	26	97.4	98.2	62	62	125/80	130/80
D-13	Oozevoseuk, C. ..	M	25	62.5	133.0	3700	11	97.9	99.0	80	58	115/70	96/65
D-14	Appassingok, H. .	M	24	66.2	129.5	3100	15	97.4	99.0	80	58	115/65	104/66
D-16	Silook, R.	M	27	67.0	151.2	4750	10	97.9	100.0	80	46	125/70	108/66
D-17	Antaghame, J. ...	M	39	63.5	134.0	2900	16	97.8	98.2	68	56	115/65	90/68
D-18	Iyakitan, L.	M	24	66.0	130.7	3700	16	97.7	99.0	80	54	115/70	95/65
D-19	Nawpokuhok, L. .	M	19	66.2	132.5	3900	18	98.0	98.2	80	64	110/60	92/64
D-20	Aningayou, N. ...	M	39	66.5	144.6	3900	7	97.1	98.4	64	53	110/70	89/60
D-21	Konahok, H.	M	38	64.2	128.7	3150	16	97.3	97.9	80	52	115/80	86/67
D-22	Iknokinok, C. ...	M	24	64.2	144.2	3900	15	98.2	98.7	60	50	105/65	96/65
D-23	Malegoohtik, F. ..	F	44	60.0	124.9	-	11	97.7	97.5	80	78	120/75	114/74
D-24	Nawpokuhok, G.	F	23	60.2	121.0	-	12	98.8	98.1	80	78	105/50	98/64
D-25	Slwooko, B.	F	32	61.5	125.5	-	15	98.4	98.1	80	67	120/75	129/79
D-28	Oyaghok, M.	F	21	59.5	124 5	-	19	98.6	97.5	72	71	120/70	102/67
August 1951													
D-6	Iyakitan, D.	M	30	65.2	136.5	3700	-	97.6	98.9	60	46	105/65	100/60
D-7	Iyakitan, C.	M	39	69.0	158.7	4300	-	97.8	98.2	60	44	108/65	95/60
D-9	Harry, D.	M	30	65.7	143.0	2900	17	97.6	98.5	65	52	110/65	97/66
D-10	Aningayou, J. ...	M	35	66.2	140.7	3800	-	97.6	98.3	70	55	102/62	100/65
D-25	Slwooko, B.	F	32	61.2	124.5	3000	-	98.5	98 8	74	68	115/68	118/75
D-26	Iyakitan, V.	F	24	65.0	132.5	3510	-	98.8	98.9	80	80	118/78	125/78
D-27	Omwari, P.	F	25	61.7	128.0	2800	-	98.8	99.5	100	45	115/67	120/75
D-28	Oyaghok, M.	F	21	59.0	125.0	2600	-	98.7	98.9	80	65	104/67	104/65

Table 15.

Showing the Results of Blood Examination of the Barter Island Group.

Subj. No.	Name	Sex	Age	Hemoglobin %	Hemoglobin g	Red Cell Count	White Cell Count	Total Neutrophiles	Stabs	Metamyelocytes	Myelocytes	Lymphocytes	Monocytes	Eosinophiles	Basophiles	Sedimentation Rate	Hematocrit	Prothrombin Time (Owren's method)
	November 1950																	
A-1	Putugook, D. .	M	21	83	12.0	4,560,000	7,350	74	1	-	-	22	4	-	-	11	49	38.2
A-2	Akootchook, I.	M	28	80	11.5	3,200,000	5,350	76	3	-	-	18	4	2	-	10	45	33 0
A-3	Akootchook, D.	M	17	82	11.8	6,210,000	6,850	67	1	-	-	28	3	2	-	16	47	52.5
A-4	Nageak, V. . . .	M	47	82	11.8	5,050,000	5,350	41	4	-	-	39	9	3	4	28	47	44.0
A-6	Akootchook, A.	M	61	86	12.5	4,010,000	5,450	71	1	-	-	23	4	2	-	18	49	39.8
A-8	Rexford, H. . .	M	36	80	11.5	4,030,000	7,200	45	2	-	-	41	7	3	4	12	48	43.5
A-9	Apayaok, J. . .	M	15	82	11.8	4,230,000	6,200	55	4	1	-	34	8	2	1	10	50	37.0
A-10	Akootchook, M.	F	29	70	10.2	4,640,000	11,700	72	2	-	-	24	4	-	-	28	42	38.1
A-12	Rexford, M. . .	F	34	78	11.2	3,580,000	7,300	68	2	-	-	17	10	3	2	37	41	27.6
A-13	Akootchook, E.	F	21	72	10.5	4,120,000	12,100	57	-	-	-	35	5	2	1	19	41	38.8
A-14	Nageak, R. . . .	F	36	74	10.8	3,770,000	10,400	64	-	-	-	32	1	1	2	28	41	37.3
A-15	Akootchook, M.	F	22	78	11.2	3,620,000	8,750	71	5	-	-	29	7	-	3	6	44	40.3
	May 1952																	
A-1	Putugook, D. .	M	21	84	12.2	4,970,000	5,300	43	1	-	-	50	4	2	-	6	52	48.0
A-2	Akootchook, I.	M	28	80	11.5	4,800,000	4,850	57	1	-	-	40	2	-	-	8	49	51.0
A-3	Akootchook, D.	M	17	106	15.4	5,090,000	4,050	42	-	-	-	50	5	2	1	32	46	50.0
A-8	Rexford, H. . .	M	36	80	11.5	4,890,000	7,950	48	-	-	-	47	4	1	-	8	52	50.0
A-9	Apayaok, J. . .	M	15	80	11.5	5,060,000	6,350	29	-	-	-	66	1	3	1	11	47	52.0
A-10	Akootchook, M.	F	29	68	10.0	3,860,000	7,800	46	-	-	-	52	1	1	-	22	43	47.0
A-12	Rexford, M., . .	F	34	74	10.8	3,840,000	7,000	26	1	-	-	70	3	-	-	26	45	43.5
A-13	Akootchook E.	F	21	68	10.0	3,730,000	7,300	37	-	-	-	63	-	-	-	16	48	48.0

Table 16.

Showing the Results of Blood Examination of the Anaktuvuk Pass Group.

Subj. No.	Name	Sex	Age	Hemoglobin %	Hemoglobin g	Red Cell Count	White Cell Count	Total Neutrophiles	Stabs	Metamyelocytes	Myelocytes	Lymphocytes	Monocytes	Eosinophiles	Basophiles	Sedimentation Rate	Hematocrit	Prothrombin Time (Owren's method)
	April 1951																	
B-1	Hugo, Z.	M	20	104	15.0	5,750,000	5,350	47	-	-	-	45	6	1	1	4	54	38.5
B-2	Rullund, J. . .	M	22	84	12.3	4,290,000	7,650	45	1	-	-	50	-	2	4	6	46	54.0
B-3	Mekiana, J. . .	M	22	94	13.7	5,100,000	7,450	56	2	-	-	36	7	-	1	9	49	54.0
B-4	Mekiana, H. .	M	47	84	12.3	4,260,000	7,150	43	1	-	-	51	2	3	1	6	47	38.5
	August 1951																	
B-1	Hugo, Z.	M	20	80	11.6	4,480,000	7,600	53	1	-	-	38	2	4	2	6	-	-
B-2	Rullund, J. . .	M	22	70	10.2	4,630,000	7,450	50	1	-	-	37	7	4	1	6	-	-
B-3	Mekiana, J. . .	M	22	86	12.5	-	6,700	65	1	-	-	29	4	1	-	10	-	-
B-5	Ahgook, Bob	M	21	84	12.2	5,120,000	7,250	65	2	-	-	32	-	-	1	14	-	-
B-6	Hugo, J.	M	30	80	11.6	4,570,000	8,300	46	-	-	-	45	4	4	1	10	-	-
B-7	Morry, A. . . .	M	22	84	12. 2	4,500,000	8,150	54	1	-	-	39	5	1	-	8	-	-
B-8	Ahgook, Ben	M	29	88	13.0	4,430,000	9,850	64	-	-	-	31	-	4	1	9		-
B-9	Morry, B. . . .	M	36	88	13.0	4,620,000	5,650	70	1	-	-	24	2	2	1	16	-	-
B-10	Morry, J.	M	40	76	11.0	4,160,000	4,400	33	2	-	-	58	4	1	2	21	-	-
B-11	Ahgook, J. . . .	M	31	82	12 0	4,930,000	11,300	69	2	-	-	24	3	2	-	5	-	-

Table 17.

Showing the Results of Blood Examination of the Kotzebue Group.

Subject No.	Name	Sex	Age	Hemoglobin		Red Cell Count	White Cell Count	Total Neurophiles	Stabs	Metamyelocytes	Myelocytes	Lymphocytes	Monocytes	Eosinophiles	Basophiles	Sedimentation Rate	Hematocrit	Prothrombin Time (Owren's Method)
				%	g													
	December 1950																	
C-1	Curtis, J.	M	35	85	12.3	4,580,000	11,450	49	2	1	-	40	3	3	3	16	49	46.5
C-2	Sours, M.	M	36	77	11.2	4,170,000	7,550	71	1	-	-	23	4	-	2	20	42	35.0
C-3	Goodwin, W..	M	36	88	12.8	4,460,000	6,850	41	-	-	-	39	13	6	1	12	49	42.7
C-4	Curtis, D.....	M	31	94	13.7	4,770,000	8,350	46	2	-	-	40	11	-	-	21	49	39.9
C-5	Jones, C.	M	27	90	13.0	4,780,000	10,250	62	1	1	1	26	7	2	2	14	52	41.1
C-7	Arnold, C. ...	M	20	86	12.5	4,170,000	5,300	49	1	-	-	38	3	8	2	40	48	41.1
C-8	Smith, I......	M	58	78	11.4	4,890,000	7,650	43	3	-	-	45	6	4	2	18	50	35.1
C-9	Ticket, H. ...	M	49	79	11.5	4,990,000	7,950	63	1	-	-	30	4	-	3	22	48	39.8
C-11	Barr, C.	M	18	74	10.8	4,440,000	8,800	32	1	-	-	57	9	-	1	12	51	40.3
C-16	Vestal, D.....	F	52	82	11.9	5,300,000	8,900	61	4	-	-	28	10	1	-	16	52	42.2
C-17	Vestal, M. ...	F	21	70	10.2	4,200,000	10,450	62	-	1	-	20	14	2	-	11	51	46.8
C-18	Kagoona, J. ..	F	23	88	12.8	4,360,000	6,950	52	3	1	-	42	1	5	-	29	48	38.4
C-19	Analoak, M...	F	23	84	12.2	3,970,000	8,600	38	-	-	-	59	2	1	-	50	41	39.5
C-20	Tikik, M.	F	31	80	11.6	4,460,000	5,150	43	-	-	-	53	2	1	1	16	47	40.0
C-21	Norton, L. ...	F	30	70	10.2	3,570,000	9,800	41	-	-	-	53	3	2	1	31	39	42.8
C-22	Mills, A......	F	44	70	10.2	3,300,000	11,700	65	5	-	-	21	6	3	-	23	49	40.0
C-23	Sours, B.	F	38	81	11.7	4,120,000	7,600	78	5	-	-	20	2	-	-	35	29	30.0
C-24	Barr, E.	F	22	88	12.8	4,300,000	8,300	64	2	-	-	27	7	-	1	32	44	36 0
C-25	Otton, I......	F	30	70	10.2	3,710,000	9,900	69	1	-	-	20	6	2	1	46	39	38.0
	June—July 1951																	
C-3	Goodwin, W..	M	36	80	11.6	5,150,000	6,900	56	2	-	-	40	-	2	-	3	53	39.5
C-12	Ballod, O. ...	M	25	80	11.6	4,430,000	7,500	67	4	-	-	27	-	2	-	12	51	52.0
C-13	Jones, J.	M	23	84	12.2	4,700,000	5,250	50	-	-	-	44	2	3	1	8	53	53.0
C-14	Ramoth, R....	M	19	84	12.2	4,430,000	4,600	35	-	-	-	57	4	2	2	10	50	57.0
C-15	Mitchell, C...	M	22	80	11.6	4,080,000	11,350	67	-	-	-	28	4	1	-	9	51	60.0
C-16	Vestal, D.....	F	53	80	11.6	4,780,000	6,800	49	4	-	-	44	-	2	-	14	51	49.0
C-17	Vestal, M. ...	F	22	80	11.6	4,000,000	9,250	52	2	-	-	40	3	1	2	26	39	40.0
C-18	Kagoona, J. ..	F	23	72	10.5	3,690,000	6,750	33	-	-	-	65	-	-	2	31	48	60.0
C-19	Analoak, M...	F	24	72	10.5	4,060,000	6,700	30	-	-	4	64	-	-	2	18	47	50.0

Table 18.

Showing the Results of Blood Examination of the Gambell Group.

Subject No.	Name	Sex	Age	Hemoglobin %	Hemoglobin g	Red Cell Count	White Cell Count	Total Neutrophiles	Stabs	Metamyelocytes	Myelocytes	Lymphocytes	Monocytes	Eosinophiles	Basophiles	Sedimentation Rate	Hematocrit	Prothrombin Time (Owren's Method)
	March 1051																	
D-1	Slwooko, V.	M	33	82	12.0	4,460,000	11,300	65	3	-	-	32	3	-	-	16	48	40.9
D-2	James, W.......	M	27	94	13.7	4,650,000	5,300	31	1	-	-	66	2	1	-	12	54	36.0
D-3	Chauncy, W. ...	M	19	90	13.2	4,850,000	5,900	42	1	-	-	54	3	-	1	30	52	38.6
D-4	Iyakitan, L.	M	21	80	11.6	4,830,000	4,800	37	-	-	-	57	6	-	-	34	48	41.2
D-5	Walunga, W. ...	M	24	85	12.3	4,380,000	4,950	19	-	-	-	77	1	2	1	27	48	32.0
D-6	Iyakitan, D.	M	30	90	13.2	4,970,000	6,750	53	1	-	-	41	4	-	2	20	52	42 2
D-8	Slwooko, J......	M	24	82	12 0	5,140,000	6,500	43	2	-	-	50	6	1	-	15	52	37.8
D-9	Harry, D.	M	30	82	12.0	4,140,000	5,250	27	3	-	-	64	5	3	1	14	50	43.8
D-11	Slwooko, R.	M	18	80	11.6	4,890,000	5,700	44	1	-	-	52	3	-	1	18	49	47.3
D-12	Slwooko, H.....	M	31	80	11.6	4,990,000	6,300	36	3	-	-	63	-	1	-	15	52	40.9
D-13	Oozevoseuk, C. .	M	25	88	12.9	4,460,000	4,600	36	5	-	-	61	-	3	-	15	45	41.0
D-14	Appassingok, H..	M	24	84	12.1	4,490,000	5,450	55	4	-	-	39	4	-	2	8	49	42.0
D-16	Silook, R.	M	27	83	12.2	4,730,000	2,750	48	4	-	-	47	-	2	3	25	51	42.0
D-17	Antaghame, J. ..	M	39	94	13.7	4,790,000	5,650	45	-	-	-	46	9	-	-	15	53	34.6
D-18	Iyakitan, L.	M	24	80	11.6	4,830,000	4,800	37	-	-	-	57	6	-	-	34	48	41.2
D-19	Nawpokuhok, L.	M	19	84	12.1	4,230,000	9,750	26	-	-	-	64	9	-	1	15	47	45.0
D-20	Aningayou, N. ..	M	39	95	13.8	4,760,000	7,400	60	4	-	-	37	2	-	1	7	52	43.2
D-21	Konahok, H. ...	M	38	85	12.3	4,750,000	7,350	55	2	-	-	39	4	-	-	29	47	41.0
D-22	Iknokinok, C....	M	24	84	12.1	4,210,000	7,050	51	2	-	-	45	2	-	-	15	52	38.6
D-23	Malegoohtik, F. .	F	44	72	10.4	3,650,000	5,150	9	-	-	-	89	1	1	-	20	39	39.0
D-24	Nawpokuhok, G.	F	23	80	11.6	4,040,000	4,200	25	-	-	-	70	3	-	2	28	44	43.5
D-25	Slwooko, B.	F	32	80	11.6	4,090,000	5,700	16	1	-	-	83	-	-	-	31	45	38.4
D-28	Oyaghok, M.....	F	21	82	12.0	4,720,000	3,550	21	1	-	-	76	1	1	-	28	45	48.8
	August 1951																	
D-6	Iyakitan, D.	M	30	82	12.0	4,900,000	10,600	72	2	-	-	24	-	2	-	9	45	-
D-7	Iyakitan, C......	M	39	80	11.7	4,810,000	5,800	42	1	-	-	50	4	1	2	24	46	-
D-9	Harry, D.	M	30	74	10.8	4,980.000	5,050	52	2	-	-	41	3	-	2	24	43	-
D 10	Aningayou, J. ...	M	35	90	13.1	5,920,000	9,800	69	1	-	-	22	4	4	-	38	49	-
D-25	Slwooko, B.	F	32	73	10.5	4,900,000	8,800	62	2	-	-	33	2	1	-	23	44	-
D-26	Iyakitan, V......	F	24	76	11.0	4,930,090	6,550	40	1	-	-	58	-	-	1	31	45	38.4
D-27	Omwari, P......	F	25	78	11.5	5,010,000	6,050	47	2	-	-	48	1	2	-	22	43	-
D-28	Oyaghok, M... .	F	21	74	10 8	5,620,000	3,650	40	1	-	-	50	2	6	1	36	43	-

Table 19.

Showing the Results of Urine Examination of the Barter Island Group.

Subject No.	Name	Sex	Age	Colour	Specific gravity	Reaction	Albumin	Sugar	Acetone	Microscopy					
										W. B. C.	R. B. C.	Epithelial cells	Casts	Crystals	Bacteria
	November 1950														
A-1	Putugook, D.	M	21	clear, straw	1.011	acid	0	0	0	0	0	0	0	some ca.ox	0
A-2	Akootchook, I.	M	28	sl. cldy, yellow	1.015	acid	0	0	trace	0	few	few	0	many ca.ox	0
A-3	Akootchook, D.	M	17	clear, yellow	1.018	acid	0	0	trace	0	0	0	0	0	0
A-4	Nageak, V.	M	47	sl. cldy, yellow	1.020	acid	0	0	0	few	-	0	0	many ca.ox	0
A-6	Akootchook, A.	M	61	cldy, straw	1.020	acid	0	0	0	0	-	0	0	ca.ox + trip. phos.	0
A-8	Rexford, H.	M	36	clear, straw	1.010	acid	0	0	0	0	0	many	0	0	0
A-9	Apayaok, J.	M	15	sl. cldy, yellow	1.025	acid	0	0	trace	0	0	0	0	many ca.ox	-
A-10	Akootchook, M.	F	29	sl. cldy, yellow	1.028	acid	0	0	trace	0	0	packed	0	few ca.ox	0
A-12	Rexford, M.	F	34	sl. cldy, yellow	1.020	acid	0	0	-	0	0	few	0	many ca.ox	0
A-13	Akootchook, E.	F	21	sl. cldy, straw	1.015	acid	0	0	trace	0	0	many	0	0	0
A-14	Nageak, R.	F	36	sl. cldy, straw	1.021	acid	0	0	trace	0	0	many	0	0	0
A-15	Akootchook, M.	F	22	cldy, yellow	1.021	acid	0	0	trace	0	0	many	0	0	0
	May 1951														
A-1	Putugook, D.	M	21	clear, yellow	1.021	acid	0	0	0	few	0	some	0	some ca.ox	0
A-2	Akootchook, I.	M	28	clear, yellow	1.022	acid	0	0	trace	few	0	many	0	- - -	0
A-3	Akootchook, D.	M	17	clear, yellow	1.028	acid	0	0	trace	0	0	few	0	few ca.ox	0
A-8	Rexford, H.	M	36	clear, straw	1.011	acid	0	0	0	0	0	few	0	some ca.ox	0
A-9	Apayaok, J.	M	15	clear, yellow	1.020	acid	0	0	0	few	few	few	0	some ca.ox + trip. phos.	-
A-10	Akootchook, M.	F	29	clear, yellow	1.025	acid	0	0	trace	few	0	many	0	few ca.ox	-
A-12	Rexford, M.	F	34	clear, yellow	1.021	acid	0	0	0	few	0	packed	0	0	0
A-13	Akootchook, E.	F	21	clear, yellow	1.020	acid	0	0	trace	few	0	packed	0	few ca.ox	0

T a b l e 20.

Showing the Results of Urine Examination of the Anaktuvuk Pass Group.

Subject No.	Name	Sex	Age	Colour	Specific gravity	Reaction	Albumin	Sugar	Acetone	Microscopy					
										W. B. C.	R. B. C.	Epithelial cells	Casts	Crystals	Bacteria
	April 1951														
B-1	Hugo, Z.	M	20	clear, yellow	1.021	acid	0	0	+ +	few	few	few	0	0	0
B-2	Rullund, J.	M	22	clear, yellow	1.012	acid	0	0	trace	few	few	few	0	0	0
B-3	Mekiana, J.	M	22	clear, yellow	1.022	acid	0	0	trace	0	-	packed	0	0	0
B-4	Mekiana, H.	M	47	clear, yellow	1.023	acid	0	0	trace	0	0	0	0	0	-
	August 1951														
B-1	Hugo, Z.	M	20	clear, yellow	1.021	acid	0	0	0	0	0	few	0	few ca.ox	0
B-2	Rullund, J.	M	22	clear, yellow	1.026	acid	0	0	0	0	0	few	0	ca.ox + trip. phos.	0
B-3	Mekiana, J.	M	22	clear, yellow	1.030	acid	0	0	trace	0	0	0	0	few ca.ox	0
B-5	Ahgook, Bob	M	21	clear, yellow	1.019	acid	0	0	0	1-2	0	few	0	0	0
B-6	Hugo, J.	M	30	clear, yellow	1.020	acid	0	0	trace	0	0	few	0	ca.ox + trip. phos.	0
B-7	Morry, A.	M	22	sl. cldy, yellow	1.025	acid	0	0	0	0	0	0	0	ca.ox	0
B-8	Ahgook, Ben	M	29	clear, yellow	1.021	acid	0	0	0	0	0	few	0	0	0
B-9	Morry, B.	M	36	clear, yellow	1.029	acid	0	0	0	1-2	0	some	0	ca.ox	0
B-10	Morry, J.	M	40	clear, yellow	1 025	acid	0	0	0	0	0	some	0	0	0
B-11	Ahgook, J.	M	31	clear, yellow	1.021	acid	0	0	trace	1-2	1-2	few	0	ca ox + trip. phos.	0

Table 21.

Showing the Results of Urine Examination of the Kotzebue Group.

Subject No.	Name	Sex	Age	Colour	Specific gravity	Reaction	Albumin	Sugar	Acetone	Microscopy: W. B. C.	R. B. C.	Epithelial cells	Casts	Crystals	Bacteria
	December 1950														
C-1	Curtis, J.	M	35	clear, yellow	1.011	acid	0	0	0	few	few	few	0	0	0
C-2	Sours, M.	M	36	clear, straw	1.015	acid	0	0	trace	few	few	few	-	some ca.ox	0
C-3	Goodwin, W.	M	36	clear, straw	1.011	acid	0	0	0	few	0	few	0	few ca.ox	0
C-4	Curtis, D.	M	31	clear, yellow	1.018	acid	0	0	0	0	0	few	0	many ca.ox	0
C-5	Jones, C.	M	27	sl. cldy, yellow	1.026	acid	0	0	0	few	0	some	0	some ca.ox	0
C-7	Arnold, C.	M	20	clear, straw	1.011	acid	0	0	0	0	0	0	0	0	0
C-8	Smith, I.	M	58	clear, yellow	1.025	acid	0	0	trace	few	0	some	0	ca.ox + trip. phos.	0
C-9	Ticket, H.	M	49	clear, yellow	1.024	acid	0	0	0	few	0	few	0	few ca.ox	0
C-11	Barr, C.	M	18	sl. cldy, yellow	1.020	alk.	0	0	0	0	0	0	0	0	0
C-16	Vestal, D.	F	52	sl. cldy, yellow	1.021	acid	0	0	trace	few	few	few	0	few ca.ox	0
C-17	Vestal, M.	F	21	clear, straw	1.006	acid	0	0	0	some	few	some	0	0	0
C-18	Kagoona, J.	F	23	sl. cldy, yellow	1.020	acid	0	0	0	some	few	many	0	few ca.ox	0
C-19	Analoak, M.	F	23	clear, yellow	1.011	acid	0	0	trace	few	few	some	0	few ca.ox	0
C-21	Norton, I.	F	30	clear, straw	1.004	acid	0	0	trace	0	0	some	0	0	0
C-22	Mills, A.	F	44	cldy, orange	1.024	acid	0	0	trace	0	0	0	0	0	0
C-23	Sours, B.	F	38	opaque, straw	1.011	acid	0	0	0	some	-	some	0	some ca.ox	0
C-24	Barr, E.	F	22	sl. cldy, yellow	1.023	acid	0	0	trace	0	0	0	0	0	0
C-25	Otton, I.	F	30	cldy, orange	1.028	acid	+++	0	trace	0	0	0	0	0	0
	June—July 1951														
C-3	Goodwin, W.	M	36	clear, yellow	1.020	acid	0	0	0	0	0	0	0	ca.ox + trip. phos.	0
C-12	Ballod, O.	M	25	clear, yellow	1.030	acid	0	0	++	few	0	some	0	some ca.ox	0
C-13	Jones, J.	M	23	clear, yellow	1.015	acid	0	0	0	few	few	many	0	some ca.ox	0
C-14	Ramoth, R.	M	19	clear, yellow	1.020	acid	0	0	0	some	few	few	0	some ca.ox	0
C-15	Mitchell, C.	M	22	sl. cldy, yellow	1.020	acid	0	0	0	few	few	many	0	many ca.ox	0
C-16	Vestal, D.	F	53	sl. cldy, yellow	1.026	acid	0	0	0	few	few	many	0	many ca.ox	0
C-18	Kagoona, J.	F	23	clear, yellow	1.020	acid	0	0	trace	few	few	many	0	ca.ox + trip. phos.	0
C-19	Analoak, M.	F	24	clear, yellow	1.010	acid	0	0	0	few	few	many	0	many ca.ox	0

Table 22.

Showing the Results of Urine Examination of the Gambell Group.

Subject No.	Name	Sex	Age	Colour	Specific gravity	Reaction	Albumin	Sugar	Acetone	Microscopy: W. B. C.	R. B. C.	Epithelial cells	Casts	Crystals	Bacteria
	March 1951														
D-1	Slwooko, V.	M	33	clear, yellow	1.023	acid	0	0	0	2-3	0	few	0	few ca.ox	0
D-2	James, W.	M	27	clear, yellow	1.020	acid	0	0	0	0	0	few	0	0	0
D-3	Chauncy, W.	M	19	clear, yellow	-	acid	0	0	0	0	0	few	0	some ca.ox	0
D 4	Iyakitan, L.	M	21	clear, amber	1.025	acid	0	0	0	0	0	few	0	ca.ox + trip. phos.	0
D-5	Walunga, W.	M	24	clear, yellow	1.024	acid	0	0	0	1-2	0	few	0	ca.ox + trip. phos.	0
D-6	Iyakitan, D.	M	30	clear, yellow	1.016	acid	0	0	0	0	0	few	0	many ca.ox	0
D-8	Slwooko, J.	M	24	clear, yellow	1.032	acid	0	0	0	2-3	0	few	0	some ca.ox	0
D-9	Harry, D.	M	30	clear, yellow	1.023	acid	0	0	0	2-3	0	few	0	few ca.ox	0
D-11	Slwooko, R.	M	18	clear, yellow	1.032	acid	0	0	0	2-3	0	few	0	few ca.ox	0
D-12	Slwooko, H.	M	31	clear, yellow	1.027	acid	0	0	0	0	0	few	0	few ca.ox	0
D-13	Oozevoseuk, C.	M	25	clear, straw	1.020	acid	0	0	0	0	0	few	0	0	0
D-14	Appassingok, H.	M	24	clear, yellow	1.020	acid	0	0	0	1-2	0	few	0	few ca.ox	0
D-16	Silook, R.	M	27	clear, yellow	1.014	acid	0	0	0	0	0	few	0	0	0
D-17	Antaghame, J.	M	39	clear, yellow	1.016	acid	0	0	trace	0	0	0	0	0	0
D-18	Iyakitan, L.	M	24	clear, amber	1 017	acid	0	0	0	1-2	0	few	0	many ca.ox	0
D-19	Nawpokuhok, L.	M	19	clear, yellow	1.019	acid	0	0	0	1-2	0	few	0	few ca.ox	0
D-20	Aningayou, N... ...	M	39	sl. cldy, straw	1.016	acid	0	0	0	1-2	0	few	0	few ca.ox	0
D-21	Konahok, H.	M	38	clear, yellow	1.010	acid	0	0	trace	0	0	few	0	0	0
D-22	Iknokinok, C.	M	24	sl. cldy, yellow	1.016	acid	0	0	0	1-2	0	some	0	few ca.ox	0
D-23	Matigoohtik, F.	F	44	clear, straw	-	acid	0	0	0	1-2	1-2	some	0	some ca.ox	0
D-24	Nawpokuhok, G. ...	F	23	clear, yellow	1.005	acid	0	0	0	1-2	1-2	many	0	few ca.ox	0
D-25	Slwooko, B.	F	32	cldy, yellow	-	acid	0	0	trace	1-2	-	few	0	0	0
D-28	Oyaghok, M.	F	21	cldy, yellow	1.014	acid	0	0	0	1-2	1-2	some	0	some ca.ox	0
	August 1951														
D-6	Iyakitan, D.	M	30	cldy, yellow	1.027	acid	0	0	0	1-2	5	some	0	many ca.ox	0
D-7	Iyakitan, C.	M	39	cldy, yellow	1.020	acid	0	0	0	0	0	few	0	few ca.ox	0
D-9	Harry, D.	M	30	sl. cldy, yellow	1.020	acid	0	0	0	0	0	few	0	few ca.ox	0
D-10	Aningayou, J.	M	35	sl. cldy, yellow	1.023	acid	0	0	0	1-2	5-8	few	0	few ca.ox	0
D 25	Slwooko, B.	F	32	sl. cldy, yellow	1.018	acid	0	0	0	2-3	0	few	0	many ca.ox	0
D-26	Iyakitan, V.	F	24	clear, amber	1.018	acid	0	0	0	0	0	many	0	some ca.ox	0
D-27	Omwari, P.	F	25	clear, amber	1.032	acid	0	0	trace	0	0	packed	0	many ca.ox	0
D-28	Oyaghok, M.	F	21	clear, amber	1.027	acid	0	0	trace	0	0	packed	0	many ca.ox	0

Of the 80 Eskimo subjects originally selected, seven were excluded. Of these, four were unable to produce satisfactory BMR tracings on account of abnormal breathing pattern. Two subjects were excluded for medical reasons, as one was found by careful and repeated medical examination to suffer from active pulmonary tuberculosis, although the temperature was not elevated (No. A-16), and the other suffered from glandular disturbances (No. A-5). One subject (No. A-11) was excluded because of unreliable conduct during the period of fasting.

The body weight had been checked several weeks prior to the test to ensure that no significant loss of weight had occurred which might influence the results. This was considered particularly important in the Gambell group, where periods of semistarvation are known to have occurred in the past. It was found, however, that the body weights remained fairly constant, as is evident from the following figures showing the body weights in pounds of some of the Gambell subjects over a period of $2^1/_2$ years.

Subj.		Feb. 1949	Feb. 1950	Feb. 1951	March 1951	August 1951
D-1	Slwooko, Vernon	-	159.0	155.5	154.5	-
D-22	Iknokinok, Clifford...	146.0	-	147.0	144.2	-
D-8	Slwooko, Joe........	149.0	147.0	146.5	144.5	-
D-15	Silook, Nolan	143.0	137.0	137.5	136.5	-
D-14	Appassingok, Herbert.	-	128.2	132.0	130.0	-
D-9	Harry, Don..........	148.0	142.2	143.0	141.0	143.0
D-10	Aningayou, John... .	-	140.5	145.0	-	141.5
D-2	James, Winfred......	-	147.5	148.0	147.0	-
D-11	Slwooko, Roger......	-	146.2	151.0	150.0	-

A total of 28 normal Whites were used as controls. In four of these subjects repeated tests were made on three or more successive days. In six trained subjects, a single test was made. Repeated tests were made on different occasions in six subjects, and a series of tests including tests while living on high and low protein diets were made in a group of 12 Whites. These White subjects were males between 20 and 40 years old, and among them were Air Force personal, Infantry soldiers and civilians living under different environmental conditions.

3. Technique and Procedure.

Field laboratory. At each of the four Eskimo settlements a complete and well-equipped field laboratory was established, with adequate sleeping quarters for the Eskimo subjects. At Barter Island, Kotzebue, and Gambell over 6000 pounds of laboratory equipment was flown in by twin-engined aircraft, while at Anaktuvuk Pass, instruments and fragile equipment, as well as personnel, were brought in from Bettles by a small one-engined aircraft landing on Summit Lake, the remainder of the equipment being paradropped from a C-47. At Barter Island, several well-equipped Jamesway huts were available for laboratories and sleeping quarters; at Kotzebue permission was obtained through the kind co-operation of Dr. E. S. Rabeau, to use part of the hospital building as well as the hospital laboratory. At Gambell the nurses' quarters were made available for the study by the Alaska Native Service. At Anaktuvuk Pass a camp was established close to the Eskimo village at Summit Lake with four large tents, which were adequately heated.

BMR Technique. The standard technique was applied, and all basal metabolism tests were made with the same Benedict-Roth metabolism apparatus. It was regularly tested for leaks, and great care was taken to make the subjects accustomed to the apparatus prior to the test. Each test consisted of two 9-minute periods, determined by stop-watch, to eliminate inaccuracies produced by variations in the cycles of the electrical power.

We were fortunate in having Dr. E. F. DuBois as a consultant on these studies, and were thus able to compare the results obtained in our laboratory with those obtained on the same person in the calorimeter at the Russel Sage Institute of Pathology. In a series of tests during the period 1935—1946, Dr. DuBois' average basal metabolism in the calorimeter was 35.0 calories per square meter per hour (DuBois, personal communication). His basal metabolism as determined by our Benedict-Roth apparatus in Alaska was 35.0 calories per square meter per hour, or 66.8 calories per hour. In 1950 his basal metabolism as measured with the Benedict-Collins apparatus in New York was 67.3 calories per hour (DuBois, personal communication).

As a further check on our technique, the author's basal metabolism was examined repeatedly, both in our laboratory at Ladd AFB, and in the field, and the same results were obtained in both cases, as is evident from the following:

Basal metabolism of K. R. at Ladd A. F. B.:

12 October 1950	35.8	cal./m²/hr.
13 April 1951	32.8	—»—
14 April 1951	33.5	—»—
15 April 1951	34.1	—»—
19 April 1951	31.3	—»—
20 April 1951	33.5	—»—
6 June 1951	33.0	—»—
7 June 1951	31.8	—»—
8 June 1951	32.0	—»—
10 June 1951	32.5	—»—
Average	33.0	cal./m²/hr.

Basal metabolism of K. R. at Barter Island:

21 May 1951	....	33.0 cal./m²/hr.
22 May 1951	....	33.3 —»—
23 May 1951	....	33.2 —»—
Average	....	33.1 cal./m²/hr.

Each record was evaluated individually in relation to the clinical and other information available on the subject. The tracings were carefully classified with regard to validity, and only good tracings, which would allow a definite slope line to be drawn with accuracy, have been adopted (fig. 15). Thus, out of a total of 443 records, 53 have been rejected on this basis.

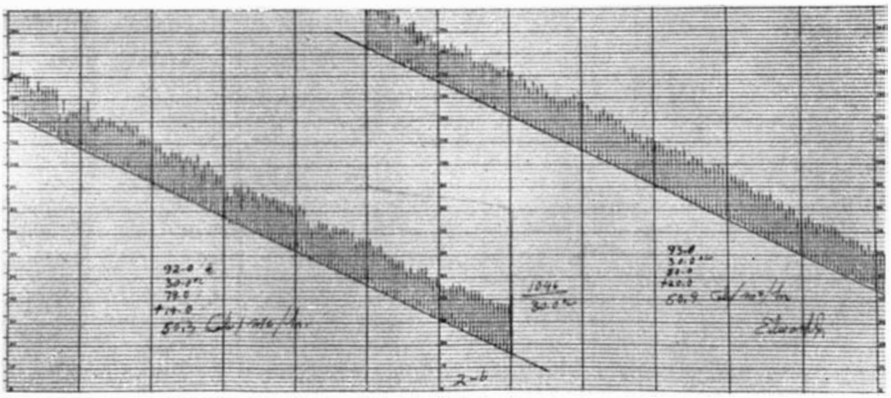

Fig. 15. BMR tracing from Eskimo subject.

The subjects were usually examined in groups of five on three successive days. Following the last meal at 5:00 or 6:00 o'clock in the evening. the subjects were admitted to the sleeping quarters at the field laboratory, where they spent the night in the presence of a technician in order to ensure reliable control of the fasting. The following morning the basal metabolism tests were commenced at 7: 00 A.M., following 30 minutes' rest in the basal metabolism bed after the body weight and height had been recorded. The number of hours fasting, as well as the oral temperature, pulse rate, and blood pressure were recorded prior to the test. A 5-hour urine sample, starting at 7: 00 A. M. was collected for the determination of nitrogen elimination. The greatest possible care was taken in the handling of the subjects to achieve maximum relaxation.

Protein intake. During all examination periods a complete nutritional survey was carried out with individual food weighing at each meal in representative families in each of the four Eskimo settlements. In addition to this, the last meal on the day prior to the BMR test, was weighed in each subject. The subjects were allowed to select the food as usual in unlimited quantities. Each food item was collected on separate paper plates and in paper cups, and accurately weighed. At the end of the meal each plate or cup together with the remaining unconsumed food was again weighed, and the food consumption recorded. For the calculation of the results, the protein values were taken from the standard tables in the cases where they were known. In the case of special Eskimo food, the figures published by Høygaard (1941) were used, and in some cases the protein content was determined by the standard Kjeldal method. The results of the nutritional surveys will be published in detail in a later report.

URINARY NITROGEN ELIMINATION

a. *Procedure for the collection of the sample in the field.* The urine was collected over a 5-hour period, the time being recorded with an accuracy of $\pm$ 30 seconds. The volume was immediately recorded. From each specimen 0.5 ml. was transferred with great care to a 50 ml. volumetric flask. The flask was filled about halfway with distilled water and three drops of concentrated sulphuric acid were added to prevent loss of ammonia. Distilled water was then added to the mark, and the content of the flask was thoroughly mixed, after which part of the diluted specimen was transferred to a labeled 1 oz. sample bottle, which was kept in a cool place until the analysis could be made at the laboratory at Ladd A. F. B.

b. *Urinary nitrogen determinations* were made by the method of Johnson (1941) as described in "Manometric Techniques and Tissue Metabolism", by Umbreit et al. (1949).

V. Results.

In agreement with previous workers, it was found that the basal metabolism of Eskimos in their native habitat was significantly higher than in Whites when examined for the first time living on their own native diet (table 23). The mean of the first test of all Eskimos of both sexes from all four settlements was 14 % higher than the DuBois standard, and the women showed higher figures than the men. The mean figures for the four groups were as follows.

Location	Men	Women	Men and women
Barter Island . . .	+ 15 %	+ 27 %	+ 19 %
Anaktuvuk Pass	+ 18 %	-	+ 18 %
Kotzebue	+ 5 %	+ 5 %	+ 5 %
Gambell	+ 10 %	+ 28 %	+ 14 %

The highest figures were observed among the more primitive Eskimos, and the lowest figures among the more civilized Eskimos at Kotze-

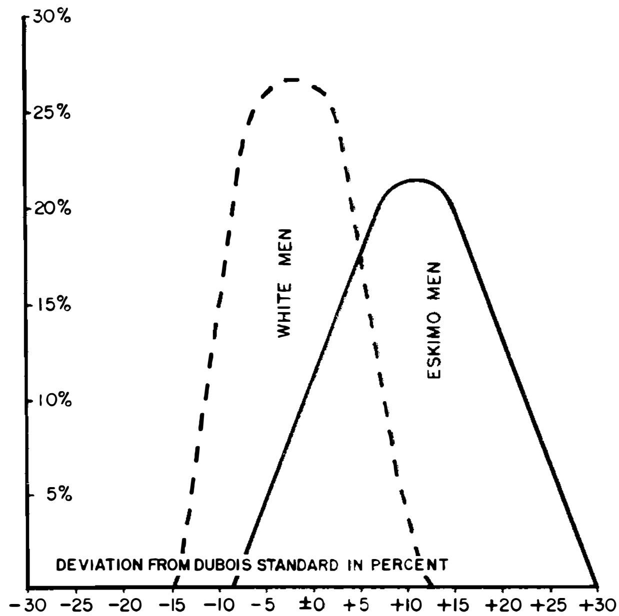

Fig. 16. Approximate percentage distribution of basal metabolic rates in Eskimo and White men examined for the first time.

bue, where the average basal metabolism was only 5 % higher than the DuBois standard.

In 28 white men, 20—40 years old, examined for the first time, the BMR averaged only 1 % below the DuBois standard, i. e., 15 % lower than that of the Eskimos (see table 24).

In Eskimos approximately 86 % of the subjects of both sexes, and 90 % of the Eskimo men, had a BMR above the DuBois standard, when tested for the first time. In the White controls only 35 % of the subjects had BMR's higher than the DuBois standard when undergoing the first test.

In the following table the distribution of basal metabolic rates determined on the basis of the first test in Eskimo men is compared with normal white men (see also fig. 16).

Deviation from DuBois Standard	White men %	Eskimo men %
+ 25 to + 30	0	10
+ 20 to + 25	0	12
+ 15 to + 20	0	12
+ 10 to + 15	7	16
+ 5 to + 10	3	26
+ 0 to + 5	25	14
— 0 to — 5	25	8
— 5 to — 10	32	2
— 10 to — 15	7	0

Table 23.

Basal Metabolic Rates in Eskimos Examined for the First Time in their Native Habitat.

Subj. No.	Name	Sex	Age	Date	Fast. Hrs.	Oral temp. °F	Pulse rate	Blood press.	Height in.	Weight lbs.	BMR Cal/m² hr.	BMR Deviation from DuBois Standard in per cent
	Barter Island											
A-1	Putugook, D. . .	M	21	21 Nov. 1950	16.5	98.4	66	124/90	67.5	133.7	45.0	+ 9
A-2	Akootchook, I. .	M	28	19 Nov. 1950	13.5	96.0	52	118/78	66.0	153.0	45.2	+ 14
A-3	Akootchook, D.	M	17	19 Nov. 1950	14.0	97.2	76	108/70	64.5	118.0	55.4	+ 23
A-4	Nageak, V.	M	47	18 Nov. 1950	14.5	97.0	68	110/76	64.2	181.7	39.4	+ 6
A-6	Akootchook, A.	M	61	18 Nov. 1950	14.0	97.0	56	104/72	66.7	151.2	42.9	+ 21
A-10	Akootchook, M.	F	29	20 Nov. 1950	16.5	98.2	66	114/72	61.2	116.0	44.6	+ 24
A-12	Rexford, M. . . .	F	34	20 Nov. 1950	14.5	98.2	60	110/78	63.0	182.5	44.3	+ 23
A-13	Akootchook, E.	F	21	20 Nov. 1950	15.5	98.4	72	112/70	62.5	111.5	45.8	+ 26
A-14	Nageak, R.	F	36	20 Nov. 1950	13.5	98.5	54	96/62	62.0	142.5	43.9	+ 23
A-15	Akootchook, M.	F	22	21 Nov. 1950	13.5	97.6	58	104/72	60.0	103.0	42.9	+ 18
	Anaktuvuk Pass											
B-1	Hugo, Z.	M	20	3 Aug. 1951	13.5	97.6	52	100/66	65.2	126.2	64.9	+ 14
B-2	Rullund, J.	M	23	6 Aug. 1951	13.5	96.4	44	106/74	63.2	125.0	46.3	+ 13
B-3	Mekiana, J. . . .	M	23	6 Aug. 1951	14.5	97.8	66	108/74	65.5	129.0	51.2	+ 24
B-4	Mekiana, H. . . .	M	47	6 Aug. 1951	16.0	98.1	68	110/78	67.0	156.5	46.4	+ 24
B-5	Ahgook, Bob . .	M	21	6 Aug. 1951	15.5	97.6	74	104/68	68.0	140.2	45.7	+ 10
B-6	Hugo, J.	M	30	6 Aug. 1951	14.5	97.0	58	120/78	67.5	140.2	40.5	+ 2
B-7	Morry, A.	M	22	3 Aug. 1951	17.5	97.6	64	128/92	66.0	137.0	52.5	+ 28
B-8	Ahgook, Ben . .	M	29	3 Aug. 1951	15.5	97.9	70	112/72	67.2	146.0	48.8	+ 22
B-9	Morry, B.	M	36	5 Aug. 1951	15.5	97.0	56	120/84	66.7	140.0	42.1	+ 8
B-10	Morry, J.	M	40	3 Aug. 1951	13.5	97.2	60	124/74	66.0	120.2	47.8	+ 26
B-11	Ahgook, J.	M	31	6 Aug. 1951	16.5	97.4	76	108/60	65.0	128.0	49.3	+ 25
	Kotzebue											
C-1	Curtis, J.	M	35	11 Dec. 1950	15.0	98.0	64	102/64	70.5	161.0	41.6	+ 7
C-2	Sours, M.	M	36	6 Dec. 1950	15.0	98.0	66	110/70	66.7	135.0	41.5	+ 8
C-3	Goodwin, W. . .	M	36	10 Dec. 1950	16.0	98.4	71	114/68	65.0	149.0	41.9	+ 7
C-4	Curtis, D.	M	31	11 Dec. 1950	17.0	98.2	74	108/68	66.2	146.2	42.0	+ 6
C-5	Jones, C.	M	27	11 Dec. 1950	22.0	97.8	64	100/56	68.0	167.0	39.4	— 2
C-7	Arnold, C.	M	20	5 Dec. 1950	16.0	97.4	60	114/50	66.5	138.0	44.7	+ 6
C-8	Smith, I.	M	58	14 Dec. 1950	15.0	97.4	56	126/84	66.0	160.0	43.1	+ 18
C-9	Ticket, H.	M	49	10 Dec. 1950	17.0	98.1	62	108/74	61.5	115.0	39.0	+ 3
C-11	Barr, C.	M	18	6 Dec. 1950	17.0	98.2	58	128/80	64.7	143.2	48.5	+ 11
C-12	Ballod, O.	M	25	6 July 1951	14.5	97.5	70	116/68	66.7	149.5	46.9	+ 16
C-13	Jones, J.	M	23	6 July 1951	15.0	97.4	52	90/56	66.0	130.7	41.3	± 0
C-14	Ramoth, R.	M	19	6 July 1951	16.5	97.7	67	92/56	67.2	139.5	44.8	+ 5
C-15	Mitchell, C. . . .	M	22	6 July 1951	16.0	98.2	51	114/70	68.5	146.0	39.7	— 3
C-16	Vestal, D.	F	52	8 Dec. 1950	14.0	98.0	76	130/78	64.0	194.5	43.0	+ 26
C-17	Vestal, M.	F	21	8 Dec. 1950	15.0	97.8	55	98/76	62.2	132.0	33.4	— 8
C-18	Kagoona, J. . . .	F	23	8 Dec. 1950	17.0	98.0	70	110/70	64.0	158.5	35.3	— 3
C-19	Analoak, M. . . .	F	23	7 Dec. 1950	15.0	98.9	78	116/78	61.0	126.0	39.0	+ 7
C-20	Tikik, M.	F	31	8 Dec. 1950	17.0	98.5	70	102/70	63.2	116.0	31.9	— 10
C-22	Mills, A.	F	44	7 Dec. 1950	16.0	97.8	82	114/66	61.7	113.0	41.5	+ 15
C-24	Barr, E.	F	22	7 Dec. 1950	17.0	98.0	70	102/68	64.0	140.0	41.8	+ 15
C-25	Otton, I.	F	30	5 Dec. 1950	17.0	99.0	88	118/72	62.0	160.0	36.7	+ 2

Table 23. (Cont.).

Subj. No.	Name	Sex	Age	Date	Fast Hrs.	Oral temp. °F	Pulse rate	Blood press.	Height in.	Weight lbs.	BMR Cal/m²/hr.	BMR Deviation from DuBois Standard in per cent
	Gambell											
D-1	Slwooko, V....	M	33	5 Mar. 1951	16.0	97.6	58	116 64	66.5	154.5	44.7	+ 13
D-2	James, W.	M	27	8 Mar. 1951	17.0	97.9	60	90 60	66.5	147.0	43 2	+ 8
D-3	Chàuncy, W...	M	19	11 Mar. 1951	15.0	98.1	76	120 70	65.2	131.5	54.6	+ 28
D-4	Iyakitan, L. ...	M	21	11 Mar. 1951	15.5	97.9	58	104 68	66 0	131.0	52.3	+ 26
D-5	Walunga, W...	M	24	14 Mar. 1951	15.5	98.0	60	106 70	66.2	146.5	46.3	+ 15
D-6	Iyakitan, D. ...	M	30	11 Mar. 1951	17.0	97.8	45	100 70	65.5	135.5	40.7	+ 3
D-7	Iyakitan, C....	M	39	16 Aug. 1951	16.0	98.3	42	90 56	69.0	157.5	36.8	— 5
D-8	Slwooko, J.....	M	24	5 Mar. 1951	15.0	97.3	52	100 70	66.0	144.0	42.6	+ 6
D-9	Harry, D.	M	30	5 Mar. 1951	16.0	98.1	50	96 56	66.0	138.0	44.4	+ 12
D-10	Aningayou, J...	M	35	16 Aug. 1951	18.0	98.0	58	108 68	66.2	140.5	39.5	+ 1
D-11	Slwooko, R....	M	18	5 Mar. 1951	16.0	98.6	66	110 64	67.0	150.0	43 9	+ 2
D-12	Slwooko, H....	M	31	5 Mar. 1951	16.5	97.8	48	110 68	66.5	163.5	47.2	+ 19
D-13	Oozevoseuk, C.	M	25	8 Mar. 1951	15 0	98.3	62	100 68	62.5	133.0	49.0	+ 22
D-14	Appasingok, H.	M	24	8 Mar. 1951	16.0	97.6	60	114 66	65.7	130.0	44.9	+ 12
D-16	Silook, R......	M	27	8 Mar. 1951	16.0	97.9	47	104 64	66.5	152.0	41.6	+ 3
D-17	Antaghame, J. .	M	39	11 Mar. 1951	16.0	97.7	52	100 70	63.5	134.0	41.3	+ 6
D-18	Iyakitan, L. ...	M	24	11 Mar. 1951	16 5	97.0	44	98 68	64.7	138.0	39.9	— 1
D-19	Nawpokuhok, L.	M	19	14 Mar. 1951	15.0	98.3	68	100 64	66.2	132.2	44.3	+ 5
D-20	Aningayou, L. .	M	39	14 Mar. 1951	15.5	96 9	52	88 60	66.5	145.7	37.4	— 4
D-21	Konahok, H. ..	M	38	14 Mar. 1951	16 5	97.9	60	90 70	64.2	128.7	47.1	+ 16
D-22	Iknokinok, C. .	M	24	14 Mar. 1951	17.0	98.1	48	92 70	65.2	144.2	47.1	+ 15
D-23	Malegoohtik, F.	F	44	20 Mar. 1951	17.0	97.8	78	118 78	60.0	126.0	46.2	+ 29
D-24	Nawpokuhok,G.	F	23	20 Mar. 1951	16.0	99.2	90	110 70	60.5	122.0	50.0	+ 39
D-25	Slwooko, B....	F	32	30 Mar. 1951	15.0	98 5	90	138 80	61.5	124.0	48.7	+ 36
D-26	Iyakitan, V. ...	F	24	19 Aug. 1951	17.0	99.2	80	122 70	65.0	132.5	43.0	+ 19
D-27	Omwari, P. ...	F	25	19 Aug. 1951	16.0	98 6	44	108 74	61.7	127.7	39.8	+ 11
D-28	Oyaghok, M. ..	F	21	20 Mar. 1951	16.0	98.7	92	112 68	59.5	125.0	49.8	+ 36

Table 24.

Basal Metabolic Rates in Normal White Men Examined for the First Time.

Name	Sex	Age	Date	Fast Hrs.	Oral temp. °F	Pulse rate	Blood press.	Height in.	Weight lbs.	BMR Cal m² hr	BMR Deviation from DuBois Standard in per cent
Bryan, T.	M	21	2 Nov. 1950	18	98.4	64	111/62	67.5	132.0	43.5	+ 4
Malek, F.	M	27	4 Nov. 1950	15	98.2	68	122 80	70.7	178 2	39.6	± 3
Varner, C.	M	20	3 Nov. 1950	18	98.1	52	118/87	72.2	179.5	44.8	+ 8
Beltran, G.......	M	20	29 Jan. 1951	16	97.2	72	112/80	67.7	126.5	39.8	— 5
Hammer, J.	M	26	20 Oct. 1950	16	97.4	60	100/68	76.0	214.2	37.7	— 7
Gorski, T.	M	25	10 Oct. 1950	16	97.8	62	104/68	68.5	143.7	37.9	— 6
Long, M..........	M	23	17 Oct. 1950	16	97.2	58	112/74	66.5	181.7	40.8	± 0
Bollerud, J.	M	36	16 Oct. 1950	16	97.2	70	108/68	71.2	171.5	36.6	— 6
Dunbar, V........	M	21	11 Oct. 1950	16	98.0	68	105/78	66.7	143.2	37.7	— 8
Herrera, A.	M	22	27 Oct. 1950	16	97.2	56	124/70	66.5	205.0	41 6	+ 1
Reese, J..........	M	19	2 Nov. 1950	17	98.5	72	114/74	68.5	145 7	48.0	+ 13
Kirwin, J.........	M	22	3 Nov. 1950	16	98.0	60	112/72	66.2	123.5	38.2	— 5
Isenberg, J.	M	20	30 Jan. 1951	17	97.8	73	100/64	66.7	154.0	41.3	— 1
Jaramillo, J.	M	20	30 Jan. 1951	16	98.4	57	116/64	64.7	134.0	47.5	+ 14
Bricker, E........	M	20	2 Feb. 1951	17	97.5	56	118/74	66 7	131 0	35.7	— 14
Laurence, C.	M	19	27 Oct. 1950	22	97.0	60	114/78	72.5	185.7	36 5	— 13
Drury, H.........	M	36	6 Jun. 1951	16	97.8	80	114/86	69.2	148.7	37.3	— 5
Blakely, R........	M	21	13 Oct. 1950	16	97.9	68	124/86	71.0	163 0	39.9	— 3
O'Brien, F........	M	21	4 Jan. 1952	15	97.8	60	102/68	72.0	193.0	43.3	+ 4
Vidal, R..........	M	21	4 Jan. 1952	16	97.2	54	110/65	67.2	136.0	38.1	— 9
Davis, J.	M	19	4 Jan. 1952	18	97.0	52	104/84	71.0	162.5	44.3	+ 5
Geist, L..........	M	20	4 Jan. 1952	17	97.0	60	104/60	69.0	146 0	42.4	+ 2
Koontz, E.	M	19	4 Jan. 1952	17	97.4	62	134/70	69.0	158.0	39.5	— 7
Lacey, B.	M	20	4 Jan. 1952	18	96.6	58	118/84	65.5	136.0	41.7	± 0
Lanning, L.	M	21	4 Jan. 1952	18	97.6	60	130 82	73.0	227.0	41.8	± 0
Manulski, P.	M	20	4 Jan. 1952	18	98.0	56	108/68	68.0	162 5	43.8	+ 5
Schunk, C........	M	21	4 Jan. 1952	18	97.2	68	110/72	65.0	149 0	39.7	— 4
White, H.........	M	22	4 Jan. 1952	18	97.5	58	106/62	68.0	135.0	41.8	+ 2
Mean............	-	22	-	17	97.6	63	113/73	68.8	160.0	40.7	— 1

After having verified the results of previous investigators, the next problem was to explain the reason for this higher basal heat production in the Eskimo.

Of the various factors involved, apprehension would be expected to play an important part in the high basal metabolic rates observed in Eskimos when tested for the first time. It is quite difficult, however, to determine whether or not an Eskimo is apprehensive. The pulse rate and blood pressure cannot always be taken as an indication of the state of relaxation in the Eskimo, since his blood pressure and pulse rate normally are considerably lower than those of Whites. Significantly elevated blood pressures were never encountered in our subjects. In the Eskimo men at the time of the first BMR test the average blood pressure was 105/70, as against 113/73 in the White controls. The average pulse rate was 58 in the Eskimos and 63 in the Whites. In later experiments we have found it useful to study the plethysmogram and the electroencephalogram as evidence of apprehensiveness in the subjects at the time of the test.

A rise of more than 10 % of the metabolism has been observed in Eskimo women (subjects A-14, A-15) by partly exposing the body by removing a blanket which was used as a cover during the test. When testing the basal metabolism in Eskimo women we have therefore made it a practice to have a woman technician present to take care of the subject.

During our initial experiments, we observed in several cases a reduction of over 20 % in the BMR when the same subject was tested repeatedly on successive days while living on the same diet, although the lowest BMR was still higher than in the White controls (table 25). The original high level was interpreted as evidence of apprehension. In some of the subjects, the basal metabolic rate has been determined on as many as 12 different occasions, and we find that the drop in BMR generally levels out by the third test.

Robertson (1944, 1951), in his excellent account of a technique that may well be adopted as standard, states that in the majority of white subjects a reproducible basal metabolism can be measured by the second day. In a series of 223 subjects aged 19 years, 156 (70 %) gave initial readings which were significantly higher than those of the second day; 48 (22 %) gave results 10 % or more higher; 21 (9 %) gave results 15 per cent or more higher, and as many as 11 (5 %) gave readings 20 per cent or more higher.

Lewis et al. (1944) studied 94 children in a small respiration chamber, and made repeated measurements of the basal metabolism on three or four days. The first test was satisfactory in 35 per cent of the cases. In 55 per cent of the cases satisfactory results were obtained by the time of the second test, and 80 per cent had satisfactory results by third examination.

Chantraine (1951) observed differences as high as 30 to 40 per cent of the values obtained when the BMR was measured twice.

Robertson and Reid (1952) adopted the practice of duplicate tests every day until the duplicates were within 5 % of each other, and then accepted the lowest reading as the value for the BMR. They argue that in a short series of 4 readings the lowest is more likely to be nearer the basal value than the mean of the third and fourth reading.

When comparing the basal metabolic rates in the Eskimo subjects as determined on the basis of the first test compared with the lowest level established by repeated tests, we find an average reduction of 9 per cent which is ascribed to the reduction in tension (see table 26). This

Table 25.

Showing the Basal Metabolic Rates of Eskimos Examined in their Native Habitat.

Subj. No.	Name	Sex	Age	Date	Fast. Hrs.	Oral temp. °F	Pulse rate	Blood press.	Height in.	Weight lbs.	BMR Cal/m²/hr.	BMR Deviation from DuBois Standard in percent
	Barter Island											
A-1	Putugook, D. . .	M	21	21 Nov. 1950	17	98.4	66	124/90	67.5	133.7	45.0	+ 9
		M	21	21 May 1951	16	97.4	56	108/64	68.2	133.7	44.5	+ 7
		M	21	22 May 1951	16	97.8	48	98/68	68.2	135.2	44.5	+ 7
		M	21	23 May 1951	16	97.8	56	110/70	68.2	136.2	41.0	— 1
A-2	Akootchook, I. .	M	28	19 Nov. 1950	14	96.0	52	118/78	66.0	153.0	45.2	+ 14
		M	29	17 May 1951	16	98.1	50	106/72	66.0	155.7	42.7	+ 6
		M	29	18 May 1951	16	97.9	48	126/80	66.0	155.7	44.5	+ 11
		M	29	19 May 1951	16	97.8	50	100/68	66.0	155.2	43.0	+ 8
A-3	Akootchook, D.	M	17	19 Nov. 1950	14	97.2	76	108/70	64.5	118.0	55.4	+ 23
		M	17	23 Nov. 1950	21	98.8	58	112/64	64.7	117.0	50.6	+ 13
		M	18	17 May 1951	18	98.3	72	114/66	65.0	115.7	47.1	+ 8
		M	18	18 May 1951	18	97.8	57	104/66	65.0	120.0	44.3	+ 2
		M	18	19 May 1951	18	97.7	60	98/64	65.0	115.5	42.6	— 2
A-4	Nageak, V.	M	47	18 Nov. 1950	15	97.0	68	110/76	64.2	181.7	39.4	+ 6
A-6	Akootchook, A.	M	61	18 Nov. 1950	14	97.0	56	104/72	66.7	151.2	42.9	+ 21
A-8	Rexford, H. . . .	M	36	17 May 1951	15	98.0	66	100/70	63.7	136.5	39.1	+ 1
		M	36	18 May 1951	15	97.4	61	120/88	63.7	138.0	38.6	— 1
		M	36	19 May 1951	15	97.8	62	106/74	63.7	137.7	37.4	— 4
A-9	Apayok, J.	M	15	21 May 1951	18	97.8	66	98/60	60.0	91.2	47.5	+ 3
		M	15	22 May 1951	18	98.1	60	102/70	60.0	91.0	44.7	— 4
		M	15	23 May 1951	18	97.5	66	98/68	60.0	90.0	44.5	— 4
A-10	Akootchook, M.	F	29	20 Nov. 1950	17	98.2	66	114/72	61.2	116.0	44.6	+ 24
		F	29	24 Nov. 1950	21	98.3	72	94/62	61.0	118.5	39.0	+ 9
		F	29	24 May 1951	12	97.3	60	88/56	61.0	116.0	35.3	— 1
		F	29	25 May 1951	12	97.4	58	88/56	61.0	114.2	33.7	— 6
		F	29	26 May 1951	12	97.0	56	94/66	61.0	116.0	34.8	— 3
A-12	Rexford, M. . . .	F	34	20 Nov. 1950	15	98.2	60	110/78	63.0	182.5	44.3	+ 23
		F	34	24 May 1951	15	98.2	54	100/72	62.5	182.5	37.5	+ 5
		F	34	25 May 1951	15	97.7	48	94/68	62.5	181.2	31.8	— 10
		F	34	26 May 1951	15	98.0	50	98/66	62.5	181.2	36.7	+ 3
A-13	Akootchook, E.	F	21	20 Nov. 1950	16	98.4	72	112/70	62.5	111.5	45.8	+ 26
		F	21	24 May 1951	17	98.2	52	100/74	62.0	112.0	41.0	+ 14
		F	21	25 May 1951	17	97.8	48	106/70	62.0	109.2	38.8	+ 8
		F	21	26 May 1951	17	98.0	50	112/72	62.0	110.0	38.7	+ 8
A-14	Nageak, R.	F	36	20 Nov. 1950	14	98.5	54	96/62	62.0	142.5	43.9	+ 23
		F	36	24 Nov. 1950	14	98.6	56	95/72	62.0	145.5	35.3	— 1
A-15	Akootchook, M.	F	22	21 Nov. 1950	14	97.6	58	104/72	60.0	103.0	42.9	18
		F	22	25 Nov. 1950	14	97.9	56	100/72	60.0	101.0	36.2	± 0
	Anaktuvuk Pass											
B-1	Hugo, Z.	M	20	3 Aug. 1951	14	97.6	52	100/66	65.2	126.2	46.9	+ 14
B-2	Rullund, J.	M	23	6 Aug. 1951	14	96.4	44	106/74	63.2	125.0	46.3	+ 13
B-3	Mekiana, J. . . .	M	23	6 Aug. 1951	15	97.8	66	108/74	65.5	129.0	51.2	+ 24
		M	23	7 Aug. 1951	15	97.9	66	98/64	65.5	129.5	51.2	+ 25
		M	23	8 Aug. 1951	15	97.8	62	110/68	65.5	130.0	45.7	+ 12
B-4	Mekiana, H. . . .	M	47	6 Apr. 1951	16	98.1	68	110/78	67.0	156.5	46.4	+ 24
B-5	Ahgook, Bob . .	M	21	6 Aug. 1951	16	97.6	74	104/68	68.0	140.2	45.7	+ 10
		M	21	7 Aug. 1951	16	97.8	74	110/60	68.0	139.5	46.7	+ 12
		M	21	8 Aug. 1951	16	97.7	72	106/64	68.0	141.7	46.0	+ 10
B-6	Hugo, J.	M	30	6 Aug. 1951	15	97.0	58	120/78	67.5	140.2	40.5	+ 2
		M	30	7 Aug. 1951	15	96.7	54	114/66	67.5	140.2	38.0	— 4
		M	30	8 Aug. 1951	15	96.8	50	100/68	67.5	139.5	38.7	— 2

Table 25. (Cont.).

Subj. No.	Name	Sex	Age	Date	Fast. Hrs.	Oral temp. °F	Pulse rate	Blood press.	Height in.	Weight lbs.	BMR Cal/m²/hr.	BMR Deviation from DuBois Standard in percent
B-7	Morry, A.	M	22	3 Aug. 1951	18	97.6	64	128/92	66.0	137.0	52.5	+ 28
		M	22	4 Aug. 1951	18	97.3	60	112/80	66.0	138.0	49.8	+ 21
		M	22	5 Aug. 1951	18	97.2	58	118/88	66.0	137.5	47.3	+ 16
B-8	Ahgook, Ben ..	M	29	3 Aug. 1951	16	97.9	70	112/72	67.2	146.0	48.8	+ 22
		M	29	4 Aug. 1951	17	97.7	68	112/76	67.2	146.5	47.1	+ 18
		M	29	5 Aug. 1951	17	97.7	74	114/80	67.2	145.5	46.6	+ 16
B-9	Morry, B.	M	36	5 Aug. 1951	16	97.0	56	120/84	66.7	140.0	42.1	+ 8
B-10	Morry, J.	M	40	3 Aug. 1951	14	97.2	60	124/74	66.0	120.2	41.0	+ 8
		M	40	4 Aug. 1951	15	97.2	60	104/68	66.0	120.0	47.8	+ 26
		M	40	5 Aug. 1951	15	97.0	60	110/76	66.0	120.2	43.8	+ 15
B-11	Ahgook, J.	M	31	6 Aug. 1951	17	97.4	76	108/60	65.0	128.0	49.3	+ 23
	Kotzebue											
C-1	Curtis, J.	M	35	11 Dec. 1950	15	98.0	64	102/64	70.5	161.0	41.6	+ 7
		M	35	16 Dec. 1950	15	97.4	48	110/70	70.5	156.5	32.5	— 16
		M	35	19 Dec. 1950	15	97.2	54	110/66	70.5	157.5	37.1	— 5
C-2	Sours, M.	M	36	6 Dec. 1950	15	98.0	66	110/70	66.7	135.0	41.5	+ 8
		M	36	9 Dec. 1950	16	98.0	67	108/70	66.7	135.0	40.8	+ 6
C-3	Goodwin, W. .	M	36	10 Dec. 1950	16	98.4	71	114/68	65.0	149.0	41.9	+ 7
		M	36	15 Dec. 1950	14	97.6	60	102/62	65.0	144.2	41.5	+ 7
		M	36	28 June 1951	14	97.8	60	94/62	64.5	137.2	38.9	+ 1
		M	36	29 June 1951	13	96.8	50	100/68	64.5	136.2	36.8	— 5
		M	36	30 June 1951	13	96.9	52	88/58	64.5	136.2	38.0	— 5
C-4	Curtis, D.	M	31	11 Dec. 1950	17	98.2	74	108/68	66.2	146.2	42.0	+ 6
		M	31	16 Dec. 1950	16	98.2	70	92/48	66.2	144.5	41.3	+ 5
		M	31	17 Dec. 1950	14	98.1	66	100/46	66.2	145.5	56.8	— 6
C-5	Jones, C.	M	27	11 Dec. 1950	22	97.8	64	100/56	68.0	167.0	39.4	— 2
C-7	Arnold, C.	M	20	5 Dec. 1950	16	97.4	60	114/50	66.5	138.0	44.7	+ 6
		M	20	6 Dec. 1950	15	97.8	55	108/66	66.5	137.0	45.0	+ 7
C-8	Smith, I.	M	58	14 Dec. 1950	15	97.4	56	126/84	66.0	160.0	43.1	+ 18
		M	58	15 Dec. 1950	17	97.8	64	118/74	66.0	158.0	38.1	+ 5
C-9	Ticket, H.	M	49	10 Dec. 1950	17	98.1	62	108/74	61.5	115.0	39.0	+ 3
		M	49	17 Dec. 1950	14	97.0	63	110/78	61.5	114.0	36.6	— 2
C-11	Barr, C.	M	18	6 Dec. 1950	17	98.2	58	128/80	64.7	143.2	48.5	+ 11
		M	18	9 Dec. 1950	16	97.3	54	112/70	64.7	142.0	47.6	+ 10
		M	19	28 June 1951	13	97.0	60	110/74	65.2	145.0	46.6	+ 9
C-12	Ballod, O.	M	25	6 July 1951	15	97.5	70	116/68	66.7	149.5	46.9	+ 16
		M	25	7 July 1951	13	96.8	58	104/60	66.7	151.5	43.5	+ 6
C-13	Jones, J.	M	23	6 July 1951	15	97.4	52	90/56	66.0	130.7	41.3	± 0
		M	23	7 July 1951	14	97.0	52	92/58	66.0	133.2	43.1	+ 5
		M	23	8 July 1951	15	96.6	54	90/58	66.0	133.0	38.6	— 6
C-14	Ramoth, R.	M	19	6 July 1951	17	97.7	67	92/56	67.2	139.5	44.8	+ 5
		M	19	7 July 1951	16	97.5	52	92/60	67.2	141.5	42.5	± 0
		M	19	8 July 1951	16	97.7	58	94/60	67.2	139.0	39.9	— 6
C-15	Mitchell, C.	M	22	6 July 1951	16	98.2	51	114/70	68.5	146.0	39.7	— 3
		M	22	7 July 1951	16	97.5	56	100/58	68.5	147.2	41.1	+ 1
C-16	Vestal, D.	M	52	8 Dec. 1950	14	98.0	76	130/78	64.0	194.5	43.0	+ 26
		F	52	16 Dec. 1950	14	98.0	72	124/74	64.0	191.0	36.7	+ 8
		F	52	17 Dec. 1950	21	98.0	70	122/76	64.0	194.5	34.4	+ 1
		F	52	1 July 1951	17	98.4	66	118/68	64.0	197.0	31.5	— 7
C-17	Vestal, M.	F	21	8 Dec. 1950	15	97.8	55	98/76	62.2	132.0	33.4	— 8
		F	22	1 July 1951	13	97.0	56	102/74	62.0	131.5	36.5	+ 1
		F	22	2 July 1951	14	97.4	64	90/64	62.0	132.0	34.0	— 6
		F	22	3 July 1951	15	97.6	58	96/66	62.0	131.5	33.7	— 7

Table 25. (Cont.).

Subj. No.	Name	Sex	Age	Date	Fast. Hrs.	Oral temp °F	Pulse rate	Blood press.	Height in.	Weight lbs.	BMR Cal/m²/hr.	BMR Deviation from DuBois Standard in per cent
C-18	Kagoona, J.	F	23	8 Dec. 1950	17	98.0	70	110/70	64.0	158.5	35.3	— 3
		F	23	13 Dec. 1950	14	98.0	74	110/68	64.0	160.0	39.6	+ 9
		F	24	1 July 1951	13	98.6	74	104/68	64.0	151.5	40.8	+ 13
		F	24	2 July 1951	15	98.4	56	98/62	64.0	153.0	37.1	+ 3
		F	24	3 July 1951	17	98.6	78	108/72	64.0	153.3	36.8	+ 1
C-19	Analoak, M....	F	23	7 Dec. 1950	15	98.9	78	116/78	61.0	126.0	39.0	+ 7
		F	23	13 Dec. 1950	14	98.4	72	116/66	61.0	123.0	37.9	+ 4
		F	23	14 Dec. 1950	17	98.7	82	104/62	61.0	124.0	43.1	+ 18
		F	23	19 Dec. 1950	20	98.2	66	104/72	61.0	125.0	39.0	+ 8
		F	24	1 July 1951	16	97.8	62	116/80	61.5	130.5	36.7	+ 2
		F	24	2 July 1951	16	98.9	58	108/74	61.5	129.5	41.1	+ 13
		F	24	3 July 1951	14	97.8	64	112/82	61.5	130.0	37.3	+ 3
C-20	Tikik, M.	F	31	8 Dec. 1950	17	98.5	70	102/70	63.2	116.0	31.9	— 10
C-21	Norton, L.	F	30	12 Dec. 1950	16	98.3	72	112/74	61.2	160.5	33.2	— 7
C-22	Mills, A........	F	44	7 Dec. 1950	16	97.8	82	114/66	61.7	113.0	41.5	+ 15
C-23	Sours, B.	F	38	12 Dec. 1950	15	98.7	80	106/60	62.0	148.0	30.0	— 16
		F	38	15 Dec. 1950	15	98.6	82	108/62	62.0	148.0	31.5	— 12
C-24	Barr, E.	F	22	7 Dec. 1950	17	98.0	70	102/68	64.0	140.0	41.8	+ 15
		F	22	12 Dec. 1950	16	97.8	68	102/64	64.0	136.0	36.7	+ 1
C-25	Otton, I.	F	30	5 Dec. 1950	17	99.0	88	118/72	62.0	160.0	36.7	+ 2
		F	30	10 Dec. 1950	17	98.5	76	112/68	62.0	161.5	33.7	— 5
		F	30	11 Dec. 1950	17	98.5	76	98/60	62.0	162.0	34.8	— 2
		F	30	13 Dec. 1950	20	98.2	66	108/66	62.0	162.0	35.1	— 2
	Gambell											
D-1	Slwooko, V. ...	M	33	5 March 1951	16	97.6	58	116/64	66.5	154.5	44.7	+ 13
		M	33	6 March 1951	16	97.4	52	96/60	67.5	152.5	45.0	+ 14
		M	33	7 March 1951	16	98.1	58	90/54	67.7	153.5	43.0	+ 11
D-2	James, W.	M	27	8 March 1951	17	97.9	60	90/60	66.5	147.0	43.2	+ 8
		M	27	9 March 1951	18	98.0	57	100/70	66.5	146.5	40.6	+ 1
D-3	Chauncy, W....	M	19	11 March 1951	15	98.1	76	120/70	65.2	131.5	54.6	+ 28
		M	19	12 March 1951	15	98.2	60	98/70	65.5	129.5	47.2	+ 11
		M	19	13 March 1951	15	97.2	64	96/66	65.5	130.5	43.0	+ 1
D-4	Iyakitan, L. ...	M	21	11 March 1951	16	97.9	58	104/68	66.0	131.0	52.3	+ 26
		M	21	12 March 1951	16	98.0	56	92/68	66.2	130.2	53.2	+ 28
		M	21	13 March 1951	16	97.2	48	90/60	66.2	131.0	45.8	+ 10
D-5	Walunga, W....	M	24	14 March 1951	16	98.0	60	106/70	66.2	146.5	46.3	+ 15
		M	24	15 March 1951	16	98.0	56	98/60	66.2	145.7	42.8	+ 6
		M	24	16 March 1951	16	98.3	64	96/60	66.2	144.7	47.8	+ 19
D-6	Iyakitan, D. ...	M	30	11 March 1951	17	97.8	45	100/70	65.5	135.5	40.7	+ 3
		M	30	12 March 1951	17	98.1	88	90/72	65.5	134.2	46.7	+ 18
		M	30	13 March 1951	17	97.9	72	88/62	65.5	133.5	39.2	± 0
		M	30	16 Aug. 1951	16	97.8	52	104/60	65.2	136.0	47.0	+ 18
		M	30	17 Aug. 1951	16	97.4	46	100/58	65.2	136.5	45.2	+ 14
		M	30	18 Aug. 1951	16	97.3	42	98/62	65.2	136.5	47.0	+ 18
D-7	Iyakitan, C. ...	M	39	16 Aug. 1951	16	98.3	42	90/56	69.0	157.5	36.8	— 5
		M	39	17 Aug. 1951	16	97.4	46	94/68	69.0	159.5	35.5	— 9
		M	39	18 Aug. 1951	16	97.6	42	102/72	69.0	158.7	34.5	— 11
D-8	Slwooko, J. ...	M	24	5 March 1951	15	97.3	52	100/70	66.0	144.0	42.6	+ 6
		M	24	6 March 1951	15	96.6	49	98/64	66.7	144.5	42.8	+ 5
		M	24	7 March 1951	15	97.3	46	96/60	66.7	143.0	38.7	— 4
D-9	Harry, Don ...	M	30	5 March 1951	16	98.1	50	96/56	66.0	138.0	44.4	+ 12
		M	30	6 March 1951	16	97.1	53	100/64	66.0	141.0	43.1	+ 9
		M	30	7 March 1951	17	97.9	48	86/54	66.0	140.0	43.1	+ 9
		M	30	16 Aug. 1951	14	97.6	48	96/68	65.7	142.0	37.7	— 5
		M	30	17 Aug. 1951	15	97.8	50	96/64	65.7	143.0	40.7	+ 2
		M	30	18 Aug. 1951	14	97.4	56	102/68	65.7	143.5	38.1	4
		M	30	22 Aug. 1952	17	97.4	43	98/56	65.7	143.0	40.4	+ 2

Table 25. (Cont.).

Subj. No.	Name	Sex	Age	Date	Fast. Hrs.	Oral temp. °F	Pulse rate	Blood press.	Height in.	Weight lbs.	BMR Cal/m²/hr	BMR Deviation from DuBois Standard in per cent
D-10	Aningayou, J. . .	M	35	16 Aug. 1951	18	98.0	58	108 68	66.2	140.5	39.5	+ 1
		M	35	17 Aug. 1951	18	97.3	56	98 62	66.2	141.5	39.6	+ 2
		M	35	18 Aug. 1951	18	97.3	50	98 66	66.2	140.7	39.5	+ 1
		M	35	22 Aug. 1951	17	96.8	50	100 66	66.2	140.5	37.5	— 4
D-11	Slwooko, R. . . .	M	18	5 March 1951	16	98.6	66	110 64	67.0	150.0	43.9	+ 2
		M	18	6 March 1951	16	97.6	60	114 64	67.7	148.0	45.2	+ 5
		M	18	7 March 1951	17	97.8	50	108 66	68.0	147.0	43.5	+ 1
D-12	Slwooko, H. . . .	M	31	5 March 1951	17	97.8	48	110 68	66.5	163.5	47.2	+ 19
		M	31	6 March 1951	17	97.0	48	102 60	67.0	163.0	40.5	+ 2
		M	31	7 March 1951	16	97.4	47	104 66	67.5	165.0	44.2	+ 11
D-13	Oozevoseuk, C.	M	25	8 March 1951	15	98.3	62	100 68	62.5	133.0	49.0	+ 22
		M	25	9 March 1951	16	97.7	56	90 58	62.2	133.0	49.0	+ 22
		M	25	10 March 1951	15	97.7	58	100 70	62.5	134.0	43.5	+ 7
D-14	Appassingok, H.	M	24	8 March 1951	16	97.6	60	114 66	65.7	130.0	44.9	+ 12
		M	24	9 March 1951	17	97.4	56	100 64	66.5	129.5	36.0	— 10
		M	24	10 March 1951	16	97.3	58	100 68	66.2	129.5	39.1	— 2
D-16	Silook, R.	M	27	8 March 1951	16	97.9	47	104 64	66.5	152.0	41.6	+ 3
		M	27	9 March 1951	17	98.0	48	118 68	66.5	151.2	41.6	+ 3
		M	27	10 March 1951	17	97.8	44	104 68	66.5	150.0	44.3	+ 9
D-17	Antaghame, J. . .	M	39	11 March 1951	16	97.7	52	100 70	63.5	134.0	41.3	+ 6
		M	39	12 March 1951	16	98.0	60	84 66	63.5	134.0	39.9	+ 3
		M	39	13 March 1951	16	97.9	56	90 68	63.5	133.7	40.2	+ 3
D-18	Iyakitan, L. . . .	M	24	11 March 1951	17	97.0	44	98 68	64.7	138.0	39.9	— 1
		M	24	12 March 1951	16	97.6	52	86 60	64.5	136.2	45.2	+ 11
		M	24	13 March 1951	16	97.3	44	96 64	64.7	134.7	37.2	— 7
D-19	Nawpokuhok, L.	M	19	14 March 1951	15	98.3	68	100 64	66.2	132.2	44.3	+ 5
		M	19	15 Mareh 1951	15	97.7	64	88 68	66.2	132.5	44.0	+ 5
		M	19	16 March 1951	15	98.0	62	88 60	66.2	133.2	41.7	— 1
D-20	Aningayou, N. .	M	39	14 March 1951	16	96.9	52	88 60	66.5	145.7	37.4	4
		M	39	15 March 1951	16	97.0	54	88 60	66.5	144.2	42.0	+ 8
		M	39	16 March 1951	16	97.5	54	92 62	66.5	144.0	42.4	+ 9
D-21	Konahok, H. . .	M	38	14 March 1951	17	97.9	60	90 70	64.2	128.7	41.7	+ 6
		M	38	15 March 1951	17	96.8	48	86 66	64.2	128.0	42.1	+ 8
		M	38	16 March 1951	17	97.2	50	84 66	64.2	129.0	41.5	+ 7
D-22	Iknokinok, C. . .	M	24	14 March 1951	17	98.1	48	92 70	65.2	144.2	47.1	+ 15
		M	24	15 March 1951	17	98.1	58	98 66	65.2	144.0	48.6	+ 18
		M	24	16 March 1951	17	98.3	46	100 60	65.2	144.2	45.0	+ 10
D-23	Malegoohtik, F.	F	44	20 March 1951	17	97.8	78	118 78	60.0	126.0	46.2	+ 29
		F	44	21 March 1951	17	97.8	78	116 78	60.0	124.7	42.8	+ 20
		F	44	22 March 1951	17	97.7	78	108 68	60.0	124.0	37.2	+ 4
D-24	Nawpokuhok, G.	F	23	20 March 1951	16	99.2	90	110 70	60.5	122.0	50.0	+ 39
		F	23	21 March 1951	16	98.7	78	100 66	60.5	121.0	46.8	+ 30
		F	23	22 March 1951	16	98.6	68	84 56	60.5	120.0	43.0	+ 20
D-25	Slwooko, B. . . .	F	32	20 March 1951	15	98.5	90	138 80	61.5	124.0	48.7	+ 36
		F	32	21 March 1951	15	98.3	66	128 84	61.5	126.5	44.2	+ 24
		F	32	22 March 1951	15	98.4	68	130 74	61.5	126.0	44.8	+ 25
		F	32	19 Aug. 1951	18	99.0	76	126 78	61.2	125.0	42.7	+ 19
		F	32	20 Aug. 1951	18	98.6	68	110 70	61.2	124.5	39.1	+ 9
		F	32	21 Aug. 1951	18	98.0	64	118 74	61.2	124.2	40.0	+ 12
D-26	Iyakitan, V.	F	24	19 Aug. 1951	17	99.2	80	122 70	65.0	132.5	43.0	+ 19
		F	24	20 Aug. 1951	17	99.3	80	128 74	65.0	132.5	43.0	+ 19
		F	24	21 Aug. 1951	17	98.5	82	126 76	65.0	132.5	40.5	+ 11
D-27	Omwari, P. . . .	F	25	19 Aug. 1951	16	98.6	44	108 74	61.7	127.7	39.8	+ 11
		F	25	20 Aug. 1951	16	98.8	44	124 86	61.7	128.0	34.0	— 5
D-28	Oyaghok, M. . .	F	21	20 March 1951	16	98.7	92	112 68	59.5	125.0	49.8	+ 36
		F	21	21 March 1951	16	98.7	64	98 66	59.2	125.5	46.2	+ 27
		F	21	22 March 1951	16	98.5	58	96 68	59.5	124.5	49.5	+ 36
		F	21	19 Aug. 1951	16	98.4	64	108 70	59.0	124.5	39.5	+ 10
		F	21	20 Aug. 1951	16	98.9	64	102 66	59.0	125.0	37.9	+ 4
		F	21	21 Aug. 1951	16	98.0	66	104 62	59.0	125.0	39.7	+ 10

relative reduction was higher in women than in men, as is evident from table 27, showing the average the reduction in the BMR in the different groups.

It is also observed that the reduction in the basal metabolism by repeated tests, is greatest in the subjects showing the highest levels of metabolism at the first test, as is evident from the following extract from table 26.

Reduction of BMR by Repeated Tests in Relation to Deviation from the DuBois Standard at First Test.

		Deviation from DuBois Standard at first test			
		< 5 %	5—14 %	15—24 %	> 24 %
Men	Reduction:	3.7	6.1	10.7	21.5
	Number:	13	18	11	2
Women	Reduction:	5.0	10 4	15.8	18 0
	Number:	3	5	5	5

T a b l e 26.

Showing Reduction in the BMR in Eskimos as the Result of Repeated Tests.

Subject	Deviation from DuBois Standard, %		Reduction
	First BMR test	Final BMR test	
Barter Island			
Men: A-1	+ 7	— 1	8
A-2	+ 6	+ 6	0
A-3	+ 23	+ 13	10
A-8	+ 1	— 4	5
A-9	+ 3	— 4	7
Women: A-10	+ 24	+ 9	15
A-12	+ 5	— 10	15
A-13	+ 14	+ 8	6
A-14	+ 23	— 1	24
A-15	+ 18	± 0	18
Anaktuvuk Pass			
Men: B-3	+ 24	+ 12	12
B-5	+ 10	+ 10	0
B-6	+ 2	— 2	4
B-7	+ 28	+ 16	12
B-8	+ 22	+ 16	6
B-10	+ 8	+ 8	0

Table 26. (Cont.).

Subject	Deviation from DuBois Standard, %		Reduction
	First BMR test	Final BMR test	
Kotzebue			
Men: C-1	+ 7	— 16	23
C-2	+ 8	+ 6	2
C-3	+ 7	+ 7	0
C-4	+ 6	— 6	12
C-7	+ 6	+ 6	0
C-8	+ 18	+ 5	13
C-9	+ 3	— 2	5
C-11	+ 11	+ 10	1
C-12	+ 16	+ 6	10
C-13	± 0	— 6	6
C-14	+ 5	— 6	11
C-15	— 3	— 3	0
Women: C-16	+ 26	+ 1	25
C-17	+ 1	— 7	8
C-18	+ 13	+ 1	12
C-19	+ 7	+ 4	3
C-23	— 16	— 16	0
C-24	+ 15	+ 1	14
C-25	+ 2	— 5	7
Gambell			
Men: D-1	+ 13	+ 11	2
D-2	+ 8	+ 1	7
D-3	+ 28	+ 1	27
D-4	+ 26	+ 10	16
D-5	+ 15	+ 6	9
D-6	+ 3	± 0	3
D-7	— 5	— 11	6
D-8	+ 6	— 4	10
D-9	+ 12	+ 9	3
D-10	+ 1	— 4	5
D-11	+ 2	+ 1	1
D-12	+ 19	+ 2	17
D-13	+ 22	+ 7	15
D-14	+ 12	— 10	22
D-16	+ 3	+ 3	0
D-17	+ 6	+ 3	3
D-18	— 1	— 7	6
D-19	+ 5	— 1	6
D-20	— 4	— 4	0
D-21	+ 16	+ 7	9
D-22	+ 15	+ 10	5
Women: D-23	+ 29	+ 4	25
D-24	+ 39	+ 20	19
D-25	+ 36	+ 24	12
D-26	+ 19	+ 11	8
D-27	+ 11	— 5	16
D-28	+ 36	+ 27	9

Table 27.

Location	Average reduction of BMR in % by repeated tests		
	Men	*Women*	*Men and women*
Barter Island	8	16	11
Anaktuvuk Pass	6	—	—
Kotzebue	7	10	8
Gambell	8	15	10

In the normal white controls, the following observations were made: In a group of 21 untrained persons, undergoing the first test, the average of the first BMR was ± 0 (variations + 14 to — 14 %), i. e. 41.6 cal/m²/hr. (variations 35.7 to 48.0) (see table 28).

Table 28.

BMR in Untrained White Controls Undergoing the First Test.

Subject	Age	Cal/m²/hr.	Deviation from DuBois Standard, %
Bryan	21	43.5	+ 4
Malek	27	39.6	— 3
Varner	20	44.8	+ 8
Beltran	20	39.8	— 5
Herrera	22	41.6	+ 1
Reese	20	48.0	+ 13
Kirwin	22	38.2	— 5
Isenberg	20	41.3	— 1
Jaramillo	20	47.5	+ 14
Bricker	20	35.7	— 14
Laurence	19	36.5	— 13
O'Brien	21	43.3	+ 4
Vidal	21	38.1	— 9
Davis	19	44.3	+ 5
Geist	20	42.4	+ 2
Koontz	19	39.5	— 7
Lacey	20	41.7	± 0
Lanning	21	41.8	± 0
Manulski	20	43.8	+ 5
Schunk	21	39.7	— 4
White	22	41.8	+ 2
	Mean	41.6	± 0

In a group of trained personnel well acquainted with the technique of the test and the technician performing the test, the first BMR was on an average 6 % lower than the DuBois standard (see table 29).

In a group of four White men examined repeatedly on different occasions under strictly controlled conditions, an average reduction of 9 % in the BMR was observed between the first and the final test, which is the same figure as found in Eskimo subjects examined by repeated tests. (see table 30).

Table 29.

Subject	Age	Cal m² hr.	Deviation from DuBois Standard, %
Hammer	26	37.7	— 7
Gorski	25	37.0	— 8
Long	23	40.8	± 0
Bollerud	36	36.6	— 6
Dunbar	21	37.7	— 8
Mean	—	38.0	— 6

Table 30.

Subject	Age	First Test		3rd and 4th Test		Difference
		Cal m² hr.	Deviation from DuBois Standard, %	Cal m² hr.	Deviation from DuBois Standard, %	
Bryan	21	43.5	+ 4	40.2	— 4	8
Malek	27	39.6	— 3	35.1	— 12	9
Varner	20	44.8	+ 8	39.4	— 5	13
Beltran	20	39.8	— 5	36.5	— 13	8
Mean	—	—	+ 1	—	— 8	9

When these four White subjects were admitted to the laboratory and examined on three consecutive days, as in the case of the Eskimos, the first test showed an average BMR 2 % below DuBois standard, the second test 6 % below, and the third test 8 % below DuBois standard (see table 31). In another group of 12 White men examined later, similar findings were made, the average of the first test being ±0, and the average of the final test being 6 % lower than the DuBois standard.

It should be noted that the so-called DuBois standards are generally recognized as being 6—8 % too high, and that the original level, published in 1916, included the factors of tension in patients undergoing their first or second test.

It was observed that the Eskimo groups that had the highest basal metabolic rates also had the highest protein intake, and when comparing the BMR with the urinary nitrogen elimination, the same positive correlation was observed (see fig. 17). The highest BMR's and nitrogen eliminations were observed at Anaktuvuk Pass among the caribou meat eaters where the fasting urinary nitrogen at times was as high at 3 g per hour. The relation between the average BMR, the average daily protein intake at the four Eskimo settlements, and the urinary nitrogen elimination determined during a 5-hour period is shown in table 32.

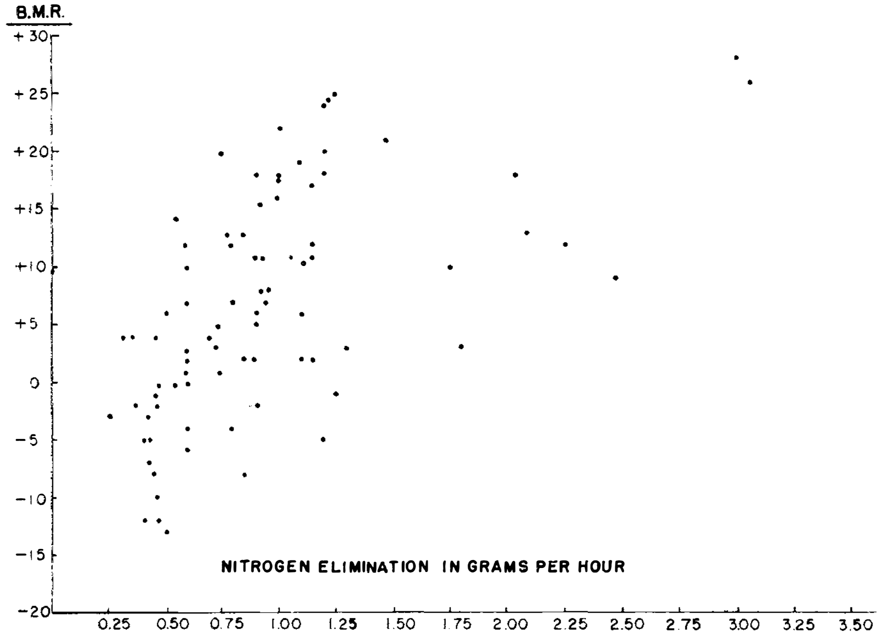

Fig. 17. Relation between BMR and Urinary Nitrogen.

Table 31.

Showing the Effect of Repeated Tests on the BMR in White Controls.

Name	Sex	Age	Date	Fast. Hrs.	Oral Temp. °F	Pulse Rate	Blood Press.	Height in.	Weight lbs.	BMR Cal/m².hr.	BMR Deviation from DuBois Standard in Per Cent
Bryan, T.	M	21	11 June 1951	18	98.0	72	112/70	68.0	135.7	43.3	+ 3
	M	21	12 June 1951	18	98.1	62	100/68	68.0	135.5	41.1	— 2
	M	21	13 June 1951	18	97.7	58	100/66	68.0	135.5	40.2	— 4
Malek, F.	M	27	11 June 1951	17	98.0	62	112/72	71.2	171.2	39.1	— 3
	M	27	12 June 1951	17	98.0	64	114/76	71.2	171.2	38.0	— 6
	M	27	13 June 1951	17	97.7	62	114/78	71.2	171.2	35.1	— 12
Varner, C.	M	20	11 June 1951	16	97.2	54	126 88	72.0	178.2	41.6	± 0
	M	20	12 June 1951	16	97.0	54	108/80	72.0	178.0	39.4	— 5
	M	20	13 June 1951	16	97.0	54	114 82	72.0	179.2	39.4	— 5
Beltran, G.	M	20	11 June 1951	15	97.6	66	106/74	65.5	128.7	37.8	— 10
	M	20	12 June 1951	15	97.4	60	105/74	65.5	129.0	37.1	— 12
	M	20	13 June 1021	15	97.5	62	104/72	65.5	129.5	36.5	— 13

It was also observed that the basal metabolism was higher in the winter when the protein intake was increased, than in the summer. At Barter Island the BMR was 5—24 % higher, and at Kotzebue 0—19 % higher in the winter than in the summer. At Gambell the average daily protein intake as well as the urinary nitrogen elimination was 20 %

Table 32.

Average Basal Metabolic Rate, Protein Intake and Urinary Nitrogen Elimination in Eskimos.

Location	Basal Metabolic Rate		Protein Intake g per 24 hours	Fasting Urinary Nitrogen g per hour
	Cal m^2 hr.	Deviation from DuBois Standard, %		
Anaktuvuk Pass	46.3	+ 16	202	0.9
Gambell	42.9	+ 10	132	0.8
Barter Island	39.7	+ 2	129	0.6
Kotzebue	40.2	+ 3	98	0.6

higher in March than in August. In March the basal metabolic rate was 11 % higher than the DuBois Standard, while in August it was only 6 % over the DuBois Standard.

The relation between the high basal metabolism in the Eskimo and the diet has been suggested long ago by several workers, such as Heinbecker (1931), and later Høygaard (1941). Heinbecker studied the basal metabolism of Eskimos at Baffin Island in 1926 and again in 1930. During his first visit he found abnormally high figures for the basal metabolism associated with a high nitrogen metabolism, while during his second visit the basal metabolism was more than 20 % lower, and the nitrogen metabolism was markedly reduced.

On the other hand, Odin (1937), who had observed that while basal metabolism was below DuBois standard in Whites from Norrbotten in Northern Sweden, found that a significant rise in the basal metabolism occurred after an addition of 120—150 g protein daily in the diet. Similar observations have been made by McClellan and collaborators (1931) and others.

Aub and DuBois (1917) observed a rise in the metabolism of 46 per cent above the basal level in their achondroplastic dwarf following a single meal of 662 g meat.

Glickman et al. (1948) examined the specific dynamic action of two diets containing 7 and 37 per cent of protein calories in 6 young men for periods of 6 to 7 hours post prandium. The total specific dynamic action was calculated to be 17.0 per cent for the high-protein and 9.6 per cent for the high-carbohydrate group of the total calories consumed (approximately 1000 calories).

It is well known that considerably higher amounts of protein are regularly consumed by the Eskimos (DuBois 1928) who, generally speaking, prefer a diet where approximately 50 % of the calories come from protein and the greater part of the remaining 50 % is derived from fat. August and Marie Krogh (1913) report that the normal diet of the West Greenland Eskimos contained an excessive amount of animal protein,

Table 33.

Showing Basal Metabolic Rates, Protein Intake and Urinary Nitrogen Elimination in Eskimos Changing to White Man's Diet.

Subj. No.	Date	Fast. Hrs.	Oral temp. °F	Pulse rate	Blood press.	Height in.	Weight lbs.	Nitrogen at last meal 11—18 hrs. prior to BMR	Fasting Urinary Nitrogen g/hr.	BMR Cal/m² hr.	BMR Deviation from DuBois Standard in per cent
A-1	12 Feb. 1951	18	98.2	50	112/66	68.0	136.5	167	0.4	42.0	± 0
	13 Feb. 1951	16	97.3	61	120/74	68.0	140.0	62	0.4	43.1	+ 3
	14 Feb. 1951	18	98.2	56	118/70	68.2	136.7	107	0.5	42.0	+ 1
	16 Feb. 1951	20	98.0	56	108/60	68.2	135.0	-	-	41.9	— 3
	19 Feb. 1951	16	97.4	56	110/76	67.7	135.0	-	-	37.2	— 10
A-2	12 Feb. 1951	17	98.3	48	100/70	66.0	155.0	100	0.3	43.8	+ 10
	13 Feb. 1951	18	97 9	52	108/70	66.2	156.0	22	0 4	43.1	+ 7
	14 Feb. 1951	17	97.7	54	108/70	65.7	156.0	80	0.4	43.8	+ 10
	15 Feb. 1951	21	97.8	46	112/76	66 0	156.7	-	-	41.1	+ 3
	19 Feb. 1951	18	97.3	42	104/72	66.0	156.0	-	-	38.3	— 4
A-3	12 Feb. 1931	18	98.6	56	112/60	64.2	118.0	86	0.3	50.3	+ 16
	13 Feb. 1951	17	98.0	52	116/66	64.5	119.0	46	0.4	42.5	— 2
	14 Feb. 1951	18	98.2	56	100/64	64 5	118.2	103	0.4	45.5	+ 5
	16 Feb. 1951	16	98.1	54	100/60	64.5	117.0	-	-	41.4	— 4
	19 Feb. 1951	17	98.2	65	100/64	64.2	119.0	-	-	43.2	— 1
A-4	12 Feb. 1951	16	98.1	66	102 70	64.5	174.0	87	0.3	37.5	± 0
	13 Feb. 1951	19	97.5	64	112/74	64.2	174.7	56	0.5	36.3	— 3
	14 Feb. 1951	16	97.4	61	106/70	64.0	174.0	92	0.4	39.2	+ 5
	15 Feb. 1951	16	97.2	56	102/74	64.2	173.2	-	-	32.1	— 14
B-1	6 April 1951	13	98.8	60	130/90	65.5	129.0	79	0.9	50.6	+ 22
	7 April 1951	15	98.2	56	106/62	65.5	128.7	30	0.6	43.8	+ 6
	8 April 1981	15	98.0	50	120/74	65.5	132.0	48	0.5	40.8	— 1
	9 April 1951	15	98.5	56	120/70	65.5	132.2	19	0.3	41.7	± 0
	10 April 1951	16	98.4	56	130 80	65.5	132.7	-	-	42.2	+ 1
B-3	6 April 1951	15	98.4	60	118/78	66.0	132.2	56	0.8	44.7	+ 9
	7 April 1951	17	98.4	52	128 88	65.7	132.7	23	0.5	47.1	+ 15
	8 April 1951	17	97.0	46	108/74	66.0	133.7	40	0.4	40.8	± 0
	9 April 1951	17	97.4	50	118/78	66.0	134.0	22	0.2	37.4	— 8
	10 April 1951	20	97.8	50	110/78	66.0	133.2	-	-	36.9	— 9
C-1	5 Feb. 1951	19	97.5	55	114/68	70.0	161.0	27	0.4	42.6	+ 9
	6 Feb. 1951	19	96.9	54	100/68	70.0	157.7	34	0.4	41.5	+ 6
	7 Feb. 1951	18	97.4	56	116/66	70.5	157.0	48	0.3	36.3	— 6
	8 Feb. 1951	16	97.8	58	108/68	70.5	156.7	-	-	34.5	— 14
C-2	5 Feb. 1951	16	98.0	59	112/74	66.7	132.0	22	0.3	40.5	+ 5
	6 Feb. 1951	18	97.2	60	114/74	66.7	132.0	32	0.4	37.9	— 2
	7 Feb. 1951	15	97.7	54	110/70	67.0	133.0	38	0.4	38.0	— 2
C-3	5 Feb. 1951	17	97.8	50	92 64	64.5	141.5	23	0 3	40.8	+ 5
	6 Feb. 1951	17	97.4	60	112 66	64.5	141.0	33	0.3	37.9	— 2
	7 Feb. 1951	16	97.9	56	114/70	64.5	140.5	42	0.3	38.4	± 0
	9 Feb. 1851	23	98.3	60	110 76	64.5	136.5	-	-	32.7	— 15
C-4	5 Feb. 1951	18	97.2	56	102/64	66.2	146.2	27	0.5	35.1	— 11
	6 Feb. 1951	16	96.9	58	96 66	66.2	148.0	29	0.3	34.0	— 13
	7 Feb. 1951	17	97.2	64	114/64	66.2	147.0	52	0.3	34.4	— 13
	8 Feb. 1951	20	97.6	67	100/58	66.3	145.0	-	-	36.8	— 7
D-1	26 March 1951	16	97.8	54	110/70	67.2	154.2	40	0.3	41.2	+ 4
	27 March 1951	15	96.7	50	96/68	67.2	153.5	39	0.3	37.5	— 6
	28 March 1951	15	97.0	46	106/72	67.2	154.5	59	0.5	39.4	± 0
	29 March 1951	16	97.2	48	114 80	67.0	154.5	86	-	38 0	— 4
	31 March 1951	15	97.5	52	110/74	67.2	155.0	10	-	38.0	— 4

Table 33. (Cont.).

Subj. No.	Date	Fast. Hrs.	Oral temp. °F	Pulse rate	Blood press.	Height in.	Weight lbs.	Nitrogen at last meal 14—18 hrs. Prior to BMR	Fasting Urinary Nitrogen g/hr.	BMR Cal/m²/hr.	BMR Deviation from DuBois Standard in per cent
D-2	26 March 1951	17	98.5	54	100 68	66.7	145.0	25	0.6	48 2	+20
	27 March 1951	16	97.3	54	94/60	66.7	145.2	35	0.5	44.3	+ 9
	28 March 1951	16	97.3	50	88 64	66.7	144.5	39	-	42.6	+ 5
	29 March 1951	20	98.0	52	84 60	66 5	143.5	53	-	39.1	— 3
	30 March 1951	16	97.6	54	84/56	66.7	145.2	7	-	39.7	— 1
D-3	26 March 1951	18	98.0	54	100/74	66.0	132.0	18	-	43.1	+ 2
	27 March 1951	16	97.5	58	106 78	65.5	132.5	14	-	41.3	— 3
	28 March 1951	16	97.8	52	108 78	65.7	131.0	35	0.6	41.9	— 1
	30 March 1951	16	97.3	52	114/68	65.5	131.5	-	-	39.2	— 8
	31 March 1951	17	97.8	50	104 84	65.5	130.7	14	-	38.8	— 9
D-4	26 March 1951	19	98.0	54	102 70	66.0	130.0	27	0.4	44.9	+ 8
	27 March 1951	18	97.7	49	98/62	66.0	129.5	23	0.2	44 0	+ 6
	28 March 1951	17	97.6	52	108/70	66.0	130.0	38	0.3	44.9	+ 8
	30 March 1951	20	98.1	51	112/70	66.0	130.2	-	-	42.9	+ 3
	31 March 1951	18	98.2	58	100/68	66.0	129.5	14	-	40 2	— 3

— 280 grams daily, and they noted that there seemed to be a considerable delay in the metabolism of protein and excretion of nitrogen, only 60 % of the nitrogen being excreted in the first 24 hours after large meals rich in protein. In their feeding experiments they observed an intake of 1804 g boiled meat a day, containing 85 g nitrogen and 218 g fat. The loss of nitrogen in the faeces was 3—5 g per day, and the maximum quantity of nitrogen found in the urine was 53 g in a day. Several subjects eliminated more than 3 g nitrogen per hour, and one reached 4.9 g per hour. In East Greenland the Eskimos consume an average of 300 grams of protein daily (Høygaard 1941). In Alaska a daily protein consumption of more than 300 g has been observed among the most primitive Eskimos.

In order to study the significance of the specific dynamic action of the protein in the high meat diet, with reference to the high basal metabolic rates in Eskimos, a special series of studies was carried out on representative subjects from each of the four groups. These subjects, 14 men in all, were first studied in the field on their normal native diet, and then brought into our laboratory at Ladd Field where the basal metabolism was again tested under carefully controlled conditions on three or more different days while the subjects were eating the normal White man's diet. We then found that in all cases the basal metabolic rates were reduced to the range of the normal White controls examined under similar conditions and on the same diet (table 33 and table 34).

Table 34.

Basal Metabolic Rates in Per Cent of DuBois Standard in 14 Eskimo Men.

Location	Subject No.	On Native Diet	On White Man's Diet
Gambell	D-1	+ 11	— 6
	D-2	+ 1	— 3
	D-3	+ 1	— 9
	D-4	+ 10	— 3
Barter Island ...	A-1	+ 9	— 10
	A-2	+ 14	— 4
	A-3	+ 13	— 4
	A-4	+ 6	— 14
Kotzebue	C-1	— 16	— 14
	C-2	+ 8	— 2
	C-3	+ 7	— 15
	C-4	— 6	— 13
Anaktuvuk Pass	B-1	+ 14	— 1
	B-3	+ 12	— 9
	Mean	+ 8	— 8

Table 35.

Average Basal Metabolism, Protein Intake and Urinary Nitrogen Elimination of Normal White Controls Compared with Eskimos on White Man's Diet.

Subjects	Basal Metabolic Rate		Protein Intake g per 24 hours	Fasting Urinary Nitrogen g per hour
	Cal/m²/hr.	Deviation from DuBois Standard in per cent		
Normal White Controls (♂):				
1st Test	40.4	— 2	75	0.4
2nd Test	38.9	— 6	70	0.5
3rd Test	37.8	— 8	60	0.4
Eskimos (♂) on White Man's Diet	37.4	— 8	73	0.4

At the same time, the urinary nitrogen elimination was reduced to the same level as that of White controls. Thus, when examined in their native habitat, the average BMR of all the 14 Eskimo subjects on the third and subsequent days was 8 % higher than the DuBois standard, and the average nitrogen elimination was 1.2 g per hour in these Eskimos. The average BMR in the same Eskimos when living on the White man's diet at Ladd Field was 8 % lower than the DuBois standard, and the urinary nitrogen was reduced to 0.4 g per hour. In a group of 4 normal White men of similar age examined on three successive days under similar conditions and on the same diet, the final BMR was the same as in the

Table 36.

Basal Metabolism in Four Eskimo Men from Gambell on Different Diets.

Subj. No.	BMR: Deviation from DuBois Standard in per cent		
	On Native Diet Average protein intake: 175 g/day	On White Man's Diet Average protein intake: 72 g/day	On High Meat Diet Average protein intake: 225 g/day
D-1	+ 11	— 6	+ 7
D-2	+ 1	— 3	+ 9
D-3	+ 1	— 9	+ 15
D-4	+ 10	— 3	+ 17
Mean	+ 6	— 5	+ 12

Table 37.

BMR in White Controls on a Normal Diet and on a High Meat Diet.

Subject	BMR: Deviation from the DuBois Standard in Per Cent		
	On Normal White Man's Diet	On High Meat Diet, 137 g protein daily	Difference in per cent
O'Brien	— 9	+ 8	17
Geist	— 16	+ 1	17
Koontz	— 17	+ 3	20
Lacey	± 0	— 8	— 8
Manulski	— 2	+ 4	6
Schunk	— 15	+ 8	23
Mean	— 10	+ 2	12

Eskimos: 8 % lower than the DuBois standard, and their urinary nitrogen elimination was the same as that of the Eskimos (table 35).

Similar findings were made in another group of 12 White men examined later. It may be added that normal White controls examined by Dr. E. F. DuBois in New York (personal communication) excreted about 0.5 g urinary nitrogen per hour 14 to 18 hours after the last meal.

In a separate experiment, the Gambell group was given a high meat diet, and their basal metabolism went up to 12 % over the DuBois standard (table 36).

A similar experiment, using normal White subjects on a high meat diet similar to that of the Eskimos, failed because of the fact that it was impossible for the subjects to become accustomed to eating such great quantities of meat within the short time available for the experiment. In a later experiment, however, a group of 6 normal White men consumed 500 grams of meat daily (137 grams protein or 21.9 grams nitrogen), and an increase in the BMR of 12 % was observed (table 37).

It is interesting to note that an Eskimo soldier who had lived for several months on the normal mess hall diet, had a basal metabolic rate 4 % lower than the DuBois standard. It should also be noted that the above reported findings are essentially the same both in the 67 full-blooded Eskimos and in the 6 half-breeds examined.

Twenty R.Q. determinations were made in a group of 5 Eskimo subjects living on their native diet. The average R. Q. was 0.82, which is the figure upon which the calculations are based.

VI. Discussion.

It is hardly fair to compare the metabolism of Eskimos on high protein diets with White people on comparatively low protein diets, and perhaps one would be justified in speaking of an "Eskimo basal condition". In most of the previous studies the Eskimo subjects apparently were not basal, and our subjects were not strictly basal until the third day on White man's diet. However, since we determined the basal metabolism 14—18 hours after the last meal, this would normally fulfill the requirement for "standard metabolism", "post absorptive metabolism", or "basal metabolism".

On the basis of the reported data, it is definitely established that the basal metabolism of the Eskimo when examined for the first time while living in his native habitat, is signifcantly higher than in normal White controls. This is in agreement with the majority of previous investigators. Most of the previous investigators report basal metabolic rates in the Eskimo 13—33 per cent higher than the DuBois Standard. The mean value of the first test of all our Eskimos was 14 per cent higher than the DuBois standard, and 15 per cent higher than the average of 28 White men examined for the first time.

In the past the normal standards, with which the racial findings have been compared, have been subject to much discussion. In this study the DuBois standard has been used throughout. It should be emphasized that the DuBois standard is generally recognized as being 6—8 per cent too high, since the original level, published in 1916, included factors of tension in patients undergoing their first or second test.

In carefully conducted experiments under strictly controlled conditions we found that the average BMR in normal untrained White subjects undergoing their first test, deviated less than 1 per cent from the DuBois standard. In trained subjects well acquainted with the technique of the test, the first test gave results 6 per cent lower than the DuBois standard. When normal White subjects were given repeated tests, the final BMR was 8 per cent lower than the DuBois standard.

When normal Eskimo subjects were given repeated tests while living on the White man's diet, and examined under conditions similar to those of the White controls, their basal metabolic rates were almost identical to those of the White controls. It may therefore be concluded that there is no racial difference in the basal metabolism between Eskimos and Whites.

In an endeavour to explain the reason for the higher basal metabolic rates normally observed in the Eskimo when examined for the first time in his native habitat, a number of factors have been considered.

The technique has been carefully controlled and checked, as is evident from the foregoing description. The technique may therefore be excluded as a factor which might account for the difference in the results in Eskimos and Whites.

The closed-circuit method was chosen for technical reasons. As pointed out by Robertson (1951), the closed-circuit method with the necessary precautions, is less open to errors with far less trouble than is the open-circuit. Abnormal respirations can be more quickly detected by the closed-circuit method, where the respirations are recorded on the kymograph. Immediately at the completion of the test it can be determined whether the test is unsatisfactory, in which case a further test can be taken at once.

It has been emphasized by some writers that the closed-circuit method is open to grave errors since this method assumes an arbitrary respiratory quotient of 0.82. Under the most extreme conditions, however, this error can at the very maximum not exceed 7 per cent, and these extreme conditions are unlikely to occur after a fast of 12 hours. With an R. Q. of 0.70, when only fat is being combusted, the caloric value of a litre of oxygen is 4.686 calories, while it is 5.047 when only carbohydrate is being combusted and the R. Q. is 1.00. This represents the maximum possible difference, however, and by assuming an R. Q. of 0.82 the maximum error possible is only 3.5 %. According to Benedict, quoted by Robertson (1951), "the basal metabolism can be measured without any regard whatsoever for the carbon dioxide with a maximum error of ± 3 per cent and a probable error of very much less than that."

Functional abnormalities of the subjects were excluded on the basis of thorough medical examination, and all subjects studied may be considered as normal individuals. In our material there is no evidence to support the hypothesis that oral temperature, blood picture and the pulse rate are factors influencing the basal metabolic rates of the Eskimo.

It has been suggested by many workers that climatic factors such as temperature, humidity, atmospheric pressure and season, influence the metabolism. In our material there is no evidence indicating a positive correlation between climate and basal metabolism in the Eskimos studied.

While the mean temperature at Barter Island and at Anaktuvuk Pass was about the same, the BMR was higher in the Eskimos at Anaktuvuk Pass. When comparing the Kotzebue and the Gambell groups it is observed that the mean temperature at Gambell was higher than at Kotzebue, and yet the BMR was higher in the Gambell Eskimos than in the Eskimos at Kotzebue. As is evident from our environmental studies, there is little difference between the room temperature in the Eskimo houses and the living quarters of our White controls. Similar comparisons with regard to wind exposure, precipitation and sky cover in relation to basal metabolic rates also failed to show any positive correlation between climate and basal metabolism. There is a seasonal variation, however, but this was found to be associated with dietary changes which were sufficient to explain the difference.

Furthermore, in our 28 normal White controls living in Alaska under climatic conditions similar to those to which the Eskimos were exposed, the basal metabolism was 6—8 per cent lower than the DuBois standard, i. e. the same as the basal metabolism observed by modern technique in Whites in the temperate environments. If the corrections for climate, suggested by Quenouille et al. (1951) were to be adopted, our White controls examined in Alaska should have had a basal metabolism approximately 10 % higher than the standards for normal White men in temperate climates.

In this connection it may be noted that some of the statements in the literature regarding the effect of climate on basal metabolism are based on the fact that in subtropical climates the basal metabolism has been reported to average 6.5 to 10 per cent lower than the standards for temperate North America (Keys 1949—1950). It should be borne in mind, however, that since these standards are 6—8 per cent too high, the reported deviations from these standards in subjects living in subtropical climates may in reality be insignificant.

The Eskimo group at Anaktuvuk Pass lived at an altitude of 3000 feet, while the remaining groups lived at sea level. From the numerous investigations available into the effect of altitude on the energy metabolism on human subjects, it is evident that change in altitude at levels below 9000 feet does not affect the basal metabolism (Lewis et al., 1943).

Almeida (1921) has pointed out that differences in the degree of physical activity may probably account for differences in metabolic rates. Deitrick et al. (1948) observed a decline in basal metabolic rate during immobilization, of 6.9 per cent on an average. Their four subjects were examined during a prolonged period of rest of 6—7 weeks' duration with complete immobilization.

In our subjects the difference in physical activity between the four Eskimo settlements was only slight, as is evident from the following figures:

Group	Approximate caloric expenditure cal/day	
	Winter	Summer
Barter Island	3 000	2 500
Anaktuvuk Pass ...	3 000	3 000
Kotzebue	2 600	2 500
Gambell	2 500	2 500

Table 38.

Body Surface Area in Eskimos and Whites.

	Eskimos			Whites
	Average of 53 males and females	Average of 11 females	Average of 42 males	Average of 7 males
Age, weight, and height.				
Average age, years......	28 (16—53)	30 (21—53)	28 (16—47)	28 (19—68)
Average weight, kg	63.2 (43—91)	63.2 (50—91)	63.2 (43—74)	78.0 (62—103)
Average height, cm	164.0 (151—178)	157.1 (151—163)	165.8 (152—178)	176.9 (168—185)
Surface area.				
Ht.Wt. surface area, m^2..	1.68 (1.35—1.96)	1.63 (1.48—1.96)	1.69 (1.33—1.88)	1.95 (1.71—2.27)
Linear surface area, m^2..	1.67 (1.37—1.96)	1.61 (1.47—1.96)	1.68 (1.36—1.88)	1.91 (1.72—2.19)
Difference in per cent.				
$\frac{\text{Ht.-Wt.-Lin.}}{\text{Linear}} \times 100$	+0.9 (—2.2+3.8)	+1.1 (—0.5+2.7)	+0.8 (—2.2+3.8)	+1.9 (±0.0+3.6)

Furthermore, in our material the caloric expenditure was about the same in our Eskimo subjects and in our White controls. This possibility may therefore be ruled out.

The factor of anthropometric differences has also been considered. It has previously been suggested by several workers that the DuBois height-weight formula, when utilized for the calculation of body surface area, may not be applicable for the Eskimo, thus introducing an error in the calculation of the results, which might partly explain the high basal metabolic rates of the Eskimo. For this reason we have actually measured the body surface area by the linear method in 53 of our Eskimo subjects, and it was found that the height-weight formula on an average gave results which were only 0.9 per cent higher than the results obtained by the linear method. (Table 38). This is within he limit of accuracy claimed for the height-weight chart (DuBois and Dubois 1916), and is therefore insignificant (Rodahl and Edwards, 1952). This possible error has thus been eliminated. Nor have we observed any significant relation between basal metabolism and constitutional types in our material.

Any significant error caused by deviations in the R. Q. has been ruled out, as the average R. Q. in the Eskimos was 0.82, the figure upon which the calculations are based.

During our initial experiments it became apparent that apprehension might play an important part in the high basal metabolic rates observed in Eskimos when tested for the first or second time. In this study the factor of apprehension has been carefully examined. By excluding factors of tension and apprehensiveness through repeated tests on successive days, an average reduction of the basal metabolic rate of 9 per cent was observed. This reduction was observed both in Eskimos and Whites.

The relation between the high protein Eskimo diet and the high basal metabolism in the Eskimo has been suggested long ago by several workers. In the present study this relationship has been the subject for a series of experiments. On the basis of the reported data, it has been concluded that the high protein Eskimo diet accounts for approximately 15 per cent of the higher basal metabolism of the Eskimo. When the Eskimo subjects, who originally showed significantly higher basal metabolism than the Whites when examined by repeated tests while living on their native diet, were given the White man's diet, the basal metabolism was reduced to the same level as in the normal Whites. When again given the high meat diet, the basal metabolism returned to the original high level. When the normal White controls were given a high meat diet similar to that of the Eskimos, the same rise in the basal metabolism was observed.

This study has shown that there is no racial difference between Eskimos and Whites in the basal heat production. Apprehension and the specific dynamic action of protein are the important factors in the high basal metabolism generaly observed in the Eskimo examined in his normal native habitat.

The same thing may or may not apply to other primitive races, and it would be highly desirable to conduct a similar study among some of these races, such as the American Indians.

VII. Summary and Conclusions.

Previous investigators have reported significantly higher basal metabolism in Eskimos than in Whites. This paper reports the results of 340 basal metabolism tests in 73 healthy Eskimos from 4 different locations in Alaska. The study includes complete medical examination, environmental observations, body surface area measurements, food consumption

and urinary nitrogen elimination. In agreement with previous workers, the basal metabolism of Eskimos examined for the first time on their own native diet was found to be significantly higher than in Whites. Approximately 9 % of this higher basal metabolism may be accounted for by apprehension. The high protein Eskimo diet accounts for approximately 15 %. When these two factors were eliminated, the metabolism was almost exactly the same as in White controls. From these studies it is therefore concluded that there is no racial difference between the Eskimos and Whites in the basal heat production.

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