W96

THE DENTAL OUTLOOK

VOL. XI NEW YORK, SEPTEMBER, 1924 No. 9

ORIGINAL COMMUNICATIONS

FOCAL INFECTION AND ITS RELATION TO RESTORATIVE DENTISTRY *

By DR. WESTON A. PRICE

(Read Before A. D. C. Tenth Anniversary Meeting)

MEMBERS of the Allied Societies:—It gives me very great pleasure to be with you, and enjoy with you the subject of this evening, the relation of focal infections to the operative procedures of dentistry. I will ask you to think with me for a few minutes of our present situation. You will agree that the art and science of dentistry have each reached a very high state of perfection. It has been said if all the arts and all the sciences were to be wiped out, they could all be reproduced from dentistry. Dentistry has taken art from ceramics, and from architecture, and engineering, from physics, and has made modern physical dentistry. You will agree with me that we, as members of the dental profession must all be proud of that phase of dental practice which is expressed in dental science and dental art.

I wish you would think for a moment how that has come about and you will readily recognize that there has been given to this generation of dentists an art and a science that has been built up upon a long series of experimentation. A system of exact procedure has antedated our modern art. The amount of money that has been expended to produce our modern science of dentistry runs into hundreds of millions, so today the works of art in dental structures will reach as high a state of perfection as physical art will reach in any applied science I know of.

Where do you place your splendid crowns and magnificent fillings? On teeth. How good are those teeth? What about their safety? You will agree with me that there has been handed down to this generation a group of fundamentals of dental pathology which has not been built up upon an exact science of research such as has been responsible for all of our mechanical art, and it is a question if as many thousands of dollars have been spent to determine how safe your foundation is, as millions to perfect the physical side of the art.

I wonder how much do we need to perfect this art? I think I might be justified in calling to question whether or not the pathology of our profession has been sufficient to jus-

* The slides indicated in Dr. Price's lecture were unavailable for publication. We feel, however, that the paper is so lucid and instructive that it will not suffer without them.

tify our accepting it without question. Whence came our pathology, as you have practiced it? Has it not come as an inheritance from a former generation of dentists, which was accepted by them? As I will present tonight some of the questions that seem to challenge our accepted fundamentals, I want to make sure that you will not misunderstand my attitude.

I have not come as a destructive iconoclast, but to present to the court some new evidence, and I want you, as the court, to decide whether or not the fundamentals are sound, in the light of our new information. But why challenge it? Do you recognize that there is an opportunity for dentistry to do one of the greatest goods to humanity (if the information I shall bring you is based on fact) that has ever come to dentistry, and which opportunity will be lost to us and go elsewhere, unless we see it first? I say there is a necessity for a new orientation.

I will show you, in a few minutes, a birdseye view of the diseases that are scourging humanity today. It has been said that the average length of life has been lengthened fourteen years. Is that not wonderful? While that splendid increase in the length of life has occurred, it has happened by reducing the infective diseases, such as scarlet fever, typhoid fever, yellow fever, small-pox, etc. But while we have made progress in curtailing tuberculosis and such diseases, we have lost ground in the degenerative diseases, such as diseases of the heart, and kidney and nervous system, and the organs of digestion, including cancer and more people are dying of such diseases.

I have said there is need for a new orientation. At a recent meeting of the American Association for the Advancement of Science, when the president of your splendid Cornell University was addressing that body on the health of the nation, he reminded them that while we have made this wonderful increase of fifteen years for men and women in life expectancy, in the last forty years, the other fact stands out, that we not only have lost ground in the deaths from heart disease, and kidney disease, and the other degenerative diseases, but we do not know the causes of those diseases.

I am frank to say to you that I have no doubt—or, to express it otherwise, the new information that has come to me from my research work and my reading, makes me believe—although I do so reluctantly—that focal infections are contributing a large part towards the development of the degenerative diseases. I personally fear that the increase in heart and kidney lesions is partly due to an increase in focal infections, and I think I can give you the data to verify that.

We are placing these wonderful pieces of bridgework and these magnificent crowns, our unsurpassed pieces of physical science on foundations that may be questionable.

The material I will review this evening is covered in a book that I have written, of some 700 pages, that will give you a better idea of these things.

Description of Slides

This first slide is taken from a report of the Metropolitan Life Insurance Company, and you will recognize that the number of deaths from organic heart disease is 153 for the month of February, 1921.

The important message, you will note, is that heart lesions represent by far the largest single item. Next to that will be tuberculosis—108; then we go to the pneumonias, coming in as part of the flu epidemic. The Bright's diseases are also high.

If every time you see a funeral go by, you will say to yourself, regardless of the age of the individual—that means that one in ten of all the funerals in the United States, and Great Britain and Wales, and all districts of the world where they are taking a census—is due to an organic heart lesion.

If you see ten funerals go by in any week, one of those ten was where a heart stopped too soon; but if you take from that group all the children, and those from 35 to 45, and those past 60 or 65, it is one in five. If then, it is true that we do not know the causes of these heart lesions as has been suggested, and that so many hearts, an increasing number, are going out, we should stop to see whether there is any relationship between the practice of dentistry and this relatively large number of heart lesions.

Again: I wish you would note that this heart lesion that I have mentioned is only one of a large group of diseases. The kidneys, the digestive tract, the nervous system and the brain all enter into the degenerative processes.

I will show you that.

I will ask you to go over again some of the data that is evolved at the present time. This slide will show the result of some dental examinations.

You will grant that the roentgenogram is considered very important in considering whether a dental infection is serious; but will it necessarily show you what you are looking for, or if it is present, will it always be revealed by the roentgenogram? Do you see any evidence of this granuloma, or this one, in any tooth in that list?

Do you see on those centrals any evidence of such granuloma as is present there? Do you see any evidence of this granuloma, or that one, and yet they are present? Why not?

This is the first one in the last group. You do not see on any of those centrals any evidence of a lesion, and yet when we extract the tooth, there is a granuloma on the side. We could not photograph a dotted line behind a tree, because the tree is in the way. So it is here. There are many of such conditions that may enter into this.

Here we find this tooth has been passed as being safe, and not involved, as had all these teeth, in a splendid clinic; and yet the roentgenogram shows this condition. That is partly the fault of the position. It could not be seen in the roentgenogram.

If you will note this picture, you will appreciate that there is probably a disturbance on the roots of the first molar, but very little disturbance on the roots of the second molar. When we extract those two teeth, the granulomata are larger on the second molar than the first molar. There is a condensing osteitis obscuring the rarefied area.

If we look at roentgenograms of teeth that we can treat, we would think this was a very nice, smooth section; but when we get photographs of those teeth that are covered with barnacles that would make it impossible to keep them there, we think differently; and yet they do not show in the roentgenogram.

These roentgenograms do not suggest that you have this root filling penetrating into the tissue, or a bicuspid root filling extending into the tissue; and yet when it is extracted, we find this sticking through, and in the next picture——

You will see that it is penetrating to this extent. You see the angle. How the ray is used makes a difference in the prominence of the root filling, simply because of the mechanical relationship of the apex and the root filling. The angle of the ray then may show a different picture, but if your target is low, you cannot get your angle. We have many such conditions that we must consider.

I wonder if you have been taught, as I was, that when a dental infection is doing harm systemically, it is because there has entered into that particular tooth a strain of organism which is unusually virulent, and is capable of producing a lesion on a particular organ. We can take all the different types of streptococcus, and study them in relation to their dominance—their occurrence in these lesions, and we will find the various organisms that we recognize as strep-

tococcus buccalis and all the others —all down through this list.

These lesions appear in relation to these different strains of organisms. You might say that the biological classification of the organism has nothing to do with it—that it matters not what strain of streptococcus it is, it can produce that lesion. If that were true, we have immediately this new responsibility—that if the organism is not to blame for this, perhaps the host is.

We will have a study of the local expressions of dental infections. We find that dental infections in our patients may appear in extensive infections, as shown here. We can classify all of the patients according to the amount of destruction of bone that occurs with a given type of dental infection.

Take our lateral teeth. If we compare the amount of infection around lateral teeth, and we have in each of those cases an amount of infection that can come from an infected pulp —in some there is a very large area with a fistula, in some an area without a fistula, others with a small area with a fistula, and others with a large area of condensing bone around the tooth.

This quality of rarefaction expresses itself differently in different patients with the same kind and quantity of infection.

If we study these types of bone that are found in our surgical conditions, we find normal bone is very coarse and cancellous; but we may have zones of condensed bone. Here the trabeculae are small. The medullary spaces are large. When individuals have a broken defense around the teeth, it may be this type of condensed bone, or an abscess.

There may be so much density of bone that you do not see the curvature of this root; but when a lead wire is placed there, it is enough more dense to reveal that.

You may have an extensive zone of condensing osteitis. When we take the germs from dental infections, and place them into animals, not teacups full, but amounts not as large as the head of a pin, and place them into a rabbit, we have this:—Here in the spine of the rabbit you see the infection is not making a hole in the bone at all but a more condensed bone—not a rarefied osteitis, but a condensing osteitis.

In some patients you will have an excementosis so great that the diameter of the root is increased to twice its normal condition: whereas in another patient it will be reduced to a wafer, like thin tissue paper. You will not find these same conditions all produced at the same time in the same individual. There are two different types of individual. This type has a different type of reaction to a dental infection than this type. There are many physical characteristics—it makes them easy to recognize. For example:—If we would make the blood chemistry of these two individuals, we would find this one is totally different from this one.

Here this one is normal, and this one abnormal. This will produce not a proliferative arthritis, but it produces an absorption of the bone.

We may get another strain, which when put into a rabbit's ear produces this type. One is straight, and here it is all warped out of position—in the knee of the rabbit. You notice these plug-shaped effects—a proliferative process. We may not have a process of rarefaction, but just as readily a deposition.

If we will keep in mind, that the same process which attacks the joint of an individual with arthritis, may attack all of the joints of the body, and since the peridental membrane is a joint, and since the teeth have joints in their attachments, arthritis may attack the attachments of the teeth.

Here is a patient with arthritis, and here is a pulp stone in the pulp chamber. It is a process depicted in these larger magnifications. You notice this zone extending deep into the cementum. You see the giant cells

busy taking away the tooth structure.

That process may be reversed, and the bone may be built in again. There are no odontoblasts present, and they must be built in with bone—no cementoblasts. We have often these zones of repair, which I am not taking the time to show you. The teeth of arthritic patients may be attacked as well as the other joints of the body. This patient has had five teeth become non-vital, not due to caries, but due to the attacking of the joints of the teeth and attaching processes, due to the arthritis.

I must be careful not to strengthen what might be perhaps an overzealous attitude on the part of the exodontist, because he does not understand that some of these teeth are worth more in the mouth of the patient than away from it. I might show you the tragedy of this lack of information on the part of the exodontist—I do not suppose you have any in New York, but we have some out where I come from! So many people have added to the load of arthritis, the additional load of being made dental cripples for life.

Let us take up now the systemic side. I will try to give you some of the results of the research that has been done by my staff for many years. I have a staff of eighteen, entirely supported by my clinic, and everything is built around research work. We see patients—yes—but only as they are needed for clinical material which is necessary for the research. Incidentally we charge them enough to pay for the research work that is being done.

In the susceptibility to dental infections, we have so large an amount of data that if spread over that piano, with the figures in ordinary typewritten figures, it would cover the entire surface of the piano. It comprises 140,000 entries, and some of them took up practically an hour. I can only give you a birdseye view of what it means, and it resolves itself into this:—If we go through this audience, individuals may be divided into two groups—those with a susceptibility to streptococcal infections, and those with a defense. Of the latter group we find they divide into two groups—those who still have a defense for streptococcal infections, and those who have had it and who have lost it. We will divide them into three groups:— those with an absent susceptibility for those infections, those with an acquired susceptibility, and those with an inherited susceptibility.

If we made a tabulation of all the members of the families, we would find it runs about like this: In 15 families, the total susceptibility is 16—only one per family. You will see it all here on this chart:—

It means we are dealing with the factor that obeys Mendel's law of inheritance. This susceptibility is something we inherit, just as we inherit the color of our hair and the length of our nose. Since you have first heard about rheumatism, you have heard that rheumatism runs in families, or heart troubles run in families. We are brothers, or half brothers—as father and son by different mothers. We have the same forces within us.

Some have very extensive and some very little absorption about the roots of teeth.

We will take a comparison of the data that has come out, and compare that with the systemic infections. Let us take these groups of inherited susceptibility and acquired susceptibility and absent susceptibility, and relate them to the types of dental pathology —condensing osteitis, or rarefying osteitis. Take rarefying osteitis. In the group with absent susceptibility, we find the presence of a rarefaction decreases as you go into the groups with the stronger inheritance.

To my mind, I have never had any thrill come into my life that has been so powerful, or has made such an effect upon me as recognizing this great fact that dental infections about the roots of teeth demonstrate—if you know how to read your roentgenogram—pretty nearly the family

history; and if you know the family history, you will know just about what kind of pathology you will find around the roots of the teeth. Dental infections, when studied from the standpoint of the local pathology, made it possible to put patients into a series of groups. Now we find this remarkable thing: that not only are we dealing with the same groups, but we found when we picked out the individuals we had identically the same individuals in the same groups for classification. The individual with a normally high defense for streptococcal infection (for all dental infections are streptococcal) always has a large zone of rarefaction in proportion to the dental infection, as compared with an individual with a low defense.

Then there are individuals, no matter how you extract a tooth or treat the socket, or not, it takes good care of itself. They come back the next day, and everything is fine. The teeth are easy to extract, they are easy to anaesthetize with infiltration. They have a higher defense, and are safe—not because of what you do, but in spite of what you do. If you are going to make root resections, or fill roots of teeth, do them for this individual who has a high defense.

But what about the individual of low defense? As you go down the list, you find more and more trouble, and less and less rarefaction, a more difficult tooth to extract and anaesthetize by infiltration—the patients who have the so-called dry sockets after extraction—and if you make a study of the patient before, as to his defense, you know just what to promise him. You can say:— "You must be very careful and come for treatment, because in spite of all my care, it will be impossible for me to keep this from being painful"; and if you tell him that, there will be no comeback. There is a false impression going out, and there are a great many more suits for malpractice. If you play the game with marked cards and advise the patient according to his susceptibility, there will not be this trouble.

Patients are coming with the idea (and I fear the dental profession believe this, too) that the quantity of infection is in proportion to the size of the zone of infection—that the danger is in proportion to the size. Is that true? Lots of dentists, and most physicians think that, as well as the laity. They will extract the tooth with the large area for the people who have the high defense. Do not get the impression that the tooth with the small area has the least amount of infection. Given a tooth with a putrescent pulp in the mouth of a patient with high defense, that patient will have a fistula very often. What will the dentist do? He will remind that patient frequently of his or her dental trouble or danger. What about the patient with a low defense? The tooth in that case does not get sore, or have a fistula, or a large zone of rarefaction. What do we say to them? We say:— "As long as it is comfortable, we will let it go; if it gives trouble, let me know." Frankly, I think that is where we get a lot of the heart lesions. If they did not get their streptococcal infection from the teeth, they would get it from another source—from a tonsil, or an appendix, or an infected toe nail. It is important that we should visualize that danger is not in proportion to our zone rarefaction.

Here we have the first picture of the last group. (Reading chart.)

This man had a magnificent high defense. There is not as much infection actually produced in those teeth in those large areas.

This man is safe in general, in spite of what you do. Suppose he gets blue, or overworks, or uses some tissue of his body too much. He is a public speaker and reads until one or two o'clock every night, and his eyes are overstrained, and the toxin from his infection makes it difficult at 55 years to read. When his dental infection was attended to, he gave up his glas-

ses. He is just going into the acquired group.

This patient had a very high defense. He had this dental infection, and developed neuritis. Patients with flu have their defense broken. If I have time, I will speak of the relation of that to the deaths from pneumonia. Do you realize that the number of patients who die from streptococcal infections with the flu is very much greater if they have dental infections, than if they do not? A study of five hospitals shows it is two and a half times as great. What about the patient with the wonderful bridge you put on? If that root is not entirely free from infection, it may be their defense going down will make it possible for them to have a systemic involvement.

Here is a girl of twenty-three years. There have been nine cases of rheumatism and seven cases of heart disease in that family. Her parents are dead, and she has to work; but she has been out of work for six months, on account of her illness. Look at this chart.

Will you put gold crowns there? Could you fill those roots when they are as crooked as that? When a patient has an inherited susceptibility like this, it is an entirely different matter. Her father died of a heart infection at 56, and her mother died of a heart infection at 52. Her brother and sister had heart trouble and my judgment is that girl should not have any root fillings. Why? See what happened after the removal of the dental infections. She gained 22 pounds, and in five years she had no recurrence. What would have happened had we put crowns on there? She would have had no defense—at least in my opinion. In any case, where there is inherited susceptibility in an organ which, if incapacitated would cause death, do not fill the roots of a tooth; or if you do, watch that patient carefully. In that type, the patient is not permitted by me to retain root-filled teeth, because the number of those teeth that are infected is probably larger than you think.

Can you see evidences of focal infection about these teeth? All these patients have heart trouble. Would you be satisfied with a casual reading of a roentgenogram? I would stress the necessity for other means of diagnosis.

(To be continued)

TOOTH BRUSHES AT COST

As an aid to the Oral Hygiene Campaign three tooth brush manufacturers have agreed to supply children's size tooth brushes at actual cost.

These brushes are only sold to Health Officers, Oral Hygiene Workers and those working with school children. Already 36,066 have been sold.

This work is being done under the Auspices of the Oral Hygiene Committee of Greater New York.

All communications should be addressed to the undersigned.

DR. THADDEUS P. HYATT,
1 Madison Avenue—Room 9082,
New York City.

2nd part

FOCAL INFECTION AND ITS RELATION TO RESTORATIVE DENTISTRY

By DR. WESTON A. PRICE

(Read Before A. D. C. Tenth Anniversary Meeting)

(Continued from September Outlook)

This is a chart of the relation of pyorrhea to susceptibility in the rheumatic group lesions.

I have had the data suggesting that for ten or twelve years, and it is only recently that I have had the courage to tell the profession about it.

I am not of the opinion that all individuals with pyorrhea cannot have heart and kidney involvement, but I say in all the cases with a marked susceptibility to the rheumatic group lesions, we do not find pyorrhea. Why is that? If we will take the same individual and compare the destruction of tissue at the gingiva with the destruction of the root apex, you will find in every case a large area of rarefaction. It is the same process, whether at the apex or at the gingival margin. We are dealing with reaction. We have completely mistaken the function of the granuloma, and the nature of pyorrhea. Pyorrhea so-called is a reaction process—not exactly a beneficent process, but it is guarding that patient against food decay, or a deposit on the teeth, or a gold crown; but if that patient has a broken defense, he goes into the group with acquired susceptibility.

Think, then, of the granuloma as a tissue that nature places at the root of a tooth to take care of the infection as it comes from that tooth. A large healthy granuloma in an individual with an amply high defense, is virtually sterile. Some of you have found that to be so; but how long will it remain that way? Very few people will have that healthy granuloma throughout an entire lifetime. They will come to a time that their defense breaks down. The process of the degenerative granuloma is not identical at all with the one with a healthy functioning process. You must learn to recognize the degenerative tissues. You will not treat them differently, but the important thing will be you will think of them as having a different significance. If your individuals with a marked susceptibility to pyorrhea will be studied by you, you will find that those are the patients who will become 80 or 90, not because they had pyorrhea, but they had a defense against streptococcal infection that is so high that they react to all infections, and those individuals, if you remove the food packed between the teeth, or the pockets from the side of the teeth, they make a good recovery and quickly. Why have you had no trouble with the sockets after extraction? You remember one, but what about the other ninety-nine? Could you tell before you took out the tooth what the result would be?

Here your dental infection is travelling through from the tubuli. You see the pulp stone here. There is a degenerative process which causes ultimately the death of the pulp, and this type tends to be more prevalent with individuals of a rheumatic susceptibility. I am not suggesting that you extract all teeth with caries for fear they have pulp stones, but recognize that they can become the source of infection.

Notice this degeneration of the odontoblastic layer, which is prevalent in many teeth, and which becomes later an infection.

What of the tooth with the gold crown? This molar was crowned, and underneath it was a vital pulp. I will not have time as I would like, to give you the story of the toxins of these infected teeth, but just a suggestion of it. The toxic substance from the stump of this tooth irritated the pulp so that for a year she had a pain over her temple, with no suggestion of pain in the tooth. All of the symptoms disappeared after the removal of the pulp. The tooth was extracted, and here is a section of the tooth showing the calcifications in the pulp, and here the pulp tissue. Note the extensive calcifications way up to the apex. That kind of tooth produces the type of infection which in the patient with the marked susceptibility tends to pick out the tissue which in that patient is most susceptible. If this heart is susceptible, it would produce a heart involvement; if it is kidney, there will be a nephritis.

Here the filling was placed too near the pulp. The dentist apparently did not judge correctly the relationship to the pulp. See the effect of the irritation. There is calcification within the pulp tissue with its large pulp stone. There was neuralgic pain on the side of the face.

We have changes taking place in the pulp, expressing themselves as very extensive depositions of pulp calcification, due to an original pyorrhectic infection. Every time a tooth has a deep caries, or pyorrhea pocket, there is likely to be some change in the pulp of the tooth; so always think of those cases as being potentially causes of infection, for producing in a susceptible patient a break in their susceptibility.

What about the blood stream chambers? This rabbit died in twenty hours after being inoculated with a small quantity of germs not larger than the head of a pin, in normal salt solution—the germs being taken from a patient who was suffering with spontaneous hemorrhages from the gum. The physician said:— "Can you find any cause—the patient is nearly dying. He has had two transfusions." When we raised his defense, we helped him so much that he is back on his job after five weeks—after we had removed five teeth.

The man had had a tooth extracted, and night and day the blood was just going drip, drip, drip, all the time.

The rabbit was dead within 20 hours, through spontaneous hemorrhages from his blood vessels. This organism, growing in his teeth, was destroying the clotting quality of that young man's blood. As I studied him for an hour or two, I found the hemorrhage was greatest around his pulpless teeth.

The first tooth we extracted, after we got our culture for vaccine—we could have just as well gotten it from the crown—we had to have the nurse hold in the packing, after having it tied in for eight or ten hours in order to control the hemorrhage; but each time we had less and less hemorrhage. This man's clotting time came down from ten minutes to three and a half minutes; and when we put that germ into rabbits, the clotting time changed and went to ten minutes. Not one of those teeth was sore.

After the extraction of this man's tooth, a secondary hemorrhage started, and for several hours we had the patient in our private ward, with the nurse staying right with him all the time to control the hemorrhage. The total quantity of ½ c c of a 24 hour culture—half the size of the head of a pin—was injected in this rabbit, and he died of hemorrhages all over his body.

Here is a hemorrhage in the intercostal region, and here is a hemorrhage in the stomach. This patient had a severe myocarditis. He could not walk a block. He was a man with tremendous responsibility, the chief spirit in some large undertaking, and they said: "This whole plant will go to pieces, if this man dies. He not

only made the patents on which this runs, but he runs the whole business besides." That man, with that myocarditis, in ten days' time, had so wonderfully improved that he could walk ten or twenty blocks, and those attacks of heart involvement that made him in terror of his life, ceased. Something was going on in that man's body, due to these dental infections. He had been examined in five different clinics in the United States—two of the best in our Eastern cities—he had had disturbance in his abdomen that they thought was an appendix involvement. Placing the germ in this rabbit produced an appendix disturbance.

This rabbit has decreased in weight 41%. That amount of decrease has taken place by injecting into it the washings from the crushed extracted tooth. We are getting almost the same effect, if we put those washings through a Birkfeld filter. What does it mean? That the teeth contain toxins.

Here is a chart of rabbits with subdermal implantations.

We planted the teeth of a patient suffering from lethargic encephalitis. That germ seemed to be in the teeth, and caused the death of those rabbits. Since the extraction of those teeth, the patient has been very much better.

Here are two granuloma—this one extracted from the patient, and this one built bv the patient, and you cannot tell them apart. They were built for the same purpose—for the purpose of taking care of the toxic substances there.

Even though a cyst is formed, it may cause very serious disturbances. The rabbit does not break down with any rapid process, but there is a breaking down of a kidney, for instance.

If we take some of the urine from a patient with nephritis, and place it under the skin of a rabbit, the rabbit develops acute Bright's disease. This was injected under the second rabbit's skin, and it died of nephritis.

Yet those teeth in the patient's mouth were not causing pain. It was a pretty well-filled root, too; but that patient has nephritis and that tooth certainly produced nephritis in the rabbit, because it did not have kidney trouble before.

Now as to pneumonia: Here influenza has been produced in the rabbit, but it does not kill the rabbit. This rabbit here has developed a streptococcal pneumonia, where the influenza has been produced by putting the washings of an influenza patient into the trachea of the rabbit.

Let me just give you this one gen- Our pathology was inherited from a eral thing, as a closing suggestion. former generation of dentists, who concluded that because things were comfortable, they were safe. I am saying to you that the result of this research demonstrates to me that dental infections have danger not in proportion to the extent of the rarefaction about the teeth, or the soreness of the teeth, but in proporion to the lowness of the defense of that patient for infection; for practically all of those teeth are infected with streptococcal infection.

Dr. Burgess:—I need not tell you that we have listened to a wonderful paper, pregnant with information, and it has come out of the mind of a man than whom none is better fitted to do this work. These are not theories, but absolute facts, demonstrated in his own laboratories, and under his own hands and eyes, and to suggest even the importance of them, would be superfluous on my part. If there are questions that will bring out information on some of the points that are not quite clear to you, Dr. Price has kindly offered to answer them.

A Member:—Will Dr. Price tell us his procedure, when a patient first presents himself, in regard to leaving some of these infected teeth in his mouth? What shall a general practitioner do, to be on the lookout?

Dr. Price:—The procedure in my hands, and I do nothing but diagnostic work and the directing of research work, is about as follows:— I nearly always have two or three things—a set of roentgenograms taken not only from the regular angles, but many special angles, because I recognize that in my studies, probably in one out of ten cases I treat, there is no evidence in the roentgenograms. Therefore in addition I must have something that I consider just as important, or more so, and that is a study of the systemic quality of my patient. We have a questionnaire where we fill out such charts as I showed you, and I make a record of them, and the members of their families, which immediately gives me an index whether they are to be grouped as having an acquired or inherited or absent susceptibility. It also gives me the information that that type of infection or disturbance is found in that patient's family. Frequently a person of twenty presents with a roentgenogram, and I would decide to fill the roots with involved pulps; but when I would find that perhaps five brothers of that family had died with nephritis, I would not leave a root-filled tooth in that patient's mouth, and they were on the toboggan—on the decline—and had no suspicion of it; but after an examination, they had casts or albumen in the urine. I found it before the physician found it. By the time the kidney has gone far enough to have the physician called in to treat it, it is too late. We find it long before the physician finds it, because the patient only goes to the physician when it is too late. I also want a urinalysis. As to the blood chemistry, it can only be done by a well-trained biological chemist. The processes of determining calcium are so very difficult, and the errors can so easily creep in, that the dentist will not be able to do it until methods are more simplified. This thing comes out, and it strengthens all the other evidence, and the other evidence is sufficient without the blood chemistry: that we can almost always anticipate and fill out our blood chemistry chart by making our susceptibility chart and getting a record of the family history.

In patients with a marked susceptibility to rheumatic group lesions, the calcium content is almost always low. I am not able to give you here the shadings that go over the borderline.

We never get a proliferative arthritis in cases with exorbitant calcium, but a degenerative type. Our nephritis and our heart lesions all come in that subdued calcium class, whereas our nerve lesions tend to come in a high calcium. In a word, that is about it—the ionic calcium gives you immediately a clue as to the patient's defense.

I again say to the patient: "You cannot have any root-filled tooth in your mouth, let alone having this special root filled, because you have a history of heart and kidney troubles in the family that is so serious that that is likely to be the weakest tissue in your body; therefore we must not produce a condition which is likely to harbor infection." We fill the roots of lots of teeth, but with the expectation of the patient that every root-filled tooth is on the waiting list, if the danger should arise. A person must be able to decide today pretty carefully in those borderline cases. I do not take nearly the chance with a young mother as I would with a big, husky man; because she cannot take care of the extra poison and toxin someone else can, on account of the overload she will have. I have an entirely different vision of my responsibility to mothers and expectant mothers, when I find many of these troubles date back to pregnancy.

Dr. Berlin:—I would like to ask your opinion as to the necessity for curettment after extraction.

Dr. Price:—In every case I would say remove all of the tissue that would make up what you would

understand as the granuloma, or the thickened membrane at the base, or the apex.

Dr. Berlin:—And beyond that?

Dr. Price:—I would not advise undertaking to remove all infected bone, or sclerotic bone, notwithstanding that it is often the case that if you take it away—if you remove the source of infection—that patient will often reconstruct that bone, I find I get an infection one-fourth of an inch at least, and if I undertake to remove it all, I would do more harm than good. Here again we have borderlines—I know in many cases there are special reasons for removing sclerotic bone. I would say remove all soft tissues that are granulomatous; but not the cancellous bone.

I would like to say just a word in passing: Iodine and creosote, if mixed half and half, and placed on gauze, to the quantity that will be left after you have wiped off all you can wipe off, will change that socket from a painful one to a painless one. Put that in the form of two or three drops in about thirty drops of eugenol, and place it in that socket, and you will change the type of infection in the socket. You keep the air out of the socket, and you make it possible for granulations to form. If you will take a hypertonic solution of sodium chloride, and put it into that socket, and make the lymph come into the socket by osmosis, you will immediately change the type of reaction in that socket. It is a physical process.

A Member:—You classify the inherited group, and the acquired susceptibility, but you do not mention the factor of age in each of these individual groups.

Dr. Price:—It would make no difference to the inherited group, but it can to the acquired. As age progresses, they have less and less of their native defense, and there is a time when the inherited defense will not protect it. In the patient of 70 or 80, there is no inherited defense left.

A Member:—I have found that in the young patient, the result is shown in the process itself. As the age advances, irrespective of the class of susceptibility, the effect is on the cementum and the peridental membrane, and in many cases I have slides where the bone regenerates at the same time that the peridental membrane and the cementum and dentine are destroyed.

Dr. Price:—I can show you the same thing where the teeth are not treated at all. That becomes a dangerous condition, where before it was not dangerous. There is an evidence there of decreasing defense.

A Member:—In some of these slides, you showed granulomas on the roots, below the apices. Have you not found that many of those cases showed entrance from pockets, and have formed on the root as granulomas?

Dr. Price:—I showed two like that. It may happen with a tooth with a vital pupil. The thing that has happened is the reaction to an irritation, and the defensive membrane is built there to take care of your approaching destruction.

A Member:—Don't you believe very often it is just due to an irritation, with no infection? The granuloma is infected through the blood stream—primarily the granuloma is due perhaps to the use of an instrument, or a filling, or some type of irritation which is sterile.

Dr. Price:—I believe granulomas are always the reaction to an irritation. I believe there is always infection, plus the other things.

A Member:—Don't you think that the removal of the irritant would restore those teeth to health?

Dr. Price:—We find precisely the same thing happening to our rabbits as to our patients. When we put the sterile coin there, there was absolutely no reaction.

A Member:—Would you remove infected teeth from pregnant women?

Dr. Price:—I certainly would, and do. Where we have put dental infection, in the rabbit, the offspring in the pregnant mother would be killed by the injection of that rabbit; whereas it would not affect other female rabbits.

A Member:—Would a constitutional disturbance produce an infection?

Dr. Price:—I showed you teeth where your cementum was taken entirely from the root of a tooth—that was a disturbance in an infection. That can go on without the presence of germs. These processes that go on on the teeth that are vital, often have vitality sufficient to make response, and yet vour pulp is infected. There may be an infected pulp contributing there.

A Member:—To what extent do you recommend vaccines?

Dr. Price:—Autogenous vaccines in some cases seem to do good, and in some cases no good, and in some definite harm. The dosage is a very important factor. The method of preparing the vaccine—if you are familiar with the method of making the process—where certain structures are used only—you would have a type of vaccine which is less irritating than the ordinary stock vaccine.

In a patient with low resistance, the tooth should be extracted. In a patient with a high resistance, you could make the experiment.

A Member:—In a tooth having a fistulous opening—if the fistula closed, would you consider the patient's vitality lowered?

Dr. Price:—That patient may have enough reaction to take care of what is left.

Dr. Rice:—In view of the fact that you stated that a sterile coin in the rabbit will produce no irritation, would you consider it safe to leave protrusions of gutta percha?

Dr. Price:—If you had asked me that question a year or two ago, I would have answered it differently than I do tonight. We have slides taken of infected teeth which had carried wonderful bridges and crowns. The dentist thought, as I used to, that because everything was comfortable, it was all right, and we took some of those teeth and drilled them, and found they were infected, and we injected them under the skin of a rabbit, and the rabbit died within five days. If you want a hard job, see if you can sterilize the infected cementum by sterilizing through your dentine. If in any root-filled tooth there is much cementum at the apex, I have not been able to sterilize it by treating through the dentine, because there is a fire wall between the two.

I know how easy it is to show there is a connection, but we have no proof that there is an interconnection between the cementum and dentine. We can carry toxins through that zone, and these cases of excementosis that were shown are toxins irritating the cementum. Whether or not that sterile gutta percha can be left in the root, makes me ask: "How do you know the gutta percha is sterile, and do you know to what extent your cementum is infected?" Your high defense patient will protect himself against that.

Think of the reaction process that goes on there as being a quarantine station, and in every man or woman who can maintain such a station, the granuloma will take care of itself, and you can do anything you want for that patient; but the type of patient who cannot maintain that quarantine will not be able to do that, and if the fight goes on to a finish, some tissue that is weakest in the patient's body will break, either from overload or inheritance, and you will come to the feeling as I have, that perhaps we, in dentistry, have some responsibility in lowering this enormous death rate from hearts and kidneys and nervous systems.

A Member:—What do you think of leaving vital tissue at the apex?

Dr. Price:—By all means, if the

pulp is healthy enough, leave it there, rather than put in a filling. What business have you to take out a pulp that has that kind of tissue? That is no excuse for putting on a crown or a bridge.

A Member:—What is your opinion of silver nitrate?

Dr. Price:—Silver nitrate, neutralized with formalin, is one of the best means for sterilizing a tooth. Next to it is silver nitrate neutralized with eugenol, and next to that, dichloramin T. The way to use it is to rub it into a powder, and put into the tooth an excess. If you do not have an excess, it will become infected from the root apex, and you will have an infected dressing in your tooth in thirty-six hours. By putting silver nitrate in there, we cannot sterilize infected dentine. You may reduce your total quantity of toxin and infection to a point where your patient can take care of it.

A Member:—You have been speaking of healthy granulomas as a distinction to infected granuloma.

Dr. Price:—Does the presence of a policeman in front of your house indicate that there is a bad man in your house? My interpretation of the granuloma when it forms is that it is a defensive physiological tissue, and not a pathological tissue. It becomes a degenerative infected mass when that patient's defense goes down; but at the time it is functioning at its best, it is a physiological tissue. It is there to take care of typhoid fever, just as you have a watchman at your door to take care of smallpox, or whatever is in your house. It is a quarantine station.

Dr. Maret:—I have a little patient of fifteen years—the daughter of a prominent physician. This girl has been running a temperature of about 101. Everything has been examined and found to be negative. I radiographed the mouth and found two central incisors filled, scientifically or otherwise, and two upper first molars. If I advise the extraction of those teeth, and the temperature continues, what will they think of me?

Dr. Price:—If it is true, after an examination, that that patient's defense should be high, but is broken, you should expect considerable improvement from removing such a source of infection. You must have the patients understand that they must not expect too much in such cases—there is a potential source of danger in all root-filled cases.

Dr. Maret:—I have been told that there is a possibility of infection at the end of the root, and she is probably running a rheumatice fever. A brother of hers, seven years of age, died of a rheumatic heart.

Dr. Price:—There you have your answer, I believe.

A Member:—I have a patient, a lady between 55 and 60. She has teeth which have been radiographed, and show nothing except they have very large pyorrhea pockets. There is no pus, but a recession. She complains not of pain, but of heat or fever. She has acidosis, also rheumatism.

Dr. Price:—You have given a splendid picture of a patient whose defense is broken. Ten or twenty years ago, that woman had pyorrhea. The alkalinity of the saliva was 7/4 or 7/6 at that time. You now have a blow-up to 12 or 13. She is probably tending toward a diabetes. You say she has acidosis.

A Member:—If I should extract, and the sensation not pass away, what would I do?

Dr. Price:—My procedure would be this: the type of bacterial flora in those pockets will tell you the type of action. If, as I suspect, you have some necrotic bone in your pyorrhea pockets, in which a streptococcal infection is now developing, you would have an entirely different procedure. The defense is low. If your patient is making a good reaction, part of the reaction will be throwing a lot of lymph into the pockets, and also some leucocytes, and that is what you call

pus. If your leucocytes are not there, and there is no pus, it looks better but it is really a great deal worse.

Dr. Rosalsky:—Many of us know some of the healthiest type of children, with perfect mouths, and a good condition of the gums, were taken away by the flu. Also a number of our strongest and most able-bodied men were taken by the flu; whereas if we go to the underworld, we find men with gonorrhea and syphilis, and they do not get the flu.

Dr. Price:—I am glad you brought that out. If you go to any of our physicians who are having their clinics in the hospital, they will say: "When you can show me why it is that this type of man with several old roots in their teeth and pus running out of their mouths, have not got rheumatism, then I will believe your theory." What is there about this? These individuals with all the pus running out, are making a good reaction.

Dr. Rosalsky:—They have a good many blind abscesses.

Dr. Price:—That type of person would not have blind abscesses. You have answered the question yourself. That type of person with the open fistula would not have a fiistula at the end of the root if he did not have a high defense. That is evidence of a working defense. If you take the trouble to take the pus from the fistula, and examine it under the microscope, you will find lots of leucocytes there—very few organisms outside of the leucocytes. That material is blood serum, and it is a war to a finish. The patient is making a good fight yet, but the time will come when the germs will win.

A rising vote of thanks was tendered to Dr. Price for his splendid presentation.

Adjournment.

In Memoriam

Dr. Maurice H. Oser, 1851 Seventh Avenue, New York.
Died August 14, 1924, in his 52nd year.
Graduate N. Y. C. D., 1898.
Member Eastern Dental Society; First District Dental Society.

Dr. Louis Gample, 866 Eastern Parkway, Brooklyn, N. Y.
Died August 17, 1924, in his 41st year.
Graduate C. D. O. S. N. Y., 1914.
Member Kings County Dental Society; First District Dental Society.

Dr. Charles Brower, 107 Bristol Street, Brooklyn, N. Y.
Died August 28, 1924, in his 32nd year.
Graduate N. Y. C. D., 1913.
Member Kings County Dental Society.