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with Cycles in Vitamin Tides

WESTON A. PRICE, D. D. S.

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View of Health and Disease Based on a Rise and Fall in the Levels of Life with Cycles in Vitamin Tides*

WESTON A. PRICE, D. D. S.

Cleveland, O.

VARIATIONS in susceptibility and resistance to disease have long been recognized as of paramount importance in determining individual health levels. The controlling factors for these variations have been but little understood, and prophylactic procedures have not been able to diminish materially the rate of apparent increase in diseases of the heart and circulatory system, and those of some other organs.

As an approach to the presentation of some new data I would suggest the viewpoint, at least for this consideration, that instead of individuals dying chiefly at this time from degenerative diseases we think of them as getting the degenerative diseases in many instances because they are in the process of dying.

This immediately raises the question as to why they are in the process of physical degeneration or death. It apparently is not simply a case of the running down of a physico-chemical mechanism since we have a series of cycles of degeneration, and when we compare the characteristics of the mortality and morbidity curves throughout a series of annual seasons we find that in various parts of the world there is remarkable constancy in the nature of the curves. This will be seen clearly in Figure I, which presents curves for mortality rates for pneumonia and heart disease for the United States, England and Wales, and New South Wales (Australia), for comparison. The similarity will immediately be seen to be most striking whether reading across the page or up and down. There is, in general, a rise in mortality in winter and a fall in summer. Our concern is why.

* Read at a Joint Session of the Food, Drugs and Nutrition and the Child Hygiene Sections of the American Public Health Association at the Fifty-ninth Annual Meeting at Fort Worth, Tex., October 27, 1930.

COMPARISON OF THE MORTALITY RATES BY MONTHS FOR THE UNITED STATES OF AMERICA, ENGLAND AND WALES AND AUSTRALIA

PNEUMONIA U. S. A. Jan. 1923 to Dec. 1927
Eng. & W. Oct. 1923 to Sept. 1928
Austr. Jan. 1924 to Dec. 1929

HEART U. S. A. Jan. 1925 to Dec. 1927
Eng. & W. Oct. 1923 to Sept. 1928
Austr. Jan. 1928 to Dec. 1929

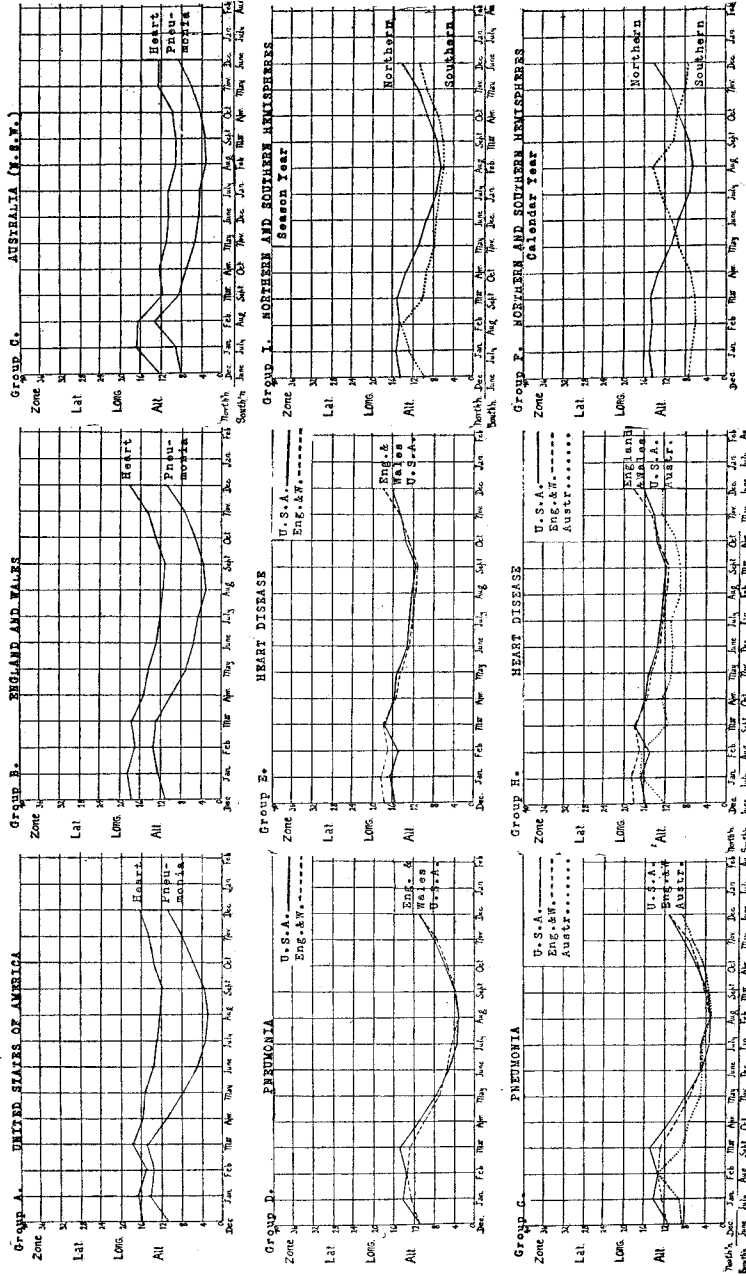


FIGURE I.—Seasonal variation in the severity of pneumonia and heart disease is shown to be the same in general for United States, England and Wales, and Australia. Such common results probably have common causes.

It is clear that we are dealing with a force or forces fundamental to life itself, having an expression which bears a distinct relationship to seasons. This rise and fall in the level of life has an almost endless variety of expressions. Since animal life can only exist by using as nutrition directly or indirectly organic compounds developed by plant life, and the plant can use only binary compounds which it builds into ternary and higher compounds, we will look for characteristics of the plant foods to find, if possible, factors that will be related directly and indirectly to the characteristics of the morbidity and mortality data.

In order to make the problem still more specific it seems important to study the characteristics of those products which are most efficient in maintaining both life and physical development. There are many different types of plant foods available for the sustenance of life, both on the land and in the sea, all of which go back directly or indirectly to the chlorophyll of plant life.

It is of particular significance that the great group of the animal kingdom constituting the mammalia are characterized by their dependence upon milk for a period of growth in early life. We have in this fluid the only single food capable of sustaining life and growth, and a product that is remarkably uniform, regardless of the species from which it is obtained. Since milk contains the essentials for life and is the product of plant life, it may and probably does contain expressions of variation in those controlling factors which are involved in the rise and fall in the levels of life, for it contains the elements which maintain life.

The products of the pasture must contain essentials for life, both mineral and accessory, and since so many varieties of plant life can provide the requirements for milk, we probably have in milk the best index for studying these requirements in fluids.

The last two decades, and particularly the last few years, have rapidly increased our knowledge of the accessory food factors—those obscure products which make the difference in the levels of life, for when they are decreased below a certain minimum life cannot exist. These activators or vitamins may be divided into two groups, the water soluble and the fat soluble; while both are essential and both are subject to fluctuations, our chief emphasis in this review will be centered on the group which is most difficult to obtain, namely, the fat soluble vitamins. Contrary to the general conception, the sources of some of the fat soluble vitamins and activators are actually very restricted. Being fat soluble, they are found only in the small amount of fat that is present in growing plants and in certain of the fats of animals, chiefly stored there from plant life.

COMPARISON OF VITAMINS A AND D IN BUTTER BY MONTHS FOR THREE YEARS, 1928, '29, AND '30.

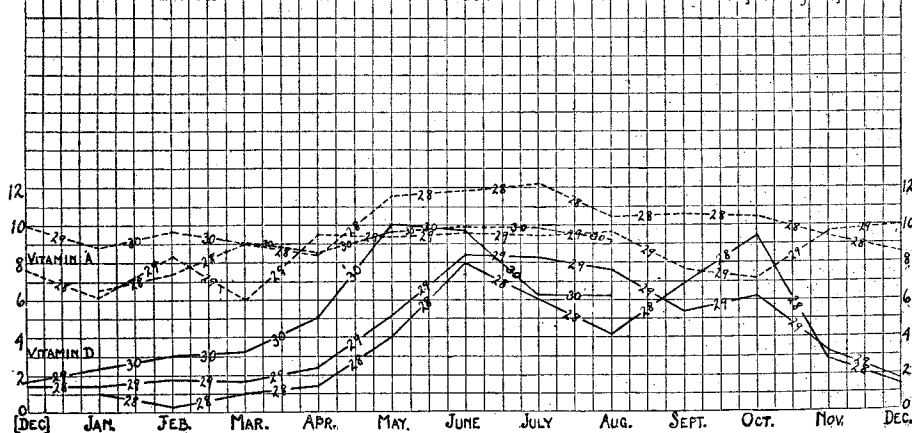


FIGURE II—Average levels of vitamins A and D for a 5-state area

It now seems probable that the principal reason milk is the infant food of so large a group of the animal kingdom is because the parent is able to take these fat soluble factors from plant life, or from the tissues of animals in which they have been stored, and make them available in the suspended fat of the breast food. The variations in mineral content of milk produced under varying conditions are found to be very much less than those in both the water soluble and fat soluble activators, both of which are essential. We are, however, primarily concerned with the variations in the fat soluble vitamins. The fat soluble activators which are chiefly responsible for mineral utilization are found in large quantities in only two important sources of food, the fat of some milk and the oils of some fishes.

Since mineral utilization is essential for the building and maintenance of all tissues of the body, particularly the bones and teeth, we are led at once to place great importance on those activating substances without which the minerals, though present, are not available for the animal body.

I am carrying out an extensive investigation on the variations in the levels of these activating substances in the fats of milk. This involves a study of the level of the fat soluble activators in dairy products as obtained from many countries throughout the world. Samples are being received from countries in both Northern and Southern Hemispheres, regularly monthly, weekly or every 2 weeks. The Alaska products include reindeer milk, butter and cheese, beside marine-life oils. The number of butter and cream samples received during the summer season this year reached 700 per month. It is ex-

ceedingly significant that there is evidence of a seasonal cycle in practically all of the countries of the world so far studied.

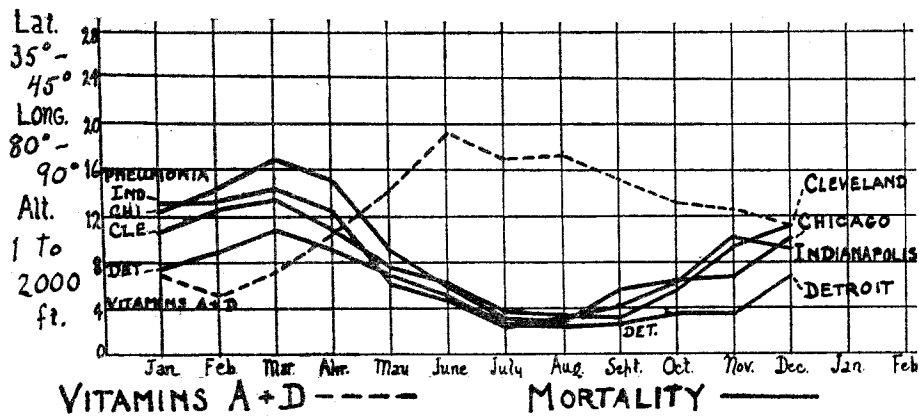
In Figure II will be seen graphs for the average level by months for both vitamins A and D for a 5-state area for 1928, 1929, and 9 months of 1930. The vitamin A level is shown by the broken line and is the average for all samples for this area, and vitamin D is shown by the solid line. The outstanding feature is the low level of available fat soluble vitamins in the dairy products from November to May in many districts in the northern latitudes where the spring or summer rise comes much later than in the less northerly latitudes. Note that the vitamin levels for 1929 are shown to be higher than 1928 and higher for 1930 than for 1929.

In Figure III we see the relation of deaths from pneumonia in 4 cities to the level of a factor obtained by adding the vitamin units A and D. The curve for deaths from pneumonia is shown by the solid line and the vitamin A plus D curve by the broken line. It will be seen that there is a remarkable similarity in the pneumonia curves for these various cities, all having their high point in the late winter and the low point in the late summer; also, that in general these factors are in opposite phase to the vitamin level as expressed in the butter fats obtained throughout the months for this area.

The finding of such a relationship for one district may be coincidence. It is important to apply the principle to many districts. This I have accomplished by dividing the United States and Canada into 16

FIGURE III—RELATION OF DEATHS FROM PNEUMONIA IN FOUR CITIES TO LEVEL OF VITAMINS A PLUS D BY MONTHS

OHIO, INDIANA, ILLINOIS, MICHIGAN, AND WISCONSIN



large geographic areas in the general order of their physical location as shown in Figure IV.

The solid line is a composite curve showing the deaths from pneumonia and heart disease and the broken line shows vitamin A plus D as expressed in the data obtained from the analyses of the butter and cream samples received month by month in 1929 from many places. In general when the vitamin curve is low the mortality curve is high.

There are two great sources of fat soluble food activators, namely the pastures of the sea and those of the land. Many people have the opinion that fish oil, particularly cod liver oil, would be a complete substitute for the fat soluble vitamins of land plant origin. In my clinical and technical investigations of the activators for inducing mineral metabolism, I have continually found evidence indicating that cod liver oil contains products that are very seriously toxic to humans and other land animals and can do much harm when given in large doses, even only as large as frequently advocated.

If it be true that we are dealing in these matters with factors that are related as cause and effect, it should be true also that data would readily be obtainable, throwing light on this whole problem by changing the incidence of morbidity and mortality as a result of administering or utilizing butter fat vitamins during periods of such low vitamin tides. Since dental caries is said to be the most universal disease in the world and is so important because of its significance as a nutritional disturbance, its prevention becomes one of the prime needs in any program for health betterment.

A study was made of 200 individuals during the fall, winter and spring of 1929-1930, on the basis of the development of dental caries (Figure V). Diagnosis included the use of X-rays at different periods and detailed instrumental examination. One group received no additional activators to those available in their regular dietary. Those in this group are shown for the different age periods by the dotted line; the solid line shows the number of cavities per individual in the various age groups for those receiving additional activators provided them each week in capsule form. It will be seen that there is a very marked difference in extent of dental caries of the two groups, amounting to tenfold as many cavities in those not receiving the additional activators as in those receiving them. In addition to the activators there was considerable counsel given regarding the selection of the dietary in general.

In 20 individuals between the ages of 10 and 20 not receiving additional activators, there was a total of 143 cavities when examined in the late spring and early summer of 1930, whereas in the group re-

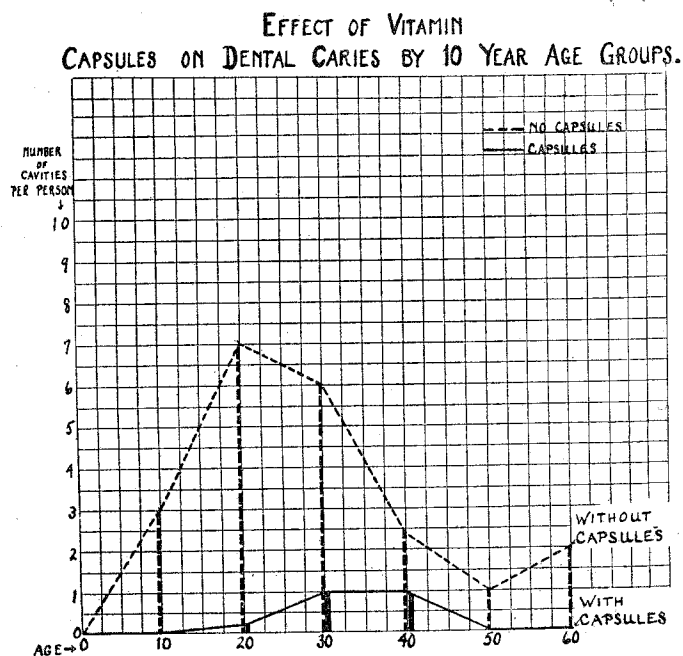


FIGURE V—Progress in control of dental caries, by difference in number of cavities developed per individual in group receiving special activators and those not receiving them.

ceiving additional vitamins there were only 3 cavities found in the 20 individuals. The additional activators were given in capsule form, each capsule containing 0.6 gm. Usually two capsules were taken with each meal. The capsules contained a mixture of the activators as concentrated from an exceptionally high vitamin butter, with about an equal quantity of an exceptionally high vitamin cod liver oil, both of which were selected by means of chemical tests. The improvement in general health, freedom from colds and capacity for work was very marked in all of these age groups receiving the capsules.

Since it is true that normal growth and maintenance of health are dependent upon the availability of the building blocks for growth, function and repair, it is not sufficient that we provide only the energy factors and the minerals, but also the activators with which these factors may be utilized. These apparently must come chiefly from plant sources. If the plant does not find in the soil the essential factors, chiefly mineral, and radiant energy out of which it can build its structures including its activators, it cannot provide for animal life those other building blocks without which animal tissues cannot be built or maintained.

When we study a map showing the locations where heart disease is most severe and on the increase, we find we are dealing in general with those areas that have been longest populated and the soil partly

depleted of such minerals as phosphorus, calcium, magnesium, potassium, etc. This newer view of disease, or the lack of growth and the maintenance of function, seems related primarily to the absence of this newer group of forces, the activators, and we see more clearly why we have the annual pilgrimages to the hospitals, and that many conditions we have thought of as diseases are really symptoms.

SUMMARY

Very little emphasis seems to have been placed upon or importance attached to the fact that annual tides have existed producing rhythmic rise and fall in the levels of vital phenomena. I have placed much emphasis upon the fact that the very existence of the tides as rise and fall in the levels of life is itself the indisputable evidence that the phenomena are related directly to factors which are variable from month to month in cycles.

Since the newer knowledge of the rôle of the activators, including vitamins, has shown them to be fundamental contributing and even controlling factors in growth and function; since all animal life is dependent upon plant life for its food supply; since the fat soluble activators are in general the most difficult to obtain; and since milk is the only single food that makes available all the various factors essential for life and growth; it has been used as the chief food product for these studies.

Intensive studies over a period of several years have revealed variations in the level of the fat soluble activators of milk which are traceable directly to the food of the animals providing the milk. The winter rise in morbidity and summer fall in the same seem to have some relation to the sun's position and to the growth of plants through the activity of the chlorophyll, which produces activating substances which are essential for animal life.

The extension of this study to dairy products obtained from many countries distributed throughout the world in both hemispheres demonstrates the presence of this relationship. The application of the principles involved by the administration of the fat soluble activating products that are obtainable from actively growing plant foods, particularly from milk fat produced from such foods, is found to be capable of effecting a very marked amelioration of the pathological phenomena associated with a reduction of infection through increased resistance as a defensive reaction, and in general is preventing the recurring cycle of morbidity in many individuals.

The accumulating evidence suggests the consideration of disease being, in many cases, more correctly speaking, a symptom and that

individuals often, instead of dying because they contract disease, primarily develop disease because they are dying. This interpretation provides an explanation for the increasing incidence of several diseases in particular localities, and seems to be associated with a depletion in the activating products of plant foods in these districts in part or chiefly the result of soil depletion of essential chemicals for efficient plant development, since these chemical elements are essential to the plant for creating these vitalizing activators which are essential for animal life.

To the extent to which these interpretations are correct, there is need for a change of emphasis in health programs from prophylaxis which has been found to be only partially effective, to an increase in the required activators partly by an improvement of soil conditions in order that plant life may be improved in quality, both for its use as food for humans and for the improvement of the nutrition of the foster mothers—the dairy animals—around which our civilizations have been built. This I interpret to be the means in the light of the best available knowledge for meeting the challenge of not only the Nordic races in the temperate zones, but for the betterment of human life wherever found; namely, to make available not only the mineral and other chemical elements needed for body building and repair, but also the vitalizing factors or activators, some of which are the known vitamins.

BIBLIOGRAPHY

1. Carr, F. H., and Price, E. A. *Biochem. J.*, 20: 497-501, 1926.
2. Yoder, L. *J. Biol. Chem.*, 70: 297 (Oct.), 1926.
3. Tisdall, Frederick F., Brown, Alan, and Kelly, Arthur D. *Am. J. Dis. Child.*, Jan., 1930.
4. Poulsson, Edvard. The Quantitative Determination of Vitamin D, *Biochem. J.*, 20, 1, 1928.
5. McCollum, E. V., and Adams, G. *J. Biol. Chem.*, 78: 495 (July), 1928.
6. Price, Weston A. (102) Calcium and Phosphorus Utilization in Health and Disease; I, The Rôle of the Activators for Calcium and Phosphorus Metabolism; II, The Nature and Source of Calcium and Phosphorus Activators; III, Seasonal Variations in Butter-fat Vitamins and Their Relation to Seasonal Morbidity, *J. Certified Milk*, Oct., Nov., Dec., 1929; and *Dominion Dent. J.*, Oct., Nov., 1929.
7. Price, Weston A. (108) Vitamin Tides and Their Expression in Seasonal Disease, Including Dental Disturbances, *J. Am. Dent. Assn.*
8. Price, Weston A. (95) Calcium Metabolism Studies; A. The Raising of Serum Calcium by Tropical Applications of Raw and Activated Cod Liver Oil; B. Disturbances Associated with the Active Dental Caries of Childhood and Pregnancy, *J. Am. Dis. Child.*, 33: 78-95 (Jan.), 1927.
9. Price, Weston A. (97) Calcium, its Activation, Utilization and Metabolism, *J. Am. Dent. Assn.*, Apr., 1928.
10. Price, Weston A. (99) Some New Fundamentals for the Prevention of Dental Disease, with Special Consideration of Calcification and Decalcification Processes, *Dental Cosmos*, Feb., 1929.
11. Price, Weston A. (100) Calcium Metabolism Studies on the Nature and Rôle of the Activators: Researches on Fundamentals for the Prevention of Dental Disease, *J. Am. Dent. Assn.*, Feb., 1929.
12. Price, Weston A. (101) New Fundamentals for the Treatment and Prevention of Dental Disease Based on Calcium Utilization and Disturbance, with Special Consideration of Factors Determining When an Infected Tooth Becomes a Liability, *J. Am. Dent. Assn.*, Mar., 1929.
13. Price, Weston A. (103) Seasonal Variations in Butter-fat Vitamins and Their Relation to Seasonal Morbidity, Including Dental Caries and Disturbed Calcification, *J. Am. Dent. Assn.*, May, 1930.
14. Price, Weston A. (106) Why the Annual Pilgrimages to the Hospitals?, *Your Health*, Mar., 1930.
15. Price, Weston A. (107) Some Contributing Factors to the Degenerative Diseases, with Special Consideration of the Rôle of Dental Focal Infections and Seasonal Tides in Defensive Vitamins, *Dental Cosmos*, Oct., Nov., 1930.
16. Price, Weston A. (110) Some Means for Improving Human Life by Increasing the Vitamin Content of Milk and Its Products, *Assn. Bull.*, Internat. Assn. Milk Dealers, Jan. 29, 1931.