

LETTER TO THE EDITOR

SUGAR INTAKE AND DIABETES

To the Editor: 1. In this clinic we have for many years been making investigations on the relationship between total per capita annual sugar intake and the incidence of diabetes. This has been done by comparing identical ethnic groups living under very different circumstances, and by comparing per capita annual sugar intake of a very large number of divergent racial groups all over the world with the "commonness" or "uncommonness"⁸ of diabetes in these groups.¹

2. A brief summary of our findings follows:
 - a. It appears that a high caloric intake is not necessary for a "common" incidence of diabetes. Indeed in some of our identical and ethnically comparable groups, the groups *not* prone to diabetes had a higher caloric intake than those prone to diabetes.²
 - b. The chief difference in the diet among identical ethnic groups, exposed to widely differing social circumstances and in whom diabetes incidence varied greatly, is that the carbohydrate intake although of equal caloric value, in the diabetes-prone group consisted almost totally of refined carbohydrate, and in the group not prone almost wholly of unrefined carbohydrates.
 - c. In 1959 we found that in people who were moved from areas of dietary deprivation into urban areas where food was freely available, that there was a strikingly constant period of exposure to ingestion of the Westernized diet before diabetes emerged, and we postulated a "Rule of Twenty Years."³
 - d. If one examines carefully the statistics of the International Sugar Council as regards per capita annual refined sugar intake in various countries and correlates this with the prevalence of diabetes one sees that in almost every instance in tropical countries, as soon as per capita annual sugar intake passes 70 lb. per annum then diabetes becomes "common."¹
 - e. In those racial groups where diabetes is particularly common and caloric intake is *low*, it is invariably found that the caloric intake of refined sugar exceeds 10 per cent of the total per capita caloric intake of the particular racial group.⁴ "The Rule of the Ten Per Cent."

3. We have been particularly interested in those groups that do not fit into the rules set out by ourselves above, and of these we have studied carefully a number of Pondo cane cutters in the sugar plantations on the North Coast of Natal.⁵ Diabetes or glycosuria is negligible amongst these people, who are adult males chiefly between the ages of twenty and fifty-five. We studied 2,016 such cane cutters, who do not tend particularly towards obesity, by means of testing random postprandial urines with a glucose oxidase strip and found a trace of sugar in only three. It is of interest to note that in 1929, Banting⁶ made the observation in Panama that diabetes was absent in cane cutters who ate large amounts of sugar by chewing cane, but common in their employers who ate large amounts as refined sugar. The Pondo cane cutters, during the cutting season of nine months, ingest one-half to one pound of sugar per day by chewing sugar cane, and are in addition given a sugar ration of three-quarter of a pound per week. In addition to this they eat indefinite amounts of extra sugar purchased with their wages. Excluding the amounts purchased, this sugar intake therefore basically ranges between 176 and 309 lb. per annum. This amount is in contrast to the intake of most Westernized countries which average between 110 to 120 lb. per annum.

It is probable that the chewing of sugar cane—an arduous and lengthy process—and the consequent dilution of the sugar cane juice by the very free flow of saliva, minimizes the impact of these massive amounts of sucrose on the carbohydrate-regulating mechanisms of the body. The relationship between the present-day large consumption of refined carbohydrate and a number of very diverse diseases of more socially advanced people have been recently discussed at length.⁸

4. In view of the habit of cane cutters of pooling their weekly rations of three-quarters of a pound amongst four of them, and eating them as a quantity of three pounds at one sitting every fourth week, we were anxious to study the acute effects of these massive amounts of sugar on the glucose tolerance. In a paper called "The Sugar Orgy"⁷ we reported half-hourly plasma glucose levels by the AutoAnalyzer method for two and one-half hours after the ingestion of either two or one pounds of sugar by these cane cutters in less than ten minutes. In nine such subjects tested we found a remarkable glucose tolerance curve which had a peak at one-half to one hour, a trough from one

TABLE 1

Name (all male)	Sugar (amount eaten)	Time taken to eat sugar (minutes)	Presucrose load (mg. per 100 ml.)	Blood-sugar levels (mg. per 100 ml.)				
				½ hr.	1 hr.	1½ hrs.	2 hrs.	2½ hrs.
2 lb.-eater (900 gm.) O	2 lb. (900 gm.)	8	115	134	95	84	105	110
1 lb.-eater (450 gm.) G	1 lb. (450 gm.)	12	84	105	94	110	110	102
E (No. 2)	1 lb. (450 gm.)	5	95	130	116	115	115	115
J	1 lb. (450 gm.)	5	60	140	95	94	85	85
J	1 lb. (450 gm.)	6	95	160	126	85	115	102
M	1 lb. (450 gm.)	8	65	134	103	84	85	102
S	1 lb. (450 gm.)	6	82	115	105	95	116	95
M	1 lb. (450 gm.)	6	85	116	120	85	115	84
Less than 1 lb. (450 gm.) J	10 oz. (280 gm.)	6	77	130	110	84	102	84
		Mean	84	129	107	93	105	98
		Range	60-115	105-160	94-126	84-115	85-116	84-115

and one-half to two hours, and in all patients but one, a further peak at two to two-and-one-half hours, giving us what we have christened "The Bactrian Glucose Tolerance Curve."

5. We are not aware of the exact significance of these studies but we intend to repeat them with Gastrografin in the sugar to see how much these two peaks are due to delay in emptying of the stomach. Further, we are anxious to collect stools over two or three days and assess the amount of sugar still present in the stools. We believe that these studies will further stimulate research concerning the role of the saccharides in the gastrointestinal tract on glucagon, and other hormonal responses.

6. We are very anxious to receive information from those living in areas where people eat gigantic amounts of sugar, and would be very grateful were such information sent to us.

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around Durban. *S. Afr. Med. J.* 37, 48:1195, 1963.

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