MICROCOCCUS HALODURANS N. SP.¹

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ABSTRACT. A salt-tolerant coccus is described which possesses morphological and physiological characteristics most nearly corresponding to those of the genus Micrococcus. The organism was isolated from sea water but is not a strict halophile; growth occurs in media containing 0-15% NaCl. The characteristics are sufficiently discrete to suggest the establishment of the new species Micrococcus halodurans. Possible relationships to other genera are discussed.

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Gram-negative asporogenous bacteria predominate in marine environments; hence, tentative generic identification of these isolates has been aided by "rapid methods" (Shewan, 1963; Cleverdon et al. 1961). Gram-positive cocci are less frequently isolated from marine material but present no less a taxonomic problem when compared with terrestrial forms (Aaronson, 1956; Wood, 1952; Diebel and Niven, 1960). The organism reported here presents such a challenge.

Micrococcus halodurans was isolated from Long Island Sound water containing large numbers of decomposing starfish (Asterias sp.). The bacterium was shown to be non-hemolytic and nonpathogenic for starfish but has retained taxonomic interest because of its morphological and physiological properties which are sufficient to differentiate it from previously described cocci.

¹ Contribution No. 37 of the Marine Research Laboratory, University of Connecticut, Noank, Connecticut. Supported in part by Grant No. AI-00706, National Institutes of Health.

Description

Morphology. Gram-stained smears showed the bacterium to be 0.8 to 1.5 μ in diameter and Gram-positive (Fig. 1). In unstained preparations, cell grouping was primarily in pairs, with some tetrads and small irregular clumps occurring. The organism was nonmotile, nonencapsulated, and without endospores.

Figure 1. Gram stain of Micrococcus halodurans showing various cell arrangements. X 2,000.

Cultural characteristics. Colonies on agar are unpigmented, smooth, circular (1-3 mm in diameter) and opaque. Growth on slants is heavy, smooth and colorless. In broth the growth is uniform and colorless with dense turbidity and without a pellicle. Good growth is evident in broth prepared with sea water, distilled water and distilled water containing up to 15% NaCl; growth is poor in 20% NaCl. Oxygen relation, aerobic; temperature relations, mesophilic with optimum growth between 18° and 37°C. Good growth occurs in sea water media between pH 4.5 and 8.5.

BACTERIOLOGICAL NOMENCLATURE
AND TAXONOMY

Physiological characteristics. Acid but no gas produced from lactose, maltose, sucrose and fructose; xylose and arabinose are not attacked. In the MOF medium of Leifson (1963), acid but no gas is produced fermentatively from glucose. Nitrate reduced to nitrite. Starch and gelatin hydrolysis negative. Reduction, acid and coagulation produced in milk. Indole and H₂S not produced. Catalase positive. Nonhemolytic on sheep and human blood agar. The pH of tryptone-glucose-yeast extract-phosphate broth is lowered to 4.5 and 0.25% acid produced. Nonpathogenic for starfish.

Habitat. Isolated from sea water.

Taxonomic Considerations

Since tetrad formation occurs, one is tempted to consider the isolate as a member of the genus Gaffkya. Comparison of physiological reactions, however, with ATCC strains of G. homari and G. tetragena yields equivocal results. Also, serious reservations concerning the validity of this genus have been advanced (Aaronson, 1956; Diebel and Niven, 1960). Pediococcus is an attractive choice; in general, the bacterium described here conforms with characters reported to be common to all pediococci (Günther and White, 1961). Notable exceptions include nitrate reduction, presence of catalase, low acid production and high salt tolerance, although the above workers suggest the possibility of a salt-tolerant group of pediococci. Staphylococci are presumed to ferment carbohydrates, as reported here. However, Skerman (1959) briefly discusses difficulties encountered using this and other characteristics for distinguishing the genera Gaffkya, Pediococcus, Staphylococcus, and Micrococcus, i. e., physiological variations inherent in bacterial isolates and the lack of both definitive and supporting information on existing cultures.

Micrococcus halodurans is here pictured to be a "border-line" organism most nearly corresponding to characteristics of the genus Micrococcus. Breed et al. (1957) include species of varying cell arrangements, salt tolerances and marine origins. Relatively low acid production, presence of catalase, general morphology and high salt tolerance seem the more diagnostic features for insertion in the genus Micrococcus.

Acknowledgments

Acknowledgment is extended to Dr. John S. Rankin, Jr. for provision of samples and facilities and to the late Dr. Robert C. Cleverdon for valuable comments during the study.

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