

bacteria, the tubercle bacillus, for instance; even daylight produced the same effect, though more slowly. Cultivations of the tubercle bacillus, propagated for from five to seven days at a window, died. Moisture was necessary for the growth of bacteria; moisture, however, on the other hand, hindered their spreading. A bacterium never rose; its transmission took place only by the flying of dust, if it remained for some time capable of life in dry air. By means of improved staining methods some knowledge of the inner structure of bacteria had recently been gained; there seemed to be an inner nucleus of plasma with flagella proceeding from it. In certain infectious diseases—measles, scarlet fever and small-pox, for instance—the presence of a pathogenic bacterium had not yet been proved. In hydrophobia, influenza, whooping-cough, trachoma, yellow fever, cattle plague and pleuro-pneumonia of cattle, also, no specific bacterium had been discovered, though the infectious nature of these diseases was evident. And perhaps these diseases were caused, not by bacteria, but by organic parasites belonging to quite another group of animated beings. In the blood of malaria patients protozoa had been found, which were now suspected of causing this and other infectious diseases. Whether protozoa, the lowest representatives of the animal world, really deserved this suspicion would have to be decided by a method analogous to bacteriological pure cultivation.

But now there remained the question, what had been the practical utility of all these extremely laborious investigations? The investigator, indeed, ought not to inquire after the immediate practical utility of his work; in the present case, however, the question was not entirely devoid of justification. Nor was it quite impossible to give it a satisfactory answer. Had not bacteriological investigation alone led to effective methods of disinfection? The value of water filtration, the question of the filtering qualities of the soil, of the fitness of surface water for use as drinking-water, of the best method of constructing wells, the sterilization of milk—so important, especially for the nutrition of infants—the investigation of the air in school-rooms and in sewers, the proof of the presence of pathogenic bacteria in the soil and in the air, were all bacteriological questions, or conquests. The diagnosis of isolated cases of Asiatic cholera rendered timely preventive measures, the discovery of tubercle bacilli rendered timely therapeutic measures possible. Besides these, indeed, only Pasteur's inoculations against hydrophobia, anthrax, symptomatic anthrax and swine erysipelas remained to be mentioned, and the first of these probably did not belong to bacteriology at all, though they had grown on its soil. "But," concluded Professor Koch, "it will not always remain so. Therapeutics proper will always de-

rive benefit from bacteriology; hardly, indeed, for diseases of rapid course, in which prevention will remain the main thing, but certainly for slow diseases, such as tuberculosis. Others also, like Billroth, maintain this hope; but the mistake has frequently been committed of beginning the experiment on human subjects. I regard this as wrong, and look upon the alleged successes of various remedies, from benzoate of soda to hot air, as illusory. For years past I have been seeking means for the therapeutic treatment of consumption, but I began with the pure cultivation of the bacillus. I found a number of substances—etheral oils, tar-pigments, mercurial vapor, salts of gold and silver, especially cyanide of gold, for instance; some of which, like the last, even when very strongly diluted, prevent the growth of the bacillus, which, of course, suffices to bring the disease to a standstill. All these substances, however, have proved ineffectual when used against the bacillus in the bodies of animals. I continued my search, however, and found what I sought. Susceptible as the guinea-pig is to the tubercle bacillus, it proved non-inoculable when treated with the substances in question, and even when its disease was far advanced, it could be brought to a standstill by this means. This fact may give occasion to search for similar effective remedies in other infectious diseases also, and here lies the field for an international contest of the highest and noblest kind."

## A FURTHER COMMUNICATION ON A CURE FOR TUBERCULOSIS.\*

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In an address delivered before the International Medical Congress I mentioned a remedy which conferred on the animals experimented upon an immunity against inoculation with the tubercle bacillus, and which arrested tuberculous disease. Investigations have now been carried out on human patients, and these form the subject of the following observations. It was originally my intention to complete the research, and especially to gain sufficient experience regarding the application of the remedy in practice, and its production on a large scale before publishing anything on the subject; but in spite of all precautions, so many accounts have reached the public, and in such an exaggerated and distorted form, that it seems imperative, in order to prevent false impressions, to give at once a review of the position of the subject at the present stage of the inquiry. It is true that this review can, under these circumstances, be only

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