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Original article

Molecular analysis of Malaysian Chinese D- donors: a single centre experience

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Background: The Rh blood group system is highly polymorphic and next to the ABO system is the most clinically significant in transfusion medicine. The frequency of D- phenotypes and the underlying molecular genetics vary widely in different populations.
Objectives: We determined the prevalence of different D- phenotypes among Malaysian blood donors in a tertiary medical centre and identified the molecular basis of Chinese D- donors in this population.
Materials and methods: A total of 146 D- Chinese donors with various Rh phenotypes were identified from review of blood donor records between January 2003 and September 2008. Fresh blood samples from 36 of these donors were obtained and further characterized by PCR-SSP to determine the molecular basis of these D- individuals.
Results: A total of 86,620 blood donor records were reviewed. Of these 911 were D-, consisting of 483 Indians, 189 Malays and 146 Chinese. The ccee phenotype was the most common among D- individuals with a prevalence of 91.51% (442/483) in Indians, 74.60% (141/189) in Malays and 55.48% (81/146) in Chinese. D- phenotypes with C and/or E antigens were most common in Chinese {44.52% (65/146)}.In the molecular analysis of the 36 D- Chinese donor samples, 19 samples with ccee phenotype and 5/17 of samples with Ccee phenotype showed no detectable *RHD* gene. The remaining 12/17 Ccee samples had intact *RHD* genes with *RHD* (K409K) mutation.***Conclusion:*** In our donor population, we found a wide variation in the incidence of D- as well as the distribution of various D- phenotypes among the three major ethnic groups. A significant number of D- Chinese donors with Ccee phenotype were found to be DEL with *RHD* (K409K) mutation. DEL red cells are known to cause anti-D alloimmunization. Therefore, in clinical practice, it is important to exclude DEL RBCs from D- donor pools.

Keywords: Chinese D- donors, DEL variant, Malaysian blood donors, molecular genotyping, RhD-negative phenotypes

The Rh blood group is the most complex and polymorphic of all human blood group systems, consisting of at least 46 different antigens. Next to the ABO blood group system, it is the most clinically significant in transfusion medicine [1, 2]. The D antigen is a potent immunogen and is responsible for most of the clinical problems, such as haemolytic transfusion reactions (HTR) and haemolytic disease of the foetus and newborn (HDFN). The Rh antigens are encoded by two genes on the short arm of chromosome 1: the *RHD* and *RHCE* genes**.** *RHD* encodes the RhD protein which carries the D antigen whereas *RHCE* encodes RhCE protein which carries the CE antigens in various combinations (ce, Ce, cE, or CE) [3-6]. These two genes are highly homologous, having 10 exons each. However, the encoded proteins differ by 32 to 35 amino acids [7]. This degree of difference explains why exposure to D antigen can result in a potent immune response in D-individuals [7].

Wide racial differences are recognized not only in the frequency of RhD-negative (D-) phenotypes but also in the molecular basis of D- phenotypes [8]. The frequent cause of D- in Europeans is the deletion of the entire *RHD* gene [9] whereas D- phenotypes in Africans and Asians are caused by silent or inactive *RHD* genes due to the presence of various *RHD* alleles [7].

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