Onderstepoort Journal of Veterinary Research, 62:223–226 (1995)

The distribution of *Pasteurella haemolytica* serotypes among cattle, sheep and goats in South Africa and their association with disease

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ABSTRACT

ODENDAAL, M.W., & HENTON, M.M. 1995. The distribution of *Pasteurella haemolytica* serotypes among cattle, sheep and goats in South Africa and their association with disease. *Onderstepoort Journal of Veterinary Research*, 62:223–226

Over an 8-year period (September 1986 to March 1994), a total of 497 organ specimens from sheep and goats and 96 from cattle, were received for the isolation of *Pasteurella haemolytica*. They were collected in seven geographical areas in South Africa (as it existed before the April 1994 elections). These areas include the eastern Cape, Transvaal (new name: Gauteng), Namibia, Orange Free State (new name: Free State), Natal (new name: KwaZulu-Natal), western Cape and the northern Cape. This investigation does not represent the statistical incidence of the organism from each region, only the distribution of serotypes isolated from organ specimens submitted from diseased animals in these regions.

Pasteurella haemolytica serotype 6 was the most prevalent type isolated from sheep and goats, but was followed closely by types 9 and 2. From cattle, *P. haemolytica* serotype 1 comprised 39% of the isolates. In sheep and goats, the majority of serotypes were associated with pneumonia, followed by gangrenous mastitis ("blue udder") and septicaemia. The situation in cattle was similar regarding the incidence of pneumonia followed by septicaemia. Up to 33% of the isolates from cattle and sheep specimens were non-typeable.

Keywords: Blue udder, cattle, disease, gangrenous mastitis, goats, *Pasteurella haemolytica*, pneumonia, septicaemia, serotype, sheep

INTRODUCTION

Pasteurella haemolytica is frequently the cause of disease among cattle and sheep in South Africa, such disease resulting in economic losses arising from mortality and morbidity. Although it is not always associated with mortality, it causes morbidity which is more of a problem with its negative economic impact. In cattle it is commonly seen in animals in feedlots and in very young calves under intensive conditions, while in sheep it occurs under intensive as well as extensive conditions. This paper is a factual account of the number of *P. haemolytica* serotypes isolated from specimens that were received from different areas of South Africa, and the diseases with which they were associated in cattle, sheep and goats.

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Accepted for publication 5 September 1995—Editor

MATERIALS AND METHODS

The organisms were isolated on bovine-blood tryptose agar, and incubated under atmospheric conditions at 35°C for 18 h. Biochemical tests that were

performed to identify the organism included indole, ornithine decarboxylase, urease, catalase, oxidase, glucose, mannose, trehalose, mannitol, inositol, aesculin, haemolytic reaction on blood tryptose agar and CAMP reaction (Mutters, Mannheim & Bisgaardt 1987).

Serological typing was done by passive haemagglutination test with type-specific hyperimmune serum prepared in rabbits (Biberstein 1978).

RESULTS

Sheep

The specimens from sheep and goats yielded 329 (66,2%) typeable and 168 (33,8%) non-typeable *P. haemolytica* serotypes divided between all 15 serotypes (types 16 and 17 not included). Overall, types 6 and 9 were the most prevalent, representing 9,3 % and 8,5% of cases, respectively. They were followed by serotypes 2 (8,0%), 15 (7,4%), 5 (6,4%), 14 (5,6 %), 4 (5,4%), 12 (3,8%), 10 (2,6%), 7 (2,4%) and 1 (2,4%). Serotypes 3, 11 and 13 each comprised less than 1% of the specimens (Fig. 2).

The isolation of these serotypes was associated with pneumonia (51,3%), gangrenous mastitis ("blue udder") (28,14%), septicaemia (8,66%) and other infections such as abscesses and arthritis (11,9%) (Fig. 3). In order of importance, serotypes 15, 6, 2, 4 and 5 were isolated from pneumonia, types 9, 5, 6, 14 and 12, from gangrenous mastitis ("blue udder"), and types 2, 9 and 15, from septicaemia.

The eastern Cape provided the most specimens, with 50,9% of the total, of which only 66% could be typed. Serotypes 4 (7,9%), 6 (7,9%), 9 (7,9%), 14 (7,1%) and 15 (8,6%) occurred freely, whereas the others were

FIG. 1 Historical geographical map of South Africa depicting the regions prior to April 1994

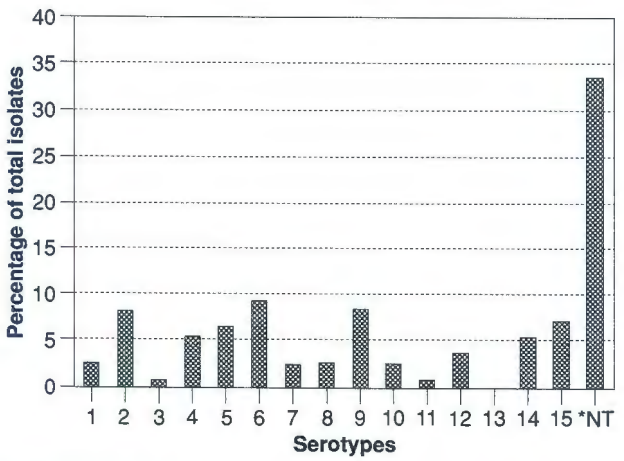
less prevalent. Transvaal (now incorporating Gauteng, Northwest Province, Mpumalanga and Northern Transvaal) provided 109 specimens, 75 being typeable. The important serotypes included types 2 (10%), 5 (11%), 6 (7%), 9 (8%) and 15 (8%). All the other serotypes were present to a much lesser extent.

With the exception of Namibia, the remaining regions had less than 10% of the total *P. haemolytica* organisms isolated. The Namibian isolates were distributed among type 2 (19%), 6 (13%) and 15 (7,5%). In the Orange Free State the serotypes were distributed among types 2, 5, 6 and 9. From Natal, serotypes 2, 9 and 15 were each isolated from a single case and type 6 from two cases. Only seven isolates originated from the western Cape, representing serotypes 1, 5, 6, 9 and 14. The northern Cape had an even distribution of serotypes 1, 2, 4, 5, 6, 7, 9, 10 and 14.

During the period September to January (spring to early summer), more isolates were made than throughout the rest of the year (Fig. 4).

Cattle

The specimens from cattle yielded 67 (69,8%) typeable serotypes and 29 (30,2%) non-typeable isolates. Only serotypes 1, 2, 3, 5, 6, 9, 13, 14 and 15 were represented. Serotype 1 was the most prevalent, being isolated from 38 cases (39,6%), followed by type 14 from 8 cases (8,3%), type 6 from 6 cases



*NT= non–typeable

FIG. 2 The distribution of different serotypes of *Pasteurella haemolytica* isolated from sheep and goats over an 8-year period

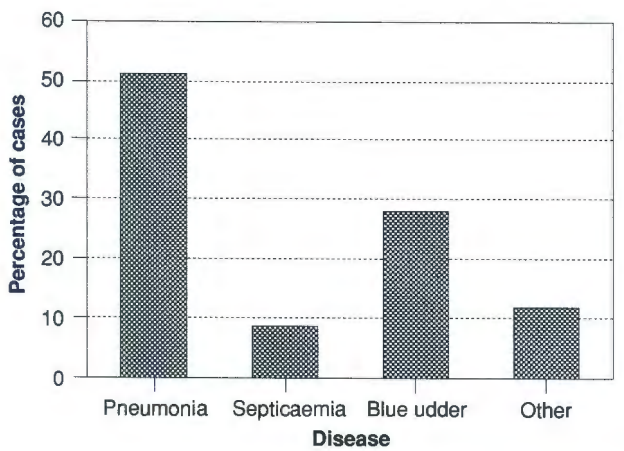


FIG. 3 The association of *Pasteurella haemolytica* with disease from sheep and goats over an 8-year period

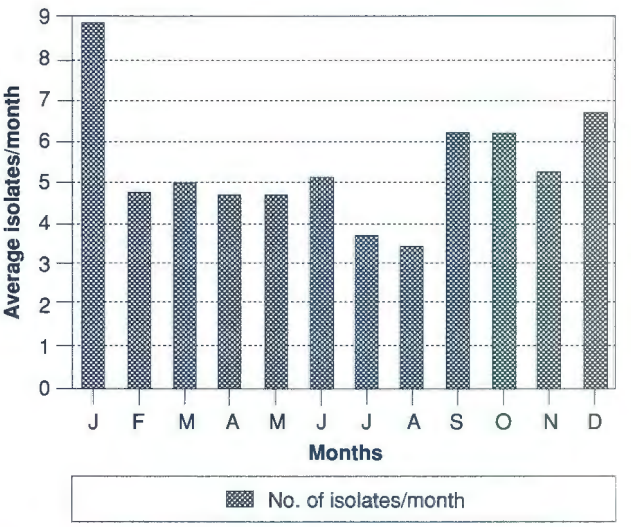
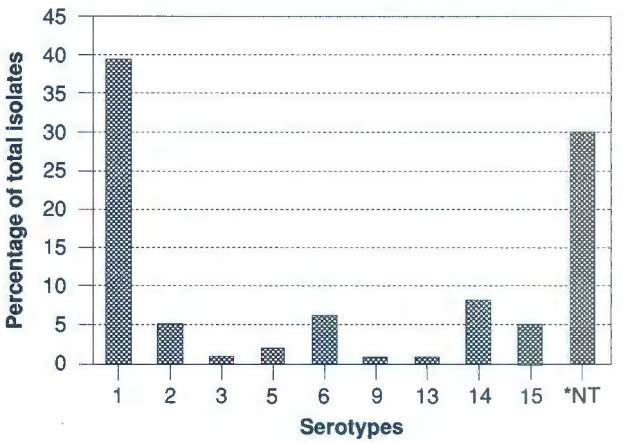


FIG. 4 The distribution of average numbers of *Pasteurella haemolytica* serotypes isolated from sheep and goats for each month from August 1986 to March 1994



*NT = non-typeable

FIG. 5 The distribution of different serotypes of *Pasteurella haemolytica* isolated from cattle over an 8-year period

(6,3%) and types 2 and 15 from 5 cases (5,2%) each (Fig. 5). Serotype 1 was primarily associated with pneumonia, whereas the other serotypes were, to a much lesser extent, involved with pneumonia, septicaemia and arthritis. Twenty-two cases from which non-typeable serotypes were isolated, were associated with pneumonia/septicaemia.

Fifty cases (52%) originated from Transvaal, with type 1 being the most prevalent, and serotypes 14, 6, 2 and 15 following in decreasing order of importance. Types 3, 5, 9 and 13 occurred to a much lesser extent and were represented by one to three cases from the Orange Free State, Namibia, Natal, and the eastern and northern Cape.

Most of the isolates were made from cases received during the winter months of June and July.

DISCUSSION

Only 15 serotypes were examined during this investigation. Recently two additional serotypes, types 16 and 17, were added (Younan & Fodor 1995). This could possibly reduce the number of non-typeable isolates obtained from clinically affected animals.

The number of typeable and non-typeable *P. haemolytica* isolates made from specimens submitted to the Bacteriology Diagnostic Section, Onderstepoort Veterinary Institute, varied from one region (and year) to the other, and does not represent their incidence. Serotype 1 remains the most important serotype isolated from cattle, while in sheep and goats, serotypes 6, 9, 2, 15, 5 and 14 are involved in the pathogenesis of this infection. In both cattle and sheep, pneumonia is the most important disease associated with *Pasteurella haemolytica*. In cattle, most of the isolates were made during the winter months of June and July, whereas in sheep and goats, most of them were made during the late spring and early summer months of December and January.

This information could be useful for the compilation and inclusion of these serotypes in bacterin-based vaccines for sheep and goats.

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