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SHORT COMMUNICATION

The prevalence of intestinal *Salmonella* infection in horses submitted for necropsy

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ABSTRACT

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Specimens from the ileum, colon and rectum were aseptically collected from 50 consecutive horse carcases submitted for necropsy to the Department of Pathology, Faculty of Veterinary Science, University of Pretoria. These were bacteriologically examined for the presence of *Salmonella*. Seventeen of these were positive for *Salmonella* at one or more sites. Serotyping of the isolates revealed a dominance of *Salmonella* Hayindogo in these horses.

Keywords: *Salmonella,* ileum, colon, rectum, horse, equine

INTRODUCTION

Salmonellosis, caused by numerous serovars of *Salmonella enterica*, is a contagious disease with a worldwide distribution and wide species distribution. As in other species, the prevalence of the infection in horses is on the increase (Smith 1990). In horses, salmonellosis is most commonly associated with enteric disease which may vary from severe, acute to mild, chronic, intermittent diarrhoea. Complications encountered include septicaemia and persistent, asymptomatic shedders of the organism following recovery (Smith, Reina-Guerra, Hardy & Habasha 1979; Gibbons 1980).

Clinical signs caused by enteric *Salmonella* infections are known to be precipitated by stress such as transport, severe exercise, surgery, antibiotic therapy, changes in diet and pregnancy (Gibbons 1980). It has been suggested that these stress-induced cases in adult horses are the result of recrudescence of an asymptomatic carrier state (Gibbons 1980; Sloet van Oldruitenborgh-Oosterbaan & Van Duijkeren 1993).

This study was intended to document the prevalence of enteric *Salmonella* infection in horses presented for necropsy, and to record the most common serovars isolated from these cases.

MATERIALS AND METHODS

Specimens for bacterial isolation were collected by means of the standard aseptic technique from 50 horses consecutively necropsied at the Department of Pathology, Faculty of Veterinary Science, University of Pretoria. The specimens consisted of a 50-mm segment

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from the distal ileum; a 50 x 50-mm piece of the wall from the descending colon at the level of the diaphragmatic flexure; and a 50 x 50-mm portion of the rectal wall. After collection, each sample was placed separately in a sterile plastic container, identified and submitted for culture. In most cases, a full necropsy was performed and the result of this examination recorded.

All samples were subjected to pre-enrichment in a non-selective liquid culture medium [Bacto peptone water (DIFCO 1807-14-4) (Difco Laboratories, Detroit, Michigan, USA), followed by selective enrichment in a selenite liquid medium [Selenite Broth Base (OXOID CM 395) (Unipath Ltd, Basingstoke, Hampshire, England) and sodium biselenite (OXOID L 121) (Unipath Ltd, Basingstoke, Hampshire, England)]. Isolation was then done on a selective solid-plating medium with indicative and differentiating characteristics [XLD Medium (OXOID CM 469) (Unipath Ltd, Basingstoke, Hampshire, England)]. A positive control was run in parallel with each batch. Cultures which yielded presumptive *Salmonella* were subjected to biochemical identification/sugar profiling using a standard method for the identification of *Enterobacteriaceae* [MICROBACT 24 E SYSTEM (Disposable Products Pty Ltd, Adelaide, South Australia)]. *Salmonella*-positive cultures were stored at –70 °C until all the horses had been sampled, after which the cultures were reactivated and submitted to the Bacteriology Section, Onderstepoort Veterinary Institute, for serotyping.

RESULTS

Positive cultures of *Salmonella* were obtained from 17 cases; in nine, from all three sites, in three, only from the ileum, in three, only from the rectum, and in two, from both the ileum and colon (in one of which rectal tissue was not sampled). In only one animal were two serovars isolated (serovar Agona and serovar Hayindogo). Ten of these 17 cases (59%) showed clinical signs typical for colic. Of the group that yielded positive isolates in all sites examined, 7/9 (78%) showed clinical signs of colic. However, not all *Salmonella*-positive cases were associated with a clinical enteric disorder, or with significant gross intestinal pathology characteristic of intestinal salmonellosis.

TABLE 1 Summary of cases positive for *Salmonella*

Case no.	Ileum	Colon	Rectum	Diagnosis	Colic
2	Kingston	–	–	Acute small intestinal volvulus	Yes
15	Mbandaka	Mbandaka	Mbandaka	Acute gastroenteritis	Yes
17	Braenderup	Braenderup	–	Subacute hepatosis	No
19	Hayindogo	Hayindogo	Hayindogo	Subacute ileus	Yes
22	Hayindogo	Hayindogo	–	Subacute ileus	Yes
24	Hayindogo	Hayindogo	Hayindogo	Pericarditis	No
25	–	–	Hayindogo	Chronic neuritis	No
26	Agona Hayindogo	Agona	Not done	Postoperative ileus and pneumonia	Yes
34	Typhimurium	–	–	Acute African horse sickness	No
35	Hayindogo	Hayindogo	Hayindogo	Colon displacement	Yes
37	–	–	Hayindogo	Acute African horse sickness	No
38	–	–	Hayindogo	Acute African horse sickness	Yes
40	Hayindogo	Hayindogo	Hayindogo	Colon perforation and peritonitis	Yes
43	Hayindogo	Hayindogo	Hayindogo	Euthanasia, no apparent abnormalities	No
44	Hayindogo	–	–	Carpal chip fractures	No
46	Istanbul	Istanbul	Istanbul	Subacute colitis	Yes
50	Hayindogo	Hayindogo	Hayindogo	Chronic ileus	Yes

Serotyping of the isolates yielded a variety of serovars. *Salmonella* Hayindogo was most frequently isolated (12/17), while *Salmonella* Typhimurium, *Salmonella* Agona, *Salmonella* Kingston, *Salmonella* Braenderup, *Salmonella* Mbandaka and *Salmonella* Istanbul were each isolated once. These findings are summarized in Table 1.

DISCUSSION

Seventeen *Salmonella*-positive horses were identified, and serotyping of the isolates showed that a high percentage of these cases were infected with serovar Hayindogo. Selection of tissues from three anatomically diverse sites in the gastro-intestinal tract yielded 14 positive isolations from the ileum and 11 each from the colon and rectum. Infections were detected which were limited to either the ileum or rectum, but not the colon. The findings suggest that successful isolation of *Salmonella* at necropsy requires tissues sampled from multiple intestinal sites.

The cases from this survey where *Salmonella* was isolated from all sites, showed a high (78%) prevalence of clinical signs typical for colic, although very few showed gross lesions of intestinal pathology characteristic for salmonellosis. This suggests that positive isolation, rather than being indicative of active enteric salmonellosis, most probably reflects recrudescence of a quiescent infection precipitated by stress and pain associated with the colic.

The finding of 17/50 (34%) positive cases is comparable to the 1–27% prevalence reported in other countries (Gibbons 1980). The high prevalence of *Salmonella* Hayindogo (12/17 = 70%) in this study was unanticipated, as *Salmonella* Typhimurium is generally the most commonly isolated serovar (Carter, Hird, Farver & Hjerpe 1986; McCain & Powell 1990; Gibbons 1980; Palmer, Whitlock, Benson, Becht, Morris & Acland 1985; Sloet van Oldruitenborgh-Oosterbaan & Van Duijkeren 1993). Apart from serovar Typhimurium, serovar Agona was the only other serovar in this survey which had also been isolated from horses in this country (Van der Walt, unpublished data 1993). A situation analogous to the one in this study was reported, where *Salmonella* Senftenberg, which had previously not been prevalent in horses, was the dominant serotype to be isolated (Palmer, Benson & Whitlock 1985).

Serovar Hayindogo was isolated for the first time during 1985, from a human patient in Nigeria (Le Minor & Bockenmühl 1986). No other reports were found where this serovar was noted in particular, and the pathogenicity of this serovar in equines is unknown. The isolation of serovar Hayindogo during this study was the first known instance of it being noted in the Republic of South Africa.

The predominance of serovar Hayindogo raises the possibility of a single source of infection such as encountered with nosocomial infections and feed contamination, or it may reflect a high prevalence of this serovar in the environment (Palmer *et al.* 1985; Powell, Donahue, Ferris, Osborne, & Dwyer 1988). The records of these cases were deficient and did not allow a valid assessment of the source of infection. Furthermore it was very difficult to determine whether the infection had been acquired shortly previously, such as in nosocomial infection, or whether it was a pre-existing, asymptomatic infection that had undergone recrudescence (Carter *et al.* 1986). The findings of this study demonstrate the need for further investigation, particularly into establishing the source of the infection and the pathogenicity of serovar Hayindogo to equines.

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