

NORMAL BANTU URINE

A PRELIMINARY REPORT

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We are interested in the reason for the rarity of renal stone in the Bantu race. In studying this we obtained 24-hour urine collections from Bantu and White men. Immediately we were struck by the greater volume presented to us by the Bantu. Why should they be so thirsty? Analysis revealed further previously unsuspected differences between urine from the two groups. These are presented both for their intrinsic interest and for their possible bearing on certain clinical conditions.

Procedure

Young Bantu men from Basutoland, arriving to work on the De Beers mines at Kimberley, are initially kept in a hospital enclave for 24 hours for routine medical examination. During this 24-hour period their food, which conforms closely to their normal diet, is obtained from the hospital kitchen. Salt is allowed *ad lib*. Before this they all eat their customary 'Bantu food'. Twenty-four hour urine collections were made during this period in the hospital enclave, the volumes measured, and aliquots then sent by rail to Cape Town. Thirty-four such samples were received. Twenty similar collections were obtained

from Bantu serving on the staff of the mine hospital, and another 6 from Bantu living in Bellville, Cape.

Twenty-four-hour urine collections were obtained from 60 White volunteers, all medical students at the University of Cape Town, eating self-selected food.

Urine samples were collected in bottles containing toluene as a preservative. All collections were made during the winter.

Methods

Volumes were measured to the nearest ml. Osmolarity was determined on a Fiske Osmometer, accurate to 2%. Sodium and calcium estimations were performed by flame photometry,¹ and potassium, inorganic phosphate and ammonia were estimated as described by King and Wootton.²

Results

The sodium and osmolar contents, and the volumes of the 24-hour urine samples, were markedly greater in the Bantu than in the White subjects (Fig. 1). The respective means and standard deviations are shown in Table I.

Despite the greater osmolar output by the Bantu, their urines were of lower concentration; furthermore daily calcium, potassium and phosphorus outputs were less than those of the White group.

Comparison of the 26 urines obtained from the urban Bantu (viz. those on the hospital staff at Kimberley and those at Bellville) with those of the White group, revealed no differences in their urinary outputs of potassium, ammonia or inorganic phosphate; their calcium output was lower.

The rural Bantu, on the other hand, excreted less potassium, ammonia and inorganic phosphate than did the White group. All differ-

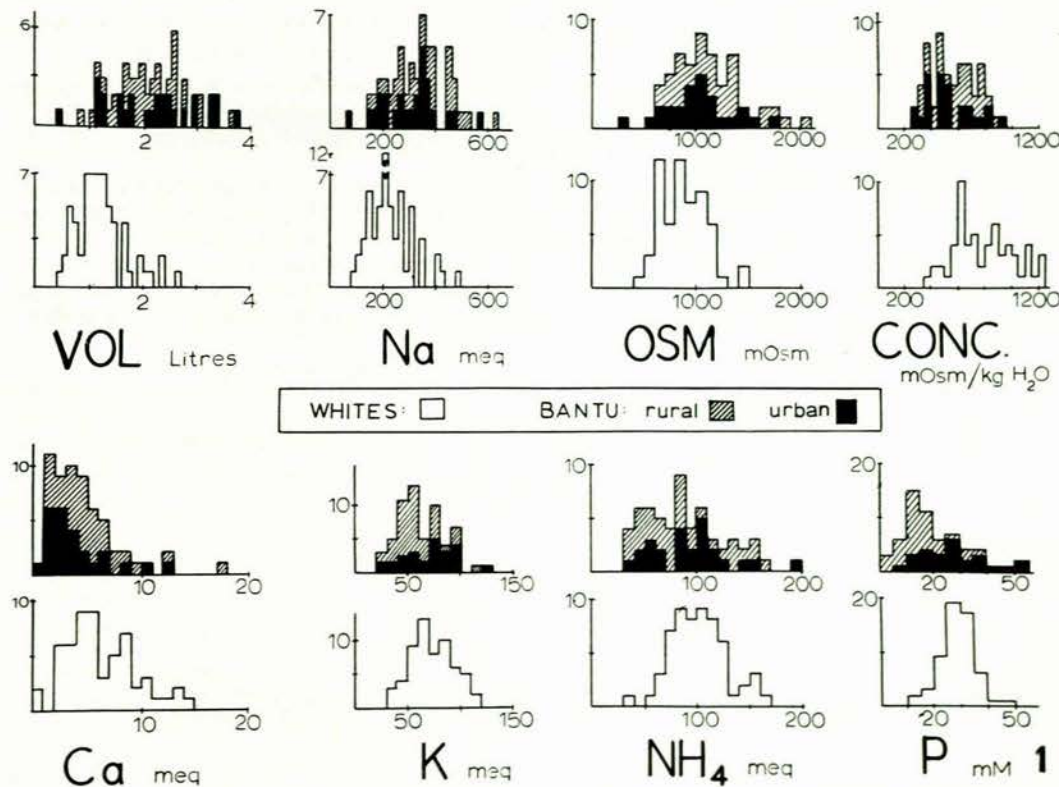


Fig. 1. Concentration and constituents of urine from White and Bantu groups. The histograms indicate the number of subjects to each group. Note especially the less concentrated urines with greater volume and greater sodium and osmolar content in the Bantu.

TABLE I. RESPECTIVE MEANS AND STANDARD DEVIATIONS

		Urine concentration (mOsm./kg. water)	24-hour output							
			Na (mEq.)	Osm (mOsm)	Volume (litres)	K (mEq.)	Ca (mEq.)	P (mM)	NH ₄ (mEq.)	
Whites (60)	mean	797	231	830	1.19	73.9	6.27	28.0	101.9
		S.D.	216	82	210	0.45	19.8	3.15	8.6	26.0
Bantu:										
Urban (26)	mean	538	306	1,036	2.10	66.3	3.78	27.6	100.1
		S.D.	172	108	314	0.78	24.3	2.96	12.2	51.2
Rural (34)	mean	587	353	1,153	2.06	60.2	5.13	16.1	84.7
		S.D.	152	111	336	0.62	20.2	3.26	8.1	38.0
Total Bantu (60)	mean	566	331	1,100	2.07	62.9	4.54	21.1	92.5
		S.D.	163	112	332	0.69	22.2	3.15	11.6	44.7

ences mentioned above are statistically significant.

DISCUSSION

Most of these differences in 24-hour urine composition must reflect differences in dietary habits. The differences between the osmolar outputs are largely caused by the differences in sodium. The 24-hour urinary sodium output can be regarded as a close approximation to the daily intake excluding loss in sweat.³ Our data reveal that the Bantu subjects were taking an average of 100 mEq. or 5.8 G. of sodium chloride per day more than the Whites and about 900 ml. more water. (The effects of sweating can be ignored; the urines were collected during the South African winter, and neither group of subjects was engaged in manual labour during the relevant period).

The average 24-hour urinary sodium output, and presumably therefore the minimal daily intake in the Bantu, was 331 mEq. of sodium or 19 G. of sodium chloride. This is considerably more than that usually quoted for Western communities,⁴ and plainly more than in our own student group. Excess of dietary sodium has long been thought to be a factor in the causation of hypertension.⁵ Both autopsy and clinical studies suggest that hypertension is common among the South African Bantu;^{6,8} indeed Ordman gives the overall incidence of hypertension (by his definition) among Bantu as 30-40%.⁷ Dahl, in a study of 5 different population groups throughout the world, has postulated a linear relationship between dietary sodium and the communal incidence of hypertension.³ The figures quoted above are in close accord with his data.

Renal stones are a rarity in the Bantu.⁹ While many other factors are probably involved, it is of interest that their dietary habit of eating more salt and drinking more water leads to a faster flow of a less concentrated urine. Further, the Bantu's urinary calcium and phosphorus appears to be lower than those of the White group. The low urinary phosphorus must reflect, rather surprisingly, a lower intake of phosphorus; the low urinary calcium, however, is probably more complicated and may be

associated with a lower serum-calcium level, or may even be a racial peculiarity of 'survival' value.¹⁰

Perhaps the Bantu's freedom from nephrolithiasis is obtained at the expense of an increased incidence of hypertension.

SUMMARY

Twenty-four hour collections of urine obtained from 34 rural and 26 urban young Bantu men differed significantly from similar collections from 60 White South Africans.

The Bantu urines were of greater volume and lower concentration than those of the White group, but bore greater sodium and osmolar loads. Their calcium, potassium, ammonia and phosphorus contents were less.

These findings must reflect differences in diet, and may be of importance in theories relating to the causation of hypertension and renal stones.

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