

CONCISE COMMUNICATION

Salmonella sepsis and miscarriage

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We present a case of a miscarriage at 16 weeks of gestation due to infection and transplacental passage of *Salmonella* group C. This was identified as being *Salmonella* Virchow from genital tract swab culture, and placental Gram-staining revealed numerous colonies of Gram-negative bacilli within the fibrin between the placental villi, confirming a true villitis associated with a hematogenous infection. Based on the patient's history, it was suggested that she had contracted the salmonella infection from eating undercooked eggs. Treatment of salmonella infection in pregnancy is controversial, and antibiotic therapy should be reserved for cases of invasive disease, using amoxicillin or a cephalosporin.

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CASE REPORT

A 34-year-old multigravid woman presented at 16 weeks of gestation with a six-hour history of abdominal pain, similar to uterine contractions, and mild vaginal bleeding. For 24 h prior to the onset of abdominal pain she had felt generally unwell, with flu-like symptoms, a headache, and mild pyrexia. She had no gastrointestinal disturbance. The pregnancy had otherwise been uneventful. She had undergone an ultrasound scan at seven weeks of gestation for reassurance, as she had a history of a previous miscarriage at 11 weeks of gestation. Her obstetric history also included a normal delivery at term and two early terminations of pregnancy.

On examination she was distressed, requiring opiate analgesia. She was pyrexial, with a temperature of 37.6 °C. She had a tense, tender uterus on palpation, and proceeded to deliver a 16-week male fetus, but failed to deliver the placenta, and required an evacuation of retained products of conception.

Postoperatively, her temperature rose to 38.2 °C, and antibiotic therapy was started. Twenty-four hours later she was afebrile with no abdominal pain and minimal vaginal blood loss, and was discharged home on oral antibiotics. A full blood

count taken on admission had initially shown a raised white cell count with neutrophilia and a high monocyte count, which returned to normal 24 h post-miscarriage.

A high vaginal swab was taken at the time of the evacuation of the placenta. This grew *Salmonella* group C, which was later further identified as being *Salmonella* Virchow. As part of the investigations into the cause of the midtrimester miscarriage, the fetus and placenta were histologically examined. Histology of the fetus confirmed a male fetus weighing 83 g, equivalent to 16 weeks of gestation. There were no fetal malformations.

However, the histologic assessment of the placenta revealed the presence of intervillous thrombi with focal perivillous and villous inflammatory changes. This was a true villitis associated with a hematogenous infection. The placental tissue was then Gram stained, and this revealed numerous colonies of Gram-negative bacilli within the fibrin between the villi (Figure 1). There was no significant inflammation or colonization of the membranes and placental bed, as would be expected if this had been an ascending infection.

Two weeks prior to the miscarriage, the woman had been on holiday in Turkey and had eaten an

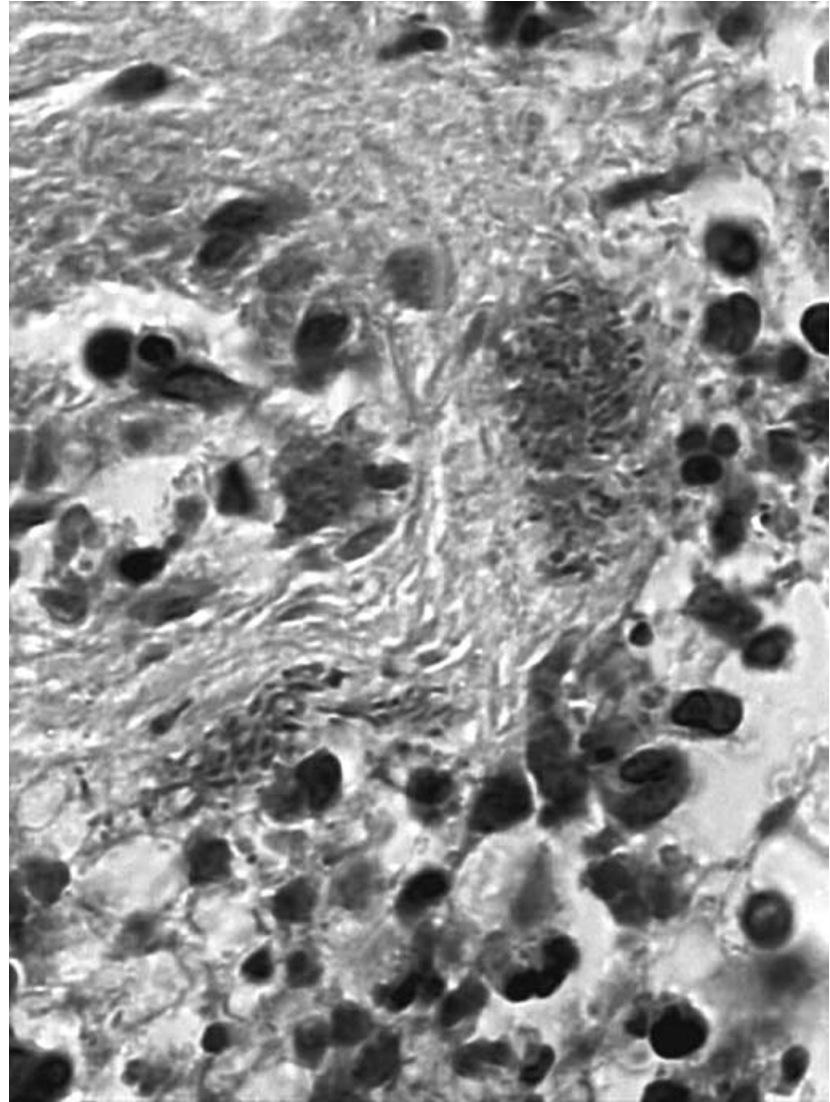


Figure 1 Colonies of Gram-negative bacilli within the tissue adjacent to blood vessel. Gram stain. Magnification $\times 100$. Courtesy of Dr P. Dowling.

omelette, which she felt was undercooked. Twenty-four hours after this she had symptoms of loose stools and a temperature for one day, but these symptoms were mild and no medical attention had been sought. There were no other dietary or animal exposures to *Salmonella*.

Based on this history, it was suggested that she had contracted a salmonella infection from eating undercooked eggs while on holiday but had remained well until the time of the miscarriage. Given the evidence of swabs taken from the posterior fornix growing *Salmonella*, the placental histology showing hematogenous infection with a Gram-negative bacillus, and the woman's pyrexia and neutrophilia, it appears that the miscarriage was caused by a salmonella sepsis, with crossing

of the infection to the placenta itself and subsequent chorioamnionitis.

DISCUSSION

Non-typhoid salmonellae are generally responsible for food poisoning and gastroenteritis. In England and Wales in 1998, there were 23 420 cases of salmonella infection as reported by the Public Health Laboratory Service (PHLS) [1]. Of these cases, 16 000 were due to *Salmonella* Enteritidis, and 2994 to *Salmonella* Typhimurium. Other non-typhoid salmonellas accounted for 4230 cases. Non-typhoid salmonellae, e.g. *Salmonella* Dublin, *Cholerae-suis* and *Virchow*, can also cause septicemia and other invasive diseases such as septic

arthritis [2], as well as gastrointestinal upset. *Salmonellae* can be contracted from many sources, but poultry represent the main source of non-typhoidal salmonellae. The incubation period of salmonellae is variable, and may be up to 1 week, but typically is between 6 and 72 h.

It is well known that systemic maternal infection can contribute to miscarriage. *Salmonellae* are also well documented in abortions of sheep, cattle [3], and horses [4]. Scialli and Rarick [5] reported a case of *Salmonella* group C being the probable cause of miscarriage in a woman of 15 weeks' gestation who had previously undergone an amniocentesis for chromosomal aneuploidy and later became unwell with salmonella sepsis. It was thought that this was due to eating undercooked eggs, and that the amniocentesis had no relationship with the miscarriage, although salmonellae were not looked for in fetal/placental tissues or in the female genital tract. In our case, a salmonella was identified in the genital tract, and the placenta itself had Gram-negative bacilli in the fibrin between the villi. It could be presumed that the salmonella identified on the high vaginal swab could merely be due to contamination, but the bacteria identified within the placenta could not have come from contamination alone, and would be consistent with the infection crossing from the maternal circulation into the placenta.

The majority of cases of chorioamnionitis are due to an ascending genital tract infection, and more commonly occur when there has been prior spontaneous rupture of the membranes. However, one other Gram-negative organism that has been associated with amnionitis with intact membranes is *Haemophilus influenzae*, and again this infection is thought to be caused by hematogenous spread across the placenta [6]. *Salmonella* Virchow itself has also been associated with genital tract infection, again from hematogenous spread, and has been associated with testicular abscesses in particular [7].

It has been suggested by Scialli that, given the potential for salmonellae to cause miscarriage, all pregnant women with diarrhea should have cultures for salmonellae and treatment. However, salmonella infection is usually short and self-limiting, and antibiotic therapy should not be used unless clinically indicated, as routine use of antibiotics contributes to the emergence of antibiotic-resistant strains. Treatment usually consists of

rehydration alone, and antibiotic therapy should be reserved for cases of invasive disease. Although fluoroquinolones are extremely effective in treating salmonella infection and effective in the treatment of long-term carriers of *Salmonella typhi*, their safety in pregnancy has not been established, and if antibiotic treatment is to be used, amoxicillin or a cephalosporin would be more appropriate during pregnancy.

The timing of miscarriage after the initial symptoms is variable, as the bacteremia can occur one to two weeks after the initial gastrointestinal symptoms. In the Scialli case, the woman miscarried five days after her initial symptoms, whereas, in our case, the event was delayed for over two weeks.

Prevention of salmonellosis is possible, and depends upon rigorous hygiene in the kitchen, thorough cooking of both poultry and eggs, and care when handling pets and animals, with thorough handwashing. This message should be given to all women during pre-pregnancy counseling and in early pregnancy, when they are often counseled on the prevention of disorders such as listeriosis. Many salmonella infections are contracted in our own homes and kitchens. Women do undertake holidays while pregnant, and the message should be reiterated to any pregnant woman planning holidays/travel, especially as hygiene standards may not be as rigorous.

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