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## A Case of Death in a Foal Caused by *Salmonella typhimurium*

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**Abstract:** In this report, the isolation of a *Salmonella typhimurium* strain as pure culture from abscess foci on the liver, spleen, kidney, stomach and intestines, and lungs of an 8-month-old, male, Thoroughbred foal, which had died in a racehorse breeding farm, is presented.

Heavy respiratory infection and prolonged antibiotic therapy were considered to be stress factors that played a significant role in this case.

**Key Words:** *Salmonella typhimurium*, foal, abscess

### Bir Tayda *Salmonella typhimurium*'un Neden Olduğu Ölüm Olgusu

**Özet:** Bu olguda safkan yetiştiricilik yapılan bir harada ölen 8 aylık erkek tayın karaciğer, dalak, böbrek, mide ve bağırsaklarında şekillenen abse odaklarından ve akciğerlerinden saf kültür halinde *Salmonella typhimurium* izolasyonu bildirilmektedir.

Tayın ölümünde stres faktörlerinin (solunum infeksiyonu ve uzun süreli antibiyotik terapisi) etkili olduğu düşünüldü.

**Anahtar Sözcükler:** *Salmonella typhimurium*, tay, abse

### Introduction

Equine Salmonellosis is considered an important and serious problem, particularly at large animal hospitals and stud farms where horses are concentrated together (1,2). The disease is characterized by acute colitis and typhoid syndrome with severe diarrhoea (3,4). Salmonellae may cause septicemia in addition to diarrhoea in foals that may also localize in joints or other organs, particularly in young foals (1,5,6). Although abscesses caused by *Salmonellae typhimurium* are described in many organs in human

beings (7-10), Salmonellae are rarely reported as the cause of abscesses in horses (6). On the other hand, the pyemic form of Equine Salmonellosis has been reported (11). Furthermore, Smith (12) has described a syndrome characterized by fever, anorexia and depression, though without diarrhoea, in both young and adult horses. Morse et al. (13) have indicated that Salmonellae may be a primary cause of infection in foals under 6 months old. Begg et al. (14) have determined that the disease is more common in foals less than 8 months old.

Very young and debilitated horses are the most severely affected with transportation, exhaustion, starvation and water deprivation, overtraining, early weaning, antimicrobial therapy, concurrent illness, intestinal parasitism, general anesthesia, and surgery playing significant roles as stress factors (1,13-16). Many horses are asymptomatic carriers of *Salmonellae* and they also play an important role in the epidemiology of the disease (5,17). The immune system may be suppressed by the stress factors mentioned above. Therefore, clinical infection and disease may develop (5).

It has been reported that more than 40 *Salmonella* serotypes have been isolated from Equidae, with *S. typhimurium* being the most common pathogenic serotype among them (13,14,16,18).

This case report presents a *S. typhimurium* infection in an 8-month-old male foal, which had died in a Thoroughbred breeding farm in December 1999.

## Materials and Methods

### The foal

Antimicrobial therapy was begun upon observation of respiratory infection with symptoms of tachypnea, fever and coughing when it was 3-months-old. Several antibiotics were used with unsuccessful results. After a long period of antibiotic therapy, respiratory disorder improved but mucosal anemia, depression and anorexia occurred. Later, abdominal pain and gastrointestinal disorders occurred. Despite antibiotic and antipyretic administrations, high fever continued and the foal died.

### Postmortem examination

Necropsy was performed just after the foal died, and the organs were investigated macroscopically.

### Bacteriological examination

Lung, liver, spleen, kidney, stomach and intestine samples taken from the foal were sent to our laboratory for bacteriological examination, and inoculated onto horse blood agar and MacConkey agar plates.

Inoculations onto blood agar plates were duplicated for each sample. Half of them, along with the MacConkey agar plates, were incubated aerobically, while the others were incubated microaerobically at 37°C for 24 hours. The colonies that formed on the plates were observed macroscopically. Gram stain was performed on the

colonies. Routine bacteriological methods were used for identification (19).

Serotyping of the isolate was performed by *Salmonella* antisera for O and H (Denka Seiken Co., Tokyo, Japan) and *Salmonella* H sera for phase induction (Denka Seiken Co.) according to the instruction manual.

## Results

### Postmortem examination of foal

Suppurative abscesses were observed during postmortem examination in all the organs except the lungs. Abscesses and necrotic foci of different diameters were seen in the small and large intestines. The liver had adhered to the diaphragm due to the abscesses. The liver and spleen were enlarged and abscesses were seen on their cut surfaces. The kidneys were greatly enlarged and contained pus. There were abscesses on the outer surface of the stomach.

### Bacteriological examination of the isolate

Non-hemolytic, white and mucoid colonies, 2-3 mm in diameter, were seen as pure cultures on all the blood agar plates under both aerobic and microaerobic conditions at 37°C after 24 hours of incubation. Lactose negative colonies were observed on MacConkey agar plates as pure cultures at 37°C after 24 hours of incubation under aerobic conditions. Gram negative bacilli were seen on the microscopy of the cultures. The strain was oxidative-fermentative, oxidase negative and catalase weakly positive. The other properties are shown in the Table.

The isolate was demonstrated to possess *Salmonella* antigen of O:4, H1:i, H2:1,2 serologically, and finally it was identified as *S. typhimurium*.

## Discussion

Salmonellosis is a significant and potentially serious problem that occurs worldwide in Equidae. Severe outbreaks have been reported in the USA (13), UK (4), Japan (20), and Australia (1). Morse et al. (13) have reported that the incidence of Equine Salmonellosis may range from 0.36% to 27% in several countries. There is no data on the incidence of Equine Salmonellosis in Turkey as detailed studies have not yet been performed.

Stress factors such as antibiotic therapy and concurrent or existing diseases play a significant role in

Table : Biochemical properties of the isolate.

Gram staining	-	Arabinose	+
Motility	+	Dulcitol	+
H <sub>2</sub> S production (TSI)	+	Fructose	+
Gas from glucose	+	Galactose	+
Methyl red	+	Glucose	+
Voges proskauer	-	Inositol	-
Indol	-	Lactose	-
Nitrate	+	Maltose	+
Citrate	+	Mannitole	+
Lysine	+	Melibiose	+
Arginin	+	Rafinose	-
Ornithin	+	Rhamnose	-
Gelatinase	-	Salicin	-
Urease	-	Sellobiose	-
ONPG	-	Sorbitole	+
Aesculin hydrolysis	-	Sucrose	-
Phenylalanine	-	Trehalose	+
Adonitol	-	Xylose	+

the course and outcome of salmonellosis. Concurrent infections when complicated with salmonella infections, may especially result in death, particularly in foals (1,12-14,16). We consider that stress factors were present in

this case. The reason for this is because antibiotic therapy had been administered to treat the continuing respiratory infection that had started when the foal was 3 months old and different antibiotics had been used for a long period due to the unsuccessful results of previous drug administrations.

It has been reported that many horses are sources of infection for foals since they are asymptomatic carriers and shed the organism in their feces intermittently or permanently (4,5,16). Stress factors cause a suppression of the immune system and alter the intestinal flora that allows the establishment of the clinical disease (5). In this case, the origin of the infection in the foal could not be determined. It is possible that the foal was in contact with asymptomatic carrier horses or the foal was itself an asymptomatic carrier. It is considered that stress factors (heavy respiratory infection and prolonged antibiotic therapy) played a part its death.

In this case report, it was determined that *S. typhimurium* may cause the establishment of abscesses in horses in the same way as happens in human beings.

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