

buccalis in more than 14 per cent. Comparing these figures, it would appear that the common forms of pus-producing organisms (streptococci and staphylococci) have their proliferation retarded in gastric juice, but that bacilli (often of the colon group) as well as *Leptothrix buccalis* thrive in the stomach.

Bacteria of various forms live in the small intestine, or at least pass through it or into the blood stream by way of the mucous membrane. They exist in such great numbers in the large bowel that, whether living or dead, they constitute a considerable bulk of the dejecta. During the last few years some important points have been added to our knowledge of bacteria. Living germ life in the blood, or bacteremia, occurs in all infectious diseases. According to their number and virulence, the blood responds in slight or extreme degree to the symptoms, general and local, constituting the disease.

We have long known that bacteria were specified in type and action in all diseases in which we have been able to identify a specific germ. Rosenow has done a great work in showing that changes in environment may so change bacteria that specific action varies. The appearance of the bacteria is also unlike that of the original cell. In the blood stream these various forms, once they enter it, are selective in choosing their location, thereby developing specific local disease. The old "idiopathic" osteomyelitis of the child we now know may follow a short time after a specific tonsillitis. Pyorrhea, tonsillitis or sinus disease may be the source of an infection which we call rheumatism. Root abscesses and pus pockets connecting with them are often the source of acute and chronic rheumatism. The nasal sinuses and chronic mouth and throat infections develop anaphylaxis from the constant poisoning, and their results are shown in hay fevers, asthmas, urticarias, etc. Rosenow's work is going far to show that ulcerations of the stomach are conditions in which the mucosa is attacked from behind through the blood stream by bacteria which live in the blood and have a selective affinity for these particular areas. Septic bile which, in the majority of instances, is caused by infection is carried to the liver through the portal circulation. It creates such changes in the bile that it fails to activate the pancreatic and duodenal secretion, thus making various phases of indigestion, with qualitative rather than quantitative food trouble. Lower down we have the appendix with its lymphoid tissue which approximates in character that of the tonsil. Here the acid types of bacteria have the same opportunity, could they but enter the blood stream, of making erosions of the gastric mucosa as the specific form which is found in the mouth. We may here note that acid-secreting or acid-bathed surfaces are very subject to cancerous change, while alkaline-bathed surfaces are much less liable to be involved. Saliva is neutral or slightly alkaline in health, yet less than 20 per cent. of people have healthy mouths. The infected mouth shows a tendency to the acid reaction and it is through this acid change that we have an additional danger in cell degeneration, of malignant type, from chronic irritation.

The stomach is the most common location of all cancers, while the alkaline small intestine is rarely subject to cancer and the duodenum is most resistant to it. The large bowel again reverts to an acid reaction and is very subject to cancer. So also is the bladder. These structures with acid secretion are of more

recent development than are many tissues of animal life, several of them being classed as organs of convenience, which fact renders them possibly less resistant.

Certainly enough is known concerning infections and their mode of entrance, that the infected and diseased mouth and respiratory tract must be looked on as most serious menaces. Much may be done by more general and effective school inspection. The present generation of children will understand and demand protection for their children in time. The first teeth should be watched, that the second be not permitted to erupt irregularly, causing deformities. Jaws should be spread that the teeth may meet and the high arched palate, diminishing nasal breathing, thereby reduced. Tonsils and adenoids should be looked after, thus preventing ear and mastoid diseases, rheumatism, endocarditis, etc. In chronic and recurring diseases, a search must be made to establish positively the non-participation of each of the several sources of infection.

The physicians engaged in this line of observation require fully as much training in the rudiments of dentistry as the dentist does in the signs of infectious diseases. While we have leaders in all professions, through the energy of their kinetic glands, the big stick which leads to our advancement is in the hands of the progressive and educated public who are constantly demanding more of their dentists, of the medical profession, and of the state in protecting them against preventable diseases.

MOUTH INFECTION AS A SOURCE OF SYSTEMIC DISEASE*

E. C. ROSENOW, M.D.

CHICAGO

Cultures from emulsified tissues in various systemic disorders, such as the adjacent lymphatic glands draining the involved joints in arthritis deformans, in acute articular rheumatism, and the lymph-glands in Hodgkin's disease, have yielded interesting results. One striking thing in connection with some of the more chronic infections is that the character of the micro-organisms found in the lesion may be quite different from the character of the micro-organisms in the focus of infection at the same time. This, however, does not minimize the importance of the focus of infection in any way. The organisms found in the tissues may have undergone change. This fact should be borne in mind whenever autogenous vaccines are to be used. The poor results in some cases of arthritis, for example, following the use of autogenous vaccines prepared from the tonsils or other presumable focus, may be due to the fact that the organisms present in the focus at the particular time when the cultures were made were not like those actually infecting the tissues. And if so, the vaccine would fail to contain the proper antigen.

While the most common location of the focus in various infections is probably in the head, and hence the great opportunity for you, it may be located elsewhere. Thus in two cases of typical rheumatism we succeeded in isolating the *Streptococcus rheumaticus* from the stool; in one from an infected ingrowing

* Address before Section on Stomatology, American Medical Association, Atlantic City, June 24, 1914, in a symposium on Mouth Infection.

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.

PERIDONTAL INFECTION AS A CAUSATIVE FACTOR IN NERVOUS DISEASES*

C. BURNS CRAIG, M.D.

Chief of Clinic, First Division, Neurological Institute

NEW YORK

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

* Read before the Section on Stomatology at the Sixty-Fifth Annual Session of the American Medical Association, Atlantic City, N. J., June, 1914.