

## *Streptococcus milleri* and second trimester abortion

A P MACGOWAN,\* P B TERRY†

From the Department of \*Pathology, University Medical Buildings, Foresterhill, Aberdeen, and the

†Department of Obstetrics and Gynaecology, Aberdeen Maternity Hospital, Aberdeen, Scotland

**SUMMARY** Review of 214 fetal necropsies performed in the department of pathology, University of Aberdeen, showed 40 cases of chorioamnionitis or intrauterine pneumonia, five of which were associated with *Streptococcus milleri*. In two cases there was good evidence to implicate *S milleri* as the cause of infected abortion while in the other cases its pathogenic role was less clear.

There has been considerable interest in the role of Lancefield group B streptococci in neonatal infection and infected abortion. Group B streptococci are also normal commensals of the female genital tract.<sup>1,2</sup> *Streptococcus milleri*, a Gram positive coccus, is not only carried as a commensal in the vagina and cervix but also in the upper respiratory tract.<sup>3,4</sup> It is associated with wound, dental, and sinus infections and more serious disease such as liver, brain, and abdominal abscesses; peritonitis; pyometrium; and endocarditis.<sup>1,5,6</sup> We report five cases of histologically confirmed chorioamnionitis from which *S milleri* was isolated.

### Patients and methods

Two hundred and fourteen fetuses submitted for necropsy at the department of pathology, University of Aberdeen, between January 1 1983 and April 30 1986 were reviewed. Forty showed histological evidence of chorioamnionitis or intrauterine pneumonia, and five were culture positive for *S milleri*.

Necropsies were performed within 48 hours of death and cadavers were stored at 4°C until post mortem examinations could be performed. At necropsy fetuses underwent a macroscopic and microscopic examination with throat or tracheal swabs cultured routinely. High vaginal swabs had been taken 24 hours before delivery, and both maternal and fetal swabs were Gram stained and plated out on defibrinated horse blood agar (Gibco), Gentian violet agar, and MacConkey agar (Oxoid). They were cultured aerobically in a humid 5% carbon dioxide atmosphere and anaerobically at 37°C for 18 to 24 hours. Colonies suspected of being *S milleri* were identified by the API 20 Strep system (API System SA, Montalieu Vercieu, France).

### Results

The table shows clinical and pathological findings of the patients studied. Three patients (cases 1, 3, and 4) had prolonged rupture of membranes (longer than 24 hours); one had an intrauterine contraceptive device (case 5). Case 3 had a cervical suture inserted in this pregnancy after a cone biopsy in 1975, and case 4 had had a previous septic abortion and two terminations. The maternal ages ranged between 20 and 38 years and abortion occurred between 18 and 23 weeks' gestation. In all five cases there was no systemic evidence of infection in the mothers.

Histological sections (stained with haematoxylin and eosin) of all five cases exhibited chorioamnionitis and in three cases intrauterine pneumonia. Gram stains of placenta and lungs in case 1 showed intracellular Gram positive cocci in neutrophil polymorphonuclear leucocytes, and *S milleri* was also isolated from the maternal high vaginal swab taken the day before abortion. Similarly, in case 2 profuse *S milleri* was isolated from the maternal high vaginal swab the day before the abortion, but no organisms were seen on Gram staining of tissue sections.

### Discussion

Ascending infection is only one of several ways in which the placenta and fetus may be infected<sup>7</sup>; it is intimated histologically by chorioamnionitis or membranitis in early infection and vasculitis of the cord and suppurative chorioamnionitis in more advanced disease. It is known that the incidence of intrauterine infection and chorioamnionitis increases with prolonged rupture of membranes and is more common in premature delivery. Whether infection follows spontaneous rupture of membranes or whether heavy vaginal colonisation with a particular organism pre-

Table Obstetric factors and pathological findings in chorioamnionitis associated with Streptococcus milleri

Obstetric factors					Pathology		
Case No	Maternal age (years)	Parity	Gestational age (weeks)	Clinical details	Fetal necropsy findings	Bacteriology	
						High vaginal swab culture	Fetal swab culture
Case 1	24	7 + 1	19	Spontaneous rupture of membranes for 4 days prior to abortion	Normally formed female fetus with chorioamnionitis and intrauterine pneumonia	Profuse <i>S milleri</i> Scanty <i>C albicans</i>	Profuse <i>S milleri</i>
Case 2	21	0 + 1	22	One previous termination, one day PV bleeding prior to abortion	Normally formed female fetus with chorioamnionitis and intrauterine pneumonia	Profuse <i>S milleri</i>	Profuse <i>S milleri</i>
Case 3	38	4 + 2	23	Cone biopsy 1975, Shirodkar suture of cervix 7 weeks prior to abortion, spontaneous rupture of membranes for 5 days prior to abortion	Normally formed female fetus with chorioamnionitis	No significant growth	Profuse <i>S milleri</i>
Case 4	20	0 + 3	20	One previous septic abortion and two terminations, spontaneous rupture of membranes 4 days prior to abortion	Normally formed male fetus with purulent chorioamnionitis and vasculitis of the cord	No significant growth	Profuse <i>S milleri</i> , <i>Peptostreptococcus</i> , and <i>Bacteroides</i> <i>assachrolyticus</i>
Case 5	26	0 + 0	18	Intrauterine contraceptive device in situ, 9 days bleeding PV and offensive vaginal discharge	Normally formed male fetus, retroplacental haemorrhage, chorioamnionitis, and intrauterine pneumonia	No significant growth	Scanty <i>S milleri</i> and <i>Gardnerella</i> <i>vaginalis</i>

PV = per vagina

disposes to rupture and preterm labour is not known.

Many bacteria isolated from cases of chorioamnionitis are also commensals of the bowel and vagina—for example, *Streptococcus faecalis*, *Escherichia coli*, *Proteus*, *Klebsiella*, *Gardnerella vaginalis*, *Candida albicans*, *Bacteroides*, and *Peptostreptococcus* species. The latter two anaerobic bacteria are often found in mixed infection, as in case 3.<sup>8</sup>

*S milleri* is a known vaginal commensal and is also found in the faeces of 5% of normal puerperal women.<sup>9</sup> It has also been reported as a cause of septicæmia and pneumonia in premature neonates.<sup>10</sup> It has not, however, been associated with chorioamnionitis and intrauterine pneumonia in abortion.

There was good evidence to implicate *S milleri* as a cause of septic abortion in cases 1 and 2. In each case a profuse growth of *S milleri* was obtained from a maternal high vaginal swab collected prior to abortion and from a swab taken at necropsy from the fetal airways. There was also histological evidence of chorioamnionitis and intrauterine pneumonia with Gram positive cocci identified in the tissues of case 1.

The importance of the isolation of *S milleri* in cases 3, 4, and 5 is doubtful as high vaginal swab culture was unhelpful and *S milleri* was isolated with other organisms associated with chorioamnionitis. Nevertheless, these observations suggest that *S milleri* can act as a pathogen in the female genital tract and cause infected abortion.

We thank Dr ES Gray and Professor R Postlethwaite for their helpful comments during the preparation of this manuscript.

#### References

- 1 Parker MT. Streptococcal diseases. In: Wilson G, Miles A, Parker MT, eds. *Topley and Wilson's principles of bacteriology, virology and immunity. Bacterial diseases*. 7th Ed. Vol 3. London: Edward Arnold, 1984:225-53.
- 2 Easmon CSF, Hastings MJG, Neil J, Bloxham B, River PRA. Is group B streptococcal screening during pregnancy justified? *Br J Obstet Gynaecol* 1985;92:197-201.
- 3 Poole PM, Wilson G. Infection with minute-colony-forming haemolytic streptococci. *J Clin Pathol* 1976;29:740-5.
- 4 Wort AJ. Observations on group F streptococci from human sources. *J Med Microbiol* 1975;8:455-7.
- 5 Murray HW, Gross KC, Masur M, Roberts RB. Serious infection caused by *Streptococcus milleri*. *Am J Med* 1978;64:759-64.
- 6 Anonymous. *Streptococcus milleri*, pathogen in various guises. [Editorial] *Lancet* 1985;ii:1403-4.
- 7 Fox H. Infection of the placenta. In: Cold CR, ed. *Infections and pregnancy*. London: Academic Press, 1977:251-88.
- 8 Tobin JOH, Jones DM, Fleck DG. Aetiology, diagnosis, prevention and control of infection affecting pregnancy in humans. In: Cold CR, ed. *Infections in pregnancy*. London: Academic Press, 1977:1-52.
- 9 Ball LC, Parker MT. The culture and biochemical characters of *Streptococcus milleri* strains isolated from human sources. *J Hyg (Camb)* 1979;82:63-78.
- 10 Wells DW, Keeney GT. Group F streptococcus associated with intrauterine pneumonia. *Paediatrics* 1979;66:820-1.

Requests for reprints to: Dr A MacGowan, Division of Pathology, Southmead Hospital, Westbury-on-Trym, Bristol BS10 5NB, England.