

Are the Activators Revealing the Nature of Life in Health and Disease Including Dental Disease?

(Continued from August Number)

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I have now been carrying forward these studies for five years extending the areas from which samples are received for analysis of the level of the activating substances to many countries throughout the world. These samples are received either once or twice a month from the same place. This enables us to plot seasonal curves. These are now available for many countries for comparison with other vital phenomena. I have reported this phase of the problem in many communications.*⁴,⁵,⁶,⁷,⁸,⁹,¹⁰,¹¹. These also contain data relative to method for analysis.

These researches are disclosing annual cycles in vitamin levels which are strikingly similar from year to year for given places. They are also showing a marked difference in different places at the same time and season of the year. In some districts the levels are continually relatively low as compared with other districts. In a few districts the levels are relatively high as compared with the average. In general from a superficial examination of the data it would seem that since the vitamin levels are generally higher in the summer and lower in the winter in the temperate zones the vitamin level is in direct proportion to the sunlight. A more careful examination of the data, however, discloses that this is not what we find for in many communities the vitamin curves do not correspond to the sunshine curve. If, as seems to be generally supposed, the higher mortality and morbidity curves for the winter months are a direct result of the lessened sunshine this will go far toward justifying this interpretation. If on the contrary the mortality and morbidity curves have important variations from the sunshine curve this will suggest a need for a search for other factors. If it

* Price, Weston A.: Calcium and Phosphorus Utilization in Health and Disease. 1. The Role of the Activators for Calcium and Phosphorus Metabolism. 2. The Nature and Source of Calcium and Phosphorus Activators.—*Cert. Milk*, Oct., Nov., Dec., 1929, and *Dom. Dent. J.*, Oct., Nov., 1929. (Bulletin 102.)

⁵ Price, Weston A.: Seasonal Variations in Butter-fat Vitamins and their Relation to Seasonal Morbidity, Including Dental Caries and Disturbed Calcifications; *J. A. D. A.*, Vol. XVII, May, 1930. (Bulletin 103.)

⁶ Price, Weston A.: Some Contributing Factors to the Degenerative Diseases, with Special Consideration of the Role of Dental Focal Infections and Seasonal Tides in Defensive Vitamins. Oct., Nov., *Dental Cosmos*, 1930. (Bulletin 107.)

⁷ Price, Weston A.: New Light on the Control of Dental Caries and the Degenerative Diseases; *J. A. D. A.*, Vol. XVIII, July, 1931. (Bulletin 108.)

⁸ Price, Weston A.: Some Means for Improving Life by Increasing the Vitamin Content of Milk and Its Products; *The Assn. Bulletin*, No. 10, Jan. 29, 1931. (Bulletin 110.)

⁹ Price, Weston A.: A New View of Health and Disease Based on the Rise and Fall in the Levels of Life with Cycles in Vitamin Tides; *A. J. of Pub. Health*, June, 1931. (Bulletin 111.)

¹⁰ Price, Weston A.: New Light on the Cause and Prevention of Dental Caries and Some other Degenerative Diseases; *Proceedings of Congress*, August, 1931, Paris, France. (Bulletin 117.)

¹¹ Price, Weston A.: Control of Dental Caries and Some Associated Degenerative Processes Through Reinforcement of the Diet with Special Activators; *J. A. D. A.*, Vol. XIX, Aug., 1932. (Bulletin 118.)

should be that morbidity and mortality curves are found to follow the vitamin level curves rather than the sunshine curves they have importance just in proportion as there are adequate supporting data establishing the value of the vitamin curves and vitamins as nutritional defensive factors.

It is not possible in this survey to present a large quantity of extended data. I have accordingly consolidated the data, in Figure 11, on the following factors; namely, the seasonal level of vitamins by months, the death rate from heart disease and pneumonia by months, and the possible hours of sunshine for various areas when the United States and Canada are divided into sixteen districts of many thousand square miles each. These are arranged by latitude zones in the order that they occur. The mortality data are taken from government and municipal reports and are shown as averages for several years. The vitamin levels are those which I have found in the many thousands of butter and cream samples that have been sent to me from the general area. Several factors will at once be observed in a general view. The vitamin level curve may be said to follow the sunshine curve and both may be said to be in reverse phase of the mortality curve. A critical examination of the graphs reveal that in many areas the vitamin curve is depressed in the summer months and is in opposite phase, therefore, to the sunlight curve. It is further seen that in some of these districts there is a summer rise in the mortality curve following in general the sunshine curve. Note particularly the summer depression in the vitamin curve for all four of the Pacific areas and particularly the rise in the mortality curve of Northern California, Idaho and Utah. There is a reversal of these curves for Southern California, Arizona, and Nevada also in Georgia and Florida. It is particularly important that we note that the vitamin curve goes higher in the summer or in the spring or fall or both in some of the Northern districts than in the Southern districts, the highest point being reached in western Canada. The summer depression is less pronounced there than in most of the other areas. It should be a matter of profound concern and even alarm that the height of the mortality curve in the winter, spring and fall for these diseases should be so high in our New England and the north Central states. It is important that we note critically that the records of the American Heart Association show this

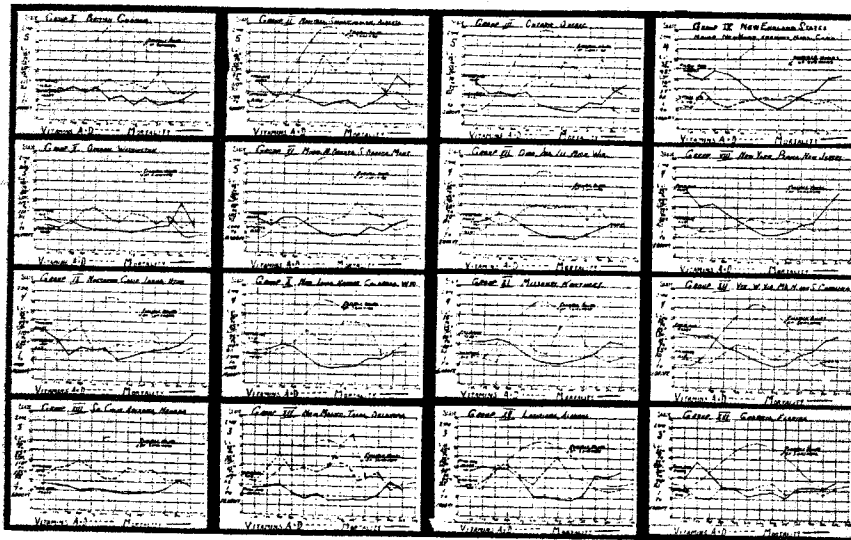


FIGURE 11

disease is steadily on the increase in many of the states in this general district and this notwithstanding increased knowledge and improved care together with prophylaxis. The summer depression on the level of the vitamin curve for the northwest districts is probably related in part to smoke from forest fires.

There is need for knowledge as to whether the factors which we are discussing as vitamins and activators are directly related to breakdown in health and whether by supplying these factors health can be reinforced. As an approach to this phase we will consider a group of turkeys shown in Figure 12 which began to go down with what was thought by the owner to be a contagious rheumatic affection. The joints would swell and the turkeys would be unable to rise. The so-called disease seemed to be spreading through the flock. They were on a standard ration prepared and sold to meet all the needs of growing turkeys. Six of them were brought to my laboratory at my request, after I was asked for advice regarding their care. A quantity of their food was also brought to me. The turkeys were divided into three groups of two each. Two of them were kept on the same food and they were used as controls. In the period of observation they gained 8.3% in weight. Two others received this same stock ration but in addition were given 2% of cod liver oil of high vitamin content. These gained 16.7% or twice as much as the first group. They did not however, get up. The third pair received the same stock ration and the same quantity and kind of cod liver oil but in addition a butter vitamin concentrate. These gained over four times as much as the controls and over twice as much as the cod liver oil group. The weight increase was 37.5%. One of these turkeys is shown standing, though its leg rotated the foot pointed laterally instead of forward as the turkey walked. It grew to full size and seemed to be little if any handicapped by its deformity. No turkeys got up from the other groups.

A chemical analysis of the blood from these turkeys is particularly important. The calcium in group one is seen to be very much lower in this group than in groups two and three. Indeed it is half again as high in the latter two groups.

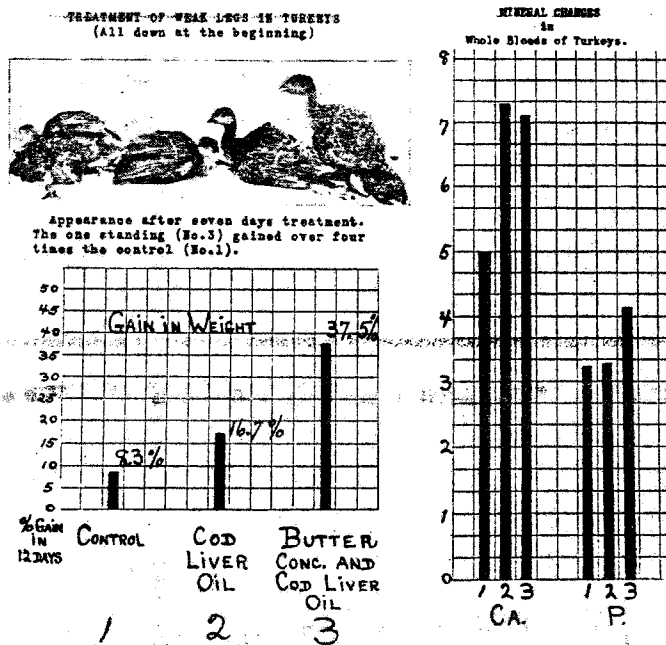


FIGURE 12

The phosphorus increased in group three but not in group two indicating that an important contributing factor was provided in the butter vitamin concentrate.

In Figure 4 I have indicated the effect produced by the addition of butter activators in the development of bones in the process of growth. It will be of interest to observe the effect of different quantities of this substance. In Figure 13 we saw the paws of eight rats all on the same basic ration (Steenbock 2965), the difference being only in the kind and quantity of activators. Number 1 received *no activators*; number 2 received 0.5% butter activators; number 3 received 1% butter activators, number 4 received 2% butter activators; number 5 received 4% butter activators, number 6 received 8% butter activators; number 7 received 2% cod liver oil and number 8 received 2% of each cod liver oil and butter activators. It will at once be seen that the carpal bones of the wrist are scarcely forming in rat number 1. There is also a marked decalcification of the radius and ulna. The small amount of one part in two hundred of the butter activators added in the ration of rat number 2 has made a marked difference in the capacity of the animal to utilize the minerals. There is a progressive increase in calcification with the increase in the quantity of butter activators up to rat number 6. Number 7 received only the cod liver oil and shows good calcification but of a different type. Rat number 8 which received both the cod liver oil and butter activator in moderate quantity shows by far the best calcification. It is very clear that these activating substances have added

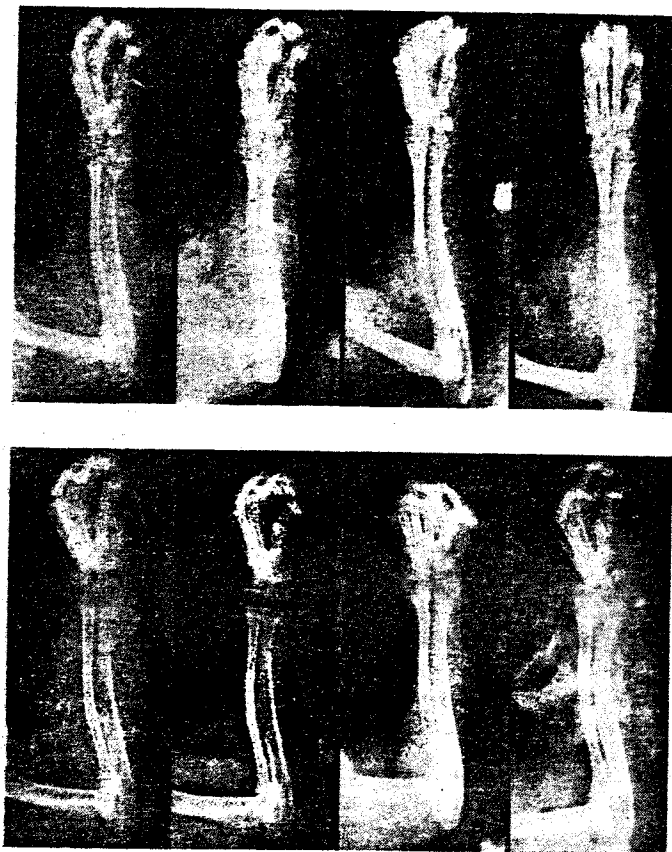


FIGURE 13

to the animal's capacity to utilize the minerals. No appreciable amount of minerals were provided in the activators.

When three groups of chickens of twenty-five each were placed on the same deficiency diet (McCollum's 3134) in identical cages and provided with all the butter they would eat of three different grades; namely, Group 1, butter of high A and D vitamin content, Group 2, butter of high A and low D vitamin content, and Group 3, butter of low A and D vitamin content the percentage of deaths in one week was as follows: There were no deaths in Group 1, in Group 2 there were 16% that died, and in Group 3, 28% died. In 19 days the percentage of deaths were for Group 1, 24%, Group 2, 53% and Group 3, 73%.

It is very evident that there are important nutritional factors in butter and that they may be present in varying amounts. This immediately raises the question of our ability to select instinctively or by other means food factors that are particularly efficient. A great deal that we do as suggested previously has grown out of the experience of the past. We can readily understand how this quality of ability to select may have come to humans through example and parental instruction but it is not so easy, however, to explain the capacity of infant chicks to select butter high in vitamins rather than the butter low in vitamins. When a group of 40 chicks on the same deficiency diet (McCollum's 3134) were placed in a cage in which three kinds of butter in similar dishes were made available at the same time though placed in different positions in the cage each day they had eaten in 56 days twice as much of the highest vitamin butter as of the lowest vitamin product. This clearly is evidence of an effort at self-preservation through the selection of higher vitamins.

From the problems presented in the case of the rats, turkeys and chickens the evidence indicates that something indispensable to life was made available through the high vitamin butter product. Very little information is conveyed in the nomenclature whether we speak of vitamins or activators, the latter seems to suggest reinforcement and is now general.

It will be helpful in studying the importance of these substances in the matter of life itself to examine more critically the changes that take place in humans since fundamentally our problem concerns that species. We will start with the case of a child three years of age with an ununited fracture of the femur of two months' standing, extremely weak and very nervous. This child had a history of having convulsions for about six months prior to breaking his leg. He would often fall to the floor from a chair or when walking when he had one of these attacks. It was while walking across the room that his leg was broken. In the light of our newer knowledge convulsions of childhood except epilepsy are due chiefly to a low level of calcium in the blood. His nervousness was directly related to his disturbed calcium level. With no other treatment than the addition to his diet of some high vitamin butter and a larger quantity of milk his convulsion immediately ceased. In a month's time the fracture was united and the cast removed. The clinical results indicated that something inimitable to life and repair had been provided by the special butter which had been selected on the basis of its vitamin content. Radiograms of the femur thirty days apart, shown in Figure 14, reveal the remarkable change produced in the healing of the fracture. Blood chemical studies were not made in this case. Blood studies when made splendidly throw an important light on these cases. Such a case is illustrated in Figure 15. In this instance an ununited fracture of six months' standing made a marked improvement in 35 days. A few of the blood chemical elements are shown in the chart in this figure. Whereas the product of serum calcium and serum inorganic phosphorus should be about 40 for normal individuals and normally tends to go above that point at

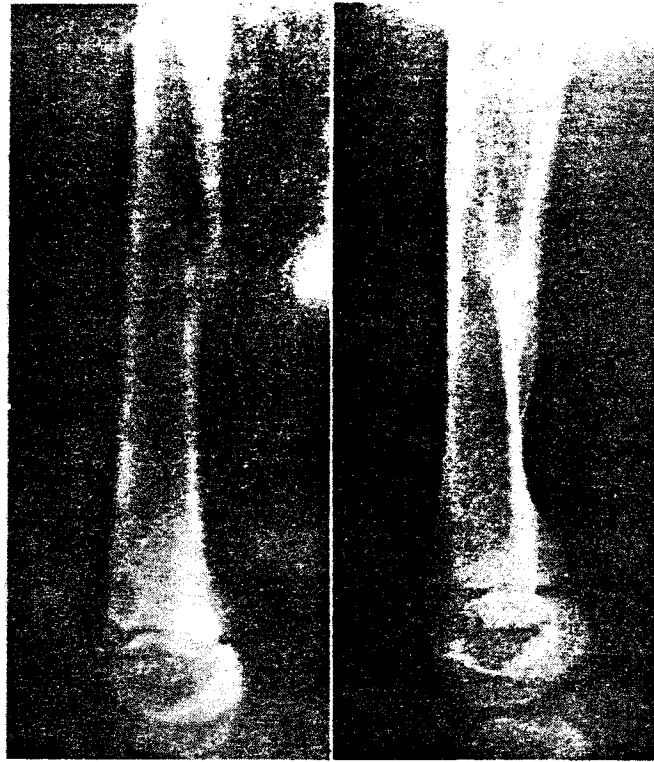


FIGURE 14

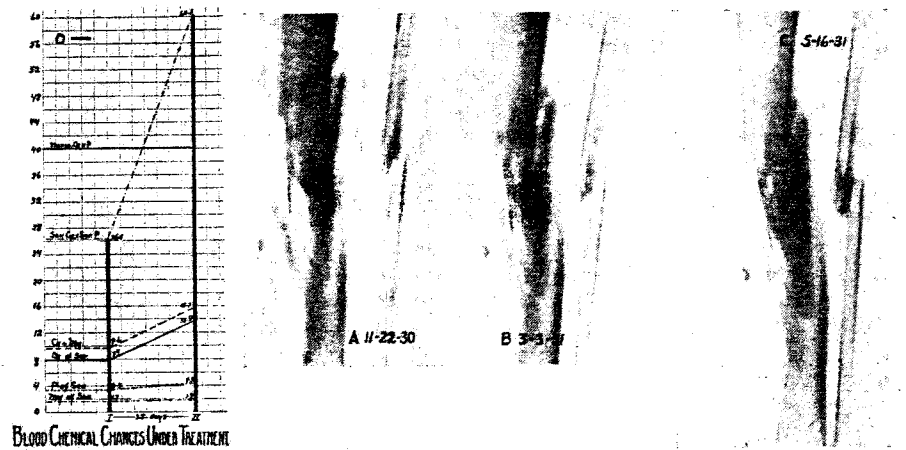


FIGURE 15

the time the body is making an effort to repair a broken bone, at the time our assistance was solicited and the blood studies made this product was at 26.1. The calcium of serum being at 7.9 and the inorganic phosphorus at 3.3. The magnesium of serum was at 1.7. Under treatment in 35 days the magnesium advanced to 1.9, the inorganic phosphorus to 4.3 the calcium to 13.8 and the

product of serum calcium and serum inorganic phosphorus to 60.1. This was accomplished by the administration of the activators as concentrated from a high vitamin butter mixed with a little high vitamin cod liver oil and given in small doses. It is of interest that he had been receiving both cod liver oil and activated ergosterol as viasterol previous to our treatment.

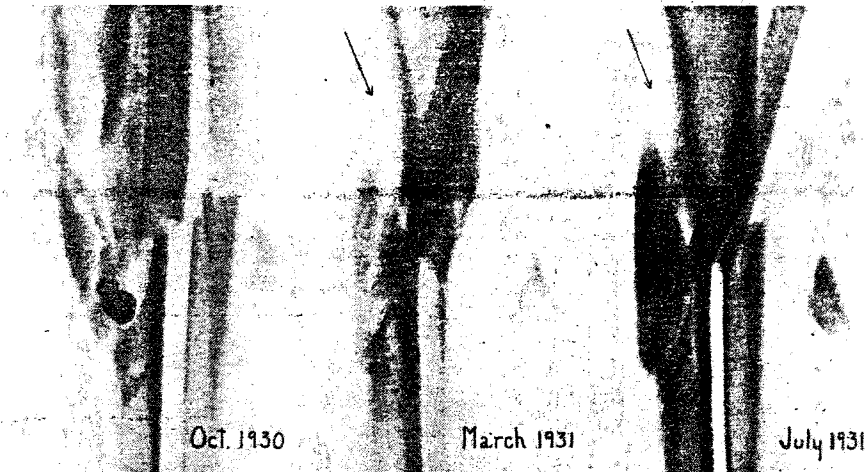


FIGURE 16

It is important to observe the progressive changes in this case as shown in Figure 16. The arrow points to one view of the condition at the time the treatment was begun. Note that there is little evidence of bridging of the bone or callus formation between the splinters even six months after the fracture. Note in the last view shown that there is a strong bridge of bone built between the splinter and the shaft. At this time the limb was being used with a sense of splendid solidity. It is important to note that this man was conscious within a week after starting treatment of an added strength in the bone with marked reduction in tenderness and pain. In the condition when the treatment was started with the calcium and phosphorus low he not only was not able to heal the fracture but was in a physical state in which he was borrowing the minerals from the skeleton to maintain organ and tissue function and to provide the minerals for the blood. The change in diet was slight, it simply emphasized the desirability of using milk liberally. The change in the basic foods eaten—does not explain what happened. The marked change in the mineral content of the blood was apparently the fundamental basis for the great improvement. In this case a rubbing oil consisting of a high vitamin cod liver oil that had been exposed to the sunshine for ten minutes was rubbed upon the affected limb. The effect would have been nearly the same as I have previously shown had the oil been rubbed on other parts of the body. The activating substances are taken up through the skin thus raising the mineral content of the lymph and the blood. A considerable group of fracture cases could be presented in all of which the blood shows a marked increase in mineral content under treatment. The clinical conditions markedly improved with rapid bone formation and splendid healing in all cases where bones were in good apposition.

In many of my research reports I have presented data indicating that dental caries is very greatly reduced under a program which includes the addition of the activating substances which are provided primarily in high vitamin butter and

also in high vitamin cod liver oil and particularly well in combinations of these two. The minerals must also be in suitable form and adequate quantity. For details and charts which space does not permit presenting here see References 10 and 11 in the bibliography.

A summary of some of these data is shown in Figure 17 which shows in

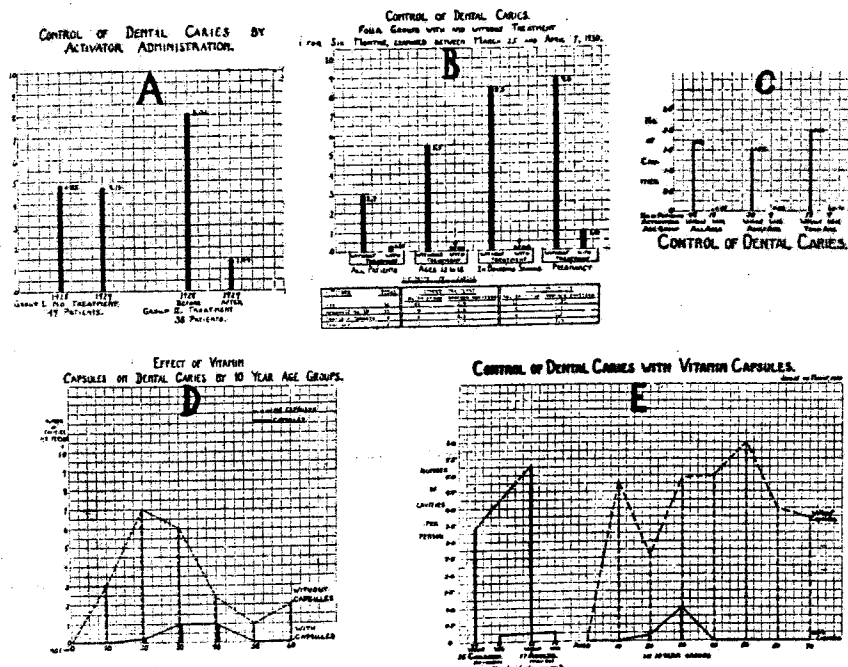


FIGURE 17

graphic form the results of five separate studies made at different times for the comparison of individuals who are treated with those who are not treated in regard to the matter of prevalence in caries cavities. A, compares the same individuals in two different groups neither of which received treatment in 1928 and one of which, including 38 patients received treatment in 1929. This second group included individuals who in 1928 had excessively active dental caries; namely, an average of 8 cavities per person. In 1929 after these individuals had been put on the defensive treatment the number of cavities dropped in this very susceptible to 1.4 cavities per person, whereas in the other group not receiving treatment either year there were cavities per person in 1928 an average of 4.85 cavities and in 1929 about the same 4.73.

In B, will be seen results of the examination of individuals presenting in a two weeks' period for their regular check up at spring vacation in 1930. Of 56 patients 44 had not received treatment and since their last examination approximately six months previously they had an average of 2.9 cavities per person. Twelve had received treatment and the number of cavities was 0.25 per individual. In the age group 12 to 18 there were 9 without treatment with an average of 5.5 cavities per individual while the 6 with treatment had no cavities. In the boarding school group 4 without treatment had an average of 8.5 cavities while 4 with treatment had no cavities.

There were two cases of pregnancy, one without treatment had 9 cavities and the one with treatment had one cavity.

In series C, is a report of 66 patients in which 48 were without treatment and for the period of study had 1.73 cavities per person. Eighteen with treatment had 0.05 cavities per person. When the adults and teen-age people are separated there were 30 adults without treatment, they had 1.55 cavities per person and the 9 with treatment had no cavities. In the teen-age group there were 18 without treatment with an average of 2 cavities per person and the 9 with treatment had 0.11 cavities per individual.

In series D (1930) a group of two hundred individuals including 100 with treatment and 100 without treatment are shown in ten year age groups up to sixty years. The lower solid line with its upright solid column represents those with treatment, and the upper dotted line with upright broken columns represents the number of cavities for those without treatment. It is of interest that in the age group 10 to 20 there were forty times as many cavities in those not receiving treatment as in those receiving treatment. For all the groups of this series an average difference of ten fold was found.

In series E, is shown the result of another series of ten year age groups covering the period from January 15 to May 15, 1931. In this series there were 92 individuals of which number 57 were adults and 35 were children. In this graph again as in the last one the lower solid line represents those receiving treatment and the upper broken line those without treatment. It will be noted that in the 24 children without treatment there were 3.4 cavities per person whereas the 11 with treatment had only 0.24 cavities per child. Of the 57 adults there were 43 without treatment and they had 5.3 cavities per individual, of the 14 receiving treatment there was an average of 0.3 cavities per individual. There were seventeen times as many cavities in the group of children not receiving treatment as in the group receiving it. There was a slightly larger difference in the group of adults. When divided into ten year age groups the caries was practically controlled except in the 20 to 30 age group which averaged one cavity per person under treatment while those of this age not receiving treatment had 4.9 cavities per person. For the entire series as expressed in Figure 16, A, B, C, D, E, there is an average of 5.2 cavities per person in the groups without treatment as compared with 0.55 cavities per person in the groups receiving treatment, or 9.25 times as many cavities per person in the individuals not receiving the treatment as in those receiving it.

The remarkable effect of the activators in raising the resistance of the tooth pulp, and at the same time the active caries being checked, is exceedingly important both as additional means for tooth conservation and for throwing light upon the process of tooth and pulp degeneration. In the case in Figure 18, A the upper bicuspid is shown with deep caries about a loose proximal filling. Decalcification has extended through to the pulp as evident exposure beneath the caries dentine. A layer of the decalcified dentine was permitted to remain rather than expose the pulp. This was medicated and a temporary filling placed as is shown in B of this figure. The effect of the systemic treatment is splendidly shown in C in which case an excellent protecting wall of dentine has been built within the pulp chamber which is now reduced in size. The medicated residual caries dentine has now been removed and more substantial fillings placed. Under treatment the density of this tooth increased both in the crown and roots as occurs routinely in many of these cases.

It is important to note that it has been commonly observed that when individuals who had been immune to dental caries for several years suddenly have extensive caries that this was frequently if not usually, the forerunner of a serious physical break usually referred to and treated as a particular disease. In the light of our newer knowledge both should be considered in considerable



FIGURE 18

measure to be symptoms of the metabolic stress that is associated usually with nutritional deficiency. In young people this is often very marked even in the teen ages.

A striking illustration is that of a young man sixteen years of age brought from another city because of excessively rapid dental caries, a heart lesion, shortness of breath, enlargement of the glands and marked lassitude. He had 38 open cavities notwithstanding very frequent and skillful dental care. The cavities were filled and he was placed on the vitamins as provided by a high vitamin butter and a small quantity of a high vitamin cod liver oil with emphasis in the diet on wheat germ and milk. He had been using milk liberally all his life. In three months time the swelling of the glands had disappeared, the heart condition very greatly improved, and he had gained three and one-half pounds in weight. No new cavities had formed and the roentgenograms showed a marked improvement in the density of the teeth and bones. When asked how he felt he stated that now he was more rested in six hours sleep than he had been previously in ten hours and that the only way he could express the change in his feeling was the one word "life." Now he had an abundance of energy whereas before he was tired all the time. It seemed evident to him and to all concerned that something had been provided which greatly changed the physical efficiency of his body.

From our standpoint in this discussion we are concerned to know whether these activating substances literally become a part of the physical being. Disturbances in the utilization of minerals have varied expressions in tissue and body fluids, some are so slight that they might be said to be physiologic, others are marked and are distinctly pathologic, though even these cases are probably in large part physiologic.

There is a marked difference in the way different individuals react in life to imbalances between the available minerals and the levels of the minerals in such tissues as the blood. If we would think of two people of similar stations in life both of whom have lost their positions, and each has had a small savings account. One considered this reserve too sacred to touch and will almost starve rather than disturb it and will continue to refrain from buying new clothes. The other views life differently. He uses his savings to buy food and clothing. When you try to evaluate the effect of general business depression on these two as judged by their appearance and physical well-being you might readily conclude the one has fared much worse than the other. To correctly evaluate you would

have to consider obscure factors such as bank balance rather than either appearance or the amount of money being carried. Similarly some individuals go readily to their stored minerals and for the time being maintain an adequate level of minerals in the blood and tissues and thus maintain resistance against disease. An examination of the mineral depots of the skeleton often discloses the price that has been paid for the maintenance of these levels. It is important, therefore, in studying blood chemical data to have in mind these different types of individuals and not be confused with the conception that all people behave similarly.

I have previously shown in Figure 7 that in a study of averages for the product of serum calcium and serum inorganic phosphorus in five hundred individuals there is a progressive decline in the late teens reaching the vicinity of thirty at about forty years of age and remaining at a low level the balance of life. If, as seems to be indicated by an abundance of data this is an essential phase of lowered defense and if the activating substances with which we are concerned can materially raise this level it will be instructive to make this study.

In Figure 19 will be seen the effect of the use of the activators in changing the levels of these chemical factors in twenty cases. We are again using the product of serum calcium and serum inorganic phosphorus in relation to the normal at forty. The average level of this factor before treatment was 27.1 and after treatment was 37.5. The treatment consisted of the administration of the activating substances obtained from a high vitamin butter mixed with about an equal part of a high vitamin cod liver oil. The average dose was from 1.2 to 1.8 grams three times a day. Care was taken that the food provided the minerals in available form. It will be kept in mind that those individuals who are in a state of stress but who have the capacity of taking sufficient minerals from the bones to keep the levels nearly normal in the blood will not show the marked increases as evidenced in the blood stream as will other types. The depth of the water above the dam may give a very poor idea of the amount of water that is being used by the mill. It becomes necessary therefore, to study the efficiency of the mill.

There becomes at once the need for an examination of both the capacity of the organs for carrying normal or even abnormal loads for normal functioning processes and of the organ tissue changes that are in progress. In the latter group we would consider arthritis which is associated with the destruction of joint cartilages and membranes, decalcifications both general and localized, inflammatory processes and hypertrophic changes of the bones about the articulation. While time does not permit here of a critical discussion of the pathology of arthritis it should be stated that three principal contributing factors seem to be involved. They are heredity, focal infection and disturbances in mineral metabolism. We are concerned with governing mechanisms which have to do with the maintenance of levels of minerals in blood and soft tissues and particularly with those processes which are monitors to determine where minerals should be deposited and where they should be absorbed to make a normal group of functioning tissues. It is at this point that evidence becomes available that is of great significance since different types of arthritis on the basis of pathologic differentiation are found to respond favorably to a program which provides a marked increase in the activating substances with which we are concerned. Unfortunately space only allows a couple of typical cases as illustrations.

Figure 20 is very instructive. This woman reported that she had not worn her shoes for eight years. She had not been able to touch her thumb with her fingers on either hand for years. She had been in such pain for eight years that she seldom got to sleep before four o'clock in the morning and then was

RELATION OF SERUM (CA. X IN.P.) TO AGE

AVG. OF 500 CASES ———— LOWEST 10%----

TREATMENT
AVG. 20 CASES

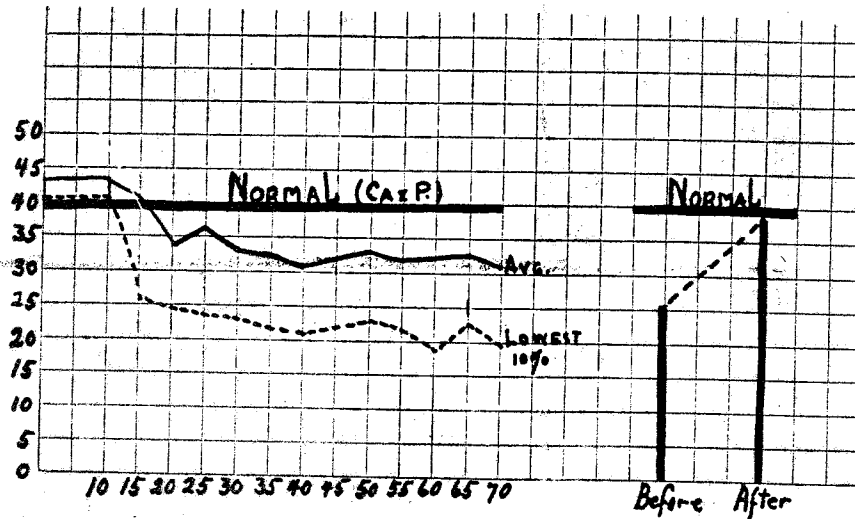


FIGURE 19

easily disturbed. She was practically never without pain and much of it was very severe. In a few weeks' time after being on the treatment there was a marked change in all these symptoms. The inflammatory process ceased almost entirely. Natural and undisturbed sleep was experienced all night long. In a few months' time she had recovered the use of her hands so splendidly that she could sew, tie knots in thread and write letters. While she had not walked without her crutches for eight years except for a couple of weeks during one mid-summer she went all about the house without them often not knowing where they were for a week at a time. The increased mobility was such that she could put her hand behind her head as illustrated. The lower view shows the extent of the movement of the elbow from being nearly fixed eight months previously. The mental changes in this and many similar cases are very striking.

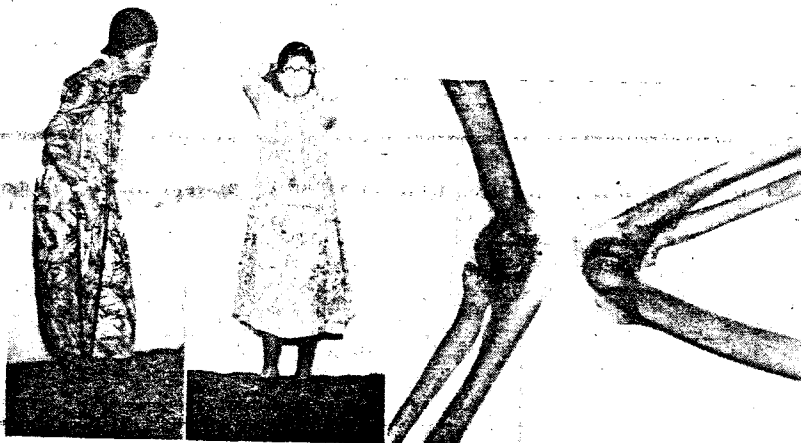
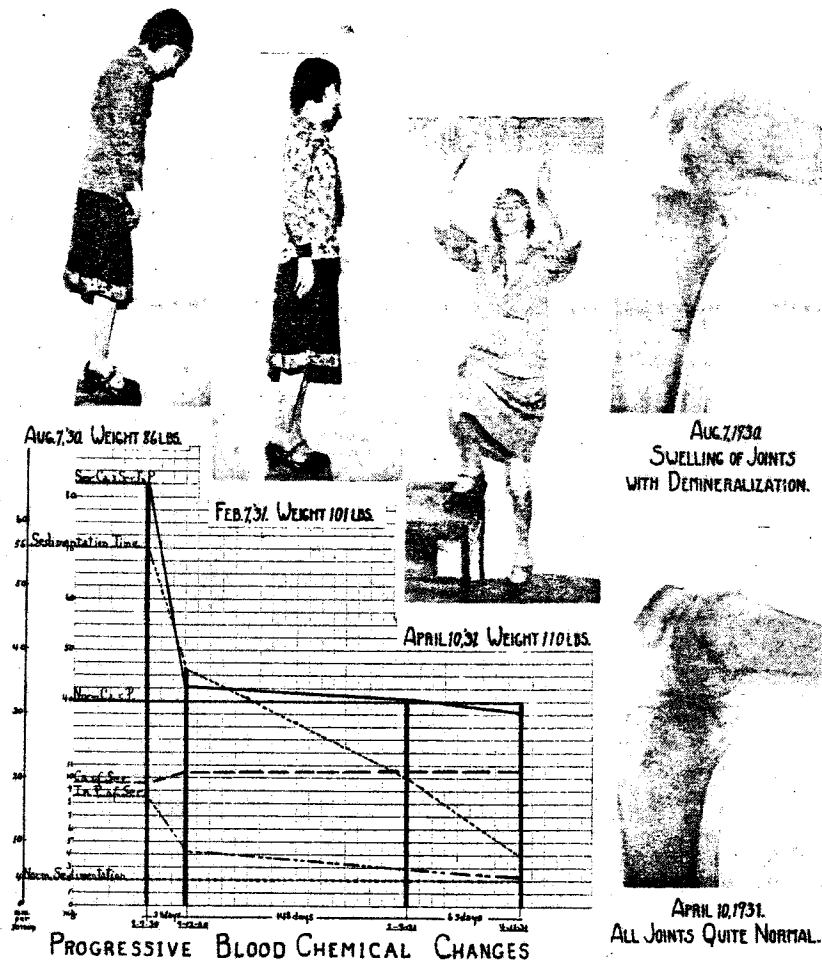


FIGURE 20



ACUTE DEGENERATIVE ARTHRITIS WEIGHT LOSS 54 LBS RECOVERY IN 8 MONTHS WEIGHT GAIN 24 LBS.

FIGURE 21

Another type of arthritic process involves chiefly the soft tissues in the early stages and seems to be very largely associated with demineralization of the bones. Such a case is seen in Figure 21. This young woman at thirty years of age was so incapacitated that she could not walk without being assisted and could not get out of a chair herself. The dental infection problem was considered a possible contributing factor and she was returned to the referring doctor with advice that the infected teeth be removed. She was given the additional vitamins which were provided in the high vitamin butter and high vitamin cod liver oil. She was given suggestions relative to the selection of foods to provide adequate minerals. The blood chemical studies revealed a very interesting condition in that the inorganic phosphorus of the serum instead of being in the vicinity of four was at 8.6. The serum calcium was at 9.6 and the product of serum calcium and serum inorganic phosphorus instead of being near forty was over eighty. The sedimentation time of the blood cells which is normally at about 4 millimeters in thirty minutes was at 56. This girl's normal weight

had been about 140 pounds from this she had gone down to 86 pounds. Four different blood studies are shown and it will be noted that the effect of the activating substances was to rapidly bring these chemical factors within normal levels. These marked improvements occurred before dental focal infections were eliminated. She gained twenty-four pounds in weight in eight months. The complete flexibility of her stiff joints is shown in the third picture in which she has her foot on the chair. The roentgenograms of the bones show that the process of mineral deposition as recalcification was rapidly progressing. An interesting phase of this case was the disturbed menstruation which returned to normal. The patient's whole life was changed including her interests and ambitions from wishing to die to getting a real joy of life.

Arthritic processes may involve a very wide range of associated mineral metabolism disturbances. This is illustrated by comparing the last case with another in which the level of serum inorganic phosphorus was at 1.3. The serum calcium was at normal at 10.2. The product of serum calcium and serum inorganic phosphorus instead of being near forty was at 13.7. The prostration in this case was very extreme. The roentgenographic appearance of the bones in this case revealed a very severe type of decalcification. In some types of arthritis the serum Ca or In. P. or both are normal but bone change marked.

Among the important affections which seem to be directly related to mineral utilization would be pneumonia and heart disease. Defense of the body against respiratory infections seem to be directly related to an adequate supply to the body of the activators of particularly the vitamin A group. It has been of interest that through the flu epidemics and seasonal epidemic colds individuals of my experimental group who are receiving the vitamin capsules have had very much less severe attacks if they did become involved but in the majority of cases they escaped the infection. One young lady, for example, in a dormitory with 19 other girls did not get the flu when all the others did. She was the only one taking the additional vitamins and this notwithstanding the fact that the previous year she had had a succession of distressing colds. The report cards of the children on this program show a higher percentage of attendance and higher grades than the average for the schools or than previously for them.

The role of minerals, particularly calcium, in making possible improved catabolic and anabolic processes of organ tissues has been abundantly demonstrated. An important clinical result that is almost constantly recognized by patients is not only an increased sense of physical well-being but primarily a direct improvement in heart function. A number of patients experience a missing of beats when they do not take the additional vitamins and this symptom entirely disappears with the use of the vitamins. A number of heart patients find that they can live restricted but nearly normal lives while taking the additional vitamins. Many individuals taking the capsules report improved kidney function.

The data suggest if they do not indicate that the improvement is produced as a result of two factors; first a change in permeability of the tissues due to an improvement in the available minerals in the circulating fluids and second, the providing to the tissues of factors which enter into the building structure of the organs and cells. This would seem to include an energy factor.

Since our fundamental problem has to do with the significance of the reactions that appear to be produced by activating substances it is important that we include in this study at least a brief consideration of some of the factors involved in child life both from the standpoint of the child and mother. My extensive studies on dental caries include a large series of records of the dental problems of pregnancy cases and the development of dental tissues of infancy and childhood.

It seems to have been recognized throughout the world and as languages have been spoken or written that maternity has constituted a period of stress upon the teeth, for every language has a phrase equivalent to "a tooth for every child." It is important that in the series where expectant mothers are receiving these additional activating substances dental caries is practically completely controlled. The records show that there is not an average of even one small cavity for both the period of gestation and lactation. It is important to note that the infant dentitions are apparently improved as to be nearly one hundred per cent normal. A striking illustration will be seen in Figure 22. A and C as compared with B and D.

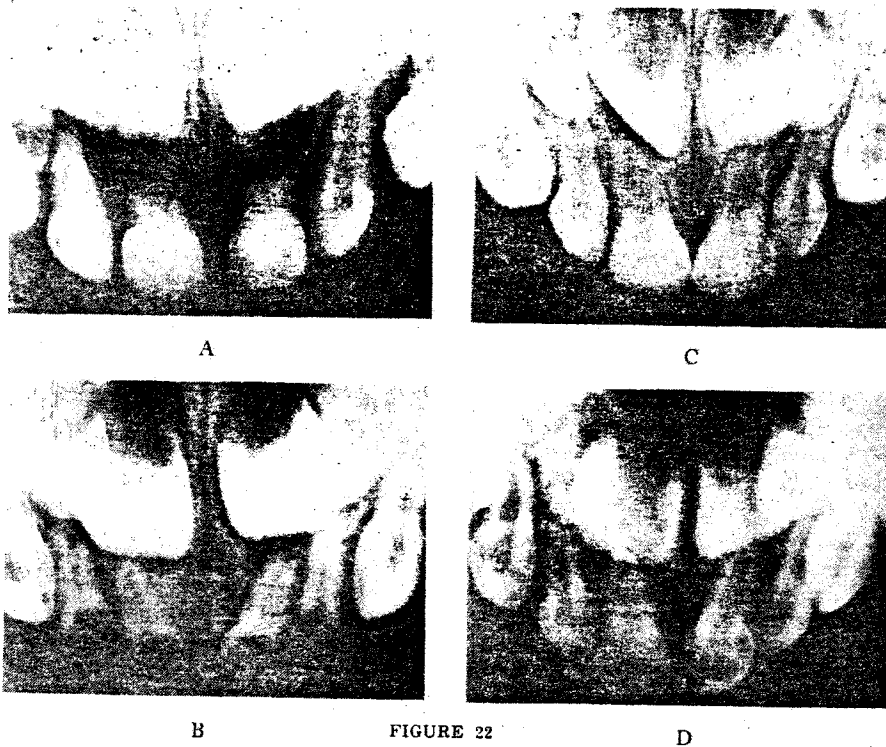


FIGURE 22

This is a case of a boy 4 years of age. Note the normal spacing the splendid density of the enameled caps of both the deciduous and permanent teeth. This boy and his brother who is two and a half years of age have practically perfect physical bodies. Both have received the combination of butter vitamins and cod liver oil vitamins since breast feeding ceased. Their mother received the mixture during the period of gestation and intervening periods. In the same figure I have shown the teeth of a boy the same age who has not had adequate vitamins. It is important to note the marked difference in structure of both the teeth and the bones, particularly difference in density.

If it be true that the nature of life will be found to be related to these strange activating substances it would seem that improvement in prenatal development will be found to be associated with the use of these factors. This is illustrated in the following case. This boy whose teeth are shown in Figure 22 C has practically perfect physical development including perfect dentition. Both his mother and he have received their special vitamins chiefly in the form of special milk high in vitamin content selected by analyzing the milk of individual

cows of a herd. They have also used a high vitamin butter or butter vitamin concentrate. When he was ten days old he won first prize as the most perfect baby in a group of 40 in the maternity ward in the hospital in which he was born. This notwithstanding the fact that he was his mother's first child and she a frail young girl. His birthweight was a trifle over six pounds. His negative weight period very short. He received the prize on the basis of physical development including strength and the naturalness of sleep and the level of his nutritional efficiency. He is ahead of his age mentally and physically and has a splendid disposition.

As I dictate this I have before me a report of a mother on her little girl's condition in which she says—"B—— is fine, has gained two more pounds, now weighs 50. She has a better disposition, more patience. Her average in school far exceeds last year's work. Her work is not the effort or the worry."

The improvement in the grades on report cards of children under treatment is general.

Recently a boy of nine years of age brought by his mother primarily because of the extensive decay of the teeth. I found that she had been required to take him out of school because teachers could not get along with him due to his nervousness, which was so great that he would cry with slight provocation and was very impatient. Nearly all of his deciduous teeth had been removed because of extensive dental caries with abscesses. Both lower first permanent molars had deep caries, one with its pulp exposed. After going on a nutritional program which provided additional vitamins with an emphasis on milk and wheat germ in his diet his mother telephoned within a week and expressed her gratification and joy in his great improvement. He had already gained in weight, was sleeping and eating better and had ceased to cry with slight irritation. Blood studies were not made in this case because of the nervous strain it would have been to have anything whatever done. This world has changed in a short time for him from a series of harrowing torments to normal child's joy in play.

It is not only child life that experiences marked improvement in a sense of general well being. The reports of adults of all ages are almost universal to the effect that there has been a decrease in lassitude, or tired feeling together with a sense of greater recuperation from rest. Many report that they can do more hours of efficient work per day after taking the capsules than previous to their taking them.

The evidence on every hand emphasizes the view that we are dealing with something that is intimately related to life itself because of the improvement of organ and tissue function. If it be true that practically all the functioning processes of the body are enhanced by providing an adequate amount, or at least an additional amount of some essential activating substances, and particularly if it be true that through the means that we are using some of these substances are being provided it should be possible to find a group of individuals living in a community that has provided these factors in adequate quantity and of efficient quality.

(To be Continued)

A New Process in the Reproduction of Living Masks Using Negocoll as the Impression Material

Negocoll was invented by Dr. Alphonse Poller of Vienna. In addition to its artistic value it has considerable value in Prosthodontia and Orthodontia. There are greater possibilities in bringing out the finer details than in any other material known.

The use of Negocoll is still in the experimental stage. Only one book has

been published on the subject and that is in German, which makes the translation rather difficult; however, I will do my best to give you the notes on my own experience with this material up to the present time.

The impression material used in producing these models is *Negocoll* which is similar to *Dentocoll*. Both were invented by Dr. Poller. *Negocoll* was originally used in restoration of war injuries. It is now being used by dentists, artists, physicians, police, undertakers and museums in reproducing objects. In modeling, a sculptor can reproduce a subject, but he cannot get the finer details that can be obtained with *Negocoll*. The material can be used by any dentist if he will follow a few rules which differ somewhat from those in the use of *Dentocoll*.

After the impression, the model itself can be cast in plaster of *Hominit*, a material similar to sealing wax.

Negocoll is useful in dentistry in reproducing the face to the exact lip lines and expression, which you cannot obtain from wire, X-rays, photos or study models. It is cleaner to use and more comfortable to the patient than plaster. It may be used over hair and in undercuts like the ear without adhering to the object as plaster does. Orthodontists using this method are able to show parents the result of different types of cases that a picture would not show.

HOW TO BE USED

Negocoll can be made aseptic by boiling and can be used over and over again. A good plan is to keep your material in boxes marked by numbers and keep a record of the use of same. For example, material that has been used on any part of the face mark No. 1, that used on any other part of the body mark No. 2, diseases No. 3, death masks No. 4, and so on.

The method of using *Negocoll* is to heat the material in a double boiler until dissolved and then chill to body temperature. Begin to boil your material about one hour ahead of time (and keep it warm, as it takes one-half hour to dissolve a large amount) so as to be all ready when the patient arrives. It will require one-half hour for a beginner to make a nose and mouth impression, fully an hour and one-half for a half head and close to a day for what is known as a bust. Different parts of the body need different moulds; for example, a leg, arm, etc., may have a mould made of cardboard.

After the material is chilled to body temperature, apply it with a brush and fingers to about one inch thickness, then thoroughly chill by use of a fan, compressed air, or hair dryer with only cold air applied. Before removing, it may be reinforced with plaster, wires or gauze saturated in *celerit*. On account of its rubber-like consistency it may carefully be removed out of undercuts, which would be impossible in the use of plaster. Plaster moulds would have to be taken in many sections. *Negocoll* section forms have to be used very seldom. Piece forming with plaster on the living is very complicated and nearly impossible. With *Negocoll* this is very simple. A seamless impression of a hand or face in plaster is also impossible. Plaster cannot be used for impressions of eyes, ears, wounds, scars, skin diseases or operations.

Three boxes of *Negocoll* are necessary to get an impression of the face and ears; four boxes for a profile; ten for the whole bust; one and one-half for a hand and one and one-fourth for an ear.

It is always necessary to have a larger amount prepared than needed since *Negocoll* hardens on the walls of the container before you complete your work. A beginner is apt to waste quite a lot of material. It is also advisable to pour off a certain amount into a small basin or a thick china coffee cup which has been previously heated in boiling water; it will hold the desired temperature for quite a while. Also have boilable cups handy and paint brushes one to one and one-half inches in size.