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A REPORT OF THE PROGRESS OF THE RESEARCH COMMISSION OF THE NATIONAL DENTAL ASSOCIATION*

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The most significant thing in the dental profession today in my judgment is this psychological moment or age in which we are living, and I wonder if we, as a profession, appreciate the opportunities we have in living today. I am wondering if we really realize that we are the gatekeepers, if not the keepers of the gate, and by keepers of the gate I mean the gate to the grave, if we may judge from the literature that comes to us from many of the writers of today.

I wish to emphasize our present situation by contrast and I want you to go back with me just a few hundred years and see a band of men and women driving children with switches to the tomb of St. Vitus to be cured of St. Vitus' dance, some of them driven one hundred miles, two hundred miles, made

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today, for it puts us in a position of being not only guardians, but we are in the position of having the first opportunity of diagnosing conditions as soon as we see patients before they are seriously afflicted with these disorders. Let us take some heart infection as endocarditis. The latest histological and pathological work on etiology of heart valve infection indicates that the lesion is not caused by the organisms which were drifting through the blood stream and bathing the heart valve and clinging to it as they passed, but these organisms passing through a small blood vessel at the base of the valve and cutting off nutrition to the valve, and the little vessel ruptures, with granulations extending over the margin of the valve in consequence.

Let us take as another instance the modern conception of hardening of the arteries. When we come to study that from a histological and pathological standpoint we find it is not a hardening of the entire orifice, a hardening of the blood vessel, but it is a series of discs, and each one of these discs has as its central point the beginning of calcification, due to a rupture in one of the capillary blood vessels surrounding the main artery, and which was caused by an embolus due to a drifting of the organisms in the system. We could go through a whole series of what we call the chronic disorders. We find that every one of them has as its first expression a blocking of a capillary.

Another significant, thing, and I put it under four heads, is the fact that organisms have a selectivity for tissues, which is one of the greatest discoveries of modern times. Again, we have to thank Dr. Rosenow more than anyone else for the establishment of that fact. I will not attempt to go into details because you are familiar with them. I will say this, however, that a certain strain of a given organism will have an appetite or an affinity for a particular kind of tissue and as it goes through the body it may or may not block. If it does not get a foothold it is because its appetite is not for that particular tissue. Therefore, a particular strain that produces an inflammatory process in a joint continues to do it so long as it is of the same strain and may pass through the liver or stomach, the arterioles and capillaries, and not produce a lesion because it has no affinity for that particular kind of tissue.

The next very important point is that the organism of a given species may change in type and specificity, so that it will today attack a heart valve or a knee joint. We may have a typical joint type of infection, and in a month from now the organisms may manifest an affinity for some other kind of tissue, or a year from now still another kind, so that we will have developing in the same patient four or five different expressions of disease from this one organism. Take with that the other thought I wish to mention—I will not undertake to establish it because it has been established, namely, these chronic disorders are largely the result of a focus of infection which may themselves be very slight, but there is a definite focus of infection in some part of the body, and of all districts of the body where a focus of infection is likely to occur the mouth seems to be universally the most common and the most frequent. Where does that put the dental profession today?

We find, as was expressed in the meeting I referred to, the medical profession are placing the question of diagnosis of an arthritis in the hands of the dental profession which means that you will see these cases years and months before the physician, and the dental profession must learn to observe the first symptoms of enlargement of the joints, and immediately recognize the significance and look for the focus of infection, immediately eliminate it if possible, and save the patient from these grave joint disorders which come from a deforming arthritis, because after it has established itself with secondary foci in the joints, it is almost impossible to remove it, to correct it, and cure it, although the primary focus has been removed. Then it becomes necessary for the dentist not only to recognize arthritis, but to recognize the symptoms by questioning in regard to a large number of those chronic disorders from which people suffer before they are serious enough to have consulted their physicians about them. How are we going to do it? There is only one way, and that is to know the symptomatology of these chronic disorders. In the second place, we should know the pathology of their development, and, in the third place, we should know the relation of that pathology to the focus of infection and recognize and differentiate the various types of infection of the mouth and know which one is

probably related to them. In my judgment, there is no question brought to the attention of the dental profession today that is more urgent than that of the problem of differentiation. I shall not refer particularly to the discussions of this afternoon, although they demonstrate it, but it is true that every discussion that I have heard for some time has brought up the question of septic infections without differentiating between the different types of infections, and without really having a basis for differentiation, for we have not yet the knowledge, and yet it is very clear that it will be possible in ten years from now. We will be able to differentiate the different types as we differentiate the degrees or types of infection of what we term pyorrhea alveolaris, or whatever you choose to call it. The point I want to emphasize is that to get that information, and to do so as a dental profession we must become students. I would like to go into the progress that has been made toward differentiating these infections, but I can hardly do so at this time. What has this got to do with this scientific research commission? There are enough eminent pathologists to study the great problems of pathology, and enough bacteriologists in the medical profession to solve the problems of bacteria in the mouth. What do we need special research for? We have only to look at the literature today to see that we need special dental pathologists and bacteriologists. How are we going to get them? We must train them. How are we going to train them? We must support them while they are getting their training. We must give them an opportunity to get special information along our lines. The development of pathologists and bacteriologists is an example of what the Research Commission of the National Dental Association is undertaking today. This commission is composed of twenty-seven men, twenty-five of whom are elected by the trustees of the National Dental Association, and not more than two of whom come from any one state. Two of them are the president and secretary of the National Dental Association. This commission has an *ad interim* board known as the executive board of five, which carries on the active work of the commission. That commission is gven the responsibility and opportunity of raising funds for carrying on research work, of organizing researches, of seleting men who are

competent to undertake research work, and placing in their hands not money to pay them for doing research work, but money with which to hire technicians for enlarging their output, and to give them more hands to work with, more eyes to see with, and more fingers to manipulate with, to enlarge the number of men who are engrossed with work which they are doing through their own devotion, but whose limitations make it necessary for them to sacrifice their health to get out a small quantity of work.

The commission has also the responsibility of training research workers, and we are undertaking today to select men who will be ultimately competent, and in the meantime placing them in an environment where they will get such training as will eminently fit them for this work.

The dental profession will have by next September a metallurgical and electro-chemical engineer who will be available for all scientific metallurgical problems of our profession, who will devote his life to this work unless some big corporation succeeds in buying him away from us. That man is getting a salary of $110.00 per month while doing our metallurgical research work, and the University of Michigan is going to grant him, Mr. Fahrenwald, the degree of Doctor of Philosophy for the work he is doing along the lines of metallurgy and chemistry. I want to say that kind of preparation is the only kind that we know of that will ultimately make a man large enough to solve these problems. Men who are compelled to work from morning till night to earn their bread and butter for their wives and children cannot work at night and do this research work to advantage. You know it cannot be done. We are taking up the subjects of bio-chemistry and biology, metallurgy, bacteriology and physiology, and I think ultimately, in five or ten years, we will not have to go to the medical profession for competent men to work out these problems.

You are familiar with the work that has been done, for instance, by Dr. Hartzell. For those who are not familiar with his work, I will say that Dr. Hartzell last year had two men assisting him in studying the relations of mouth infections to arthritis particularly. This year he has three assistants, one simply a chief technician, another a dentist, working as an in-

terne in the hospital, and a bacteriologist. But it is necessary for a man like him or any other man directing researches to have sufficient help to do the detail work so that he himself can direct a large quantity of it. You are all familiar with the fact that the work of Dr. Hartzell in relation to mouth infections has paralleled the excellent work of Dr. Rosenow, and has duplicated some of it from a particularly important dental aspect. I also want to state that Dr. Hartzell did that work under the advice of Dr. Rosenow, who was in conference with him. It was not simply the case of duplicating work, but it was developing the necessary dental phase of it. The effect of that work has been very beneficial. When Dr. Hartzell's work was demonstrated last year before the American Medical Association I had the privilege of having charge of the exhibit in the Scientific Exhibit of the A. M. A. Members of the American Medical Association looked at this exhibit along with the others that we had, and said there was more in this one exhibit to show the medical profession what the dental profession can do than has been done by the Stomatological Section of the American Medical Association in the twenty years of its existence. (Applause.) I do not say that to belittle the work of the Stomatological Section, because I admire the men in that section and the work they have done. This exhibit made such an impression that it gave us a standing invitation hereafter to make a scientific exhibit.

I might take a good deal of your time in giving you the details as to the work that has been covered and the success accomplished by these different men, but I will only emphasize two or three new and important things.

I would like to call your attention first to the places in which the work is being carried on this year. I have spoken of the work done in the University of Minnesota, and the University of Minnesota hospitals and their medical staffs are giving us splendid co-operation. The president of that university is doing all he can to aid us so that our men may work to the limit of their capacity in carrying on these researches.

We are also carrying on splendid work in the University of Illinois under the direction of Dr. Fred B. Noyes. There is no

other guarantee necessary because of our confidence in his ability and in his work.

It is a matter of very great satisfaction to the commission that they have been able in a small way to strengthen the work of our adored father of the profession, Dr. G. V. Black. (Applause.)

The commission is also carrying on work in the University of Columbia.

The dentists of New York City and state have been giving splendid support to the work of Dr. Gies for some time, and our commission has united with them in support of his work. We hope to be able to enlarge the work.

The Research Commission is assisting Dr. Russel Bunting in the University of Michigan on the problem of dental caries, and Dr. Marcus Ward in the same institution on the study of cements.

The research department is giving support to the solving of metallurgical problems, and I think I am justified in telling you that one-third of the platinum used in the world is used in the practice and art of dentistry, and do you realize that for the dental profession it amounts to $2,500,000 annually. If we would utilize the opportunity and the information we have on the tungsten product which has been developed through our Research Commission, it would result in great benefit and good to the dental profession. This metal is six times as strong as iridio-platinum; it has a melting point nearly twice as high as that of platinum; its elasticity is twice as great as that of steel. It has a hardness so much greater than that of steel that the management of the General Electric Company is responsible for the statement that one tungsten point will outwear two hundred steel points. It is a metal that does not lose its elasticity when you heat it. This metal is available for any man in this room for use in making posts for crowns and for casting bridges upon. It is so stiff and rigid that you can make a framework of it and cast about it and control the contraction that will take place in casting a bridge with its abutments, all at the same time. You may use it for orthodontia appliances either by the

method which has been presented by Dr. Robinson or by the standard methods.

Relative to the application of the metal in orthodontia appliances, I am advised that it is destined to supplant largely the metals that are in use up to this time for orthodontic work. With its greater elasticity, you can make attachments to it with hard gold solder. It has the property of enormous strength; it does not break off like clasp metal wires by crystallization. You may use wire that is so much smaller that it seems incredible for it to accomplish the work it does.

Any dentist who will write to the commission can get the metal. We are furnishing it to the profession at what it costs us to produce it, and ultimately the manufacturers will make it. The selling price is virtually one-sixth of that of platinum for the same weight.

In the last two or three months our research department has been able to furnish the profession enough tungsten to supplant the use of platinum to go far toward paying for the research expense that the commission has gone to for that particular line of research work. (Applause.)

There are only a few who know about it because you have not read the recent issues of the *Journal of the National Dental Association* with reference to the research work we have been doing in regard to this metal.

As to palladium, it requires no special preparation. Any man can send to the American Platinum Works, New Jersey and buy palladium for $48 an ounce. You can get twice the bulk for the same weight that you can with platinum. You can make it equivalent to platinum at $26 an ounce.

I might spend considerable time in detailing some of the work the research commission is doing with regard to these metals, but I shall not do so.

As to the progress that is being made in differentiating certain organisms and certain infections of the mouth, and particularly the problem that is paramount today as to whether or not the endameba is the etiological factor in pyorrhea alveolaris, and whether emetin is a specific for this disease, I am in a rather embarrassing position in that I must refer to the researches I have been directing myself. In a word, let me say that there

are four strong arguments in favor of the assumption that pyorrhea is caused by an organism known as the endameba buccalis, and they are these:

1. The statement of bacteriologists who have national and international reputations.

2. The finding of that organism in large numbers, if not in a large proportion of the pyorrhea pockets, meaning all pyorrhea pockets from which there is pus in sufficient quantity to be seen with the eye.

3. The inference based upon the fact that since the amebic dysentery of the warm countries is caused by the ameba histolyticus, and since that organism is destroyed and the disease cured by the injection of emetin, they have assumed by inference, let me repeat, that this infection of the mouth is caused by the endameba buccalis.

4. The testimony of a great many men who are using it.

I have given four arguments for, while there are over twelve almost unimpeachable arguments against those that have been advanced. It is rather significant that bacteriologists, with the exception of Dr. Barrett, who have made the bold and strong statement relative to the specificity of the endameba buccalis, have been working in a purely medical field. They are not dental bacteriologists and dental pathologists, so that over against my first argument we have still a larger number of pathologists and baeteriologists from the dental profession who are not ready to assume that this organism is the cause. I will not enumerate the whole twelve arguments, but simply give the effect of them. The inference that endameba causes pyorrhea, and since emetin cures amebic dysentery, it cures pyorrhea, is met by this argument. If emetin has a beneficial effect in pyorrhea treatment, it is not demonstrated at all that it is because of its effect on the endameba, because in the cases we have tabulated, and there are a large number, where the emetin has shown a beneficial effect, and where that treatment is started in December and January and continued into February and March, those pockets that did not show emdameba when the lesion was first examined and during the early stages of the treatment with emetin, have an abundance of the organism after the spring months, even in March and April. That is a most formidable

argument against the theory that the endameba buccalis is the sole cause of pyorrhea alveolaris, because if emetin is going to be efficient as a remedy the endamebae must not increase in number. There is still another reason, and almost no account has been taken of this, namely, that emetin is almost as certain and as important a bactericide as it is an amebicide for certain microorganisms in the mouth, and this you can readily demonstrate for yourselves if you take half a dozen culture tubes and open them to the air and in two or three of them put a loopful of emetin to every five c.c. of culture media. Those test tubes that have no emetin will be cloudy in twenty-four hours from the bacteria that come in with the air, and those that have emetin will be clear.

We might consider the effect of emetin on the pathogenic organisms of the mouth, the typhoid bacillus, the colon bacillus, the diphtheria bacillus, a number of non-pathogenic organisms in the laboratory and hospital air, so that we are not justified in assuming that if emetin is beneficial its good effect is due to its action on the endameba. The observations of the men who are making careful studies would seem to establish very clearly that the treatment with emetin is rarely beneficial further than the temporary abatement of the total quantity of pus flowing, and only largely beneficial in those cases in which there is an abundant flow of pus. Since emetin is only applicable, or beneficial in that type of case, what about the etiological factor that goes back of the time when the pocket was secreting pus?

The letters we have been receiving from various parts of the country are interesting and instructive. One of the most important functions of this commission will be and perhaps has been to establish a course of correspondence in various parts of the United States. At the present time, our research department has nearly two hundred and fifty correspondents as dental observers. We have the presidents of the various state societies, and from six to ten men selected in each state by the presidents of these state societies and the members of the commission. We have slides prepared for use from all parts of the country, from Canada, Mexico, South America, Porto Rico and Cuba, and it is interesting to find that the endameba buccalis is not present in all these communities universally, and it is not always pres-

ent in the cases of pyorrhea alveolaris which we see in Cleveland.

The correspondence of these men is significant because it shows the importance and skill of careful observation. For instance, one man writes that he has been using emetin for two weeks during which time he has treated sixteen cases, and has had five absolute cures. (Laughter.) Another man writes that he has treated now sixty cases, with only one failure. Over and against that we have a larger mass of correspondence from men who are competent to judge, and the sentiment of the large bulk of them is to the effect that they have found practically no beneficial effect from the use of emetin unless instrumentation has been a part of the treatment. (Applause.) We find still another large group of men who say that emetin has apparently a definite beneficial effect which they cannot understand.

It would be interesting if we could take the time and analyze all of the replies that are favorable and unfavorable. In brief, only eyelen per cent of the replies received were favorable to the use of emetin; forty-seven per cent were unfavorable, and forty-two per cent. were noncommital.

Another important thing I want to emphasize is that emetein may have a very much greater significance for us eventually than the one that has been given. You are familiar with the fact, for instance, that when quinin is injected into the circulation of a patient who has malaria, it is a specific for that disease, and it kills the organism if it is injected at the right time. You are also familiar with the effect of salvarsan or what is known as 606. Here is one of the most profoundly significant things in the whole situation: Emetin apparently is but slightly injurious to the body itself, when injected in the quantities we may use. Its effect on certain bacteria that we know are pathogenic is simply marvelous. Those of you who are treating cases of pyorrhea know that occasionally you will get a patient in whom you cannot treat more than half of the teeth in the mouth at one time without that patient having a severe reaction the next day. You will see it. If you undertook to scale all the teeth of such a patient at one sitting, that patient would be made profoundly sick the next day. Why? We use words sometimes to signify that which we do not know. One of them is that we

say these patients are suffering from bacteriaemia. What do we mean by that? Do we mean the organisms have gone all through the blood, or do we mean the products of those organisms have gone through the blood, or do we mean that we have liberated certain forces of the body itself that have been able to split up proteins that constitute these bacteria, and by splitting them so rapidly our body is poisoned?

There are certain cases that respond to emetin treatment not a large proportion of cases. This is precisely as certain cases respond to instrumentation. What takes place? From the observations we have made in our research work we have found that the injection of emetin causes an immediate change in the phagocytic power of the leucocytes. If you will take a microscope when you go home, and note one of these typical cases, you will find the leucocytes you take from a pus pocket before you use emetin, even without instrumentation, will show a given proportion, which will be a small number of ingested bacteria. If you inject emetin today and more after tomorrow, you will notice a more pronounced condition. You will find the phagocytes have taken up a larger number of bacteria. How do they do it? Metchnikoff gives us the wonderful and beautiful theory that the leucocytes gather up the bacteria by throwing out pseudo-pods. I have never seen them do it, although I have watched that process by the hour. A later theory of phagocytic action is that the leucocytes take in bacteria because of the sticking substances they have on their surfaces which hold the bacteria they come in contact with. The bacteria themselves have a sticky quality to their surfaces and what emetin seems to do is to produce in the blood that very quality. Note this parallelism; succinimid of mercury has been found to produce almost the same effect on pyorrhea infection that emetin does, and that was found accidentally, and it produces the same reaction. It has been found that emetin seems to be almost a specific in many cases of the condition which we know as psoriasis which has never been suggested as being an infection due to the amebas. Literature has accumulated rapidly to demonstrate that emetin has an action entirely apart from its amebricidal action, hence its beneficial effect in these cases.

We find in tabulating the temperature curve for November, December, January, February, March and April, that there was a definite relation, in Cleveland, at least, of the presence of endameba to the mean temperature, and frequently after there was a rise in temperature in January or February; the day after that rise we found spores in the mouth, and on the second and third days we find the motile organisms. A significant thing happened. After two or three of these series had followed, we wrote to one of our friends about it and he found the same parallel in his climate, though he had attributed it to less and more favorable cases. In Cleveland, at least, the presence of endameba seems to be very easily influenced in the winter months. It has been easy to understand why in New Orleans they can find the endemeba all winter long in every mouth. When you get the next issue of the *National Dental Journal* you will find by the rise in the temperature curve there are twice as many endameba in mouths with no pyorrhea in April as are found in mouths with pyorrhea in January.

I am not going to point out to you the rest of the twelve arguments against amebic infection. I want to speak of one other important thing in this connection, and that is our responsibility in differentiating the various types of infection of the mouth. We are not justified, I think, in making a statement relative to the probable effect of an apical infection or gingival infection since the type of infection itself may vary through a very large range. When we get our microscopes and study carefully the type of organism in these cases or in others, we may find they are similar or the same, but, as a matter of fact, when we study the disease-producing effects of the organisms they are different, and one of the most valuable ways is to study the same organisms as we get them from different pockets, with a motion picture. We may find it different. It has different motility. It has a different characteristic of motion according to the condition of the infection from which we have taken it. This will give us ultimately some distinct benefit in differentiating these infections.

I want to pass quickly to the group of organisms known as the streptococcus and pneumococcus group, assuming you are familiar with the facts that they have been demonstrated to be related to the rheumatic infections, such as inflammatory

rheumatism of the joints, certain types of deforming arthritis, endocarditis, myocarditis and pericarditis, cholecystitis, peptic ulcer, and there are a few others we could name that have not been definitely related, but perhaps are.

I know of no better way than to give you the history in very brief form of the development of the symptoms in the patients themselves. In that way you may acquire information more quickly.

There are a series of affections, which may be infections, that are now not classified as chronic disorders, expressing themselves as headaches, malaize, perhaps some digestive disturbance, more or less lassitude—those definite local symptoms which are related to the liver, to the stomach or to the nervous system.

I want to speak of that particular type that expresses itself as headache. We have not appreciated the fact that many people are subjected to a swarm of infections periodically. I believe we have demonstrated the fact that certain people who have recurrent headaches have at the time of these recurrences a swarm of infection by certain organisms. You may not be able to demonstrate them by taking a few drops of blood because there are not enough of the organisms in the blood to be found in that way. The type that seems to be generally to blame will not grow in any artificial media we know of. The only way we have been able to grow it is in live rats and the patient's blood. This organism we call X, because we have never grown it on artificial media, and yet we find the organism in our motion picture films. It changes its morphology and rate of motility.

This particular type of infection seems to respond to emetin and also to the succinimid of mercury. What we are trying to do is to carry on that type of research work and be able to differentiate these infections of the body, and to do it we must have competent men. We must furnish microscopes and other things with which to carry on this work.

Lastly, what has the profession done to support the carrying on of this work? We have spent up to this time something like $10,000. Last year we spent $4,500, and this year we will spend approximately $8,000. We have subscriptions now for $49,000 and a little over. That amount has come to us almost gratuitously from the members of the dental profession as fol-

lows: $2,400 from your splendid state; $3,700 from Indiana; $2,400 from Iowa; $1,900 from Colorado; $4,200 from Michigan; $7,000 from New York State; $11,900 from Ohio, and so on. (Applause.)

The question is, is it worth while? Surely it is, but it will cost you something if you say that. The method of carrying on the work is one of voluntary contribution. We expect ultimately to have a reasearch institute of the National Dental Association, which institute will be competently endowed as are the Rockefeller or Carnegie institutions. We have already completed arrangements to secure a charter and have a board of directors selected.

The development of this research institute of necessity will be delayed by the war. Other great enterprises that were in process of consummation are utterly at a standstill because of the war conditions, and because the men who had promised to give their money expected to take it from their annual incomes and their incomes have been materially curtailed. We have some good promises which will doubtless be carried out after the war is over. In the meantime we are going on as a dental profession and are trying to work these problems out. There never was a time when the dental profession, if it so desires, could so well step into the breach and furnish information for the medical profession which will be received by that body with open arms, who will give us full credit for our place in the healing art. (Applause.)