THE ISOLATION OF SARCINA UREAEE (BEIJERINCK)
LOHNIS FROM SEA WATER

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The writer has for some years been interested in marine bacteria, particularly in connection with their role in fish spoilage and in the fouling of ships. The interesting result of the work has been to show that the bacterial flora of surface water some 5 miles offshore in the Cronulla region has a strong resemblance to a soil flora. It is the purpose of this note to record the finding of Sarcina ureae in surface water approximately 5 miles east of Jibbon Cape.

Sarcina ureae has been adequately described by Gibson and the identification of this organism by Beijerinck (1901) as a sporeforming Sarcina confirmed. Gibson (1935) has pointed out that the spores are true endospores, a fact which the present writer can fully confirm but which has not yet been admitted in Bergey's Manual of Determinative Bacteriology.

The strain isolated from sea water was a gram-positive Sarcina forming tetrads, and more rarely packets, in which a spherical endospore frequently appeared within each cell. The sporangium later disappeared, leaving the four spores united to form a tetrad; in old cultures only tetrads and diploids of spores and single spores could be seen.

A suspension of a 24-hour culture, showing no spores by microscopic examination of a stained smear, grew on shark agar after heating to 80 C for 10 minutes and 90 C for 5 minutes, but failed to grow after 3 minutes at 99.5 C. A similar suspension of a 6-week-old culture, showing numerous spores, grew on shark agar after subjection to all three heat treatments. This shows that the spores are more heat-resistant than the vegetative cells, though the latter have apparently considerable resistance. It is possible that some spores were present in the slide preparation though none were observed. Gibson mentions some degree of heat resistance in the vegetative cells.

The cultures on nutrient agar, in peptone water, and in broth showed no motility in 24 hours, whereas cultures on urea agar were actively motile. Subsequent cultures on nutrient agar made from the urea agar culture were motile, though the motility was more sluggish than in cultures on urea media.

On agar the growth was at first grayish, translucent; later yellowish and semi-opaque. The growth was rather flat and the surface granular but shiny. Agar plates showed circular colonies with a regular raised margin. Gelatin showed a white growth with a glistening surface and threadlike stab growth, but no liquefaction within three weeks. In bouillon turbidity occurred, but later a granular sediment. Indole was not produced, nor were nitrates reduced to nitrites. On shark agar, ammonia production was strong in 24 hours. No
Fig. 1. Photomicrograph of *Sarcina ureae*, stained by Gram's Method (Hucker's Modification), showing tetrads.

Fig. 2. Photomicrograph of *Sarcina ureae*, stained by Möller's Method, showing spores in packets, tetrads, and diploids.
fermentation was observed on glucose, lactose, sucrose, maltose, mannitol, salicin, inulin, fructose, galactose, glycerol, raffinose, or xylose.

In spite of the fact that nitrates were not reduced in standard nitrate broth, there does not seem to be sufficient divergence to suggest a new species for this organism. The writer has found that nitrate reduction is likely to prove variable in other species, e.g., the *Pseudomonas* group, and should be considered in relation to the general characters of the organism. Taylor (1938) mentions this in connection with *Bacterium globiforme*.

The fact that growth on nutrient agar at pH 6.8 was readily obtained and that spore formation was rapid and frequent after 6 months of subculture is worth comment, as Gibson seems to have obtained sparse growth on nutrient agar and a falling off in spore formation on subculture.

REFERENCES


