BONE MINERAL CONTENT OF ESKIMOS IN ALASKA AND CANADA:

PRELIMINARY REPORT

by

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During the past year (October, 1971 and May, 1972) measurements of the bone mineral content were made on the Eskimo inhabitants of two villages in the Foxe Basin of Canada's Northwest Territories (Hall Beach and Igloodik). This is a preliminary report of these measurements and a compilation of measurements made in 1968-1970 on the Eskimos living in the villages of Point Hope, Wainwright, and Barrow.

METHODS

Direct photon absorptiometry as developed at the University of Wisconsin was used to determine the bone mineral content at two locations on both the radius and ulna (Cameron and Sorenson, 1967). Measurements in all five villages were made with a portable system that allowed immediate digital readout of bone mineral content and bone width (Mazess et al., 1972). All scans of the radius and ulna were made with an ^{125}I source (28 keV). A three-chambered bone phantom of saturated dipotassium hydrogen phosphate solution was used for calibration (Witt et al., 1970).

In Canada bone mineral content determinations were made on 335 subjects, 164 from Hall Beach and 171 from Igloodik. There were 177 children age 5 to 19, 123 adults age 20-49, and 35 elderly age 50 and up. Males and females were equally represented in all age groups. In Alaska there were 413 subjects measured of which 63 were measured in 2 successive years (an average was taken in these cases). 217 of these were children, 88 were adults and 107 were elderly.

Four scans were made at each site in order to obtain an average value. The coefficient of variation of the determination at each site varied from 1.5 to 4%, decreasing with larger bone sizes and older subjects.

The data from the different villages was merged into Alaskan or Canadian groups after T-tests were performed. Most of the significant differences found could be attributed to the highly variable bone width at the site of the distal ulna.

RESULTS

Heights and weights of Eskimos in Canada and Alaska, and of U.S. whites,

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are presented in Table 1. U. S. whites are taller and heavier than Alaskan Eskimo males and taller than Alaskan Eskimo females. Alaskan Eskimo males and females throughout growth and adulthood have greater heights, and weigh more than Eskimos in the Foxe Basin of Canada.

Tables 2 and 3 give the bone mineral content in grams/centimeter and bone mineral-to-width ratios of Eskimos and whites. During the years of growth (5-19 years) Canadian Eskimo children have lower bone mineral content than Alaskan Eskimo children who, in turn, are lower than U.S. whites.

Both groups of Eskimo adults (age 20-49) demonstrate a similar bone mineral content. Evidently the Canadian Eskimo children grow at a slower rate, but as adults reach a bone mineral content equivalent to Alaskan Eskimos. Male and female Eskimo adults, Canadian and Alaskan, are at levels 8% less than U.S. whites.

In the elderly we find that Eskimos lose bone mineral at a rate greatly accelerated compared to that of whites. The loss is as much as 22% greater in both males and females from Canada age 60-69, and 27% greater in females 70 and up from Alaska.

DISCUSSION AND CONCLUSIONS

The lower bone mineral content of Eskimos is commensurate with their smaller height and weight. In Canada bone mineral content is 8% lower as is height and weight; in Alaska, height is 5% lower but bone mineral content is only 1% lower. Apparently Canadian Eskimos have a normal bone mineral content status relative to stature, and by this reference Alaskan Eskimos may even be slightly elevated. In the elderly this is not the case; both Eskimo groups lose bone mineral content, and the loss is far greater than stature differences.

Data collected on a skeletal series of Sadlermiut Eskimos from Southhampton Island show similar patterns of high bone loss in the elderly. This appears associated with increasing risk of fracture in the same population. It remains to be seen if the extensive bone loss in elderly contemporary Eskimos is associated with skeletal problems, and to isolate the factors operative in this population.

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TABLE 1. AVERAGE HEIGHTS AND WEIGHTS OF ESKIMO AND WHITE SUBJECTS BY AGE

	AGE	NUMBER			HEIGHT (cm)			WEIGHT (kg)		
		Canada	Alaska	U.S.	Canada	Alaska	U.S.	Canada	Alaska	U.S.
MALES	5-7	12	23	41	116	117	125	22.5	23.3	24.5
	8-9	24	19	47	125	130	138	27.1	30.4	31.0
	10-11	20	22	55	135	140	147	32.6	35.2	37.7
	12-14	20	20	45	147	151	160	43.1	47.5	52.2
	15-16	8	9	43	163	163	175	55.3	55.1	68.1
	17-19	10	15	37	165	171	182	60.6	69.7	74.5
	20-49	61	40	68	163	168	178	65.8	68.4	77.5
	50-59	12	13	24	163	166	176	61.0	74.6	77.0
	60-69	8	27	35	156	163	175	60.1	67.7	75.4
	70+	-	13	32	-	163	175	-	69.8	71.2
FEMALES	5-7	12	26	32	113	120	126	21.5	24.5	24.3
	8-9	12	22	36	123	128	136	26.2	28.9	29.4
	10-11	17	17	43	132	140	147	30.7	37.3	38.0
	12-14	20	22	46	148	152	162	44.5	53.1	48.6
	15-16	9	10	37	153	157	166	53.4	58.7	56.2
	17-19	13	12	62	152	158	166	53.4	59.9	58.3
	20-49	62	49	121	153	155	163	55.3	63.3	62.5
	50-59	11	23	37	150	153	162	61.6	62.4	64.9
	60-69	4	20	43	146	153	160	62.1	65.5	61.5
	70+	-	11	103	-	141	160	-	48.6	57.7

TABLE 2. BONE MINERAL CONTENT IN CANADIAN AND ALASKAN ESKIMOS AND IN
UNITED STATES WHITES (gram/centimeter)

AGE	<u>MALES</u>			<u>FEMALES</u>		
	Canada	Alaska	U.S.	Canada	Alaska	U.S.
5-7	.44	.46	.50	.38	.44	.45
8-9	.48	.54	.57	.43	.48	.52
10-11	.57	.63	.67	.49	.56	.61
12-14	.71	.76	.81	.67	.76	.78
15-16	.88	.93	1.08	.81	.85	.87
17-19	1.06	1.16	1.20	.82	.88	.92
20-49	1.21	1.21	1.31	.88	.90	.97
50-59	1.06	1.13	1.33	.78	.78	.86
60-69	.99	1.02	1.24	.65	.69	.80
70+	-	1.06	1.23	-	.51	.71

TABLE 3. BONE MINERAL/WIDTH IN CANADIAN AND ALASKAN ESKIMOS AND IN
UNITED STATES WHITES (gram/centimeter²)

AGE	<u>MALES</u>			<u>FEMALES</u>		
	Canada	Alaska	U.S.	Canada	Alaska	U.S.
5-7	.47	.47	.50	.44	.48	.49
8-9	.51	.53	.55	.48	.50	.55
10-11	.54	.57	.60	.52	.58	.59
12-14	.60	.64	.65	.62	.68	.67
15-16	.68	.72	.76	.68	.72	.73
17-19	.75	.82	.82	.69	.74	.75
20-49	.78	.82	.88	.69	.73	.76
50-59	.68	.75	.88	.60	.61	.70
60-69	.62	.68	.79	.49	.54	.63
70+	-	.69	.79	-	.40	.55

References

1. Cameron, J. R. and Sorenson, J. A. Measurement of bone mineral in vivo: an improved method. Science 142:230-232, 1963
2. Cameron, J. R., Mazess, R. B., and Sorenson, J. A. Precision and accuracy of bone mineral determination by direct photon absorptiometry. Invest. Radiol. 3:141-150, 1968
3. Mazess, R. B., Cameron, J. R., and Miller, H. Direct readout of bone mineral content using radionuclide absorptiometry. Int. J. Appl. Radiation (in press) 1972
4. Sorenson, J. A. and Cameron, J. R. A reliable in vivo measurement of bone mineral content. J. Bone Jt. Surg. 49A: 491-497, 1967
5. Witt, R. M., Mazess, R. B., and Cameron, J. R. Standardization of bone mineral measurements. ASAEC Report COO-1422-70, 1970

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