CASE REPORT

NEONATAL SEPSIS CAUSED BY *SALMONELLA ENTERICA* SEROVAR WELTEVREDEN

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Abstract. *Salmonella enterica* serovar Weltevreden is an uncommon cause of gastroenteritis occurring worldwide. For the first time, we report 2 cases of neonatal sepsis caused by *S.* Weltevreden from Hubli, India. In the first case, the neonate had features of septicemia and *S*. Weltevreden was isolated from a blood culture. The other neonate had omplalitis and clinical features of septicemia. *S. enterica* serovar Weltevreden was isolated from the umbilical swab culture of this neonate. Even though extensive investigations were conducted, the source of infection could not be identified. Both neonates recovered completely after appropriate antibiotic and supportive therapy.

INTRODUCTION

Salmonella enterica is one of the most common causes of human gastroenteritis worldwide. More than 2,500 different serovars of *S. enterica* have been identified; most of them have been implicated in human infections. However, only a few of them, like *S. enterica* serovars Typhimurium and Enteritidis are responsible for the majority of human infections (Aarestrup *et al*, 2003). *S. enterica* serovar Weltevreden, found in water, seafood and poultry (Boonmar *et al*, 1998; Heinitz *et al*, 2000), like many other serovars, is known to cause human gastroenteritis; the incidence of which is on the rise in Southeast Asia (Yasin *et al*, 1995; Thong *et al*, 2002). Although there are numerous reports of non-typhoidal salmonellae causing neonatal sepsis and septicemia, *S.* Weltevreden has so far not been shown to be a causative pathogen. In this report we present 2 cases of neonatal sepsis caused by *S. enterica* serovar Weltevreden, which to the best of our knowledge, is the first such report in the medical literature.

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CASE REPORTS

Case 1

A 5- day old male baby was transferred to the Neonatal Intensive Care Unit (NICU) of Karnataka Institute of Medical Sciences (KIMS) Hospital, Hubli, India from the nearby District Hospital, Dharwad, India, in January 2004. He was small for gestational age, had birth asphyxia and neonatal jaundice. On the 2nd day of hospitalization, he developed hypothermia (36.4ºC), with a heart rate of 150/minute and a respiratory rate of 50/minute. There was no focus of infection. The baby was clinically diagnosed with septicemia and routine investigations, including a blood culture and liver function tests, were performed.

Case 2

In February 2004, a female baby weigh-

ing 2.7 kg was born at KIMS Hospital, Hubli by low sagital cesarean section. The baby had fetal distress and was post term. She was admitted to the NICU since she had meconium aspiration and birth asphyxia, with Apgar scores of 2/10 at 1 minute and 6/10 at 10 minutes. On the 3rd day, she developed umbilical sepsis and later hypothermia (36.5ºC) with refusal to feed. Her heart rate was 140/minute and respiratory rate was 38/minute. Routine investigations, including umbilical swab and blood culture, were done.

Management

The results of the routine investigations are found in Table 1. The blood cultures and umbilical swab culture were processed at the Department of Microbiology, KIMS Hospital, Hubli, by standard methods (Koneman *et al*, 1992). *S. enterica* serovar Weltevreden was isolated from the blood culture of the first neonate and from the umbilical cord culture of the second neonate. There was no growth from the blood culture of the second neonate. Antibiotic susceptibility tests were performed by disc diffusion technique (National Committee for Clinical Laboratory Standards, 2000) using the following commercial discs (Himedia, Mumbai): ampicillin, cephalexin, cefuroxime, cefotaxime, ceftriaxone, cefoperozone, gentamicin, ciprofloxacin, ofloxacin and Co-trimoxazole. Both the isolates were resistant to multiple drugs. The isolate from the first case was susceptible only to ciprofloxacin and ofloxacin. The isolate from the second case was susceptible to cefotaxime, ceftriaxone, ciprofloxacin and ofloxacin. After preliminary identification, the isolates were sent to the National Salmonella Reference Center, Kasauli, India to confirm the serovar.

Both times *S.* Weltevreden was isolated, the NICU was alerted regarding the possible threat of nosocomial infection, and the baby was kept in isolation according to hospital policy. Stool samples were collected from both babies for culture. Environmental sampling of the NICU was performed both times, and samples were taken from each of the nursing staff in the NICU, including hand and stool samples for culture to detect Salmonella. Stool samples for Salmonella cultures were also obtained from the mothers of the affected babies. Blood and stool samples were obtained from all the babies in the NICU at that time for culture. All the samples were processed at the Department of Microbiology, KIMS Hospital, Hubli, according to standard procedures (Koneman *et al*, 1992). *S.* Weltevreden was not isolated form any of these samples.

The first case was treated with cefotaxime IV and the second case with ofloxacin IV along

Table 1
Results of the investigations of cases of neonatal septicemia.

Investigations	Case 1	Case 2
Total leukocyte count	15 x10^9/l	18 x10^9/l
Differential count - polymorphs	0.78	0.76
Differential count - lymphocytes	0.22	0.24
Band forms	Present	Present
C-reactive protein	Raised	Raised
Random blood sugar	1.76 mmol/l	2.64 mmol/l
Serum calcium	2.25 mmol/l	2.1 mmol/l
Liver function tests	Raised	ND

ND = Not done

with supportive therapy. Both the babies recovered completely.

DISCUSSION

Non-typhoidal salmonelloses in man vary from mild to severe presentations as gastroenteritis, severe sepsis, osteomyelitis and meningitis (Wittler and Bass, 1989). Many non-typhoidal salmonella serovars are known to cause neonatal septicemia, most of them have the potential for nosocomial spread. *S. enterica* serovar Weltevreden causes gastroenteritis in humans (Yasin *et al*, 1995; Thong *et al*, 2002; Aarestrup *et al*, 2003). Only a few reports implicate it in bacteremia/ septicemia (Obana *et al*, 1996; Ghadge and Bal, 2002). *S. enterica* serovar Weltevreden appears to infect young infants more than other serovars. The invasiveness and virulence of Salmonella serovars varies by geographical areas. This appears to be more important in determining the incidence of bacteremia in these areas (Wittler and Bass, 1989).

In the 2 cases we report here, the organism was responsible for neonatal septicemia and umbilical sepsis. The organism was not isolated in the stool samples of the babies. No other neonates in the NICU were affected. The two cases occurred independently of each other. The environmental sampling in the NICU failed to detect this organism. None of the nursing staff or mothers of the two babies were found to carry the pathogen.

These cases show that *S. enterica* serovar Weltevreden, like many other *Salmonella* serovars, can cause septicemia, especially in population groups with immature immunity or immunocompromized states. This pathogen is a rare cause of gastroenteritis occurring worldwide, with an increased incidence in recent years in Southeast Asia (Yasin *et al*, 1995; Thong *et al*, 2002). It is known to be transmitted through contaminated raw meat, poultry and dairy products. There are also reports of outbreaks associated with fresh fruits and vegetables (Heinitz *et al*, 2000). Although the incidence of human gastroenteritis due to this pathogen in India has not been reported recently, it was reported to be a serotype of increasing public health importance in India in the early 1970s (Basu and Sood,1975). It has been present among domestic animals in India (Sood and Basu, 1981) and may have continued to cause human gastroenteritis. It may also form a carrier state like other salmonelloses. While the source of infection in the present cases could not be pinpointed, it could be due to intestinal carriage of *S. enterica* serovar Weltevreden in the mothers or the nursing staff that infected the babies. The majority of neonatal septicemia cases in our hospital and in the rest of India and other developing countries are due to Enterobacteriaceae, such as *Klebsiella* and *Escherichia coli* (Tallur *et al*, 2002). These Enterobacteriaceae have also been detected in hand cultures of nursing staff at our NICU (unpublished). In light of the above facts, it is safe to assume an enteric origin of *S. enterica* serovar Weltevreden in the two cases reported here.

While some reports document low levels of drug resistance among *S. enterica* serovar Weltevreden isolated in both humans and environmental sources (Aarestrup *et al*, 2003), others report increasing drug resistance, especially to cephalosporins and aminoglycosides (Boonmar *et al*, 1998). We encountered multi-drug resistance in our isolates. Multi-drug resistance could be due to the widespread use of antibiotics in humans, animals, and agriculture (Heinitz *et al*, 2000). This resistance could have been acquired from other Enterobacteriaceae; as resistance coding genes in *S. enterica* serovar Weltevreden have been shown to be similar to those in Enterobacteriaceae (Aarestrup *et al*, 2003). Drug resistance patterns in humans and animals also vary. Isolates from raw vegetables and animals have been reported to be more resistant compared

to human isolates (Heinitz *et al*, 2000). Poultry may serve as a reservoir for disseminating drug resistance (Radu *et al*, 2001).

The isolation of *S.enterica* serovar Weltevreden in cases of neonatal sepsis suggests it is vital to be on the look out for rarer pathogens along with monitoring their drug resistance, since nosocomial or community spread of these pathogens could have serious consequences.

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