Letter to the Editor

Parvovirus B19 antigen in routine screening of blood donors

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Human parvovirus B19 (B19), an icosahedral, un-enveloped, single-stranded DNA virus (Ø 18-26 nm), is a member of the Erythrovirus genus, first discovered in 1975, in blood donors, by Cossart et al.¹. This virus replicates in active dividing cells such as erythroid precursors. In children B19 is the causal agent of the fifth disease, in adults the infection is usually asymptomatic, while in patients with haemolytic diseases, thalassaemias, enzyme disorders, in conditions of erythroid stress (such as haemorrhage and iron deficiency) or after bone marrow transplantation, it may cause a transient aplastic bone-marrow crisis, failure of erythropoiesis and reticulocytopenia². B19 infection may, of course, become chronic in immunocompromised subjects. B19, which is able to cross the placenta and cause hydrops foetalis, can be also transmitted by the respiratory route and, since it is resistant to viral inactivation procedures, by contaminated blood components and derivate³.

In our opinion screening blood donors to identify B19 antigen and to avoid contaminated transfusion could be useful, particularly for fertile women and immunocompromised or polytransfused individuals. For this reason, in the period between March and May 2003, we used a haemagglutination assay (ID-Parvovirus B19 Antigen-Test, DiaMed Italiana, Vedano al Lambro, MI) to screen for B19 antigen in 2,180 periodic blood donors (1,282 males and 898 females; aged 23 – 49 years) and in 73 polytransfused patients (53 males and 20 females; aged 51 - 73 years). All samples that were positive to the antigen screen were then tested for anti-B19 antibodies (Parvovirus B19 ELISA IgG and IgM, MRL Diagnostic, Cypress, CA, USA) and for the viral genome by polymerase chain reaction (for viral DNA extraction: QIAamp Blood kit, QIAGEN, Milano; for amplification and detection of B19 DNA: Parvovirus B19 DNA, Nuclear Laser Medicine, Settala, MI, with a sensibility of 10³ copies/mL).

No polytransfused individuals were reactive for the B19 antigen, but 18 (12 males and 6 females) out of 2,180 donors (0.82%) were reactive. Six of these 18 donors (33.3%) resulted positive for anti-B19 IgG antibodies, 3 (16.6%) for both IgG and IgM and 1 (5.6%) for only IgM; the others (44.5%) resulted negative for both IgG and IgM. PCR analysis was positive in only 3 of the 18 samples (16.6%) (Table I).

Our results suggest that the haemagglutination test (used for screening) does not have sufficient specificity, because many antigen-positive results were not confirmed by PCR analysis. In particular, screening gave a false positive results in the 6 donors who were negative for all other tests. On the other hand, contemporary positivity for both B19 DNA and antigen allowed us to identify 3 donors with acute B19 infection⁴. Considering all screened donations, the frequency of acute infection was 0.13% (equal to 1:726 donations). Four out of 18 (22.2%) samples were IgM positive, but only one of these was also DNA positive; moreover, of the 3 PCR-positive samples, IgM determination was positive for only one. Only one sample was positive for both IgM and antigen, probably because IgM antibodies appear two weeks after infection and at this stage the blood viral load is just decreasing. All these observations confirm that an IgM search alone is not sufficient to identify viraemic subjects⁵. Two donors showed both IgG and IgM positivity, indicating a phase of seroconversion. The remaining 6 samples were only IgG positive, probably due to a previous viral infection.
The B19 infection is common, in fact more than 50% of adult general population shows IgG antibodies. Although parvovirus infections are usually benign and self-limiting, symptomatic forms may be observed; it is, therefore, important to avoid transmitting the virus to pregnant women, thalassaemias, haemophiliacs or patients affected by other diseases characterised by a reduction in bone marrow activity. However the frequency of the pathology in the infectious phase in the general population is low, as is the number of patients at risk, therefore an accurate economic evaluation is required before introducing screening of single samples. For these reasons, in order to detect acute infection in blood donors with a high level of viraemia, a B19 antigen test could be proposed for rapid, easy and inexpensive routine screening, supported by PCR analysis on positive units to confirm the presence of B19 DNA. Alternatively, a real time PCR technique could be considered as the only screening test given that this is cheaper and more efficient than traditional PCR and has lower risks of contamination and false positive results.

References