Abstract

Blood components collected from a large population inevitably carry certain incipient or silent infections that may transmit to the recipients by transfusion. For reducing the transfusion-transmitted viral infections, currently, screening serological assays, such as enzyme immunoassay (EIA), have been the standard procedure. It effectively decreases the viral infections to around 0.2 per 100,000 transfused blood units for HIV, 1.0 per 100,000 transfused blood units for HCV and 1.6 per 100,000 transfused blood units for HBV. These cases are probably infected by blood from donors in the seronegative window periods of viral infections. So the pursuit for better blood transfusion safety continues. To reduce the transfusion-transmitted viral infections further, more sensitive test by nucleic acid amplification test (NAT) to directly detect viral genomes are advocated and even implemented in USA, Canada and Japan. This represents an important advance in blood safety control.

The screening program for HBV infection among blood donors differs between developed countries and developing countries that are endemic for hepatitis B infections. In developed countries, blood donors are screened for both hepatitis B surface antigens and also antibodies against hepatitis B core antigen (anti-HBc). People positive for either one are disqualified on the basis of evidence of ongoing or past infections. Such practice is feasible in developed countries in which hepatitis B infection rate is low (less than 3%). It also eliminates most of blood-transmitted hepatitis B. In contrast, in developing countries where hepatitis B is endemic, about 80-90% of adults have either past or ongoing hepatitis B infections. Such strict criteria will reject most of the volunteer blood donors and are impossible to implement. Therefore in such areas (including Taiwan), blood donors are screened only for evidence of ongoing infections by hepatitis B surface antigen and elevated ALT, but not for past infections (by anti-HBc). This protocol has been carried out for more than 20 years in Taiwan and really reduced the transfusion-transmitted hepatitis B to a lower level. However, with the advent of new viral detection technology, especially the NAT, around 10-30 % of people with past hepatitis B infection seronegative for HBsAg actually harbored viral DNA in their blood or blood cells. Even in people positive for anti-HBs and anti-HBc, a conventional criteria for full-recovery from past hepatitis B infections, there are still 5-15% reported positive for HBV DNA by NAT, though at a very low titer. These observations call for re-evaluation of the current protocol to screen blood donors in Taiwan. It is imperative to know among blood donors qualified by current hepatitis B screening protocol, the

prevalence of seropositive for HBV DNA. More important, what the consequences of transfusion of those HBV-DNA positive blood into recipients? This is a very unique setting to understand the infectivity of blood containing a low titer HBV DNA by transfusion. In addition, Since the launch of mass vaccination program to prevent HBV infection in Taiwan since 1984, the HBsAg carriage rate decreases dramatically. Nevertheless, the serum anti-HBs titer may drop significantly decade after the vaccination. It is also interestingly to know the outcome of exposing to foreign HBV in those vaccinated adolescent with low titer anti-HBs.

To study the prevalence of post-transfusion acute HBV infection in anti-HBc-seronegative recipients, we prospectively screened 8328 blood component recipients and collected 598 anti-HBc-negative recipients in this 2-year project. The overall eligibility rate was 7.2%. The hepatitis B viremic rate by real-time PCR before transfusion was 1.8% (11/598). Of the remaining 587 anti-HBc-negative and pre-transfusion non-viremic recipients, 340 recipients received 1-week post-transfusion follow-up and 203 patients completed the 3~6-month post-transfusion follow-up. By real-time PCR, the transient hepatitis B viremic rate 1 week post-transfusion was 1.5% (5/340). None of the 5 recipients with transient viremia had developed abnormal serum ALT level during the 6-month follow-up period and none had detectable viremia at the 6th month follow-up. The serial serum hepatitis markers including HBsAg, anti-HBs, and anti-HBc will be examined soon in these recipients with pre- or post-transfusion hepatitis B viremia, to differentiate among simple transient viremia (or aborted infection), subclinical recovered HBV infection, and low-titered HBV carrier. To evaluate the outcome of exposing to low titer HBV DNA in the children or adolescents with low titer anti-HBs, we also collected 73 children and adolescents seronegative for anti-HBc in this project. Pre-transfusion hepatitis B viremic rate was 1.4% (1/73). Of the remaining 53 anti-HBc-negative and pre-transfusion non-viremic recipients, 53 recipients received 1-week post-transfusion follow-up and 44 patients completed the 3~6-month post-transfusion follow-up. By real-time PCR, the transient hepatitis B viremic rate 1 week post-transfusion was 7.5% (4/53). Again, none of the 4 recipients with transient viremia had developed abnormal serum ALT level during the 6-month follow-up period and none had detectable viremia at the 6th month follow-up. The pre-transfusion serum anti-HBs titer will be determined soon to clarify the impact of serum anti-HBs titer on the exposure to low-titered HBV.

Preliminarily, we found that about 2% of anti-HBc-negative blood

recipients were actually hepatitis B viremic. Most importantly, about 1.5% of those recipients can develop hepatitis B viremia after transfusion. The exposure incidence is much hither than that in the United States or the Europe (1/50,000 ~1/100,000). This information will help deciding whether current practice programs are to be revised.

Keywords：HBV DNA；transfusion；incidence