THE IDENTITY OF BACTERIUM COLUMBENSIS CASTELLANI

MacDONALD FULTON

Department of Bacteriology, Baylor University College of Medicine, Dallas, Texas

Received for publication February 18, 1943

The organism originally isolated by Castellani (1914) from "columbensis fever" and later (Castellani, 1938) assigned by him to the genus Salmonella, has been infrequently reported in the Western Hemisphere. The only records that have been located are a note reporting Taylor's (1924) isolation of what is now strain 595 of the American Type Culture Collection, the record in the catalogue of that collection mentioning the isolation by Shaw of their strain 4298, and an indirect reference by Jordan and McBroom (1934) to the occurrence of the organism in Panama.

The organism has been encountered in Ceylon, in the tropics of Asia and Africa, in the Balkans, and also in London, and reported in the papers of Fernando (1935), Fulle (1915), Giugni and Pistoni (1936), Guidetti (1937), Jacomo (1921), Kelaart (1925), Lurie (1916), Marmo (1922), Scotti (1936, 1939), Spaar (1915), and Thomas (1936).

The fifth edition of Bergey's (1939) Manual lists Salmonella columbensis in the appendix to that genus, without a statement of its characteristics. It is explained that the species in that list are placed there because "the relationships of many of these are not clear." Certainly the characteristics recorded by Castellani and Chalmers (1919), by Castellani (1938), and in the earlier editions of the Bergey Manual, do not place the species within the genus Salmonella as at present defined.

A group of cultures has been studied in this laboratory which seem to be strains of this little-known species. Their comparison with the strains from the American Type Culture Collection and with the published descriptions, permits a restatement of the species characteristics and provides an opportunity to consider its generic position.

EXPERIMENTAL

A study has been made of 18 strains, including 4 which may be considered representative of the species since they came from the American Type Culture Collection. The origin of the cultures is indicated in table 1. They form a fairly homogeneous group having the following characteristics: Short rods, gram-negative, motile or nonmotile. Imvic ++--. Gelatin-negative, sulfide-negative, tartrate-agar-negative, urea not decomposed. Litmus milk slowly made alkaline. Gas produced from carbohydrate. The following carbohydrates are fermented by all 18 strains: arabinose, galactose, glucose, levulose, mannitol, mannose, rhamnose, and trehalose. None of the strains fermented cellobiose, dextrin, inositol, inulin, lactose, alphamethylglucoside, raffinose, starch, or sucrose. Aesculin and dulcitol were fermented by approx-
imately half the strains. Certain other carbohydrates were usually fermented: 16 of the 18 strains fermented glycerol, 15 fermented maltose, 15 fermented salicin, 17 fermented sorbitol, and 14 fermented xylose.

None of the strains was agglutinated by serums available at the Salmonella Typing Center at Baylor College of Medicine. A rabbit was immunized by intravenous injection of a young broth culture of strain “tch” preserved with 0.5 per cent formalin. The serum titers with the homologous antigen were: H, 12,800; 0, 6,400. This serum did not agglutinate live broth cultures, nor formalinized nor boiled suspensions, of any of the other strains.

The cultures were pathogenic for mice on intraabdominal injection, if the dose was large.

### TABLE 1

**Origin of strains**

<table>
<thead>
<tr>
<th>No.</th>
<th>Year</th>
<th>ATCC #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>1928</td>
<td></td>
<td>ATCC #4298</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td>ATCC #7278</td>
</tr>
<tr>
<td>46</td>
<td>1941</td>
<td></td>
<td>gastroenteritis, Dallas</td>
</tr>
<tr>
<td>226</td>
<td>1941</td>
<td></td>
<td>normal stool, Dallas</td>
</tr>
<tr>
<td>330</td>
<td>1942</td>
<td></td>
<td>gastroenteritis, Fort Sam Houston</td>
</tr>
<tr>
<td>377</td>
<td>1942</td>
<td></td>
<td>gastroenteritis, Fort Sam Houston</td>
</tr>
<tr>
<td>381</td>
<td>1942</td>
<td></td>
<td>gastroenteritis, Fort Sam Houston</td>
</tr>
<tr>
<td>505</td>
<td>1924</td>
<td>ATCC #505</td>
<td></td>
</tr>
<tr>
<td>747</td>
<td></td>
<td>ATCC #747</td>
<td></td>
</tr>
<tr>
<td>36025</td>
<td>1941</td>
<td></td>
<td>diarrhea, Austin</td>
</tr>
<tr>
<td>a</td>
<td></td>
<td></td>
<td>old stock strain</td>
</tr>
<tr>
<td>ash</td>
<td>1934</td>
<td></td>
<td>gastroenteritis, Providence</td>
</tr>
<tr>
<td>bradshaw</td>
<td>1942</td>
<td></td>
<td>normal stool, Dallas</td>
</tr>
<tr>
<td>j</td>
<td>1942</td>
<td></td>
<td>gastroenteritis, Dallas</td>
</tr>
<tr>
<td>jones 2</td>
<td>1942</td>
<td></td>
<td>gastroenteritis, Dallas</td>
</tr>
<tr>
<td>pscol</td>
<td>1941</td>
<td></td>
<td>gastroenteritis, Dallas</td>
</tr>
<tr>
<td>starr</td>
<td>1942</td>
<td></td>
<td>gastroenteritis, Dallas</td>
</tr>
<tr>
<td>tch</td>
<td>1942</td>
<td></td>
<td>stool of marasmic child, Dallas</td>
</tr>
</tbody>
</table>

### DISCUSSION

The strains here described appear to form a definite group. They resemble the genus *Salmonella* but are indole-positive, usually salicin-positive, and do not give a positive sulfide test. Their characteristics differ sufficiently to be significant, from those set down by Kauffmann (1941, p. 175) as designating “probable *Salmonella*.”

There seem to be valid differences also between these strains and the members of the genus *Proteus*. The strains here reported are not proteolytic, do not decompose urea, do not ferment sucrose, and are not “Hauch” formers on moist agar.

In some respects they resemble “paracolon” bacilli. This was the opinion also of Jordan and McBroom (1934). The reactions of some slow-lactose-fermenting “paracolon” cultures do in general resemble those set forth above. Castellani (1938) reported that his *S. columbensis* strains might ferment lactose,
especially when freshly isolated. Topley and Wilson (1936, p. 536) tabulate "Bacterium columbense" as possibly a slow lactose fermenter. Most authors have reported their strains lactose negative. None of the strains in the present study fermented either 0.5 per cent or 5.0 per cent lactose during 10 days incubation.

With the exceptions of motility and the fermentation of aesculin and dulcitol, these 18 strains form a group sufficiently uniform to represent a species. Castellani set up a species, S. pseudocolumbensis, for the nonmotile strains, but this hardly seems admissible. Neither the differences in aesculin and dulcitol, nor the failure of small numbers of the strains to ferment glycerol or sorbitol or xylose appears to furnish sufficient grounds for dividing the group. These considerations lead to the conclusion that these strains represent a quite definite species, for which the name proposed by Castellani is satisfactory enough.

There is at present no definite place for the classification of gram-negative bacilli that are lactose-negative, sucrose-negative, and indole-positive. It will be recalled that there is another better known species which has these characteristics. This is Proteus morganii. The "Morgan bacillus" is restricted in fermentative activity, producing acid and gas from galactose, glucose, glycerol (slowly), levulose and maltose; no other carbohydrate is attacked. Urea is decomposed slowly and weakly. Agglutination tests have not revealed any common antigens in P. morganii and S. columbensis. The other reactions of P. morganii, such as the Imvic, gelatin, sulfide, and litmus milk tests, are the same as those of S. columbensis.

Like S. columbensis, P. morganii was at one time assigned to the genus Salmonella. Its position in the genus Proteus is equivocal, and there are a number of points of similarity between it and S. columbensis, not only in its bacteriology, but in its habitat and in its somewhat vague relation to mild gastrointestinal disease in man.

It would seem advisable to examine the possibility of setting up a genus for Castellani's bacillus of columbensis fever, and possibly for Morgan's bacillus No. 1 as well. It is suggested that the name Morganella be coined, since the term Castellanus has been utilized previously in a different sense (Cerruti, 1930). Morganella could be defined as a genus of Enterobacteriaceae, tribe Salmonellae failing to ferment either lactose or sucrose, forming gas, and producing indole. The known species are M. morganii and M. columbensis.

Although Castellani isolated his organism as early as 1905, no description seems to have been published before 1914. The type species would therefore be M. morganii Morgan (1906).

SUMMARY

A description is given of a group of 18 strains which seem to belong to the species originally described by Castellani as Bacterium columbense. It is suggested that this species be grouped with Proteus morganii in a new genus to be called Morganella.

REFERENCES

JACONO, I. 1921 The bacillus columbensis. Riforma Méd., 37, 798.
KAUFFMANN, F. 1941 Die Bakteriologie der Salmonellagruppe. Munksgaard, Copenhagen.