THE CONTRIBUTION OF MEDICAL MICROBIOLOGY TO THE TEACHING OF SURGERY *

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The impetus provided by microbiology to surgery is easily found in the history of the two disciplines. The impact of microbiology was so great that the medical historian characterizes it as a profound reformation in medical thought. It not only explained the cause of infectious disease but also pointed out its specific etiology, treatment and prevention.

After the germ theory of disease was introduced and finally accepted, there was the natural tendency to focus attention on the study of bacteria. The literature of bacteriology was replete with terms like virulence, invasiveness, toxigenicity, pathogenicity, etc., all of which describe the attributes of an organism to produce disease. The preoccupation was to study the physiology and metabolism of bacteria to help explain disease processes. The study was enlightening, but after a time the returns from that effort diminished. The study of the factors in man that determine whether disease will result or not was relegated to the background. The pendulum began to swing to the other direction. First, we saw the gross changes in the whole organ system, then the individual organs and tissues, then the microscopic ones and finally the humoral and the cellular reactions. At present, the biochemical changes are being unravelled, and the students of infectious diseases are trying to study the human host and are talking of biochemical lesions. The matter does not end here, for recently we came across a series of articles dealing with

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the effects of thyroid states on the outcome of tuberculosis infection.

Medical microbiology today is no longer the traditional and somewhat lopsided study of bacteria that it used to be. A student of surgery cannot ignore what is contributed by this field because much of it pertains to the sick individual.

Historically, microbiology's first great contribution to surgery was towards lifting it from the divination and despondence of the "laudable pus" to the security of asepsis. Asepsis forms the cornerstone of any surgical practice. In our course in medical microbiology, facts about bacterial ecology, growth, multiplication, inhibition and death furnish the student reasons for the strict, ritualistic, and not so often frustrating procedure of aseptic technic he is to practice later on. To many of us these appear trite. It is desirable, however, that our aseptic technic and the barriers we adopt in preventing infection in a hospital be given a second look. An English worker who has been studying resistant infection acquired in the hospital calls it "microbial insurrection" and concludes that there is no satisfactory evidence that resistant strains of today are fundamentally more vague than the sensitive strains of yesterday. If the use or misuse of antibiotics has increased the incidence of staphylococcal cross-infection, this is more likely due to our reliance on drugs instead of asepsis for preventing infection rather than to any malign effect of antibiotics in selecting especially virulent staphylococci. In our course in medical microbiology, approximately twenty-five per cent of the total hours are devoted to materials connected in one way or another to the subject of asepsis.

Medicine is essentially human biology. Infectious disease in particular is the interaction between a host and a parasite. The elucidation of these interactions and their consequences is the second major contribution of microbiology to the teaching of surgery. A knowledge of the dynamics of infection and immunity to the growing list of microbial diseases, whether it be due to bacteria, fungi or viruses enrich the store of knowledge of a student from which he could draw to meet contingencies. A few years ago a surgeon confronted by a globular mass in the lung field would think only of two main

alternatives — new growth and tuberculosis. Today, he has to add fungi and viruses to his consideration. While a surgeon is seldom called upon to treat a case of infectious disease initially or as a complication, there is no doubt that he must be aware of them. As an intern in this hospital, I remember having assisted in an appendectomy in a case which turned out to be a full-blown case of bacillary dysentery.

The discussion of infectious disease process and the bodily reaction it engenders give us an entry into the laboratory procedures, the proper use of the laboratory and the evaluation of laboratory diagnostic method. The third contribution is a potential one since it deals with problems that concern the surgeon more or less and in the elucidation of which microbiology promises to play a greater share. In our course we try as much as we can to weave practical questions around basic concepts. I will just name one to illustrate my point. On the subject of antigen-antibody reactions, the following questions might be brought up. What is the significance of antibodies against plasma expanders such as dextran or poly-vinylpyrolidone? Why is it that of all human tissues the human skin cannot be available in tissue banks? What is the basis of the immunological approach to the tumor problem? What is the significance of the newly discovered antibodies against penicillin in terms of hypersensitivity to that antibiotic? These are not pressing questions but they show a student of surgery how fundamental ideas are articulated with the live questions in his specialty. They increase and clear up his perspective.

The last contribution deals with the student's over-all view of living things. When a student studies glucose metabolism of that sugar in a lowly bacteria, that impresses him with the unity of living things. When he finds that even the skin graft from a brother to a patient will not survive long because antibodies are formed against it, he realizes the uniqueness of an individual. Lastly, if he discovers to his dismay that some tuberculosis organisms develop tolerance and are finally unable to grow in the absence of streptomycin, the plasticity and adaptive mechanism among living things are underscored. What are the uses of these concepts to the student of surgery? To cite a gross example, it tells him that he

might be able to approach a problem by using a dog but he must be very careful in transfering the results from one to the other. There are other subtle applications of these concepts.

Since this is a teaching institute, I would like to comment briefly on the method of instruction. We rely mainly on recitation, laboratory work and conferences. One of the most frequent complaints that is thrown at a course in microbiology is the emphasis on methods and technic. This is a valid criticism. We were aware of it even before the President of the University foisted the question as regards teacher education. To remedy this situation we adopted a book on infectious disease as a textbook instead of a regular bacteriology text. This, we believe, removed the cook book presentation found in many textbooks of bacteriology. Students hesitate less in buying this type of book since it will be useful throughout their schooling and even after. We rearranged the laboratory exercises and built around a medical problem modified exercises which otherwise appear cut and dried when presented in the traditional manner. Thus if we want to show the dynamics of disinfection by a chemical agent, we give the student a surgical instrument or its equivalent soaked in contaminated blood instead of a saline suspension of the bacteria.

However, we cannot do away with methods and technics. After all, methods indicate the choice of facts and therefore it should be our first pre-occupation in any experimentation. It is in the method where definite things and rigor cannot be obtained in our results and conclusions unless it is first introduced in the definition. We would like to assure you, however, that we are only particular about methods and technics when we think that they provide a key to the understanding of the subject matter.