



AMERICAN ACADEMY OF PEDIATRICS

Committee on Infectious Diseases

Parvovirus, Erythema Infectiosum, and Pregnancy

Recent outbreaks of erythema infectiosum (fifth disease) have caused consternation among pregnant women and their physicians, because of the risk of spontaneous abortion caused by this viral infection. This statement contains information concerning the infection and recommendations regarding control of exposure.

The agent of erythema infectiosum is a single-stranded DNA virus called parvovirus B19, which infects humans only.^{1,2} Parvovirus B19 is principally transmitted by respiratory secretions,³ and a primary site of replication is the red blood cell precursors found in the bone marrow.⁴ After an incubation period of approximately 1 week's duration, the virus produces a febrile illness accompanied by reticulocytopenia, which lasts approximately 7 days.⁵ The normal person recovers without evident anemia and, in some cases, within another week, a distinctive rash, consisting of a slapped cheek appearance and an erythematous, lacy rash on the trunk and extremities, will develop. Atypical maculopapular rashes also occur.⁶ In adult patients, particularly women, arthralgia or arthritis may develop at this stage^{7,8}; children infrequently experience joint involvement. Asymptomatic infection without rash may occur more frequently than illness with typical rash.

Infection with parvovirus B19 can also cause aplastic crisis in patients with red blood cell abnormalities leading to shortened red blood cell half-lives (such as sickle cell disease and autoimmune hemolytic anemia). The aplastic crises develop ap-

proximately 1 week after onset of the acute illness due to parvovirus B19.⁹ Patients with aplastic crisis appear to be contagious from the onset or before the onset of acute illness and through the subsequent week or so. In contrast, patients with erythema infectiosum are likely to be contagious before onset of clinical symptoms and have little or no virus in respiratory secretions at the time of rash.^{10,11} Chronic anemias caused by parvovirus B19 can develop in some immunodeficient persons owing to persistent viral replication in the bone marrow.¹²

Infection is most common in school-aged children and occurs in epidemics that start in the late winter and spring and last 2 to 6 months. However, parvovirus B19 is ubiquitous and infection occurs throughout the year. Approximately 50% of adults have serologic evidence of past infection, in contrast to 5% to 10% of preschool-aged children.¹³ Transmission is facilitated by close contact. A susceptible adult in the household of an infected child has approximately a 50% risk of infection,^{10,11} whereas during an extensive school outbreak antibodies have been found to develop at a 20% rate in previously seronegative school teachers observed.¹⁴

Children with aplastic crisis are particularly likely to infect hospital personnel. These patients have a prodromal illness characterized by fever, myalgia, lethargy, nausea, vomiting, and abdominal pain. Rash is usually absent. The crisis occurs during an early stage of infection, and patients excrete large amounts of virus in the blood and in the respiratory tract. Nosocomially acquired parvovirus B19 infections have been observed,^{14a} and unless isolation precautions are taken, the rate of infection among susceptible personnel can be substantial.

The ability to diagnose B19 infection has improved greatly in recent years, but diagnostic tests are still not widely available. Three tests have been

The recommendations in this statement do not indicate an exclusive course of treatment to be followed. Variations, taking into account individual circumstances, may be appropriate.

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principally used: for IgG and IgM antibodies^{15,16} or for viral DNA.¹⁷ The demonstration of IgG antibodies is useful for assessing immunity, the IgM test confirms recent infection (within the previous several months), and tests for DNA show that tissues or secretions contain virus. Unfortunately, difficulty in growing the virus *in vitro* has hampered the production of diagnostic reagents. The recent development of a genetically engineered cell line that expresses parvovirus B19 antigen should lead to the wider availability of diagnostic tests.¹⁸

Maternal parvovirus B19 infection, with or without rash, can affect fetuses. Well-documented cases of fetal hydrops and death following parvovirus B19 infection of the mother have been reported.^{13,19-21} The virus appears to cause fetal anemia, leading to heart failure and death. Most reported maternal infections that have resulted in fetal death occurred in the first half of pregnancy, with fetal death and spontaneous abortion usually taking place 4 to 6 weeks after infection. Third-trimester maternal infections followed by the birth of anemic newborns were recently described.²² A parvovirus-associated fetal anomaly has not yet been established. Thus far it appears that infection during pregnancy can be embryocidal, but if not, teratogenic effects are absent or rare.²³

The primary question for public health is how often does exposure of a pregnant woman to parvovirus B19 result in fetal loss? Parvovirus infection is an infrequent cause of spontaneous abortion; it was responsible for less than 1% of spontaneous abortions in one study.²⁴ Based on the limited data available, approximately 50% of women in the average American city will be immune to parvovirus B19. Because approximately half of those susceptible will be infected after household exposure to a case of erythema infectiosum, approximately 25% of exposed women will be infected in this high-risk situation. According to unpublished data from the United Kingdom²⁵ and Connecticut (M. L. Cartter, Connecticut State Department of Health Services, and John F. Rodis, University of Connecticut Medical Center, personal communication, October 23, 1989), the risk of presumed parvovirus-related fetal death in women infected during the first 20 weeks of pregnancy is 3% to 9%. The product of these figures provides an excess risk estimate of approximately 1% to 2% to the fetus of a woman of unknown serologic status exposed in the household during the first 20 weeks of pregnancy. The risk of fetal death to a woman exposed occupationally would usually be much less than 1%.²⁶

Insufficient data are available to estimate the risk after 20 weeks of pregnancy. Immune serum globulin may prevent or ameliorate human parvo-

virus infection but the extent of its efficacy is unknown at present.

RECOMMENDATIONS

1. Children with erythema infectiosum do not need to be isolated during hospitalization and may attend school or day care, because they are unlikely to be infectious after the rash appears and the diagnosis is made.

2. Hospitalized children with aplastic crises or immunosuppressed patients with chronic aplastic anemia must receive contact isolation, including use of gowns and gloves for the duration of illness. Masks should also be worn for close contact. Acute and convalescent sera should be obtained for parvovirus antigen and antibody testing, if available.

3. Pregnant women who subsequently find they have been in contact with children who are in the incubation period of erythema infectiosum or children who are in aplastic crisis should have the relatively low potential risk explained to them, and the option of having serologic tests performed should be offered if possible. Testing for parvovirus B19 IgM antibody is available for selected patients from the Centers for Disease Control through state health departments and from university and commercial laboratories. Fetal ultrasound and α -feto-protein determinations are useful when assessing damage to the fetus.

4. Women who are exposed to children at work (such as teachers or day-care workers) or at home are at increased risk of infection with parvovirus B19. However, because of widespread inapparent infection in both adults and children, all women are at some risk of exposure, particularly those women with school-aged children. In view of the high prevalence of parvovirus B19, the low risk of ill effect to the fetus, and the fact that avoidance of child care or teaching can only reduce, but not eliminate, the risk of infection, a routine policy of exclusion of pregnant women from the workplace where erythema infectiosum is occurring is not recommended. However, pregnant health care workers should not care for patients with aplastic crisis, who may be highly contagious. Eventually, when IgG testing for parvovirus B19 antibody is widely available, women at increased risk may be able to have their susceptibility determined.

5. Transmission of infection can be lessened by routine hygienic practices for control of respiratory secretions, which include handwashing and the disposal of facial tissues containing secretions.

6. Pediatricians in their roles as school medical advisors should act as consultants in providing greater access to testing facilities, interpretation of test results, and reassurance to pregnant women.

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