

markedly greater thereafter. It is possible that this increase in heat in the suspended cell could have been brought about by "radiation" from the heated spores in the liquid. If this was the case, then there is reason to believe that the temperature within the spores was probably much higher than in the surrounding medium, which would aid in the destruction of the endospores. This point could be brought out more clearly if the combined volumes of the spores in suspension were greater in proportion to the suspending liquid. A more striking difference in temperature would undoubtedly be evident, due to the increase in radiated heat.

SUMMARY

The results of these experiments seem to indicate that the destruction of endospores by this electrical process is not entirely due to the heat created in the medium surrounding the endospores but also by another heat factor, namely, the heat generated within the endospores. Also, the temperature attained within the endospores is probably greater than that of the surrounding medium.

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DISSOCIATION OF *CL. WELCHII*

PLATING out pure cultures of *Cl. welchii* on suitable media has given rise to the development of two distinctly different types of colonies, the one a smooth hemispherical mound with sharply defined margins, the "S," the other a flat granular colony with an irregular or flagellated margin, the "R." Repeated fishing of colonies characteristic of the two types results in the development of pure strains of the two; in the case of the "S," the cultures usually show a few colonies with an "R"-like outgrowth even after many generations, the "R" types on the other hand become fixed much more readily; in the case of one culture, the "R," fished directly from the primary plate from an old laboratory culture containing both types, bred true for many generations.

These two types present the usual morphological appearance and give the characteristic reactions of *Cl. welchii* so far as carbohydrate fermentations and stormy fermentation of milk are concerned. In fluids the two types appear strikingly different in their habit of growth. The "S" produces an even turbidity with little tendency to develop a deposit, while in the case of the "R" there is a heavy bottom growth and almost clear supernatant. With the latter type, after several cultural generations in broth, a faint turbidity frequently appears and on plating out such a turbid

culture, some "S" colonies always develop which may be established as a pure strain by repeated fishing of characteristic colonies. Acid agglutination reactions and cataphoresis studies indicate the iso-electric point of "S" suspensions to be much more acid than that of the "R" type. Agglutinins specific for the two types are produced by the treatment of rabbits with washed suspensions.

There is also a marked contrast in the pathogenicity of the two types. Pigeons die in approximately four hours, following the introduction into the breast muscle of one cubic centimeter of twenty-four hour fluid cultures of the "S" type, while the same amounts of "R" cultures, grown in the same manner, have very little apparent effect.

The "S" types produced haemotoxin from ten to twenty times more potent than that produced by the "R," as measured by *in vitro* haemolysis of red cells, although both "S" and "R" haemotoxins are neutralized by stock *Cl. welchii* antitoxin. As might be expected, the "S" toxins, when introduced intravenously in suitable doses into experimental animals, result in a rapidly developing profound anemia, and blood films made during the course of the anemia show a marked degree of anisocytosis, similar to that shown in earlier papers by the use of toxin from undissociated cultures of *Cl. welchii*. The "R" toxins in the same dosage have little effect. When given in doses correspondingly large, taking the haemolytic titer as the criterion, a definite anemia is produced, though not so marked as that which follows injection of the "S" toxin nor is the anisocytosis so conspicuous.

It appears that *Cl. welchii* behaves as the many aerobic species of bacteria which have been studied from this angle. A detailed paper is in process of publication.

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