

chronic, and just recently one in which a *Streptococcus mucosus* was the predominating organism. These organisms, particularly the green-producing streptococci will in many instances grow as well anaerobically as they will aerobically.

The anaerobic cultures which do contain streptococci are rarely pure. Some contain *Bacillus fusiformis* in varying numbers. A few of these tubes, however, have practically pure cultures of fusiform bacilli.

The above results are what we have learned to expect, but there are many other organisms which occur with these. Aerobically we occasionally obtained isolated colonies of *Staphylococcus aureus* or *albus*, *Micrococcus catarrhalis*, and some unidentified saprophytic organisms. In two instances a diphtheroid bacillus has been found which grows under both aerobic and anaerobic conditions.

Anaerobically, in old cultures, we have seen in material from three different abscesses a black pigment-producing organism. This organism is slow growing and does not usually appear for about five days. We do not believe that it is of any importance in these infections.

In three of the chronic cases from which material was examined the patients were treated with autogenous vaccines with strikingly beneficial results. The vaccines were made from the cultures of both the aerobic and anaerobic organisms, and were given in graded doses at five-day intervals.

These were chronic suppurations, following that class of acute infections of the mandible characterized by much brawny swelling, persisting over a week or more with little or no indications of pointing. The pus discharge continued with no seeming diminution for several weeks after the acute symptoms had subsided. In each instance the pus flow stopped promptly on the use of the vaccine treatment.

Those who have made extensive observations of the tendency of acute attacks of alveolar abscess recognize that they occur epidemically. Whether the epidemics of streptococcus nose and throat infections follow or occur simultaneously with epidemics of alveolar abscess is a question both of interest and importance. We have not sufficient data to warrant a definite statement relative to the subject, however, since we have found in both infections the same bacteria; and as both occur epidemically it may be discovered that there is a very definite relationship between the two infections.

It seems reasonable to suppose that the presence of the streptococcus of nose and throat infections may easily cause simultaneous or secondary infections in the jaws, the organisms reaching the apices of the roots through cavities of decay in the teeth, or through the circulatory channels.

Since the discovery of a positive relationship between tonsil infections and secondary manifestations in other organs and parts, tonsils have been removed wholesale, in some instances on slight provocation. Their removal has, we fear, become with some almost a fad. A similar fad is growing up relative to the removal of teeth, since the discovery that jaw abscesses and pyorrhea alveolaris are equally as potent foci for secondary infections as are the tonsils. Some physicians are rather indiscriminately sending their patients to the extraction specialist, requiring removal of several or all of the teeth, supposing them to be a factor in some lesion, when their removal is not always justi-

fied. A roentgenogram, if properly made, is infallible, and can be absolutely relied on providing its interpretation is correct, but an improper exposure may lead one, if inexperienced, to mistake a part of the maxillary sinus for an abscess at the end of the roots of the second bicuspid or first molar. Other errors from incorrect readings may lead to similar wrong conclusions.

Some jaw abscesses may be cured by treatment through the tooth's root, still others by surgical interference, other than by extraction. Pus appearing at the free margins of the gums does not always indicate the so-called pyorrhea alveolaris. It may be due to lime deposits, the removal of which permits a speedy return of the gums to health. The diagnosis of this class of pathologic conditions of the mouth requires special study and an educated technic.

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## MOUTH INFECTION AS A SOURCE OF SYSTEMIC DISEASE\*

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The subject assigned is "Mouth Infection as a Source of Systemic Disease." I shall confine my remarks to infection of the jaws (alveolar infection) as related to systemic disease. Many radiographic films of the jaws have been made from patients in our clinic at Rush Medical College and the Presbyterian Hospital suffering from chronic arthritis. One film shows an alveolar abscess occurring in a patient with Hodgkin's disease. These films as a means of recognition of alveolar infection are not new to members of this section, but this method of examination of alveolar disease is not sufficiently utilized by dentists and physicians generally. It should be used, for by no other method may one know the exact condition of the alveoli and roots of the teeth. Alveolar infection and abscesses may be primary and due to unhygienic conditions of the mouth and I am sure it is often intensified and prolonged by irrational dentistry—teeth with infected pulp crowned or improperly filled. General malnutrition (scurvy, etc.) may cause mouth infection and alveolar disease. But whether primary or secondary, alveolar focal infection may be the dominant factor in the production of systemic disease, of which malignant endocarditis (*Streptococcus viridans*), chronic arthritis and myositis are examples. From the infected alveoli and tooth canals we have made bacterial cultures. The dominant organisms belong to the streptococcus-pneumococcus group. I would refer you to the brilliant results of the investigation of our colaborer, Dr. E. C. Rosenow, on the mutation of cultural and pathogenic characteristics of this group of bacteria. In addition staphylococci, a fusiform bacillus, the *Bacillus aerogenes capsulatus*, and various saprophytic organisms are found. The streptococcus-pneumococcus group apparently comprise the important pathogenic bacteria related to systemic disease. In five patients suffering from Hodgkin's disease, an alveolar abscess has culturally yielded the diphtheroid bacillus, which is found in the enlarged lymph-glands

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in that disease. We also know that systemic actinomycosis may arise from alveolar infection due to the ray fungus.

Systemic disease due to a focus of infection anywhere, is probably always hematogenous. The study of the infected tissues of experimentally inoculated animals and the infected muscles, joint tissues, lymph-nodes proximal to infected joints, nodes on tendons, etc., of patients, yield specific bacteria, and histologically there is found embolism of the small and terminal blood-vessels. Local hemorrhage and endo-arterial proliferation result in interstitial overgrowth, cartilaginous, osseous, vegetative and other morbid anatomical changes, dependent on the character of the tissue infected.

Partial or complete ischemia of the tissues due to the embolism is an important factor in the production of the morbid anatomic changes. Oxhausen of Berlin has produced, in animals, aseptic osteochondritis resembling arthritis deformans, by ligating the arteries supplying the joint tissues. These principles are, I think, susceptible of proof, that a chronic alveolar infection, and chronic foci in other regions also, may cause systemic disease by hematogenous bacterial emboli, which infect and at the same time deprive the tissues of nourishment. Local infection of muscles, joint tissues, etc., and lessened blood-supply result in the peculiar morbid anatomy of the respective tissues.

To investigate and manage these patients requires team work of the clinical and laboratory workers. The clinician must carefully examine the patient, exhausting every detail in the personal history. The skill of the dentist, the nose and throat specialist, the gynecologist, the genito-urinary expert and others may be necessary to locate the foci of infection. The focus must be destroyed. Tissues and exudates of foci should be carefully examined and bacterial cultures made. Vaccines of the dominant bacteria may be made for subsequent use.

With the source of the infection removed, the attempt should be made to increase the defenses of the body against the systemic infection. This involves a long and tedious period in the chronic joint infections and also in some other systemic diseases of focal origin. Rest, both mental and physical, is essential. Good, wholesome food, pure air, optimistic surroundings and, if necessary, restorative tonics of iron and other drugs. Pain must be palliated by simple drugs like the salicylates. After a time passive exercise and later active graduated exercise must be followed to aid in the restoration of local circulation and to hasten restoration of the morbid changes of the tissues. Autogenous vaccines may be used in the attempt to improve the defenses of the body. In chronic arthritis, with the circulation of the infected tissues obstructed embolically, antibodies in the blood stream, even if augmented by vaccines, would have but little effect locally. In the later stages of chronic arthritis when the local circulation has been so improved that the tissues are flooded with blood, vaccines will be of undoubted value. Patients may, however, be cured of chronic arthritis by the other measures named without the use of vaccines.

To recognize the character of this class of systemic disease and to manage successfully the patient, the physician must have absolute control. This implies hospital care where team work of the staff may insure qualified clinical and laboratory workers.

## MOUTH INFECTION AS A SOURCE OF SYSTEMIC DISEASE \*

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It has taken a long time for the general public to appreciate the full rôle of infection in the production of death, while even in the medical profession, more has come from the study of infections in the prevention of disease than in increasing the means of cure of disease, great as have been the results of treatment.

Since all animal life depends on some other form of cell life, vegetable or animal, it seems but the part of all life to carry on this process of germinative development and maturity. It is only the resistance of healthy cells that prevents the inroads of the myriads of ever-present bacteria and animal parasites which are striving to get a foothold that they may in turn carry on their life work. Disease, then, is an inflammatory process from infection and the efforts at repair. It may also be chronic from the failure of cell life through lack of defense, from defective nutrition and advancing age.

We still speak more or less lightly of the so-called diseases of childhood, and the time is not far past when mothers took their children to be exposed to whooping cough, mumps, etc. To-day the intelligent woman knows that it is not necessary that the vitality of the child should be jeopardized by such preventable diseases, and that when they occur it is through carelessness, neglect or ignorance on the part of some one.

A comparatively small number of infections occur through wounds of the cutaneous surface. Many of those affecting the special organs are incurred through direct or indirect contact, as those of the eye and of the genito-urinary system. They may make most serious inroads on the general health. Infections which produce the greatest number of diseases enter the system by way of the alimentary and respiratory tracts. Somewhere in the line, then, of the alimentary and respiratory tracts and in the excretory ducts of the body lie the sources of the entrance of organisms which terminate life in the majority of instances. The great importance of the well-known diseases of the nasal passages with their sinuses, the lymphoid tissue of the pharynx, including the tonsils, and the diseases of gums and teeth, which have been given prominence by the dental profession during the last three years, is now more generally appreciated.

The mouth is the harbor of many varieties of bacteria which are constantly taken into the stomach during the process of eating. We have long looked on the acids of the stomach as destructive to such bacteria, but Smithies, in a microscopic examination of gastric extracts from 2,406 different individuals with "stomach complaint" (dyspepsia, indigestion and the like), showed that irrespective of the degree of acidity of such gastric extracts, bacteria were present in 87 per cent. Morphologically cocci and diplococci were present in 83 per cent.; short and long rods (often of the colon group) in 58 per cent.; typical streptococci and staphylococci in 17 per cent. and *Leptothrix buccalis* in 24 per cent. In fifty-four cultural studies of saliva from "dyspeptic" patients, streptococci and staphylococci were demonstrated in over 80 per cent., bacilli in 66 per cent. and *Leptothrix*

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