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SHORT PAPER

Human parvovirus B19 infection within a family and risk for pregnant women

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SUMMARY

During an outbreak of parvovirus B19 infection among four related families at least 70% of the household contacts, including a woman at the 33rd week of pregnancy, became infected. Twins were born at the 39th week of pregnancy, both with B19 infection. B19 DNA was detected in their sera by a nested PCR, anti-B19 IgM was detectable only by an immunofluorescence assay, and low levels of maternal anti-B19 IgG were demonstrable by an immunoenzymatic test in the serum of both children. All the haematological parameters were normal at birth and 6 months later, when B19 DNA and anti-B19 antibody were no longer detectable in serum samples. This observation emphasizes the high risk of B19 infection among household contacts and the possibility of a favourable outcome of the foetal infection, possibly related to infection late in the pregnancy.

Human parvovirus B19 infection is common and in European countries and the USA anti-B19 antibody prevalence in adults is between 40–60% [1, 2]. B19 virus is spread by the respiratory route [3] but transmission by clotting factor concentrates [4] and by the transplacental route [5] has also been demonstrated. Several investigations have estimated the risk to the foetus of B19 exposure during pregnancy. This risk is related to maternal susceptibility to infection and to the rate of maternal infection following different types of exposure [6]. The risk of infection among susceptible adults seems to be higher (*c.* 50%) following exposure to B19 at home compared to school or hospital exposure (*c.* 20–30%) [6, 7]. The prenatal infection rate during maternal B19 infection has not been assessed clearly, so far, but in 8–9% of pregnancies complicated by B19 infection, spontaneous abortion and transient or ultimately fatal hydrops foetalis can occur [8, 9]. In addition, an association between B19 infection and congenital red-cell aplasia has recently been established [10]. Most pregnancies however continue to full term delivery of normal infants [8, 11]. Here we report intrauterine infection of bichorial twins following maternal household exposure at the 33rd week of pregnancy. A high infection rate in household contacts was found.

During an outbreak of erythema infectiosum (EI) in Florence in the late spring of 1994, parvovirus B19 infection was diagnosed in 10 of 15 members of 4 brothers' families, who met frequently. Six of the 7 children had EI and among the 8 adult members 4, including a woman at the 33rd week of pregnancy, had a symptomatic infection characterized by either rash or arthropathy and lymphoadenopathy (Table 1). The diagnosis in the children was made clinically only, but in the four adult patients the clinical diagnosis was confirmed by laboratory tests (Table 1). Sera from adult asymptomatic subjects were not available. B19 DNA was detected by nested PCR [12] in the sera of all the four patients and anti-B19 IgM

Table 1. *B19 DNA and anti-B19 antibody detection in sera of adult patients and twins infected* in utero

Subjects (Sex)	Clinical condition	Nested PCR B19 DNA	Anti-B19 IgM		Anti-B19 IgG
			EIA*	IFA†	EIA*
Adult					
1‡ (F)	Rash, lymphad.	+	2·3	> 128	2·8
2 (F)	Rash, lymphad., arthr.	+	1·1	64	6·8
3 (F)	Arthropathy	+	1·7	> 128	6·8
4 (M)	Arthropathy	+	2·4	> 128	7·9
Newborn§					
Twin A (F)	Asymptomatic	+	0·97	32	1
Twin B (F)	Asymptomatic	+	0·90	16	3·5
Twin A-b	Asymptomatic	−	0·18	< 16	0·47
Twin B-b	Asymptomatic	−	0·20	< 16	0·69

* EIA results are expressed as Test/Cut Off ratios (T/CO). T/CO > 1 = positive result; T/CO of 0·99–0·77 = doubtful result; T/CO < 0·77 = negative result. (Starting serum dilution 1/100).
† IFA results are expressed as reciprocal of the highest serum dilution giving positive result. (Starting dilution 1/16).
‡ Pregnant woman, mother of the twins.
§ The twins at birth and (-b) 6 months later.

and IgG were detected by commercial immuno-enzymatic tests (EIA) with a recombinant B19 antigen (Dako).

Following the diagnosis of B19 infection, the pregnancy was monitored weekly by ultra-sound scanning but no foetal complication was observed and the monitoring of maternal serum alfa-fetoprotein gave normal values.

Two female babies were born at the 39th week of pregnancy; their weight was 3300 g and 2500 g respectively. Their Apgar score was 9 at 1 and 5 min. Hematocrit values and other hematological data were normal. B19 DNA was detected in the sera of both babies at birth but was absent 6 months later (Table 1). By a semi-quantitative PCR, using an end-point titration method, it was assessed that about 10–100 B19 DNA copies were present in 2 μl of the sera at birth. Anti-B19 IgM was clearly demonstrable in the same sera only by an immunofluorescence assay (Biotrin International), whereas the EIA-IgM gave doubtful results; maternal anti-B19 IgG was present in the sera at birth but was undetectable after 6 months (Table 1). These discrepancies may be due to differences in the initial dilutions required for the IFA (1/16) and EIA (1/100) tests.

Altogether, at least 12/17 (70·6%) of the members of these 4 families were involved in the outbreak of B19 infection. This figure may be an underestimate because some of the other members (1 child and 4 adults) may have been already immune or may have had asymptomatic infection. In each of the four families the clinical infection rate was 25%, 75%, 80% and 100% respectively. This observation suggests that the risk of transmission of B19 infection to susceptible subjects is very high within household contacts and could be a serious problem for pregnant women as well as for immunocompromised subjects in whom B19 infection may cause severe acute or chronic anaemia [13, 14].

In the case reported here maternal B19 infection was transmitted to both foetuses but without adverse consequences. The low level of viraemia at birth and the lack of damage could be due to the early protective effect of maternal antibody. It is also possible that the time of infection, at the 33rd week of pregnancy, played a role in the favourable outcome. Since 1991 we have diagnosed B19 infection in 13/57 pregnancies associated with different adverse effects of unknown aetiology (spontaneous abortion, transient hydrops foetalis, fatal hydrops foetalis, congenital anaemia). Infection occurred before the 29th week of pregnancy in 12 cases, and in 1 case (congenital anaemia) we were unable to determine the exact time of infection; however, epidemiological data suggested that the time of maternal infection was probably at the 28–29th weeks of pregnancy. The serological studies on these twins confirms some observations reported by others [15], and suggests that an intrauterine B19 infection cannot always be demonstrated by serology alone, but B19 DNA detection in newborn sera may be also required.

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