B19 Virus Infection and Blood Safety
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Abstract

Human parvovirus B19 (B19) belongs to the family of parvoviridae and viral particle measures 23 nm in diameter. B19 virus has single-stranded DNA genome and is a non-enveloped virus. It is widespread in the world. The virus can be transmitted via respiratory route and blood-derived products in addition to be transmitted vertically from mother to fetus. B19 infection can cause a lot of symptoms, such as fever, headache, erythema infectiosum, systemic lupus erythematosus, hydrops fetalis. Because B19 virus is resistant to heat inactivation and solvent detergents, the risk of B19 virus transmission through transfusion still exists.

Keywords: Human parvovirus B19; Transfusion; Transmission

Viral life cycle

B19 is a non-enveloped DNA virus. Its life cycle consists of the following steps: virus attaching to the receptors of the host, penetration, uncoating, DNA replication, RNA transcription, protein translation, assembly of virions and cell lysis [18].

Epidemiology

B19 virus is widespread in the world year round [19]. Following infection, patients will develop IgM and IgG antibody. At the early stage, IgM is the main antibody, and with the progression of infection, IgG becomes dominant. About 71% pregnant women whose IgM is positive have increased risk of fetal loss [20] and fetal deaths may occur if infection was acquired before 20 weeks of gestation [21]. In epidemic seasons, high titters of B19 virus was detected in the blood donor blood without concurrent antibodies [22]. Younger females are more likely to be infected by B19 [23]. Anti-human parvovirus B19 antibody or deoxyribonucleic acid levels can be used to distinguish B19 infection from other infections [23].

Transmission

B19 can be transmitted via respiratory route and blood-derived products. In addition, it can also be transmitted vertically from mother

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to fetus. The infection can be found both in children and adults and after transplantation [24].

Symptoms

The prodromal symptoms may include fever, corzya, headache, and nausea. Among children, prevalent manifestation is erythema infectosum [25]. B19 is also associated with arthritis and it is believed to be caused by the B19-specific antibody among healthy adults [26]. Apart from arthritis, B19 infection can cause numerous autoimmune disorders such as systemic lupus erythematosus (SLE) [26]. The autoimmune disorders may occur when the anti-B19 antibody is lacking in the patients who are immunocompromised or using the immunosuppressive drugs [26].

In pregnant women, B19 infection is more significant. Vertical transmission is reported to occur in the first or second trimester [27]. Hydrops fetalis can be developed by such infection [28]. Except for the hydrops fetalis, B19 infection can also cause congenital anemia, hypoalbuminaemia, inflammation of the liver, myocarditis [29] and severe fetal thrombocytopenia [30].

B19 Infection and Blood Safety

There are a lot of patients requiring blood transfusion, so under such condition it is necessary to ensure a safe and sufficient supply of blood and blood products.

B19 can be present in blood and in plasma products, circulating at extraordinarily high titers, and thus recipients may be infected [31]. Due to the fact that B19 virus is lacking lipid envelopes, it can’t be inactivated by solvents and detergents (SD) [32]. In addition, very high temperature can’t inactivate B19 virus in plasma either [33]. It has been reported that robust virucidal [33] and pasteurization of human serum albumin [34] can successfully inactivate B19 virus. Apart from above methods, photochemical treatment (PCT) combined with amotosalen and ultraviolet A (UVA) can inactivate B19 virus efficiently [35].

Conclusion

B19 virus belongs to the family of Parvoviridae. It can be present in blood and plasma and circulate in human body, but B19 is not included in the blood screening strategy for blood donors now. Under such condition, there is still some threatens in blood safety caused by B19 virus and further investigation on how B19 virus interacts with the host is necessary.

References


