CORYNEBACTERIUM EQUI IN CHRONIC PNEUMONIA OF THE CALF

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It has been common practice in the classification of bacteria to identify pathogenic species with the type of disease caused, or with the plant or animal from which the bacteria have been first isolated. The use of the latter scheme of nomenclature is now frequently confusing, because many pathogens originally considered to be confined in their disease-producing activities to a single plant or animal species have since been found to produce natural infections in various unrelated species. An example is the diphtheroid bacillus isolated by Magnusson (1923) in Sweden and named by him *Corynebacterium equi* because it was recovered from purulent pneumonia in foals. This organism was likewise isolated from purulent pneumonia among foals in Germany by Miessner and Wetzel (1923) and Lütje (1923). In 1931 it was recovered from pneumonic foals in the United States by Dimock and Edwards. These findings lent weight to the use of a specific name derived from the animal for which the organism seemed to be naturally infectious. However, the name *C. equi* now appears to be a misnomer in view of the fact that this diphtheroid bacterium has also been isolated from cervical lymph glands and pulmonary lesions of swine by Bendixen and Jepsen (1939) and from the submaxillary lymph nodes of swine by Karlson, Moses, and Feldman (1940).

Some time ago the respiratory organs of a 6-month-old calf, dead of chronic pneumonia, were submitted to this laboratory for examination. Gross observation of cross sections of the lungs revealed marked hepatization and many small mucopurulent lesions approximately 3 mm in diameter, which were uniformly distributed throughout the lung tissue. The bronchi and trachea were likewise filled with pus, principally in the form of a mucopurulent exudate.

Microscopic examination of stained smears of the pus revealed an enormous number of short rod or coccoid forms. Many of these appeared in chains and presented the appearance of streptococci. The cells stained gram-positively and measured from 1.0 to 1.5 microns in length by 0.8 to 1.0 microns in width.

Microscopic findings tended to create the impression that infection had probably been induced by streptococci which had undergone dissociation. However, this concept was discarded following culture of the pus. Blood agar plates streaked with material from the lesions yielded, after 24 hours at 37 C, small, moist, slightly raised, nonhemolytic colonies with smooth edges. These colonies increased in size with continued incubation, became finely granular, and presented an orange-pink color. The colonial growth on the plates gave evidence that the bacteria had been present in the pus-filled lesions in pure culture. The

organism grew readily at 37 C on Difco proteose no. 3 and beef extract agars, as well as on blood agar.

Nutrient broth inoculated with pure cultures obtained from plates produced organisms of a highly pleomorphic nature. They no longer exhibited the short

TABLE 1

*Description of Corynebacterium equi Magnusson**

Corynebacterium equi Magnusson (Arch. wiss. prakt. Tierheilk., **50**, 22, 1923–24).

Rods: 1.0 to 1.5 by 0.8 to 1.2 microns; occurring in exudates as coccoid forms, singly, in pairs and chains; on solid media and in liquids as coccoid or elongated, often filamentous rods, club-shaped, striated or granular; gram-positive; nonmotile; nonsporeforming.

Gelatin stab: No liquefaction.

Agar colonies: Moist, slightly raised, finely granular, entire; growth occurs within 24 hours; increase in size with continued incubation; develop light tan, salmon to orange-pink or red pigment.

Agar slant: Fairly abundant, somewhat beaded growth.

Blood agar: No hemolysis.

Loeffler's serum medium: Moderate growth; no liquefaction.

Broth: Fairly abundant growth with uniform turbidity; pellicle absent.

Litmus milk: No change.

Potato slant: Scant growth; yellowish-tan pigment becoming orange after one or more weeks.

Indole is not formed.

Nitrates reduced to nitrites.

No acid from carbohydrates.

Aerobic.

37 C.

Source: Spontaneous pneumonia in foals, lymph node infections and pneumonia in swine, chronic pneumonia in calves.

* Descriptive information based on observations made during present investigation as well as on the previously published reports of others.

rod, coccoidal, or streptococcal forms observed in the pus. Instead, the majority of the cells were club-shaped, elongated, or filamentous, and striated or granular. They were gram-positive, nonacid-fast and nonmotile. On agar, the cells were less elongated and some coccoidal forms were observed.

The organism was found to grow readily in various differential media. Nutrient broth became uniformly cloudy and nitrates were reduced. No biochemical changes were observed in litmus milk, tryptone, carbohydrate media, lead acetate agar, Loeffler's medium, or gelatin, although growth occurred in all (table 1). The organism was as susceptible to heat as are most nonsporulating bacteria, being destroyed at 58 C in 20 minutes. It was killed by 1 per cent phenol in 10 minutes, but not by full-strength chlorox in the same period of time.

Attempts to establish the organism in mice, guinea pigs, and rabbits by intratracheal inoculation failed, even though these animals received from 0.10 to 0.25 ml of a cloudy broth culture. One rabbit injected intradermally with 0.1 ml of broth culture developed within 5 days an abscess at the site of inoculation, approximately 1 cm in diameter. Stained smears of the pus again presented the coccoidal and streptococcal forms observed originally in the lesions of the organs of the calf. On culture, however, the diphtheroidal forms were again established.

The organism under discussion was identified as *Corynebacterium equi*. This conclusion was reached because it performed typically, both morphologically and in culture, according to the description of *C. equi* as set forth by Karlson, Moses, and Feldman (1940) and by Kelser and Schoening (1943).

In view of the fact that *C. equi* has been proved pathogenic to swine as well as to the horse, and has now been isolated from an infection in a calf, it is possible that this organism is more frequently involved in livestock diseases than has been generally recognized. Hence, the limited recognition given the species in *Bergey's Manual of Determinative Bacteriology* (1939) no longer suffices. With the inclusion in bacterial classification of a more lengthy description of this organism, it might be well to consider changing the species name to one more appropriate than that employed at present. The writer is fully aware of the International Rules of Botanical Nomenclature covering changes or modifications of names and is opposed to frequent changes in nomenclature because of the confusion created in the literature. However, it seems more logical to employ a specific name for a pathogenic bacterium which describes or suggests the nature of the infection induced than to use the name of the discoverer or the host from which the species was first isolated. In view of the apparent unsuitability of the name, *C. equi*, it might be well to consider one such as *Corynebacterium purulentus*. This would suggest the nature of the infection induced by the species without regard to the animal host.

SUMMARY

An organism, identified as *Corynebacterium equi*, was isolated from purulent lesions in the lungs of a calf dead of chronic pneumonia of several months' duration. No other organism was associated with it in the lesions. The organism was pathogenic to the rabbit upon intradermal but not upon intratracheal inoculation.

The suggestion is made that the present name, *C. equi*, be changed to one descriptive of the pathology of the disease, since the organism is infectious for other animals besides the horse.

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