

in well stained specimens, it can be recognized under the 12th inch immersion, but for satisfactory work it is absolutely necessary to employ the 18th or 20th inch immersion lens. According to the depth of the stain, so does it appear either as an ovoid bacillus, which might easily be mistaken for some stained deposit in the liver cells, or as a minute diplococcus surrounded by a halo, the explanation being that with strong staining the bacillus and capsule are stained throughout, with weak, the body of the micro-organism and the capsule are decolorized, leaving simply the polar staining. Even in the tissues this micro-organism is somewhat polymorphous, that is to say, that at times one sees the two stained portions so close together as to resemble a minute edition of the gonococcus, at other times they are further apart and appear rounded like the coccus form of pneumo-coccus, while in the same specimen a rare form may be seen in which the two stained portions are even slightly elongated. These are present in greatest numbers within the cells. A remarkable feature about them, and one which years ago I noted in connection with the Pictou cattle disease, is whether they be seen in the lymphatic glands or in the liver, in the unstained condition many have distinctly a brownish tinge, so that in the liver especially these bodies may at first sight be mistaken for minute granules of precipitated bile pigment. They vary in number; in two cases in which the disease appeared to be of very slow progress but few were present; in those cases in which the bands of portal connective tissue showed an abundance of small round cells and in which the disease according to all indications was active and progressing, the number was remarkable, in fact so numerous were they that it was impossible for me to arrive at any other conclusion than that there is a distinct association between the presence of this micro-organism and the development of the disease.

So minute are these micro-organisms that it is difficult to focus them, and I would strongly urge those attempting to confirm these observations to take, if necessary, from twenty minutes to an hour studying an individual field of the microscope before arriving at any definite conclusion.

Here, perhaps, I should correct myself. In the fully stained condition the micro-organisms while small are not so very much smaller than the ordinary run of pathogenic bacteria. But in this fully stained condition, as already stated, they are very difficult to distinguish from granules scattered through the cell protoplasm; it is in the partly decolorized condition in which the polar staining alone is recognizable and is peculiarly characteristic, that they appear so very minute. Indeed, I know of no form so minute, save that recently described by Nocard and Roux as being the causative agent in the contagious pleuro-pneumonia of cattle, and the strain upon the eyes in studying these microbes is most severe. This adds greatly to the difficulty of photographing the micro-organisms.

I am indebted to Dr. Patrick, the photographer of our hospital, for the accompanying lantern slides, in which despite great difficulties he has managed, I think successfully, to demonstrate the organisms in the tissues; but with regard to this I may say that where he shows one micro-organism the slightest change of focus would bring others into view, so that his slides show but about 1-20th of the number recognizable in any given field.

As to whether the micro-organisms in the human and in the bovine liver are identical, it is impossible for me to affirm. At Johns Hopkins, as in our own hospital and in a large number of foreign hospitals, not to mention the leading hospitals in the old country, it is now the custom to obtain cultures from half a dozen or more regions, including the liver, in every autopsy performed within fif-