Salmonella bovis-morbificans (Basenau) from an outbreak of food-poisoning in the Cape Province.

By

M. W. HENNING, Department of Veterinary Science, University of Pretoria, and Onderstepoort Laboratories, and

E. C. GREENFIELD, Department of Bacteriology, University of Capetown.

Salmonella bovis-morbificans was first isolated by Basenau (1893) in Amsterdam from the carcass of a cow that was emergency slaughtered after she had aborted and developed metritis. As the meat was condemned no cases of food-poisoning occurred, but Basenau regarded the organisms isolated very similar to those obtained from another animal, the meat of which had been responsible for an extensive outbreak of gastro-enteritis. On comparing this organism with S. enteritidis (Gaertner) and other bacteria obtained from outbreaks of food-poisoning he concluded that it differed from them both culturally and in pathogenicity. Cultures of Basenau’s bacillus were kept by a number of workers and were studied by Savage (1908, 1912), Bruce White (1926, 1929) and others. Savage regarded it as a distinct sub-type of the Gaertner group, while Bruce White carefully worked out its antigenic structure.

No other strain of bovis-morbificans was recognised until Sladden and Scott (1927) isolated one from faeces studied during an outbreak of food-poisoning in Swansea, pressed meat being incriminated as the cause of the disease. The organism was recovered from the faeces of four of the affected persons and the sera of two patients agglutinated it. Later Kauffmann (1930) included two strains of Salmonella, Zeiss and Clauberg, into the new type Virchow just described by him, but, on making a closer study of the Zeiss and Clauberg strains, Kauffmann and Mitsui (1930) showed that they belonged to the bovis-morbificans type.

Recently Greenfield and Judd (1936) described an outbreak of food-poisoning in four members of the same family, incriminating boiled pork as the cause of the malady. Cultures made from the pork yielded a large number of colonies composed of "non-lactose-fermenting, motile, Gram-negative bacilli, which, by virtue of their
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cultural characters, were placed in the Salmonella group of organisms and called Salmonella Suipestifer var. Afri Aust. The sera obtained from two of the patients caused a granular agglutination of the organism. A description of the biochemical characters and pathogenicity of the bacterium was given, but a complete antigenic analysis was not undertaken. The study of the antigenic structure of the Salmonella is now described by us.

Suipestifer Afri Aust. was tested against both "O" and "H" sera prepared from a number of representative types of Salmonella; the sera were prepared according to the method described by Henning (1936). It was agglutinated only by the "O" sera of organisms containing factors VI and VIII of the Kauffmann-White schema (1934), by all group sera and by the type sera of Heidelberg and bovis-morbificans.

The organism was found to be diphasic. A culture was plated and after 24 hours incubation a number of colonies was picked and seeded into broth: after 5 hours incubation at 37° C. the broth cultures were tested against a pure group serum, e.g. Kunzendorf serum, and the type sera of Heidelberg and bovis-morbificans. The colonies that occurred in the group phase agglutinated only with Kunzendorf serum, while those that occurred in the type phase were flocculated by Heidelberg and bovis-morbificans sera. Group, type and "O" suspensions were now prepared according to the method described by Lovell (1932); these were tested against a number of sera. The results are shown in Table I. It will be seen that Heidelberg serum agglutinated the type and group antigens, but not the "O" antigen, that Kunzendorf serum flocculated only the group antigen, while bovis-morbificans agglutinated all three antigens up to a very high titre. Meanwhile sera were also prepared against Suipestifer var. Afri Aust.

On absorbing Afr. Aust. serum with Heidelberg all agglutinins for the type phases of both Heidelberg and Afr. Aust were exhausted, but there was hardly any reduction of the group agglutinins (from 6400-3200) and all the "O" agglutinins remained. (Table I). When this partly absorbed serum was reabsorbed with Kunzendorf a further reduction of group agglutinins (from 3200-400) occurred, but the "O" agglutinins remained unaltered—Kunzendorf apparently did not lower the "O" titre of the serum for the "O" antigen of Afri. Aust.; it also has no effect on the type agglutinins but it reduced the titre of the group agglutinins for the homologous group antigen from 6400 to 400. On the other hand, Afr. Aust. removed all the type and very little of the group agglutinins from Heidelberg serum without altering the "O" titre for the homologous "O" antigen. Afr. Aust. also exhausted most of the group agglutinins (lowering it from 3200 to 200) from Kunzendorf serum without reducing its "O" titre.

On absorbing bovis-morbificans serum with Afr. Aust. and Afr. Aust. serum with bovis-morbificans all agglutinins for the type, group and "O" antigens of both bovis-morbificans and Afr. Aust. were completely removed. (Table I).
It is not clear why Afri. Aust. could not exhaust all the group agglutinins from Kunzendorf serum or why Kunzendorf failed to remove all group agglutinins from Afri. Aust. serum, because the group antigen of Afri. Aust. is similar to that of bovis-morbificans and the group antigens of bovis-morbificans and Kunzendorf are identical. Bruce White (1926) and the Kaufmann-White schema (1934).

It was also observed that there is barely any "O" agglutination between Afri. Aust. and Kunzendorf, indicating that the somatic factor VI is not well represented in Afri. Aust.; but the same was found to be the case with Newport (Kottbus), S. muenchen and S. bovis-morbificans (Sladden and Scott), (Table I).

Conclusions.

These results clearly show that S. suisestifer var. Afri. Aust. contains the same type antigen as Heidelberg and bovis-morbificans (factor r) and a group antigen that corresponds largely with that of Kunzendorf and entirely with that of bovis-morbificans (factors 1, 3, 4, 5), while its somatic "O" antigen resembles that of bovis-morbificans (factors VI, VIII). Moreover, since Afri. Aust. removes all agglutinins (type, group and "O") from bovis-morbificans serum, and bovis-morbificans exhausts all agglutinins from Afri. Aust. serum there can be no doubt that the two organisms contain the same antigenic components and that they are, therefore, identical.

Greenfield and Judd (vide Addendum to this paper) agree with us that the name Salmonella suisestifer var. Afri. Aust. employed in describing the Salmonella isolated by them (1936) from pork which was responsible for an outbreak of food poisoning in the Cape Peninsula should be discarded. The organism should be called Salmonella bovis-morbificans.

This is apparently the first strain of bovis-morbificans traced to pork and it is the first record of this organism in South Africa.

Summary.

The antigenic structure of the Salmonella isolated by Greenfield and Judd (1936) from an outbreak of food-poisoning at the Cape Peninsula is described. As its antigenic components were found to resemble those of bovis-morbificans the following antigenic factors should be assigned to it:—

Somatic "O" antigen, VI, VIII.

"H" (Specific) antigen, 7

"H" (non-specific) antigen, 1, 3, 4, 5.

The reason why Kunzendorf failed to absorb all the group agglutinins from this strain of bovis-morbificans and vice versa is still obscure.
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ADDENDUM.

E. C. Greenfield and M. H. Judd (Department of Bacteriology, University of Capetown), Professor Henning's antigen, i.e. analysis of a Salmonella suipestifer described by us from an outbreak of food poisoning in the Cape Peninsula makes it clear that the organism is Salmonella bovis-morbificans. Therefore, we withdraw the name Salmonella suipestifer var. Afri. Aust. and substitute Salmonella bovis-morbificans.

REFERENCES.


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M. W. HENNING AND E. C. GREENFIELD

**TABLE I.**

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<th>Antigen</th>
<th>Unabsorbed Serum</th>
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<td></td>
<td>serum unabsorbed</td>
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0 = less than 1:50.

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