

or serrated character. With a higher magnifying power, the rim of the colony shows radiately-disposed, ovoid or club-shaped, or pear shaped bodies, while the centre when brought into exact focus appears granular, like the heart of a daisy. In actinomycosis of cattle the most constant, and in many cases the only distinct elements of the fungus colonies are the so-called clubs. Naturally, therefore, in discussing the actual nature of the organisms, and in attempting to settle its proper botanical position, attention has been turned chiefly to these bodies. Nevertheless, they are of far less importance from that point of view than the less frequently encountered structural elements that without doubt in the growth of every colony precede them.

Doubtless then, as Prof. McFadyean says, the mulberry masses or clubs which are found in every actinomycoma of cattle represent only a single phase of the growth and development of the actinomyces. This type of structure is, in fact, the last stage of the progress of the parasite within the tissues, there is some reason to believe that in the great majority of such colonies not a single element has retained the power of vegetation.

With the view of studying the earlier development of the colonies, Prof. McFadyean obtained a tumour, "rounded in form and about the size of the fist, from a cross-bred three year old ox which was exposed for sale in one of the Edinburgh marts. In this he found colonies which differed notably from the common form in that only a few clubs could be discovered at the margins. In these he found elements of three different forms: minute granules (cocci), threadlike forms, and clubs. The granules, or *cocci*, were by far the most numerous elements in the larger colonies. In many instances they formed chains, "many beautiful, comprising sometimes 10 or 15 elements" [granules or "links"] "and frequently slightly curved or wavy." The thread-like forms were, too, constantly present along with the *cocci* in all the larger colonies, "frequently shooting out in a tendril-like manner beyond the coccus

heap." In many of the more luxuriantly-growing colonies the clubs were absent.

In human actinomycosis great importance has been attached to the presence or absence of the club-like forms. Prof. McFadyean says: With reference to their occurrence here, in the tumour from the ox, in many of the larger colonies they were entirely absent. Fortunately, however, in a considerable number they were numerously present, though never in such numbers as to conceal the other elements of the colony. "I say fortunately for had they been entirely absent the form exhibited by the parasite would have lost its value as a connecting link between some of the cases encountered in the human subject and those commonly met with in cattle." In order to show the close correspondence of the elements present in this bovine actinomycoma, he continues, I may here refer shortly to Israël's description of the parasite as found in man. Israël enumerates three morphological elements in the colonies: "Long undivided mycelial threads, almost always wavy, curved or cork-screw-like; minute granules; and pear or club-shaped bodies in great variety and size." It thus appears that in the actinomyces colonies, whether occurring in the tissues of man or of cattle, three morphological elements may be found. As to the botanical life history of this parasite, Hartz, who examined specimens submitted to him by Bollinger, named it the actinomyces, and assigned it a place among the mould fungi. Prof. McFadyean apparently regards it as identical with actinomycosis hominis, as it appears in man. My own observations, he says, agree in the main with Boström's views. I have not been able to find in the colonies of any age evidence that the so-called clubs are at all concerned in the reproduction of the organism. The coccus and filamentous forms are the active vegetative elements of the parasite; and as regards the part played by each in the growth of a colony, they appear to be of nearly equal value. I believe it probable that the *cocci* are the more important as regards the formation of new centres. There are