

[On the proposition that] a Clean Tooth Does Not Decay and that Mouth Cleanliness Affords the Best Known Protection Against Dental Caries.

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Abstract: Oral cleanliness is not the best known means for the control of dental caries because:

(I) It is not Nature's method.

(II) Immunity and susceptibility can be clinically altered at will by modifying the nutrition.

(III) The controlling factors for immunity can be shown to be in the saliva and can be traced from plants to animal tissues.

(IV) Tooth decay is not a disease, but a symptom, like many other degenerative processes.

(I) Since primitive man has had high immunity to dental caries he becomes our control in the great experiment of civilizations.

It is essential therefore, that we study the controlling factors of his environment, of which he is the product, and use these as our yardstick for studying modern civilization.

For this I have studied remnants of several primitive racial stocks where their physical isolation had sheltered them from the influences of our modern civilization, and by studying them and their foods and their methods of living, certain underlying factors.

are found to be common to all these primitive groups, even though they were living in different countries and on very different foods. This permits us to critically analyze modern civilizations at their points of contact with the primitives and, by studying them and their problems with the standards of immune primitives, not the factors which are contributing to dental caries.

By studying the children in four isolated valleys in Switzerland; Loetschental, Visperterminen, Grächen, and Ayer in the Swiss Alps, I found the incidence of dental caries to be only 4.6 percent of the teeth studied. Here oral prophylaxis and modern equipment for practicing it were largely unknown. At St. Moritz, however, at approximately the same altitude, which is highly

modernized community with excellent training in oral prophylaxis, the incidence of caries was 29.8 per cent of teeth studied.

At Vissoie and Zinal, which were partially modernized, 22 percent of the teeth examined had been attacked by dental caries. At Herisau, in the plains country of Switzerland, also a highly modernized community with splendid instruction and equipment for mouth cleanliness, the incidence of caries was 24.7 per cent of the teeth examined.

Similar studies were made in the Outer Hebrides off the west coast of Scotland and revealed that in the isolated districts of the Isles of Lewis and Harris, only 1.2 percent of the teeth examined has been attacked by dental caries. Oral prophylaxes was almost unknown. In the ports and modernized sections the incidence of dental caries was found to be 30 per cent of teeth examined.

The natural foods available for these two primitive groups were very different in origin, but similar in chemical content, as will presently be shown.

Similarly, studies were made of remnants of the primitive Eskimos and Indians of Alaska and northern Canada and of those individuals of these groups who are at the point of contact with modern civilization.

The Eskimos of western and northern Alaska were reached by airplane and for several groups who had been but little influenced by modern civilization, hence living entirely on native foods, the per cent of teeth found to have been attacked by dental caries was 0.09, that is, only two teeth out of 2138 in seventy-two individuals. No effort apparently had ever been made at oral prophylaxis in these groups.

At the point of contact with modern civilization, where a government supply boat comes once a year to provision a government state, the incidence of caries among the local Eskimos increased to 13 per cent of the teeth, or 394 teeth out of 2254 in eighty-one individuals. At this point oral prophylaxis was being taught and practiced and, in spite of it, the increase in dental caries was 144-fold. The controlling factors in producing these changes will presently be shown to be nutritional. The natural food of the primitive Eskimos was almost entirely the animal life of the sea.

Similarly, quite primitive Indians were sought for and found in northern Canada who were living practically entirely on wild animals. Their physical isolation from the influence of modern civilization was very complete. Three groups were found, consisting of seventy-six individuals with 2144 teeth and without a single tooth having been attacked by dental caries. In a total of 2464 teeth examined for eighty-seven individuals in four groups, only four teeth had ever been attacked by dental caries, or 0.16 per cent.

These people knew nothing of oral prophylaxis as understood by modern civilizations.

For the groups of these Indians at the point of contact with modern civilization, 21.5 per cent of 1878 teeth in seventy individuals, or a total of 405 teeth, had been attacked by dental caries. This is an increase of 134-fold. These individuals had been taught oral prophylaxis.

More About the Connection Between Diet and Teeth

When we arrange the incidence of dental caries according to the degree of contact with modern civilization and its foods beginning with the coast towns and settlements of the Pacific coast of Canada and Alaska, including Wrangell at the mouth of the Stikine River, from which connection is made with Telegraph Creek up the Stikine River by boat in the summer and then by trail over the Rocky Mountain Divide into the Interior, we find that the percentage of teeth involved for seven coast settlements for all individuals for all groups studied is 40.8; Telegraph Creek, 14.9; Dease Lake, just over the divide, the first inside Hudson Bay Post, 9.6 per cent; and McDames and Liard, the two Hudson Bay Posts farthest in the interior, 3.1. For the most isolated and primitive of these last two groups of 0 per cent of teeth had dental caries.

This is shown graphically in Fig. 1 for twenty-four places which reveal the relation of caries to nutrition. Knowledge of and equipment for oral prophylaxis are in the direct proportion in these groups with the incidence of dental caries, and dental caries is in direct proportion to the displacement of native foods with modern foods.

Accordingly, since the incidence of dental caries is shown to be in direct proportion to the utilization of modern foods to displace the native foods, we are concerned to know the chemical or physical qualities of the foods which constitute the controlling factors. Large numbers of the samples of foods are collected for chemical analysis to provide this information.

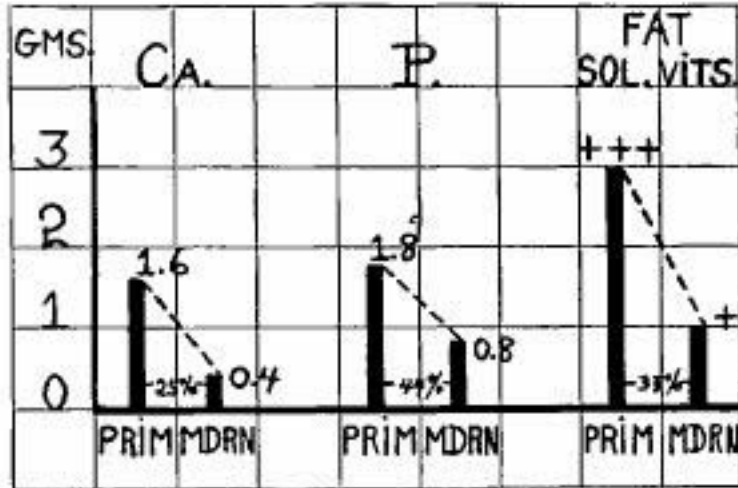
The requirements of the normal human for two of the several requisite minerals, namely, calcium, and phosphorus have been shown by Sherman to be approximately two grams of each in suitable chemical form in the daily diet in order that the body may obtain at least one gram of each per day, which can only be accomplished when there is present an adequate quantity of the various vitamins, particularly the fat-soluble vitamins.

The quantity of these two minerals found from a study of the diets of both the immunes and susceptibles in Switzerland shows a marked reduction in several minerals as provided in the normal daily diet, consisting chiefly of entire rye and dairy products in comparison with the displacing diet obtained from modern civilization. This decrease was from 1.6 to 0.4 grams for calcium, from 1.8 to 0.8 for phosphorus and from +++ for fat-soluble vitamins to + on the basis of 2000 calories. This amounts to the reduction of 73.4 per cent for calcium, 55.4 per cent for phosphorus and 67 per cent reduction for the fat-soluble activators.

The change is illustrated in Fig. 2.

FIG. 2

DAILY DIETS SWITZERLAND



2000 CALORIES

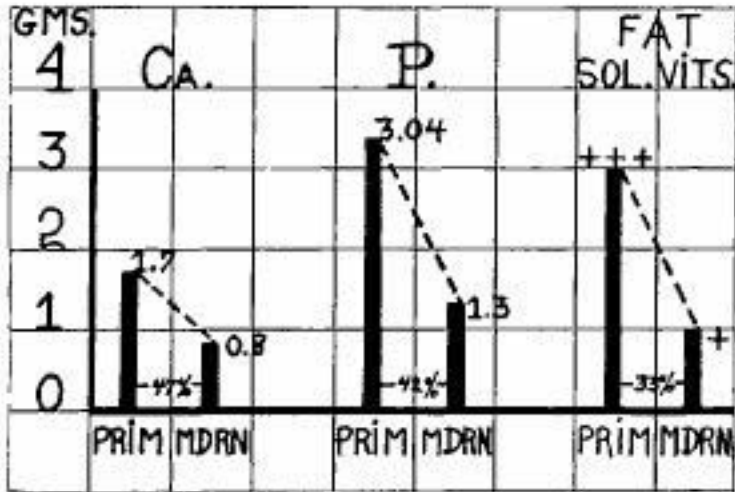
Two minerals and the fat-soluble activators only are shown for the diets in Switzerland for comparison of the more primitive with the modernized groups. These were mostly children seven to sixteen years of age.

For the Outer Hebrides when their native foods, which consisted chiefly of oats and sea foods, are displaced with the diet used by modern civilization, there is a reduction from 1.7 to 0.8 grams for calcium, from 3.04 to 1.3 grams of phosphorus and from +++ to + for fat-soluble activators, a reduction of 52.3 per cent for calcium, 57.2 per cent for phosphorus and 67 per cent for fat-soluble activators on the basis of 2000 calories daily.

This change is illustrated in Fig 3.

FIG. 3

DAILY DIETS HEBRIDES



2000 CALORIES

Two minerals and the fat-soluble activators only are shown for the diets in the Outer Hebrides for comparison of the more primitive with the modernized groups. These were mostly children seven to sixteen years of age.

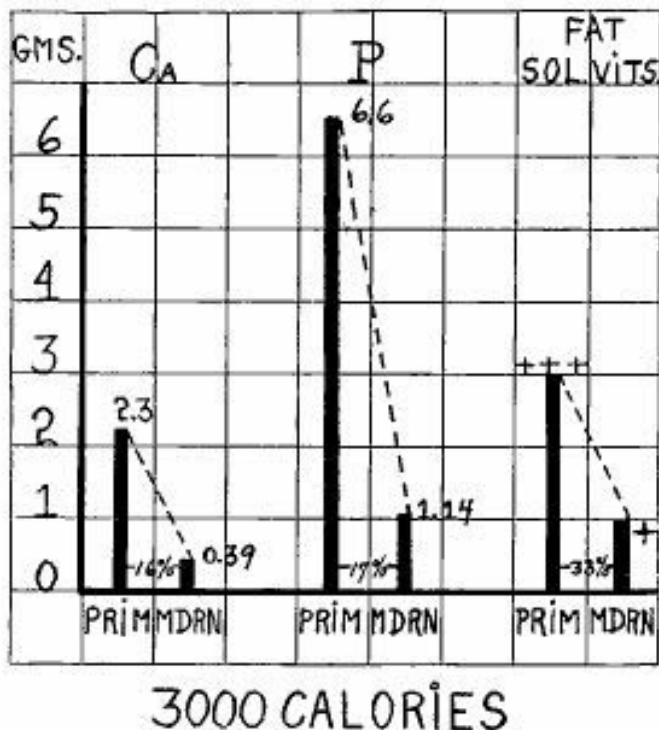
When the native diets of the Eskimos are changed from the animal life of the sea to those used by modern civilization, there is a reduction from 2.1 to 0.3 grams for calcium, from 5.7 to 1.1 grams for phosphorus. life of the land, was displaced with diets as used by modern civilization, the reduction was from 2.3 to 0.39 for calcium, from 6.6 to 1.14 for phosphorus and from +++ to + for fat-soluble activators on a basis of 3000 calories. This is a reduction of 84 per cent for calcium, 83 per cent for phosphorus and 67 per cent for fat-soluble activators. This is illustrated in Fig. 5.

Determinations were made of several other minerals, which for brevity are not shown in Figs. 2 to 5. These have included in the analysis of the foods of the Eskimos and Indians and determination of magnesium, iron, copper and iodine.

The per cent reduction for all of these for two groups, the Eskimos and Indians, when changing from high immunity to high susceptibility to dental caries, is shown in Fig. 6, in which it will be seen that the reduction in each, magnesium, iron, copper and iodine is very great, which is doubtless quite and important as in calcium and phosphorus.

FIG. 5

DLY. DIETS INDIANS N. CANADA



Two minerals and the fat-soluble activators only are shown for the diets of the Indians for comparison of the more primitive with the modernized groups. Both children and adults are represented.

The minerals I have shown to be phosphorus, from +++ to + for fat-soluble vitamins or a reduction of 86 per cent of calcium, 80 per cent for fat-soluble activators and the basis of 3000 calories for their severe climate. This is illustrated in Fig. 4.

For the Indians of northern Canada the loss of immunity when their normal diet, consisting chiefly of wild animal life of the land, was displaced with diets as used by modern civilization, the reduction was from 2.3 to 0.39 for calcium, from 6.6 to 1.14 for phosphorus and from +++ to + for fat-soluble activators on a basis of 3000 calories. This is a reduction of 84 per cent for calcium, 83 per cent for phosphorus and 67 per cent for fat-soluble activators. This is illustrated in Fig. 5.

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FIG. 6
Comparison of Diets of Caries Immunes and Susceptibles

Groups	Fat-Sol. Vitamins	CA	P	Fe.	Mg.	CU	Iodine
I. Immunes. Eskimos . . .	High	2.14	5.70	0.100	1.27	0.0312	0.000131
II. Susceptibles Eskimos . . .	Low	0.39	1.14	0.067	0.16	0.0167	0.00000276
Reduction	Marked	1.75	4.56	0.033	1.11	0.0145	0.00012824
Percent reduction		81.8	80.0	30.0	86.6	46.6	97.8
	*	*	*	*	*	*	*
III. Immunes. Indians . . .	High	2.30	6.61	0.186	0.68	0.0254	0.0000240
IV. Susceptibles Indians . . .	Low	0.39	1.14	0.067	0.16	0.0167	0.00000276
Reduction	Marked	1.91	5.47	0.119	0.52	0.0087	0.00002124
Percent reduction		83.0	82.7	63.9	76.4	34.0	88.5

The totals of six elements in the various foods used for an average day among each the immune and susceptible Eskimo and Indian groups are shown, also the total reduction and percentage reduction.

More About Nature's Method for Fighting Cavities

The minerals I have shown to be supplied in greatly reduced amount in the displacing foods as obtained from modern civilizations are building blocks out of which animal life has been constructed. The natural foods of the various primitive groups contained them in high proportion to the calories, or energy-producing factors. Ordinarily, hunger applies primarily to energy-producing foods.

The primitives, accordingly, like the individuals of modern civilizations, choose the high-calorie foods both because they easily satisfy hunger and provide energy and heat.

Since the maintenance of life is depended upon at least a minimum of minerals and other chemicals of which blood and other body fluids are made, these must be borrowed in proportion as the daily intake fails to supply them.

This produces nutritional stress which affects the blood and saliva. Dental caries is one of the direct expressions or affects this nutritional stress. Nature, as we shall see, provides immunity to dental caries by maintaining these minerals and activators in normal balance.

(II) Immunity and susceptibility can be clinically altered at will by modifying the nutrition.

If, as seems indicated in the data just submitted, the loss immunity to dental caries is caused by an inadequate quantity of minerals and activators as provided in the daily diet, it should be possible by nutrition reinforcement to change individuals from a state of high susceptibility or loss of immunity to a state in which caries ceases to be active.

I have previously reported several groups who have been treated and in which dental caries have been reduced more than 90 per cent. I have been accomplishing this for ten years in individuals in clinical practice.

In addition to individuals in clinical practice, I have selected groups of children in districts where the industrial depress has more seriously curtailed incomes, and consequently has reduced nutrition. Severe cases of dental caries have been given a reinforcement of the nutrition in order to determine the effect of that procedure upon the progress of the dental caries. This has been based upon a reinforcement of the mineral and activator content of the nutrition.

More About Immunity to Cavities

In three mission clinic groups of children selected because of their high susceptibility to dental caries, who had their nutrition reinforced by the addition of fat-soluble activators obtained from high vitamin butter and high vitamin sea foods, particularly liver oils, together with foods that are rich in needed minerals in proportion to the calories, the active caries has been practically completely controlled. This was provided in one meal a day.

This complete control of dental caries was accomplished without making any change in the oral prophylaxis program. Associated with this reinforcement of the nutrition the decalcified dentin of open cavities was remineralized and in pulps that were nearly exposed by the decalcification process, zones of normal dentin were built in, walling off the approaching caries. This remineralization of the dentin is illustrated by the increase in density, as indicated by the inability of silver nitrate to penetrate the previously decalcified dentin, as shown in Fig. 7. The dentin in many cases became so dense that when scratched with a steel instrument it produced a metallic tone. An illustration of the building in of a protective wall of dentin is shown in Fig. 8.

(III) The controlling Factors for Immunity Can Be Shown To Be In The Saliva and Can be Traced From Plants to Animal Tissues and Sera.

Typical dental caries has never been produced without the presence of saliva and even crowns of teeth attached to artificial dentures may be attacked by typical tooth decay in susceptible mouths. No teeth have been made dirty enough to induce typical tooth decay outside the mouth. Active caries promptly ceases with death. While the aciduric bacteria play a role, their action is rigidly controlled by the saliva, which provides the environment for the teeth. This control has been

shown by me to be associated with the behavior of the inorganic phosphorus in its relation to adsorbents such as the structures of the tooth.

One phase of this is disclosed by shaking finely powdered dry bone in a sample of the saliva and noting its effect on the inorganic phosphorus level as compared with the untreated sample. In cases of high immunity the effect of the powdered bone is to markedly lower the reading of inorganic phosphorus. In cases of lost

immunity or active dental caries, this reduction of inorganic phosphorus is greatly lessened or in very severe cases is increased and will follow the changes in immunity or susceptibility and vice versa as produced clinically. This is typically illustrated in a mission experimental group, as shown in Fig. 9. This shows the progressive effect

produced by providing one meal a day in which mineral-carrying foods and fat-soluble activators were reinforced. It will be seen that an average change in the level of the inorganic phosphorus of the saliva progressed from a plus 2.48 to a minus 11.7.

In a group of eighty-two individuals suffering from active dental caries who received reinforcement of the mineral and activator-providing foods, in all of whom there was complete control of the dental caries, there was a shift in the percentage of the inorganic phosphorus of the saliva when shaken with powdered bone, from an average of plus 8.4 to minus 11.2. This is shown in Fig. 10. In a group of 119 individuals, including both severe and mild cases of active caries, the percentage change was from an average of plus 5 to a minus 12 as the result of reinforcing the nutrition.

More About Immunity to Cavities

Further evidence that this effect is due to the activating substances added to the nutrition is indicated by the changing of the chemical characteristic of the saliva of individuals suffering from rampant tooth decay and showing a plus reading by shaking the saliva for a few minutes with an activating substance, such as a high-vitamin butter oil or a high-vitamin animal fat, then separating them and noting the effect of this procedure on the inorganic phosphorus when the saliva is shaken with finely powdered bone.

Twenty-seven salivas with a plus reading changed when treated from an average of plus 9.7 to a minus 6.1.

Many additional data are available which space does not permit including.

The route of the activating substances can now be traced from their original formation in the tissues of plants through the plant and animal foods to the blood and saliva and various tissues and fluids of the body. In the light of newer knowledge, some enzymes which are organic catalysts are directly formed from some of the vitamins. The vitamins in this very direct way influence and control function. These plant pigments that act as precursors of the vitamins included, according to Willstatter, Kuhn and Gyorgy, the carotenes, glycogens and flavines, of which several have been isolated. The carotenes have been termed fat-soluble, or lipochromes, and the flavines, water-soluble or lyochromes. These pigments are very widely distributed in

plant and animal tissues and give evidence of being directly related to radiation. When crystallized, the flavines concentrated from the milk have proved to be the most active growth-promoting substances as yet obtained. Evidence has been developed relating the vitamins directly to the organic catalysts or enzymes by several workers, including Kuhn and associates and Purr.

(IV) Tooth Decay is not a disease, but a symptom like many other degenerative processes.

While dental caries is recognized as the most universal affliction which accompanies civilization and is, as we have shown, a direct expression and effect of nutritional stress, it can now be shown to constitute or represent only one of many injurious effects of expressions of faulty nutrition. Rickets of childhood has been recognized as one of these.

Several affections or so-called diseases of modern civilization are progressively on the increase. Others are particularly destructive for certain groups. Others chiefly maim and produce deformities in various parts of the body, such as the face and dental arches.

Facial and dental irregularities have been chiefly ascribed to mixed racial physical characteristics. In my investigations of primitive racial stocks and of the effects produced by their displacing of part of their natural food with foods of modern civilization, it has been disclosed that the rigid conformity to physical type characteristics of these races has been lost in a single generation as an effect of nutrition on the developmental processes during prenatal and postnatal life.

For the face this may express itself as retarded growth of either the middle third or lower third or both. This directly affects the arrangement of the teeth in the dental arches as well as the interrelation of the dental arches. It occurred in as high a percentage of full bloods in the first generation after adopting the nutrition of modern civilization as in the mixed bloods. This deficiency was also found to have an expression in many other structures of the body.

One of the most serious defects results in abnormal pelvic development and consequent increase in difficulties involved in child-birth, jeopardizing either or both mother and child. This greatly increases mortality for both.

These injuries were not limited in their expression to abnormal or disturbed physical development, but were found to be associated with marked loss in ability to combat infections, both acute and chronic. Focal infections more readily metastasized, involving other organs and tissues of the body. For example, in twenty homes at the point of contact with modern civilization, ten bedridden cripples were found, chiefly involved with arthritis. Not one was found among the most primitive group.

It is common knowledge that primitive races are destroyed rapidly by tuberculosis when they make contact with modern civilization. This has been chiefly ascribed to an absence of an

inherited defense. My studies of the primitives at the point of contact with modern civilizations have revealed that the individuals chiefly affected are those who show distinct evidence of nutritional disturbance in infancy and childhood, as indicated by a disturbed development of the facial structures.

Every one of twenty Eskimo and Indian boys and girls in the Government Hospital at Juneau, Alaska, showed marked irregularities. Every one of twenty Eskimo and Indian boys and girls in the Government Hospital at Juneau, Alaska, showed marked irregularities of the teeth and dental arches. The same nutritional injury that had made normal physical development impossible and prevented the development of a normal chemical laboratory for producing the immunity maintaining factors. Most of these individuals suffered also from active dental caries.

Tooth Decay is a Symptom of Disease

In my investigations now in progress I am finding this association to obtain in modernized communities. I am also finding that a very large percentage of the individuals referred for the study of the possible relationship between dental focal infections and chronic or acute systematic involvements in a very large percentage of individuals have evidence of physical injury which has resulted from a nutritional deficiency in childhood. This throws important new light on the clinical findings previously reported that over 95 percent of the cases of heart involvement beginning before ten years of ages suffered from rampant dental caries. Neither is necessarily the cause of the other; both are symptoms of a common nutritional cause, and neither is related to the presence or absence of oral cleanliness.

A new truth is a new sense, but new truths come only to prepared minds. We must think of life in terms of its building blocks, and these are partly static and partly dynamic.

Physical decadence, including dental caries, is in large part the absence of these dynamic vital forces. They have largely been overlooked because of the difficulties in their visualization and identification.

The arguments of the affirmative are typically those of this mechanistic or machine age.