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A STUDY OF STIMULATED SALIVA IN
KALAHARI BUSHMEN

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KALAHARI Bushmen have a low caries incidence (Drennan 1929, Clement 1952, Van Reenen 1964). As saliva may be one of the factors responsible, this investigation was undertaken to study some of its aspects.

MATERIALS AND METHODS

The subjects examined comprised 90 Bushmen, 55 males and 35 females, from the Lone Tree and Kang districts of Botswana. These districts form part of the Southern Kalahari desert.

Stimulated saliva specimens were obtained from the subjects by their chewing a cube of paraffin wax for three minutes and expectorating into a glass beaker when necessary.

The pH of each saliva specimen was determined immediately after collection by means of narrow range litmus papers and the total volume of the specimen was measured in a measuring cylinder. The flow rate of the saliva per minute was then calculated for each subject.

The acid and base neutralising power and buffer capacity were determined by the method of Deakins *et al* (1941); 2.0 c.c. aliquots of undiluted saliva were titrated with 0.01 N HCl using three drops of methyl red as indicator and with 0.01 N NaOH using three drops of phenolphthalein as indicator. Each titration was continued to a distinct pink end point. Although Deakins added potassium oxa-

late to the saliva for the precipitation of calcium prior to the titration for estimating base neutralising power, this was not done in the present study. The neutralising power and buffer capacity were calculated as follows:

$$1. \text{ Acid or base neutralising power in c.c. of } 0.01 \text{ N acid or base per minute} = \frac{\text{No. of c.c. of } 0.01 \text{ N acid or base} \times \text{flow rate per min.}}{2}$$

$$2. \text{ Buffer capacity in c.c. per minute} = \frac{\text{Acid neutralising power} + \text{base neutralising power}}{4^*}$$

4* = approximate difference between the pH of the end points of methyl red and phenolphthalein.

FINDINGS

Stimulated saliva flow rates in the Bushmen group studied are shown in histogram form in Fig. 1. The calculated mean flow rate was 2.9 c.c. per minute. Wainwright (1939) reported a flow rate of 122 c.c. per hour (2.03 c.c. per minute) in Europeans and Clement and Rae (1953) described a flow rate of 6.1 c.c. in three minutes (2.03 c.c. per minute) in Bakalagadi children. The figures in this study are slightly higher. Salivary flow rates have not previously been reported for Kalahari Bushmen.

The pH of the saliva examined ranged between 6.4 and 8.7 with a mean of 8.2 (Fig. 2). Staz (1938) studied the pH values

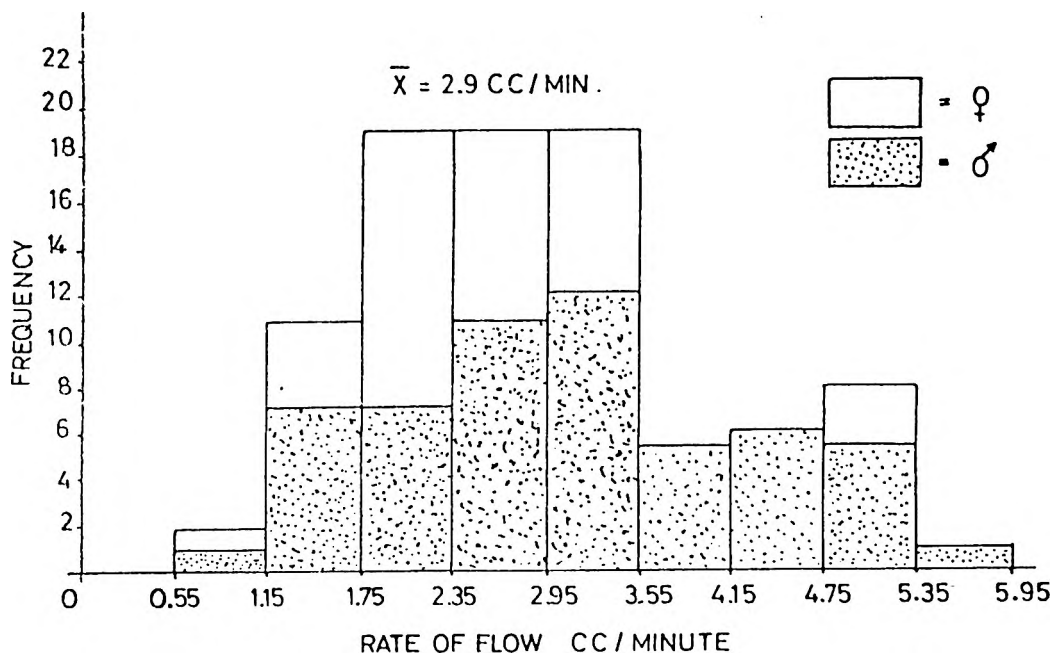


FIG. 1. SALIVA FLOW RATES.

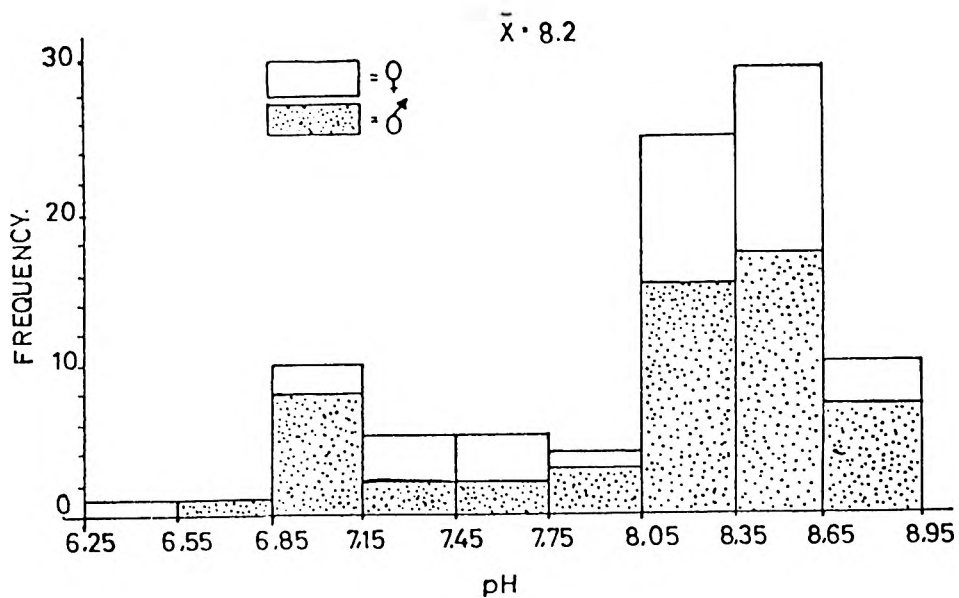


FIG. 2 SALIVA pH.

of the saliva from 900 subjects: 300 Europeans, 300 urban Bantu and 300 primitive Bantu. He found the greatest number of subjects in each group to have a salivary pH of 7.4, 7.4 and 7.0 respectively. Clement, Plotkin and Fosdick (1956) found the resting pH of dental plaques in Bushmen to be 6.9. After a sucrose rinse, in only one case did the pH drop below 5.7, while in 82 per cent of cases it did not drop below 6.0. The pH values obtained in the present study are therefore considerably more alkaline.

The ranges of acid and base neutralising powers and buffer capacities found in this and other studies are summarised in Table 1. The findings in this study are lower than those obtained by the other authors. Clement and Rae mention buffer capacity values determined in six Bushmen but as no flow rates were measured, these findings cannot be compared with those in this study.

The low caries incidence in Kalahari Bushmen is probably the result of many interacting factors, which may include the alkaline saliva and acid neutralising power

found in this study. These findings together with that of Clement, Plotkin and Fosdick, that the dental plaque did not become sufficiently acid to cause decalcification, and the fact that Van Reenen found the flora of the Bushmen mouth to be typical of a caries immune saliva, suggest that saliva is a significant factor in the low caries incidence in Bushmen.

SUMMARY

The saliva of 90 Bushmen, 55 males and 35 females, from the Southern Kalahari was studied.

The average flow rate was found to be 2.9 c.c. per minute while the mean salivary pH was 8.2.

The acid neutralising power is greater than that of the base neutralising power and these as well as the buffer capacity values are lower than those found in studies in other groups.

The alkaline saliva and relatively high acid neutralising power probably play a role in the low caries incidence in the Bushman.

TABLE 1.—Summary of three studies on saliva acid, and base neutralising power and buffer capacity.

Study	Acid Neutralising Power c.c. 0.01 N HCl/Min.			Base Neutralising Power c.c. 0.01 N NaOH/Min.			Buffer Capacity c.c./Min.		
	Highest	Lowest	Mean	Highest	Lowest	Mean	Highest	Lowest	Mean
Present study (Bushmen)	12.8	1.0	4.5	3.0	0.2	0.8	3.4	0.4	1.3
Deakins <i>et al</i> (1941) (Europeans)	52.3	3.25	—	19.8	1.83	—	14.69	1.28	—
Clement and Rae (1953) (Bakalagadi)	67.6	45.9	—	18.0	4.5	—	20.7	10.9	—

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