PRELIMINARY NOTE ON THE CLASSIFICATION OF SOME LACTOSE FERMENTING BACTERIA

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The key given below is the result of a study of 333 lactose fermenting organisms isolated from soil, sewage, and various animal sources, including man, the horse, the sheep, the cow, and the pig.

The fermentation reactions were determined in peptone water containing the test substance.

Motility was observed in a soft agar medium (nutrient broth with 0.5 per cent agar) after six, and twenty-four, hours incubation at the body temperature. Six hours seems sufficient for differentiation.

Gelatin liquefaction was recorded for five weeks.

The methyl red and Voges-Proskauer reactions were determined in 0.5 per cent glucose-peptone-dipotassium phosphate solution.

It will be observed that the subdivisions are not based upon single characters, but upon differences in groups of characters. Where inspection is impractical, or insufficient to show which character is best correlated with others, considerable information may be obtained from a study of the coefficients of correlation. That character which gives the highest coefficient of correlation with the greatest number of characters studied is the best for classification, if subdivision is to be made entirely upon correlated characters.

It should perhaps be noted that the names assigned to the species in the key are tentative, and may be changed, if upon further study of the literature, they are found to be invalid.

A small group of organisms which resemble *B. aerogenes* with respect to gas formation from various carbohydrates etc., did not give the Voges-Proskauer reaction, and were neutral to methyl red after three days incubation at the body temperature. It has been previously observed that some organisms do not give the Voges-Proskauer reaction, and are not alkaline to methyl red until the fifth or seventh day of incubation. These organisms resemble very closely the *B. gasoformans non-liquefaciens* described by MacConkey (1909) who records the Voges-Proskauer reaction as positive or negative. As this name is a trinomial, and consequently invalid, the group is included, for the present, under *B. aerogenes*.

Key to the more common species of aerobic or facultative non-spore-forming bacteria which ferment lactose with gas formation

A. Voges-Proskauer reaction negative, usually acid (at least not alkaline) to methyl red, with no reversion on long standing; indol usually positive; polysaccharids (starch, dextrin, and inulin) negative.

Coli group.

I. Sucrose positive.
  a. Motile; dulcitol, glycerol, and salicin usually positive.
    1. *B. communior.*
  b. Non-motile:
    1. Salicin positive; dulcitol and glycerol usually positive.
      2. *B. neapolitanus.*
    2. Salicin and dulcitol negative, glycerol usually negative.
      3. *B. coscoroba.*

II. Sucrose negative.
  a. Salicin positive, dulcitol and glycerol usually positive.
    4. *B. coli.*
    1. Motile *var. communis.*
    2. Non-motile. *var. immobilis.*
  b. Salicin negative; dulcitol usually negative.
    1. Motile; glycerol usually positive.
      5. *B. Gruenthal.*
    2. Non-motile; glycerol usually negative.
      6. *B. acidi-lactici.*

B. Voges-Proskauer reaction positive; (occasionally only after long incubation); reaction to methyl red alkaline, or if acid at first, it reverts to a distinct alkaline reaction after long incubation (7 days); indol, usually negative; polysaccharids, starch inulin and dextrin, negative or positive.

Aerogenes-cloacae group.

I. Non-motile; gelatin rarely liquefied; indol, dulcitol and inulin negative or positive; sucrose, raffinose, mannitol, glycerol, salicin, dextrin, and starch positive.

7. *B. aerogenes.*

II. Motile; gelatin liquefied (often very slowly); indol, dulcitol, glycerol, inulin and starch usually negative (rarely positive); dextrin occasionally positive; sucrose, raffinose, salicin, and mannitol positive (rarely negative).

8. *B. cloacae.*