toe-nail, and in another case from the wound in the thumb following a crushing injury.

The abscesses or bony changes found about the roots of teeth in various systemic diseases, especially in cases of chronic arthritis, may or may not be primary, but if found the condition should be corrected, because vaccine or other treatment largely fails so long as there exists an active focus of infection, as shown, particularly by Billings. My study on the effect of varying degrees of oxygen tension on the members of the streptococcus group, together with other facts, makes it likely that it is in the focus of infection that changes in virulence occur and the different affinities for various structures are acquired. In other words, the focus of infection is to be looked on not only as the place of entrance of the bacteria, but also the place where the organisms acquire the peculiar property necessary to infect. In the light of our present knowledge the argument that infections in the mouth are so common in individuals in apparent health, does not minimize their importance. These or other foci are so common in patients suffering from arthritis, neuritis, appendicitis, ulcer of the stomach and cholecystitis, goiter, etc., and so rare in individuals who have had superb health for years, that their direct etiologic rôle can scarcely be questioned.

Regarding autogenous vaccines, our ideas need to be revised somewhat in view of the fact that the vaccines administered are usually prepared from streptococci in the focus and which may or may not be the causative organism. The instances in which good results are obtained are probably those in which the focus harbored the causative organism and the vaccine prepared from it. The instances in which poor results are obtained may be due to the fact that the vaccine does not contain the proper antigen.

With regard to the foci: What are they, where are they, and what organisms are usually present? Probably the most common location of the focus or source of infection is the mouth. The tooth socket has a structure similar to that of the joints, and a blind abscess at the apex of a tooth may have no more significance than the lesion in the joint. While it is proper to remove the teeth that are abscessed in a case of that kind, we should not expect that that is necessarily the source of the trouble, but must look still further.

In connection with acute infections, the acute arthritis that we see in rheumatism, a few cases may be of interest. In the first case the patient had gone through the search for foci of infection; his tonsils had been removed, the teeth examined, and a thorough physical examination made. The patient had had repeated attacks of rheumatism which continued for years, and usually occurred in the fall. He came to me in the midst of one of these attacks and on examination I was unable to find any focus of infection that would account for the trouble. This particular attack followed some intestinal disturbance. On three occasions I was able to isolate from the intestinal tract a streptococcus which when injected into animals produced rheumatism. This attack cleared up and I immunized the patient for a long time with the vaccine prepared from the streptococcus from his stool in the hope that some unknown focus in the intestinal tract might clear up.

This patient went south, and while in the South he had some trouble with his teeth. He saw a dentist and the dentist happened to be a man who knew something about the work that Dr. Morehead and Dr. Gilmer are doing in regard to the teeth, and he found an abscessed tooth and pockets of pyorrhea. When he came back I examined the mouth carefully and found no evidence of infection until along the surface of the gums I raised the tissues and found pus pockets. There was not even inflammation on the surfaces, but with a probe I obtained pus from the pockets around the teeth from which I made a culture and produced rheumatism in an animal. The pyorrhea probably had existed for years. This illustrates how difficult it is to locate the focus.

Another case in which the focus of infection was entirely overlooked was that of a young lad who had an acute attack of rheumatism with endocarditis and pericarditis so serious that it was thought he would die. I was asked to see the patient, with some idea, I think, of giving a vaccine. On examination I found that the boy's thumb had been crushed off in an accident ten days before the rheumatism began. I obtained from a necrotic area remaining a culture of a streptococcus like that of rheumatism, and when injected into animals it produced rheumatism readily.

It will be seen that the question of the focus of infection is a matter not only for the stomatologist or the dentist, but for the general practitioner, the surgeon; every branch of medicine needs to be taken into consideration to run the matter down and find the focus from which the organism gains entrance to the body.

PERIDENTAL INFECTION AS A CAUSATIVE FACTOR IN NERVOUS DISEASES *

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The presence of pus in a body cavity has long been considered a finding of the utmost importance, of even grave significance, to which an almost innumerable number of symptoms may be attributed. Until recently, however, the existence of pus around the teeth has been lightly regarded and often rejected as a possible cause of serious systematic disorder. The delay in appreciation of the importance of the presence of infection about the teeth is, doubtless, largely due to the familiarity of the physician with the condition in patients whose symptoms seem too remote from the mouth to have any connection with it. Then, too, it cannot be denied that there are persons suffering from pyorrhea alveolaris in whom it has remained a purely local process.

The results of peridental infection would certainly be more disastrous were it not for two fortunate factors of safety, the one, anatomic, the other physiologic. The former is the fact that the pus usually has free drainage into the mouth. The latter factor is the establishment by the body tissues of various degrees of immunity against a continuous bacterial intoxication, for example, from *Bacillus coli communis*. Just as the colon bacillus sometimes overpowers the individual's resistance and produces a general intoxication, a localized collection of pus or septicemia, so may the bacterial flora of the mouth subdue the body resistance

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and originate an abscess, produce a general intoxication, or entering the blood-stream, may establish a new center of growth in another region of the body.

We may well ask is the alveolar pus pocket the depot of origin of brain abscess in those cases the origin of which has been unexplained, in which there has been no abrasion of the skin and no aural or mastoid infection? A purulent process in the posterior urethra, in the vagina or in the tonsil is considered ample source for any arthritis, neuritis or endocarditis which may subsequently develop. Are we not then justified in considering a septic condition around the teeth a source of various disturbed states of health, no other cause existing? Especially is this probable when the correction of the local oral condition is followed by alleviation of the general symptoms. The proof of the responsibility of oral sepsis for certain diseases of the nervous system rests on no other evidence than that just expressed — when the dental condition is corrected the manifestation of disturbance in the nervous system disappears.

Peridental infection is by no means limited to the clinic patient, it is often found in those who have taken the utmost care of their teeth. In these cases the dental work has been faulty and the real status is only revealed by a roentgenogram of the jaw. Crowns and bridge-work are peculiarly liable to have incarcerated pockets of pus.

There seems to be no portion of the nervous system for which the subtle toxin of peridental infection has a predilection. Probably the most common symptom is paresthesia in the fingers and toes—a "pins and needles" sensation—a symptom common to other chronic intoxications. For a considerable period it has been observed that a bad condition of the teeth may be responsible for adjacent disorders, such as otalgia and tic douloureux, but the observation that stubborn neuritis of the sciatic or other nerve trunk or of the brachial plexus sometimes disappears after cleaning out the alveolar disease is of comparatively recent date. The continual swallowing and absorption of pus is undoubtedly the cause of disorders of digestion, headache and finally an anemic condition almost cachectic. This depleted, exhausted state may often be associated with a melancholic state. It seems a far cry from mouth infection to mental disease, but when one witnesses profound depression clear up following the drainage of several alveolar pus-pockets, one is persuaded that the chronic intoxication, the result of absorption from the pent-up infectious process, was an etiologic factor.

Cases of pachymeningitis within the cranium have been attributed by reliable men to peridental infection. Doubtless, also, the peridental membrane has been the portal of entry for infection, causing various forms of arthritis the etiology of which has been obscure. From a variety of disorders the result of peridental infection I have selected four of diverse character whose improvement, following a cleaning up of the dental condition, was rather striking.

CASE 1.—Cardiac arhythmia associated with angina: The patient, a surveyor, aged 46, married, temperate in the use of stimulants and tobacco, began to be annoyed in August, 1912, with thumping of his heart at night. These attacks would awaken him out of a sound sleep, would last a few minutes and disappear. At first they occurred about every fortnight, but by December, 1912, the attacks of cardiac thumping were not only occurring every twenty-four hours, but were occurring in the daytime as well as at night. In addition to the disagreeable pounding of the heart, pain had appeared. The pain at first crossed to the right side of the chest, but later into the left axilla and up the back of the head. This was accompanied by a feeling of anxiety and dread and compulsory immobility. In one attack consciousness almost failed. The only other illnesses the patient had ever had were lead poisoning in 1898 and "typhoid-pneumonia" in 1899. From these he had recovered completely and had enjoyed excellent health until this present illness. Syphilis was denied and the Wassermann reaction was negative. Neither clinically nor by Roentgen ray could anything pathologic be demonstrated in the mediastinum. The heart was of normal size and location. Accompanying the systolic sound was a subdued blowing murmur, and the pulmonic second sound was slightly accentuated. When not in an attack his pulse was regular and rhythmic, 70 per minute, and the systolic blood-pressure was 125 mm. Hg. He exhibited a coarse static manual tremor said to be familial. Examination of the blood, urine and gastric contents revealed nothing abnormal. A slight pyorrhea about the teeth was noticed but was thought insufficient to cause such grave symptoms. He was put on general hygienic and tonic measures and discharged. I was not fortunate enough to see him in an attack. Three months later the patient returned having made very little improvement. Roentgenograms of the jaws were then made and disclosed no less than three pockets of pus about the roots of the teeth. These were opened, drained and treated, and since that time, a period of practically six months, he has been entirely free from cardiac palpitation and its associated angina. Quite recently he writes, "I haven't had a shadow of trouble in the region of my heart."

CASE 2.—Persistent periarthritis: A man, aged 46, of good health and temperate habits, free from venereal infection, developed two years previously moderate swelling of the tissues around the middle joint of the right finger. It became painful on movement and any trauma made it worse. Use of the joint, for example, playing golf, also aggravated it, but cessation of vigorous use didn't cure it. He had never been a sufferer from sore throat and was not otherwise rheumatic. He took the "cures" at Aix-le-Bains and Carlsbad without noticeable benefit to the joint. In February, 1914, he noticed some tenderness of a premolar tooth. Examination revealed a slight discharge of pus from the adjacent gum. The tooth was drawn and found to be abscessed at the root. Within a fortnight the periarthritis began to disappear and two months later there was no trace of it.

CASE 3.—The commonest symptoms following absorption from peridental infection: A woman, aged 54, complained of "pins and needles" sensation in her hands and feet, pain and tenderness in the muscles of the back and calves, and considerable mental irritability. On examination she was found to be fairly well preserved for her years. Her heart was slightly enlarged in both diameters; pulse 84; blood-pressure 120; auscultation negative. In all the muscles of the back, particularly those above the spine of the scapula, were points tender on pressure; also various points in the intercostal spaces were tender on pressure, especially the left border of cardiac dulness. Squeezing the muscles of the arms and calves caused considerable pain. There was no definite nerve-trunk tenderness. Besides this the physical examination showed nothing of significance except a profound pyorrhea alveolaris.

After a week of eliminative and tonic measures, during which no improvement was evident, she was advised to have the dental condition remedied. A dentist extracted several carious roots and cleaned up the pyorrhea around the better preserved teeth. Within two weeks her gums looked comparatively healthy. Coincident with the improvement in her oral condition the tender points in her muscles and the paresthesia in the hands and feet diminished. Eliminative methods were continued for another three weeks, at the end of which time her muscles were in a comparatively normal state.

CASE 4.—Presenting a picture of an agitated depression in which the presence of alveolar pyorrhea of long standing was

evidently an important exciting factor, but not, perhaps, the primary cause:

The patient, a woman, aged 59, well preserved and of more than average mentality. She sprang from a long-lived nonnervous stock; she had passed through the climacterian twelve years before without unusual disturbance. During the past three years she had sustained a series of shocks with great fortitude and for the time being without telling effect on her nervous system. Three years previous she lost her father, a year later her mother died. During the week of her mother's death she had had a nasal operation performed. Soon after this, financial losses occurred which were the cause of considerable worry. The patient continued in reasonably good health for over a year, that is, until six months previous to entering the hospital. At that time she went to a fashionable sanatorium, more as a pleasure resort than for treatment. While there she began to have attacks of dizziness. A physician told her she was suffering from mild heart-disease and prescribed Nauheim baths. After she had taken eleven baths the present "nervous breakdown" began.

When first seen the patient was greatly depressed and nearly always in a state of agitation, pacing the floor restlessly and recalling the loss of her mother as the greatest disaster in her life and weeping bitterly during every conversation. She said she was convinced she would not recover. At other times she spoke in a mournful tone without being able to give the exact cause of her depression.

Physical examination was entirely negative, except for a pulse of 100 and the condition of her teeth. Heart was of normal size and without pathologic sound. The stool when examined proved normal, except for slight evidence of catarrhal colitis. Blood examination showed hemoglobin 78 per cent.; red blood-cells, 4,869,000; white blood-cells, 6,500; differential showed mild increase in the lymphocytes; the urine was normal. A test breakfast showed diminution in the hydrochloric acid content. A serum Wassermann was negative, and the spinal fluid was normal in every respect.

After a week of tonic measures without noticeable improvement it was decided to subject the patient to the ordeal of having her dental condition improved. A roentgenogram of the jaw showed two abscessed roots under crowned teeth and a collection of pus beneath a faulty bridge.

The bridge-work was removed and abscesses drained. During the following week the cloud began to lift, and she began to have moments of better humor and saw some possibility of looking at the brighter side of things. The patient was then sent to the country for two weeks from which she returned in a comparatively happy state of mind. She arranged to take some hydrotherapy treatment at the hospital, but a few days later decided to go visiting instead.

The message of this paper is that the obvious is too often disregarded in searching for some profound cause. The discovery of a purulent process similar to that frequently seen in the mouth in other regions of the body would be sufficient ground for the hasty summons of the surgeon. A full appreciation of the possible dangers from infection around the teeth should lead us into council with the dentist. This is in no sense a criticism of the dental profession, but rather a plea for the closer cooperation of the medical man and the dentist. After an expert dentist has properly cleaned up alveolar pyorrhea or abscess, we find vaccines, as a usual thing, unnecessary.

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ABSTRACT OF DISCUSSION OF SYMPOSIUM ON MOUTH INFECTIONS

DR. ARTHUR D. BLACK, Chicago: One phase of this subject, of interest to both dentist and physician, which has not received the consideration that it should, concerns the pathologic changes that take place in the tissues which are involved in the establishment of these foci in the mouth. We have in the mouth two groups of chronic foci, the chronic alveolar abscess and the so-called pyorrhea pocket, both of which involve a single tissue—the peridental membrane—which is the important factor in establishing the chronicity of both groups of cases. As a result of the involvement of the peridental membrane, either at the apex of the root or beginning at the gingival margin, there is a suppurative destruction of the attachment of the tissue to the cementum covering the root of the tooth. As a part of this process the cementoblasts, which overlie the surface of the cementum within the peridental membrane, are also destroyed. These are the only cells which could cause reattachment of that tissue. Soon after detachment, the fibers of the peridental membrane, which passed from the cementum of the detached area to the bone, disappear, and a little later the bone to which they were attached is absorbed. Thus all of the specialized elements necessary to the connection of root with bone are lost, and we cannot have reattachment of this tissue to the cementum of the root. This is shown very clearly by the roentgenogram in both groups of cases. Careful examination of these will show a line down the side of and close against the root, which is practically always in advance of destruction of the tissue elsewhere, showing clearly that this disease has begun at the junction of the peridental membrane and the cementum. There is a progressive involvement of peridental membrane and bone, making the whole area about a given tooth funnel-shaped. Within the past few years I have cut away the tissue forming these pockets from the roots of teeth for microscopic examination. In one case I removed the tooth, peridental membrane and a section of the alveolar process and overlying gum tissue all in one piece, and had sections made for study. These sections show that the above mentioned changes take place and that detachments are permanent. Therefore pockets remain about such teeth and the overlying tissue is subject to frequent reinfection. We should not, therefore, expect vaccines to have any more than temporary effect on the local focus, because we have a condition here in which the physiologic possibility of repair is gone. The dental treatment indicated is the elimination of the focus in the case of the alveolar abscess by resecting the denuded root end, or the extraction of the tooth. If it is a pocket alongside the root, exposed to the fluids of the mouth, the tooth must be extracted, or palliative treatment employed which will be effective against reinfections.

DR. M. I. SCHAMBERG, New York: Dr. Billings gave a clear and concise description of the mode by which infections of the mouth reach these parts, and I was disappointed that he did not, even cursorily, touch on the possibility of a septic endocarditis, and likewise of producing secondary infections about the body other than those that apply to arthritis deformans. I, with many others, have been observing these conditions for a number of years. Our findings have been largely clinical up to within possibly a year or two, since which time, through the cooperation of the laboratory and the medical diagnostician and interns, we have been able conclusively to prove that the mouth is a prolific source of primary infection, bringing about serious sequellae. It is equally important that we remember that the absence in the roentgenogram of the dark area is not essential to the conviction of a particular tooth as the cause of these secondary troubles. Only recently in a case in which we were anxious to find the bacterium producing the effect on the patient's general health, a tooth was removed which showed an incomplete root-canal filling with no apical disturbance whatever. On crushing off, under aseptic conditions, the tip of this tooth, from the putrescent material in the apical end of the canal we were able to grow a pure culture of *Streptococcus viridans*. Likewise, in a case of rheumatoid arthritis of fourteen years standing, the patient, who was unable to walk, was brought in with a history of a thorough survey of the mouth for any possible etiologic factor in that region. I finally found among the few remaining teeth a tooth that had been comfortable through all these years, but the roentgenogram showed a slight area about the end. We removed the tooth and from it produced a pure culture of *Streptococcus viridans*. In this case the history of the work done on the teeth recorded that it had been treated some sixteen years previously, which was two years prior to the

onset of her articular trouble. The technic described by Dr. Gilmer in taking the pus from the mouth is probably a satisfactory one. I have, at the Post Graduate Medical School in New York, been swabbing the gum tissue on the teeth with a strong tincture of iodin, and then by means of a sterile swab have taken the pus exuding from the fistula. The efficiency of this method is shown in a case in which we were searching for an organism. After two or three attempts we had absolutely no growth of the organism, so that in this rather filthy mouth we were enabled, through the swabbing of the parts with iodin, to bring no contamination from the mouth. In this case there was a copious discharge of pus which produced no organism whatever, though we used, of course, every medium used at present for the growth of these organisms. These observations together with those already given I am sure will encourage many of us who have not applied ourself to the study of these infections about the teeth, to cooperate more with the interns toward the eradication of these systemic diseases.

DR. W. A. PRICE, Cleveland: What is a dangerous infection of the mouth? Is the roentgenogram a reliable means of diagnosis or not? I think Dr. Gilmer used the term "invaluable" provided the roentgenogram was properly taken and interpreted. The roentgenogram is simply the recording of relative densities, and relative densities do not show infections of the cellular tissue of the bone. We may also have an infection without an area of lesser density as occurs frequently in necrotic bone. It is frequently necessary to have a roentgenogram to show an area of absorption by its lesser density, but, on the other hand, it does not follow that there is an infected condition because the roentgenogram shows an area of relative lesser density. We are confronted with this problem: Patients will present themselves to members of the dental profession with roentgenograms made by physicians with the demand that we extract everything that shows an area of resorption. If we object, what shall be our reason for not extracting? Immediately our profession must come to the point where we can answer these questions intelligently, and I know of no other way to meet the situation than to make exhaustive studies and thus obtain sufficient knowledge of these cases to establish means for their differentiation and correct diagnosis. The results of our studies so far on this phase of the subject strongly suggest that the field of pathogenic culturing may be a great deal smaller part of the area of infection than we have thus far suspected; that our active culture may be in the cellular tissue, about the apical end, or adjoining a pyorrhea pocket, and perhaps in a very limited area. Is it possible for a vaccine to be effective when we do not use instrumentation, or extraction or otherwise obliterate the focus of infection? Dr. Emerson, Dean of the Medical Department of the University of Indiana, made the statement in effect recently, that, in such a case, no vaccine ever did or would do any good. That is his point of view, and another is that established by the history of clinical cases in which no other treatment than vaccines were used and which as emphatically indicates the affirmative to some observers. We must recognize, therefore, that this is an open question, because men of such prominence and ability would not make such deductions without some good evidence; so let us attack these problems with new energy and from every angle that can add new light, for only incomplete truths contradict.

DR. F. B. MOOREHEAD, Chicago: The dentist should keep three things in mind. First, the work of Rosenow in the transmutation of the streptococcus and also the pathogenicity of the streptococcus at different grades of virulency. By animal passage he changes the affinity of the organisms for certain tissues. In this way lesions of the joints, mucosa of stomach and duodenum, heart, etc., are produced in animals. The mouth is a field in which this group is most frequently found. Secondly, when tissue changes have taken place to a certain extent there is little hope of repair. When the cartilage is destroyed the most that can be hoped for is the prevention of any further changes. Hence, the importance of the removal of these foci early, before serious tissue changes have taken place. Thirdly, the placing of the mouth in a state of health without the ruthless destruction of teeth. While it may be wrong to extract some teeth it is not so wrong as to keep some teeth in some patients' mouths. It is far better to take out teeth than to sacrifice the comfort and usefulness of the patient. One must weigh the value of the teeth over against the health and the usefulness of the patient to society; that is the problem we have to face. When teeth may be saved with safety to the patient they should, of course, be saved.

DR. JOHN S. MARSHALL, Berkeley, Cal.: Dr. Billings was the first general practitioner that I know of to appreciate the fact that suppurative conditions of the mouth might be the cause of general septic conditions of various kinds in the body. He will probably remember that as far back as 1886 he sent several children to me who had enlarged cervical glands for which he could not account, with the request that I examine these children and see if I could find any diseased conditions in their mouths. I did find molars in every one of these cases with devitalized pulps and abscesses at the root. The extraction of these teeth in a short time cleared up all the inflammation in the cervical glands. I feel that this should go on record because that was a good many years ago.

DR. V. P. BLAIR, St. Louis: Does Dr. Gilmer consider it necessary to curet and disinfect the cavity after the removal of a tooth with a septic area at the apex?

DR. G. V. I. BROWN, Milwaukee, Wis.: Dr. Billings and Dr. Rosenow have not only revolutionized the practice of dentistry, but they have revolutionized the practice of medicine, and the essential feature of the work, as Dr. Moorehead reminded us, lies in the transmutation of these micro-organisms. Our old standards are lost and we are facing entirely new conditions in the matter of technic whereby these bacteria can be studied, and that was the strong point in Dr. Gilmer's paper. This question of technic is a difficult one, as everybody knows who has tried it. My friend Dr. Yates, in Milwaukee, has isolated micro-organisms in connection with Hodgkin's disease and is doing extensive work with Dr. Bunting in that direction. I have recently exhibited a patient for the purpose of calling attention to some of these features. The roentgenograms show, in the hand and finger joints and various other places, evidence of arthritis. The patient had pyorrhea and she has obviously a diseased sinus. She has been treated several times with bacterial products and we are now directing treatment to relieve the sinus, and the difficulty is to know how to do it. We believe, of course, that serum treatment in a case like that would not do that patient any good. The question of definite prevention and the necessity for further study of the efficiency of vaccine, which I think we are agreed is limited, are brought out in the papers of Drs. Billings and Gilmer.

DR. W. O. BRIDGES, Omaha, Neb.: The work of Dr. Rosenow and Dr. Billings and their coworkers in the line of the relation between the foci of infection and general disease has stimulated the medical profession the world over with reference to the determination of the foci of infection in cases that have heretofore not been looked on as anything but general disease represented by general infection. It has been my privilege in the last few weeks to come across some cases illustrative of these points that are impressive. I have studied for the last year the relationship between bacterial infection from the mouth and the serious anemias which we see—some pernicious and some secondary of a high type—and I have been struck with the influence of treatment directed toward these mouth infections. I have in mind two cases of secondary anemia in which the blood count showed fifteen hundred thousand red cells, and in which the patients had steadily gone down hill; so emaciated that they could hardly get about, and who had been through the regulation treatment for anemia with no results. Examination of the mouth indicated pyorrhea, with almost every tooth left in the mouth loose. All bad teeth were removed and mouth washes instituted and the treatment for anemia carried out. The results were perfectly astonishing. One patient, when he returned five months later for further operation, showed a blood count of four million red cells and was free from every tendency to anemia.

Another young man had gone six weeks with serious symptoms of general infection represented by chills and fevers, serious suggestion of malarial fever, but a diagnosis was made of septic endocarditis. It was impossible to find any indication or ordinary physical manifestation. We looked thoroughly for the focus of infection but found nothing except that in the throat the tonsils seemed to be unhealthy. I suggested that a throat specialist be consulted. The specialist discovered an abscess. The cavity was irrigated and the temperature went to normal in twenty-four hours; the patient had no further chills or fever and finally recovered. It has been my privilege occasionally to see lesions about the mouth which did not respond to treatment, in which cases the Wassermann test proved positive and the patient, put on salvarsan, recovered.

These cases illustrate the opinion, I think, that the mouth furnishes a large proportion of infection which we overlook. We in general practice find a large proportion of people who never saw a tooth brush; who do not know anything about the care of the mouth. If these cases were considered by the physician with reference to inspection of the mouth more generally, more patients would be referred to the dentist and have carried out mouth sanitation in the proper way.

DR. HENRY W. FRAUENTHAL, New York: We have made it a routine practice by means of a dentist connected with the institution to have all the teeth examined, and it has been remarkable to see how many chronic joint conditions are benefited by cleaning the teeth. I think one of the most common sources of infection has been in poorly built bridges and caps, work done indifferently, in cases in which infection existed. On removing the caps we find infection existing. A number of these cases have been shown in the New York Dental Clinic. A patient on my service had been treated for rheumatism in several institutions previous to admission to the hospital without any benefit whatever. Her pain was so acute that she attempted to commit suicide twice, having been informed that her condition was chronic, and would never improve, but on the contrary, would gradually grow worse. Owing to the condition of her gums, I made a diagnosis of joint condition due to septic pyorrhea alveolaris and with no other treatment but the correction of the mouth infection, as done by Dr. Harry A. Goldberg, an arthritis involving both knees, left ankle, right wrist and elbow, cleared up in ten days, and at the end of three weeks the patient was discharged cured. Her temperature varied from 98 to 102 F., with a corresponding pulse. This condition extending over a period of nine months, responded to treatment in ten days.

DR. T. W. CORWIN, Newark, N. J.: In regard to the search for the foci of infection, two points may be of interest. For instance, the appearance of the tonsils may be quite normal, but if the routine practice is adopted of making pressure on the tonsils with some instrument, frequently one will find an exudation from the crypts of matter which may be worth while investigating. Another simple procedure that I believe will prove valuable in many cases, and especially those in which there is a manifestation of anemia, is, whether it is necessary to make an observation of the temperature or not, to put the clinical thermometer under the tongue; before reading the temperature, if you will pass the end of the thermometer under your nose, frequently you will discover a fetid smell. Perhaps these two little points may be of assistance when searching for the focus of infection.

DR. W. H. MERCUR, Pittsburgh: I read a paper not long ago by Dr. Morris Manges of New York on the "Mouth as a Means of Diagnosis." I have met but few men who have read it; it is certainly most appropriate to the present discussion. In this article he shows how easy it is to examine the mouth and how hard it is to examine the stomach and other organs that we give so much attention to. In this article I think he speaks of eighteen different diseases which can be absolutely diagnosed from inspection of the mouth alone.

DR. J. A. PETTIT, Portland, Ore.: I have put on record a number of cases which have come through our service, illustrative of the salient points brought out here. Many of us have had experiences in this connection, which are similar in the gross, but vary in minor details. We are undoubtedly entering on a new era of therapeutics, medically as well as surgically. This subject is undoubtedly in the early stage of development; what the next few years will bring forth is hard to tell. Instead of bending our efforts to the relief of the ravages of infection, we are searching for the sources of infection and reaching out with the use of vaccines and other remedies to overcome them. This is the broad field of therapeutics of the coming day. Preventive medicine is gradually extending out and overshadowing the former field of materia medica and drug therapeutics. Heretofore, remedies have been applied for the relief of conditions which we are now able to prevent. In the face of all the admirable and life-saving work done by medical research and study, it is disgusting to be compelled to listen in dignified silence to the malevolence of ignorance displayed by various cults, and at the same time observe them taking advantage of the very life-saving procedures which the medical profession has discovered and devised.

DR. FRANK BILLINGS, Chicago: In my address I did not go into the details of every variety of disease that seems to be related to focal infection, but rather tried to give the principles of it. I think we should not use the word "cause" too much in relation to the focus of infection of a systemic disease. We should not, even with the focus before us, say that that focus is the absolute cause. I think we will have to use the expression that it is the predominating etiologic factor because there are so many other factors to be taken into account. None of us, it does not matter what our position in the profession may be, is capable of passing judgment on all things, and for that reason we have at the Rush Medical College clinic endeavored to encourage what we call team-work. I, myself, never pass on a special infection except when it is related to something that I think I am a better judge of than the other men. For instance, Dr. Moorehead is asked to pass judgment on the mouth, so far as the jaws are concerned, and I make him responsible. The best men in their lines, men who are teachers in the college, I ask to give judgment about an infection of the sinus or tonsil. Sometimes we call surgeons in with reference to some infection in the abdomen or elsewhere that I think may add to my own knowledge of the condition before we proceed to do anything. I do not pretend to-day to carry out the technic in bacteriology. We have such men as Drs. Rosenow, D. J. Davis, H. K. Nicoll, Gaarde and other bacteriologists, working at the problems. We must all get together. The oral surgeon has no right to diagnose a systemic condition of the patient and say outright that the mouth is related to it; he should have the family physician cooperating with him before he reaches that point. Nor should the family physician nor the one having general management of the patient order teeth out without the definite advice of the oral surgeon who is capable of giving it. I believe there is much in that principle that there is a focus of infection that is the predominating factor in many systemic diseases. This is perhaps expressed more commonly in arthritis of the chronic type than in any other disease that we can mention, but it is in many. Besides arthritis, we have traced this same hematogenous infection with its embolic occlusion of the end artery as the cause of cholecystitis. Hyperplasia in the thyroid gland, which occurs commonly in rheumatism, is associated with infection of the tonsils. The hyperplasia disappears with all of the clinical phenomena with the cessation of the tonsillitis. Also in hemorrhagic nephritis, the streptococcus obtained from that producing tonsillitis, causes hemorrhagic nephritis in the animal, etc. So that the application of the principle is much wider than the average practitioner thinks.

DR. THOMAS GILMER, Chicago: To find the cause of a condition and locate its origin is all-important, but we must go further back than this. Infections in the mouth are due, in the great majority of cases, to improper hygiene. We all recognize the uncleanly condition found in nine-tenths of the mouths which come under our professional care, although the patient may be otherwise scrupulously clean. I venture to say that if we should examine the mouths of the physicians in attendance in the various sections here to-day, few would be found clean, or even approximating a hygienic condition. It

is well to cure our patients when they become diseased, but it is far better to prevent disease by teaching the people the importance of the care of their mouths, that they may not suffer from disease primarily brought about by lack of care of the teeth. Dr. Blair asked if I considered it important to curet and disinfect bone cavities after the removal of a tooth with a septic apex. As a rule I should answer in the negative. The curettement depends, of course, on the stage of the infection and the area involved. Chronic abscesses may be profitably curetted in some cases, but in the acute cases it should never be done. In acute cases I am doubtful about the use of antiseptics. I think it would be just as well to use simply a normal salt solution. Antiseptics, if strong enough to destroy bacteria, would prove detrimental to the tissues; besides we cannot penetrate the tissues with an antiseptic so far as the bacteria have gone. Is it not true that by curettement we cause a greater traumatism which renders the tissues more liable to greater infection?

SOME IMPORTANT PHASES OF RAILWAY SANITATION *

A. E. CAMPBELL, M.D.
Health Officer Illinois Central Railroad
CHICAGO

The steamship and the railway are making the world one country. Produce is now carried from Australia to England, a distance of 11,000 miles, at less cost than was required a hundred years ago to carry goods from one end of the British Isles to the other. The construction of our transcontinental railway systems soon after our Civil War, the projection of great railway systems in Russia and continental Europe in 1873, the opening of the Suez canal in 1869 and the Panama canal in 1914, made all civilized nations near neighbors.

There were carried on the Great lakes last year 7,000,000 people. The Chicago City Railway handles 3,000,000 persons each day. The suburban lines of Chicago handled 44,347,680 persons in the year 1913. The Illinois Central Railroad handles on an average 40,757 persons on her suburban lines each day, or 14,876,300 persons each year. This requires a vast amount of care and responsibility. The railroads leaving Chicago each employ from 45,000 to 74,000 people and the care and working conditions of this army of men should be supervised by an intelligent man. He should have supervision over the ventilation of trains, the condition of the diners, the cleanliness of the depots and toilets, as well as the ventilation of waiting-rooms, the condition of all eating-houses along the line, the condition of shops and yard-offices, repair tracks, construction crews and a hundred other duties which are sure to come before him. I can assure all railroads that such a man will have all he can attend to and will be well worth what he costs many times over.

THE TRAIN

The ventilation of trains or at least of the day coach is not a difficult problem if one or two points are kept in mind. A train rushing against a strong wind causes the air to pass through a train horizontally—hence, if there are openings in the end of the coach the air will pass through, as I have repeatedly proved. All end doors of all coaches should therefore have adjustable sash and the sash in the rear door should always be open. Every coach should have a thermometer and the temperature should be kept at a certain figure. The steel coach is coming more and more into use on account of its safety, and in the South this coach becomes very hot. I have found that the temperature in the center of this coach is from 2 to 4 degrees higher than in the ends and as the electric fans are in the ends they are cooling the part of the coach that is cooler anyway. There should be two oscillating fans in the center of the coach, but if four fans consume too much electricity, three English paddle fans should be installed 15 feet apart. This will distribute the air more evenly.

Spitting on trains is so reprehensible that I believe a slip should be issued by all railroads and used in the state through which they run as follows: "In view of the authority vested in the State Board of Health you are liable to a fine of $25 for spitting, sneezing or coughing on trains without taking the precautions mentioned on this slip." On the back of the slip instructions should be given where to spit and how to cough and sneeze with the handkerchief before the face. Railroads do not like to displease their patrons and state boards should assist and issue these in the name and by the authority of the state board and thus help to stop this disgusting practice on trains.

All coaches should have separate apartments for water and ice. I see ice handled so carelessly—slid along a platform over tobacco spit and other unmentionable filth, laborers taking up the ice with their bare hands and dumping it into the drinking-water—that I have very firm convictions on this point. I do not believe it is wise to have ice in the water in our dining service, mainly because of the methods of handling the ice. Then, again, this ice is handled by a cheap class of laborers who are not overly clean and tidy and I hope all railroads will abandon the placing of ice in the drinking water on trains or on diners.

There should be a folding washbowl near the pantry in all diners, but I strongly object to a toilet in a diner, as no person would care to have odor from a toilet come to his nostrils while eating. All waiters should be instructed to wash their hands before serving food and this would be a good rule to follow in all railroad lunch rooms. It is not very appetizing to see a waitress fix her hair and pick her nose and then without washing her hands hand a piece of pie or come with her finger in the glass of milk. It is because these very matters have come under my observation that I speak of them.

The carriage of tuberculous people on trains has caused much comment and in some states attempts at legislation. We cannot deny that there is a degree of danger, but no more than from many other diseases. There is no denying the fact that diseases are transmitted from person to person and usually can be traced to excretions thrown off from the infected mouth and nose. Indeed we are all more or less exposed to this wide-spread infection at some time or other in our lives. From the best authority we can find we fail to gather information that a person traveling on a train or steamboat reasonably well ventilated would contract consumption, even though there is consumption among his fellow passengers. There is absolutely no evidence proving such incidence of infection. Yet there may be individual cases which may point to such a possibility; but they do not prove

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