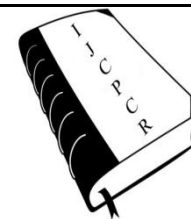




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### REVIEW OF PARVOVIRUSES AND FIFTH DISEASE

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#### ABSTRACT

Fifth disease is one of the common childhood rashes and is caused by human parvovirus B-19. It is also called erythema infectiosum or slapped face disease because of the rash on the cheeks. It is called fifth disease because it was the fifth of a series of rashes, ordered in the sequence that they were reported, that all look very similar. The others are measles (Rubeola), scarlet fever (Scarlatina), German measles (3-day measles, rubella) and Dukes' disease. About half of the US population has been infected by parvovirus B-19 and infection results in life-long immunity.

**Key words:** Erythema infectiosum, Slapped face disease.

#### INTRODUCTION

Parvoviruses are among the smallest and simplest eukaryotic viruses and were only discovered in the 1960's. Although known to be widespread in many organisms in nature, the first human parvovirus infections were discovered only in the last few decades. Unfortunately, the pathogenic human parvoviruses do not grow in culture and are therefore not very well understood. The first human parvovirus that was discovered was the B19 parvovirus. This virus was discovered by a virologist named Yvonne Cossart in London in the 1970 while investigating laboratory assays for hepatitis B. Using an immunoelectrophoretic technique, Cossart reacted sera from blood bank donors (antigen source) with samples from hepatitis patients (antibody source). When results from these tests were compared with those from more specific assays, she noticed a series of "false positive" reactions, which, when investigated further, showed particles that appeared to be parvoviruses [1]. In fact, the name of the parvovirus B19 was derived from the patient code of one of the viremic blood bank donors. A few years later, the virus was linked with fifth disease, a common rash childhood illness. Fifth disease is common in children, is usually mild and quickly resolves without intervention. It does not require treatment but it can cause serious problems in some members of the population. A child with

fifth disease shows symptoms from a few days to as long as two weeks after infection but usually they resolve after about a week. The rash can look like the redness of a slapped face, intensely red on the cheeks with a pale ring around the mouth (circumoral pallor) [2]. It may extend to the rest of the body as a lacy rash. Sometimes there is itching. Before the manifestation of the rash, the child may have cold-like symptoms and perhaps a low fever. Most people are infected early in life and become immune but adults can be infected. As with children, adults sometimes manifest no symptoms but they can also get the typical rash. This can be accompanied by swelling of the joints on both sides of the body which usually subsides in a few weeks, though the swelling can persist for longer. The disease can be spread from person to person before the rash appears. Since the patient often has cold-like symptoms before the onset of rash and the virus is found in respiratory tract secretions, spread is likely to result from aerosols (sneezing) or other contact (via the hands etc) with the secretions. By the time of the rash, the viremia has subsided and the patient is no longer infectious [4]. This is in contrast with other similar diseases in which the patient with the rash is contagious, (e.g. measles). Usually, about half of the family contacts of an infected person contract the disease. Parvovirus infection is a common and highly

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contagious childhood ailment — sometimes called slapped-cheek disease because of the distinctive face rash that develops. Parvovirus infection also has been known as fifth disease because, historically, it was one of five common childhood illnesses characterized by a rash. In most children, parvovirus infection is mild and requires little treatment. However, in some adults, the infection can be serious. Parvovirus infection in some pregnant women can lead to serious health problems for the fetus. Parvovirus infection is also more serious for people with some kinds of anemia or who have a compromised immune system [5].

### Symptoms

Most people with parvovirus infection have no signs or symptoms. When symptoms do appear, they vary greatly depending on the age of the person who has the disease [6].

#### Parvovirus symptoms in children

Early signs and symptoms of parvovirus infection in children may include:

- Sore throat
- Slight fever
- Upset stomach
- Headache
- Fatigue
- Itching

#### Distinctive facial rash

Several days after the appearance of early symptoms, a distinctive bright red facial rash may appear — usually on both cheeks. Eventually it may extend to the arms, trunk, thighs and buttocks, where the rash has a pink, lacy, slightly raised appearance.

Generally, the rash occurs near the end of the illness. It's possible to mistake the rash for other viral rashes or a medicine-related rash. The rash may come and go for up to three weeks, becoming more visible when a child is exposed to extreme temperatures or spends time in the sun.

#### Parvovirus symptoms in adults

Adults don't usually develop the slapped-cheek rash. Instead, the most prominent symptom of parvovirus infection in adults is joint soreness, lasting days to weeks. Joints most commonly affected are the hands, wrists, knees and ankles [7].

Generally, you don't need to see a doctor for parvovirus infection. But if you or your child has an underlying condition that may increase the risk of complications, make an appointment with your doctor. These conditions include:

- Sickle cell anemia
- Impaired immune system
- Pregnancy

### Causes

- The human parvovirus B19 causes parvovirus infection. This is different from the parvovirus seen in dogs and cats, so you can't get the infection from a pet or vice versa.
- Human parvovirus infection is most common among elementary school-age children during outbreaks in the winter and spring months, but anyone can become ill with it anytime of the year. It spreads from person to person, just like a cold, often through respiratory secretions and hand-to-hand contact [8].
- The illness is contagious in the week before the rash appears. Once the rash appears, the person with the illness is no longer considered contagious and doesn't need to be isolated

### Contagiousness

A person with parvovirus infection is most contagious before the rash appears—either during the incubation period (the time between infection and the onset of symptoms) or when experiencing only mild respiratory symptoms. The rash is the result of an immune system reaction that occurs after the infection has passed, so kids usually aren't contagious once it appears. Parvovirus B19 spreads easily from person to person in fluids from the nose, mouth, and throat of someone with the infection, especially through large droplets from coughs and sneezes [9]. In households where a child has fifth disease, another family member who hasn't previously had parvovirus B19 has about a 50% chance of also getting the infection. Kids with fifth disease may attend childcare or school, as they are no longer contagious. Once infected with parvovirus B19, a person develops immunity to it and is unlikely to become infected again. Parvovirus B19 infection during pregnancy may cause problems for the fetus. Some fetuses may develop severe anemia if the mother is infected while pregnant—especially if the infection occurs during the first half of the pregnancy. In some cases, this anemia is so severe that the fetus doesn't survive. Fortunately, about half of all pregnant women are immune due to a previous infection with parvovirus. Serious problems occur in less than 5% of women who become infected during pregnancy [10].

### Prevention & Treatment

#### Prevention

People with fifth disease are most contagious when it seems like they have "just a cold" and before they get the rash or joint pain and swelling.

You can reduce your chance of being infected with parvovirus B19 or infecting others by

- washing your hands often with soap and water
- covering your mouth and nose when you cough or sneeze
- not touching your eyes, nose, or mouth

- avoiding close contact with people who are sick
- staying home when you are sick

After you get the rash, you are probably not contagious. So, it is usually safe for you to go back to work or for your child to return to school or a child care center. Healthcare providers who are pregnant should know about potential risks to their baby and discuss this with their doctor.

All healthcare providers and patients should follow strict infection control practices to prevent parvovirus B19 from spreading.

### **Treatment**

Fifth disease is usually mild and will go away on its own. Children and adults who are otherwise healthy usually recover completely. Treatment usually involves relieving symptoms, such as fever, itching, and joint pain and swelling. People who have complications from fifth disease should see their healthcare provider for medical treatment. There is no vaccine or medicine that can prevent parvovirus B19 infection [11].

### **Complications**

Fifth disease is usually mild for children and adults who are otherwise healthy. But, for some people, fifth disease cause serious health complications. People with weakened immune systems caused by leukemia, cancer, organ transplants, or HIV infection are at risk for serious complications from fifth disease. It can cause chronic anemia that requires medical treatment [12].

### **The Test**

Parvovirus B19 testing is generally not used to test those with mild and uncomplicated infections. It is typically used to detect a current infection or determine immunity in those who are at an increased risk of complications, such as those with sickle cell anemia [13]. There are several methods of detecting a parvovirus B19 infection:

### **Antibody-testing**

Two types of parvovirus B19 antibodies may be produced in response to an infection: IgM and IgG. IgM antibodies are the first to be produced by the body in response to a parvovirus infection. They are present in most individuals within a week or two after the initial exposure [14]. IgM antibody production rises for a short time period and then declines. Eventually, the level of parvovirus IgM antibody usually falls below detectable levels. IgG antibodies are produced by the body a few weeks after the initial infection to provide long-term protection. Levels of IgG rise during the active infection, then stabilize as the parvovirus B19 infection resolves. Once a person has been exposed to parvovirus B19, that person will have some measurable amount of IgG antibody in their blood for the rest of their lifetime [15].

Parvovirus B19 antibody testing may be performed to determine immunity to parvovirus in pregnant women who have been exposed to someone with parvovirus B19 or who have symptoms suggestive of parvovirus infection. It may also be ordered for people who have acute or chronic anemia or persistent joint pain that may be due to a parvovirus B19 infection [16]. By comparing the absence or presence of both IgG and IgM in the same sample, the health practitioner can distinguish between current, recent, and previous infections. Antibody testing is usually not performed on children who have the characteristic fifth disease rashes and, since parvovirus B19 infection is widespread and causes few problems to those with healthy immune systems, general population screening is rarely done.

### **Viral-detection**

Viral detection involves finding parvovirus B19 genetic material (DNA) in a blood sample or, less commonly, in a sample of bone marrow, fetal cord blood, or amniotic fluid. Parvovirus B19 DNA testing is performed primarily to detect active parvovirus infection in immune-compromised people who have acute or persistent anemia. These people will frequently not produce a sufficient amount of antibodies to detect or to resolve the infection. It may also be performed to detect the presence of the virus in babies when a mother is infected or was exposed during the pregnancy [17].

### **When is it ordered?**

Parvovirus B19 testing is usually not required when a child has the characteristic "slapped cheek" and lacy rashes. The distinctive rashes are sufficient evidence for the health practitioner to be able to diagnose the infection. In general, most people who have or have had parvovirus B19 do not require laboratory testing because illness does not typically last more than 5-7 days and symptoms are usually mild [18].

Parvovirus B19 IgG and IgM antibody tests may be ordered when a pregnant female has flu-like symptoms and/or has been exposed to someone with a parvovirus B19 infection to determine if she has an active infection, had a recent infection, or has been exposed in the past. DNA testing may be performed on fetal samples in some cases [19].

Antibody testing and/or DNA testing may be ordered when someone has acute or persistent anemia or joint pain that the health practitioner suspects may be due to a parvovirus B19 infection. Parvovirus B19 DNA testing is usually ordered when the affected person is immune-compromised [20].

One or more parvovirus B19 tests may be repeated if they are initially negative but the health practitioner still suspects that a parvovirus infection is present, or to evaluate changes in concentrations of antibody over time.

## What does the test result mean?

### Antibody-testing

If both parvovirus B19 IgG and IgM are present, then it is likely that the person tested has an active, or had a recent, parvovirus infection. This can be confirmed by measuring IgG levels again 2 or 3 weeks later. A high level of IgG is not as important as an increasing concentration of antibody. If there is a 4-fold increase in IgG between the first and second sample, then the person has an active, or had a recent, infection [21].

If only IgM is present, then the person may have very recently been infected, within the previous 2-4 months. If only parvovirus B19 IgG is present, then the person had a parvovirus infection at some time in the past and has protection against the virus [22].

If antibody tests are negative, then the person tested has not had the infection and is not immune. If a pregnant woman is not immune and has been exposed to someone with the disease, she will typically be closely monitored by her doctor.

If someone is symptomatic but has low or undetectable levels of IgG and/or IgM, it may mean that the person either has a condition other than parvovirus B19 or that their immune system is not responding normally [23].

### Viral-detection

If a parvovirus B19 DNA test is positive, then the person is currently infected with parvovirus B19. A negative result does not rule out the infection. The virus may not be present in sufficient amount in the sample to be detected. Fetal infection of parvovirus B19 is often detected

through testing of viral DNA in maternal samples as well as samples from the baby [24].

The PCR assay is used to detect viral DNA and is the optimal method for detecting chronic infection in immunocompromised patients as the antibody levels are variable. Sometimes a reticulocyte test may be performed along with parvovirus B19 testing to evaluate red blood cell (RBC) production. This test measures new immature RBCs, called reticulocytes, in the blood that still contain genetic material. Since parvovirus B19 disrupts RBC production, the number of reticulocytes will decrease during an active infection [25].

Parvovirus B19 infections are usually self-limiting (limited in duration) in otherwise healthy people. Treatment may be given to relieve symptoms and, when necessary, to address anemia. A pregnant woman who passes parvovirus B19 infection to her fetus will be closely monitored for several weeks with periodic ultrasounds. In most cases, the fetus will be healthy. When *hydrops fetalis* or severe anemia develops, it can sometimes be addressed by giving the fetus a blood transfusion. The parvovirus B19 infection is not known to cause birth defects [26].

## CONCLUSION

The fifth disease although not a fatal or a serious one, still needs to be paid attention as it can worsen the condition. School children are more prone to infections and proper counselling is necessary regarding hygiene of children as well as teachers and other staff. The disease is contagious and treated symptomatically but prevention would be always better than cure to avoid drug borne complications.

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