NUTRITIONAL CONTROL OF DENTAL CARIES

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Dental caries is one of the most universal expressions of modern degeneratio due primarily to faulty nutrition. A first requisite for its control by the masses becomes a matter of education. As an approach to this problem it is helpful to review the conclusions of several of our outstanding leaders in social science.

1. "Modern man is delicate.***The organism seems to have become susceptible to degenerative diseases." (Carrel)

2. "Nearly one-third of the whole population (of two dozen states) is of a type to require some supervision." (Laird)

3. "Of nearly 2,000,000 babies to be born in 1941, 738,386 will be wholly or partially wasted, 37%." (Nat'l. Committee for Planned Parenthood)

4. "Measurable brain can be correlated with testable mind." (Waverly Researches)

5. "Thinking is as biologic as digestion." (Thorndike)

6. "Of all the psychological causes of crime, the commonest and the gravest is usually alleged to be a defective mind.***." (Burt)

7. "*****gross human congenital malformations arise solely from influence which affect the germ cells prior to fertilization***" (Murphy)

8. "Eggs (fertilized ova) are not all of equal quality, 25% are not good enough to be born as living individuals". (Streeter)

9. "It is store food which has given us store teeth." (Hooton)

10. "There is a nutritional basis for modern physical, mental and moral degeneration." (Price)

A comparison of the dental arches of modern Americans with early Americans reveals a vast change both in structure and design in both teeth and bones. This is strikingly illustrated in Figure 1 which shows the skull of an early American Indian of the Pacific Coast. All of the teeth and the dental arches are in place supported by superb boney structures providing excellent design of the face. Both men and women of this period and this area showed similar magnificent and skeletal development and finely preserved bones and teeth of high perfection with absence of dental caries. The coastal area provided an abundant quantity of excellent body building material in

the sea foods and animal products used in connection with the native plants and seeds.

In striking contrast with this we see in Figure 2 a husband and wife also of pre-Columbian period living in an interior district where the nutrition was not adequate to maintain high physical excellence for the woman during her period of physical overload of child bearing, as my be seen in the picture while her husband's teeth and bones are excellently preserved her skeleton is badly broken down. Many of the teeth are missing apparently from dental caries. This environment was not able to provide her with essential body building material.

In my study of fourteen primitive races I have found isolated groups of each of these races maintaining a very high level of immunity to dental caries. In some as low as only one tooth in a thousand teeth were attacked by tooth decay with an average of less than one tooth per hundred whereas in the modernized groups of these same racial stocks the average was about 40%. For the various racial groups the averages were as follows:

	Quite Primitive	Modernized
SWiss per 100 teeth	4.6	29.8
GAELICS	1.2	30.0
ESKIMOS	0.09	13.0
NORTHERN INDIANS	0.16	21.5
SEMINOLE INDIANS	4.0	40.0
MELANESIANS	0.38	29.0
POLYNESIANS	0.32	21.9
AFRICANS	0.2	6.8
AUSTRALIAN ABORIGINES	0.0	70.9
NEW ZEALAND MAORI	0.01	55.3
MALAYS	0.09	20.6
COASTAL PERUVIANS	0.04	40.0 plus
HIGH ANDES INDIANS	0.0	40.0 plus
AMAZON JUNG.INDIANS	0.0	40.0 plus

The fundamental factors for nutrition involve an adequate quantity of both minerals and vitamins and activators for organizing or maintaining body growth and repair. The absence from the nutrition of the vitamins even though the minerals are provided constitutes a an inadequate nutrition. This is splendid illustrated in Figure 3 which shows a small boy with the following history: at four and a half years of age he had an ununited spontaneous

fracture of the femur and suffering acutely from convulsions while on a diet of bread and milk, white bread and skimmed milk. The convulsions had been getting progressively more severe for eight months. His fracture occurred in one of his convulsions. He had rampant tooth decay. The only change made in his nutrition was substituting fresh whole milk, pastuerized, for the skimmed milk and a a gruel made from a cracked whole wheat instead of the white bread and with only one addition that was a small quantity of a very high vitamin butter. In a months time the fracture was united. His convulsions ceased immediately following the first meal and he had a rapid return to excellent health on this nutrition.

A very unfortunate misapprehension has become general through a misunderstanding as to what constitutes Nature's requirements for vitamin D for controlling mineral utilization. It has been assumed that activated ergosterol which is efficient in controlling rickets of infancy adequately supplies this need, whereas the available data indicate that Nature's vitamin for this purpose is primarily irradiated cholesterol, the former irradiated ergosterol is now expressed as vitamin D2, and irradiated cholesterol as vitamin D3. Vitamin D2 does not supply Nature's requirements.

One of the current theories regarding the etiology of dental caries can be expressed as being related to the effect of the foods by providing a pabulum for bacterial growth, while the food is in the mouth. Another implies that in addition to this effect the food plays a very important role through its in the blood stream on the entire systems and by way of the blood stream through the saliva to the environment of the tooth. In support of this I have shown that in a normal saliva which is associated with an absence of dental caries there is a marked difference in the behavior of inorganic phosphorus as compared with saliva of individuals suffering at that time with active caries.

This is illustrated in Figure 4 which shows a progressive change with improved nutrition in a group of children in the Broadway Mission, all selected on the basis of active dental caries who were provided with one reinforced

meal per day five days a week for about six months. The progressive lowering of the dotted line as shown on succeeding dates from November to June illustrates the change in the saliva with the establishment of a high immunity to dental caries. This is also illustrated in the average for a hundred individual in clinical practice to change from a high susceptibility to dental caries to a high immunity under the influence of a reinforced nutrition consisting of a selection of foods that were rich needed minerals and natural vitamins as provided by natural foods. The vitamins consisted of a reinforcement of the fat-soluble vitamins from dairy products produced by cows on a especially favorable fodder and high vitamin cod liver oil.

As a clinical illustration of the change that readily occurs a young man while attending college drinking largely skimmed milk and using largely refined flour products and sweets developed seventeen new cavities in six months, with additional white patches of the enamel. He had been very susceptible to dental caries during his early growth period as indicated by the large number of fillings in the molars and bicupsids. With the change in his nutrition to fresh whole milk, pastuerized, and a selection of foods which were supplying minerals liberally together with the fat-soluble activators as a high vitamin butter and a high vitamin cod liver oil, his dental caries ceased and the white patches largely disappeared in two months time.

In Figure 5 we see the change in the saliva from plus 9.4 to minus 14.7 on the basis of the inorganic phosphorus studies and the lacto-bacillus adidophilous reduced from 743,000 per cc of saliva to 0.

A striking illustration of the parallel change which occurred in the saliva with that of the bacterial count is shown in Figure 6 of an individual with rampant dental caries. The dotted line shows the behavior of the phosphate ions in February to June under the influence of nutritional reinforcement with the inorganic phosphate change from a high level of susceptibility to a low level of susceptibility after which the reinforcement

of the nutrition was discontinued and by the following May the saliva phase had returned to one of susceptibility. The lacto-bacillus count averaged 124,000 colonies per cc of saliva during the period of susceptibility and reduced during the perio d of immunity to 8,000 and increased during the return of susceptibility to 280,000.

An illustration of the acuteness of caries susceptibility is illustrated in Figure 7 which shows a boy with over 30 open cafities, some apparently involving the pulp. It is of interest to note that the pulp of the second molar is apparently invaded from a large cavity that has through a defective fissure in the occlusal surface the opening through which is exceedingly small. (follow this case with history and treatment)

The problem of the general public is very complicated and difficult at this time because of the general lack of information and much misguided advise. This is splendidly illustrated by the various reports as to what consitutes an adequate nutrition. A chart recommended by the Committee on Foods and Nutrition, Nutrition Research Council does not make any provision or recommendation regarding phosphorus and very little relative to vitamin D as illustrated in Figure 8.

Similarly the list of food values as published by the Journal of Living makes no provision or recommendation with regard to either vitamin D or the mineral phosphorus as shown in Figure 9.

To undertake to make the problem of nutrition very simple is shown in Figure 10 by taking any one of the foods shown in each of the eight lists of must foods which as stated make no provision for either Vitamin D or phosphorus. There is also a serious misapprehension as indicated by many of the lists of recommended foods with regard to the actual capacity of various individuals to utilize the minerals that are in the foods eaten. For example it is assumed that since the average adult require 0.7 gram of

calcium per day that any diet that provides that amount will be adequate notwithstanding that only a portion of calcium can be extracted from the food and utilized. Dr. Julia Outhouse and co-workers of the University of Illinois have shown that preschool children utilize about 20 per cent of the calcium of milk and that adult subjects gave similar results. This is emphasized in Figure 11.

Similarly the Council on Foods and Nutrition of the American Medical Association has stated in connection with the problem of adult requirements for calcium as follows:

> "If adult requirements for calcium are in the neighborhood of 0.7 gm. daily and if the caloric requirements of a moderately active man are approximately 3,000 calories, then each 100 calories of food will do its share in meeting the calcium requirements if it provides 23 mg. of calcium." (30 x 23 -690 mgs. or 0.69 gr.)

In my studies among primitive races an important factor has been emphasized, namely, that they eat a sufficiently large quantity of food to provide a high factor of safety. In my personal correspondence with Dr. Franklin Bing, secretary of the Council on Foods and Nutrition of the American Medical Association he states:

> ""Thank you for your letter of July 3 providing your comments about the importance of availability in considering the dietary requirements of man.*** The calcium of milk, However, is available, and if a considerable portion of the 0.7 or 0.8 gram of calcium which is needed by the adult is supplied in the form of milk, then we know that the calcium requirements will be met."

It is not surprising that there is marked confusion on the part of the public when the available data vary so widely in their recommendations. When I referred this matter of the confusion to Dr. E. C. McCollum he made the following observations:

> "I was very much pleased to receive your letter of July 26. I have been impressed with the criticisms you make in respect to tables showing the utilization of calcium for persons of different ages. I suppose it is unfortunate that considerable confusion should exist during the period present

period of extremely active investigation. Your point about the inclusion of phosphorus in tables of vitamins and minerals is well taken."

This emphasizes strongly the need for approaching the problem of controlling dental caries on the basis of the food combinations and dietary programs that have been found to be adequate for its control. This is strikingly illustrated by the experience of the primitive races. An efficient approach to the problem is provided by the calculating of the minerals, chiefly calcium, phosphorus, magnesium, sodium and iron that are provided in a given daily menu and then estimating the amount of these various minerals that would probably be utilized by the body. On the basis of 20% utilization which is probably higher than the average the amount of calcium and phosphonus provided in the nutrition should be probably at least five times the known mineral requirements for body utilization. As an illustration in this procedure we see in Figure 12 the estimation for the amount of minerals being provided in a given case based on the data furnished by the individual. One of the most immediate controlling factors in utilizing our poor foods, poor in part because of demineralization is the fact that the calories have been retained while body building and repairing materials have often been removed. In order to eat a sufficient quantity of poor foods to supply an adequate amount of the various minerals and vitamins, the total amount of calories provided would be far in excess of what the body could utilize. Either of two things must be provided, a very liberal amount of physical exercise to burn up the excess calories or the use of better foods, better in the sense of providing the minimum requirements of the body of minerals and vitamins. The practical effect of using this basis for selection of foods, clinically reduces the dental caries by more than 90 per cent and completely for the large percentage of individuals. Recognizing the additional demands of the growth period such overloads as sickness, pregnancy, & lactation requires that the factor of safety be increased under these conditions.