

THE TAXONOMIC STUDY OF *SARCINA*  
*AURANTIACA* FLÜEGGE

M. Kocur and T. Martinec

(With the technical assistance of J. Benesova)

Department of Microbiology  
Faculty of Natural Sciences in Brno  
Czechoslovakia

The seventh edition of Bergey's Manual (1957) includes in the genus *Sarcina* Goodsir the species *S. aurantiaca* Flügge, stated to differ from the species *S. lutea* Schroeter, and *S. flava* de Bary only by its production of an orange pigment. Flügge's original, concise description (1886) of *S. aurantiaca* also stresses the production of orange pigment as an important feature. The other characteristics of these three organisms are listed in Bergey's Manual as nearly identical, with some minor differences only. In the present study we have endeavoured to characterize *S. aurantiaca* adequately and to determine in what respects it differs from the two subspecies of *S. lutea*.

MATERIALS AND METHODS

Six strains of *S. aurantiaca*, obtained from the following laboratories, were used: strain 295, Dept. of Biol. Sci., Purdue University, U.S.A; strain 363, Inst. of Fermentation, Osaka, Japan; strain 379, Dept. of Microb., Techn. University, Delft; strain 146, ATCC; strain 836 from J. Evans, Amer. Meat Inst. Found., Chicago; strain 187 was isolated by us from water.

The methods used were those described in our previous work (Kocur and Martinec 1959).

RESULTS

**Morphology.** All of the strains of *Sarcina aurantiaca* investigated were Gram-positive and formed characteristic packets of cells on the solid media as well as in the liquid. The size of cells varied from 1.2 - 2 $\mu$ .

Cultural characteristics. On nutrient agar all strains produced round, slightly raised, convex, opaque, slightly glistening, slightly orange colonies 0.3 to 0.6 cm in diameter. In nutrient broth all the strains deposited a typical sediment, which is also characteristic of the two subspecies of S. lutea. On potato all the strains produced a slight orange pigment, with the exception of strain 363, which produced no pigment at all. Pigment was also produced on fat agar, starch agar, blood agar and other media as well.

Biochemical characteristics. These are listed in Table 1.

#### DISCUSSION

As indicated above, the morphological and cultural characteristics of the six strains of S. aurantiaca studied were identical, the only exception being that strain 363 produced no pigment on some media, e. g. potato. No importance is attached to this difference for it is a phenomenon common to the pigment-producing bacteria.

With respect to biochemical characteristics, the only differences observed were the failure of strain 367 to liquefy gelatin, the production of slight acidity in sucrose and fructose solutions by strains 836 and 187, and the peptonization of milk by strain 187.

The differences mentioned in the liquefaction of gelatin and in the action on milk are typical for the subspecies of S. lutea, as shown previously (Kocur and Martinec 1959). The differences observed in the action on carbohydrates are not significant, and they agree to some extent with the published data of Krassilnikov (1949).

The results obtained agree completely with the original description of S. aurantiaca (Flügge 1886) and with the data in Krassilnikov's Guide (1949) and Bergey's Manual (1957). Many characteristics of S. aurantiaca were ascertained for the first time in this study, and hence there is at present no basis for comparison of results with those of other authors.

The characteristics of S. aurantiaca and of Sarcina lutea subsp. flava were found to thoroughly identical, the two differing only in the respect that the former produces an orange pigment. Therefore, because pigment production by S. aurantiaca is not constant, being influenced by a great number of factors, it is felt inadvisable to retain S. auran-

BACTERIOLOGICAL NOMENCLATURE  
AND TAXONOMY

Table 1.

Test	No. +	No. -
Gelatin liquefaction	5	1
Nitrate reduction	0	6
Indole	0	6
Hydrogen sulfide	0	6
Milk	1	5
Hemolysis	0	6
Glucose	0	6
Fructose	2	4
Galactose	0	6
Lactose	0	6
Sucrose	2	4
Maltose	0	6
Glycerol	0	6
Mannitol	0	6
Sorbitol	0	6
Dulcitol	0	6
Sodium citrate	0	6
Ammonium citrate	0	6
Acetylmethylcarbinol	0	6
Methyl Red Test	0	6
Starch hydrolysis	0	6
5 % NaCl	6	0
7.5 % NaCl	6	0
10 % NaCl	0	6
Urease	0	6
Catalase	6	0
Lipase	6	0

tiaca as a separate species. Our opinion is confirmed by other authors as well. For example Miller (1952), who studied the variability in pigment production by Sarcina lutea, found that this species when inoculated on fresh nutrient agar, can produce orange or nearly red pigment.

Variability of pigment production is also characteristic for other bacteria, e.g. Serratia marcescens (Reed 1937) and Staphylococcus aureus (Bergey's Manual 1957) among others.

It follows therefore that Sarcina aurantiaca is identical with Sarcina lutea subsp. flava and it is proposed that the former name be regarded as a synonym of the latter.

#### SUMMARY

Six strains of Sarcina aurantiaca Flügge obtained from various collections.

We have found that Sarcina aurantiaca is identical with Sarcina lutea subsp. flava.

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