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CRITICISM

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## A REPLY TO BECKS AND SIMMONDS' CRITICISM\*

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IN a paper that was published in the October, 1935, issue of *THE JOURNAL*, under the caption "Dental Caries and Parodontal Disturbances: I. Importance of an Adequate Diet for Health of Teeth and Parodontium," Becks and Simmonds describe nutritional studies which they are conducting on patients at the University of California College of Dentistry. Details of procedures, questionnaires on dietary habits, methods of evaluating a patient's diet and Becks-Simmonds dietary standards for the various nutrients (protein, fat, carbohydrate, calcium, phosphorus and iron) are given. According to the authors, "Diets 1 and 2 contain adequate amounts of all the minerals and vitamins as well as other dietary essentials." It appears to be very simple, and after reading through pages of menus, case histories and food tables, it is most disappointing to find in the last chapter the statement "It should be emphasized that as yet it is unknown whether these are 'caries preventive diets.' If nutrition is of importance for the health of the teeth and parodontium, the diets outlined may be considered adequate. It is hoped that they will prevent caries, as well as other dental diseases, where only a nutritional factor is at fault." The authors add that the diets contain "generous amounts of all factors, and if they are faithfully followed and good oral hygiene is practiced, the incidence of caries and disorders of the parodontal tissue in individuals free from metabolic disturbances should be markedly reduced."

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295

In another section, the authors state: "It cannot be stressed too often that all persons working in the field of diet and its relation to dental problems should exercise extreme care in drawing far reaching conclusions." The wisdom of such advice cannot be questioned. Being fully conscious of it, as they are, one wonders how Becks and Simmonds reached their own conclusions concerning dietary prescriptions for dental disease, and why they advocate them without a single case supporting their asserted adequacy in "all the minerals and vitamins and other dietary essentials." Becks and Simmonds cite the work of Jones, Larsen and Pritchard<sup>1</sup> as an example of those who have drawn "far reaching conclusions," and state that "a study of their work has recently been undertaken by A. J. Ker of the University of California College of Dentistry, and a summary of a critical review will appear in *THE JOURNAL*."

The California group does not seem to question that a diet consisting essentially of fish, taro, sweet potatoes, fruits and vegetables is compatible with sound teeth or that a fish, fruit, vegetable and grain diet is associated with rampant tooth decay. They seek for an explanation in the increased amount of calcium obtained from the substitution of taro and sweet potato for rice, although they admit that the so-called "rather gener-

1. Jones, Martha R.; Larsen, N. P., and Pritchard, G. P.: *D. Cosmos*, 72:439 (May), 575 (June), 685 (July), 797 (Aug.) 1930; *Am. J. Dis. Child.*, 45:789 (April) 1933; *J.A.M.A.*, 99:1849 (Nov. 26) 1932.

ous" increase is comparative rather than absolute. They state: "The question of the assimilation or the retention of the available calcium, as the problem applies to babies and their dental conditions in Hawaii, is one which Jones and her co-workers have not given sufficient attention." Since cow's milk is a newly introduced food in the islands and bears no demonstrable relationship to the incidence of dental disease, we regard it as an excellent, though not indispensable, food. Taro, also, is by no means an indispensable food in Hawaii. Whatever its virtues may be in regard to preservation of the teeth, they are shared by fruits, potato and other vegetables.

As to assimilability of calcium in milk and vegetables, Sherman reported in connection with metabolism studies on children ". . . better storage resulted when the calcium was furnished in the form of milk than when even one half of the milk was replaced by vegetables of equal calcium content." Furthermore, if stature and physical development are a measure of assimilation of calcium and phosphorus, it is difficult to explain why so many large and physically well developed children in Hawaii have teeth ravaged by decay. To know whether the calcium in poi is more readily available than is the calcium in milk might prove of value. Relatively speaking, it seems unimportant among the innumerable aspects of the problem yet to be investigated. We shall leave to Becks and Simmonds the study outlined by them.

Becks and Simmonds state further:

In addition, it may be said that if the solution of the problem of tooth disintegration in Hawaii is merely one of changing the diet from acid to alkaline as stated by Jones and her co-workers, and the minerals and vitamins have little to do with the prevention of the condition, it is not clear why sodium bicarbonate was not added in the place of poi, fruits, vegetables

and milk. Is the dental profession to understand that these workers believe the beneficial effects they secured by the use of milk, fruit, poi and vegetables with an abundance of sunshine to be due solely to physical changes indicated by the shift of the urine from a markedly acid to a less acid reaction? . . . In the light of their statements that calcium and phosphorus and vitamins have little to do with the condition, we are at a loss to understand their point of view. The experiments recently published have not convinced us of the importance of a low alkali reserve in the production of bone disturbances. Until the Hawaiian group presents data showing that tooth decay (also odontoclasia) can be arrested or prevented only by the addition of sodium bicarbonate (to substantiate their theory that a high alkali reserve is essential in the tropics) we are unable to accept their work.

Referring to the papers of the Hawaiian group cited, various factors which may play a part in tooth decay were discussed under the headings of "Race," "Heritage," "Prenatal," "Age," "Function," "Bone Growth," "Oral Hygiene," "Diet" and "Inter-Relations of Certain Factors." Under "Diet," "Minerals" and "Vitamins" were considered separately. The introductory statement under "Vitamins" is as follows:

Fruits and vegetables are rich sources of vitamin A, vitamin B and vitamin C and poor sources of vitamin D, the antirachitic factor. It would seem offhand that vitamins might be the determining factor. However, when supplied in the form of cod-liver oil, which is the richest known source of "A" and "D" (irradiated foods excepted), of eggs or of milk, both human milk and fresh unpasteurized cow's milk, orange and tomato juice, these vitamins, in good measure, fail utterly to prevent the rampant disintegration of the teeth of the babies born in Hawaii.

Under the heading "Minerals," the following statement appears:

Fruits and vegetables are also rich

sources of the bone and tooth forming constituents, but the latter are not so easily assimilated by man as they are in the form of milk. They are also rich in sodium and potassium, particularly the latter and when burned in the body leave an alkaline ash. It is interesting and probably significant that in Hawaii the diets that contain a preponderance of basic elements either in the form of greens and fruits or taro and sweet potato are associated with sound enamel. Evidence available does not indicate whether this is due to the excess of base, as such, or to some factor or combination of factors of which we have no knowledge. The absolute amounts of minerals in the diet, within certain limits, does not appear to bear any relation to the incidence of dental decay.

In two subsequent papers,<sup>2</sup> the following statements are made:

There appears to be a relationship between alkali requirement and age, vitamin D, climate and disease, assuming that the diet is otherwise well constituted . . . it may be that there is some unknown factor in fruits and vegetables which is specific for dental caries and that the leafy vegetables are particularly potent in this respect. However, until that factor is discovered, the potential alkalinity of an otherwise adequate diet seems to furnish a dependable guide for the control of dental disease.

Another statement to the effect that we in Hawaii have advanced a theory that "a high alkali reserve is essential in the tropics" is, as are those cited, unsubstantiated by fact. We did state in one of the papers referred to by Becks and Simmonds:

. . . any influence which tends to increase the alkalinity of blood and tissue fluids above a certain optimal value, accelerates atrophy of the long bones and other hard

tissues—alveolar process, cementum and dentin—which have their origin in the same embryonic tissue, and decreases the liability of enamel to decay. Vice versa, those influences which make the blood and tissue fluids less alkaline, within certain limits, promote calcification of bones, cementum and dentin and increase the liability of enamel to decay.

Did Becks and Simmonds read the papers referred to, or do their preconceived ideas cause them to so distort the facts?

Becks and Simmonds desire to see the children in Hawaii fed sodium bicarbonate, and they state that they cannot "accept" our "work" until we have presented data showing that tooth decay can be arrested by the addition of soda to the diet. Dr. Becks interpreted and reported the lesions in the bones and teeth of the dogs fed by the California Stomatological Research Group. Agnes Fay Morgan, who conducted the feeding experiments, reported that 100 per cent of the dogs fed on both normal and inadequate diets plus sodium bicarbonate, with and without vitamin D, developed "paradentosis" in varying degrees of severity. Kidney damage was found in those examined.

These experiments confirm those conducted by one of us (M.R.J.) while associated with the California Stomatological Research Group. The effect on bone and "paradentium" (Becks) of long continued feeding of alkali is undoubtedly well appreciated by Becks and Simmonds. Another aspect of this type of dietary imbalance is a general metabolic upset resulting probably from the neutralization by the alkali of the free hydrochloric acid in the gastric secretion. A certain degree of acidity in the stomach contents is essential for normal digestion. The long continued use of soda that is necessary to produce obvious bone and dental lesions would not only neutralize acid formed, but also might completely in-

2. Jones, Martha R.; Larsen, N. P., and Pritchard, G. P.: *D. Cosmos*, 76:395 (April) 1934. Jones, Martha R.: *D. Cosmos*, 77:535 (June), 651 (July), 747 (Aug.) 1935.

hibit the secretion of hydrochloric acid in the stomach and start a succession of ills which would persist through life. To destroy lower animals in the interest of science is one thing, but to wreck the lives of helpless children entrusted to one's care is quite another. If such an experiment is required to convince Becks and Simmonds of the validity of our work, it is quite safe to say that we shall never enjoy their support. May we suggest that they repeat our observations on cases of their own selection?

Becks and Simmonds describe certain diets in the dog experiments conducted by Dr. Morgan that resulted in bone abnormalities as follows: "The diet responsible for these severe changes contained a salt mixture which was low in calcium and relatively high in phosphorus (owing to the low calcium content of the mixture) and contained no cod-liver oil." The title of the paper in which these experiments were described by Dr. Morgan was "The Effect of Acid, Neutral and Basic Diets on the Calcium and Phosphorus Metabolism of Dogs."<sup>3</sup> Of the four diets reported that were low in calcium and contained no vitamin D, one was highly acid and three were highly alkaline in potential reaction. Dr. Morgan reports that "typical clinical parodontosis was seen in the low calcium group without vitamin D and in all the alkaline fed dogs on normal diet as well." The dogs fed on the highly acid diet without vitamin D suffered the most severe lesions and those on the "neutral" diet were the most nearly normal. Imbalances on either the acid or the alkaline side had a profound effect.

It should be stated that Dr. Morgan's so-called "neutral" diet contained an excess of from 4 to 8 c.c. normal alkali per

3. Morgan, Agnes F.: *Univ. Calif. Pub. Physiol.*, 8:61, 1934.

kilogram of body weight. Such an excess of alkali in human diets would be extremely high. The term "neutral" as used is misleading. Why do Becks and Simmonds fail to mention these facts, which they could hardly have failed to recognize and appreciate? Have they, as have certain others, developed an obsession on the possible significance of the acid-base balance of the diet? Do they analyze their diets from the standpoint of acid-base balance, and are they in a position to say with surety that this factor is in no way concerned with mineral balance in the body? We believe not, from the fact that, in a footnote appended to their tables, it is stated "Gravy, salads, desserts and 'extra foods' are not included." Among the vegetables that they regard as interchangeable are "corn, peas, carrots, greens, cauliflower, string beans, turnips and onions." A serving of corn (about one-half cup) yields approximately 2.7 c.c. excess acid and an equal amount of spinach yields 27.0 c.c. of alkali.

In experiments on man in which rice was substituted for potato in a mixed diet, Sherman and Gettler<sup>4</sup> found that the fixed acid production was increased. About 73 per cent of the increase could be accounted for by increased ammonia and titratable acidity of the urine. The remaining 27 per cent, according to the investigators, "may have been eliminated in part at least, through the skin or in the feces, or may have been neutralized by the buffers of the blood with a corresponding increase in carbon dioxide output, and a decrease in the alkalinity of the body." Blatherwick<sup>5</sup> likewise found that foods with a predominance of acid-forming elements tend to deplete the al-

4. Sherman, H. C., and Gettler: *J. Biol. Chem.*, 11:323, 1912.

5. Blatherwick, N. R., and Long, M. L.: *J. Biol. Chem.*, 53:103 (July) 1922.

kali reserve of the blood. Is there any evidence to controvert these findings? Are we justified in dismissing their possible significance when we are confronted with a world problem that is so strikingly associated with the substitution of grains for roots and tubers? Do Becks and Simmonds have any authority for the standards they have set up, and on what bases are "corn, peas, carrots, greens, cauliflower, string beans, turnips and onions" interchangeable?

Becks and Simmonds mention the reports of a number of investigators who had observed arrested decay on improved dietaries, but did not discuss them. Some of those also reported high incidences of decay on diets containing calcium, phosphorus, iron and vitamins in excess of the amounts prescribed by Becks and Simmonds. Our analyses of some of the reports from the standpoint of acid-base

balance and also of the Becks-Simmonds "adequate" diet, show that the latter is among the very low in alkali excess. According to our scale (3) the incidence of dental caries on Becks-Simmonds Diet 1 would have been close to 85 per cent. At the time Becks and Simmonds wrote their paper, they had completed "nearly 200 dietary studies." The time covered was not stated. Most investigators can determine whether decay is arrested or active in a few months. Some report changes in a few weeks or even days. Becks and Simmonds had nothing to report, but apparently were still "hoping" that the diet would prove effective. Having finished the paper, the reader is not quite certain whether the diet is or is not important for "health of teeth and parodontium." We wonder what the object of the paper might have been.