Researchers develop novel molecular blood group typing technique

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Scientists in France have designed a new system for molecular blood group typing that offers blood banks the possibility of extensive screening of blood donors at a relatively low cost. Their approach is described in the current issue of *The Journal of Molecular Diagnostics*.

Although blood transfusion is generally safe, alloimmunization (when an antibody is formed in response to an antigen that is not present on a person's own red blood cells [RBCs]) remains a dreaded complication, particularly in patients with sickle cell diseases.

"This may cause problems, ranging from delayed hemolytic transfusion reaction to difficulty in obtaining matched RBCs. Where patients have alloantibodies, producing a sufficient quantity of extensively typed blood units will never be feasible using conventional serologic donor screening methods," explains lead investigator Jean-Charles Brès, PhD, of the Etablissement Français du Sang Pyrénées Méditerranée, Montpellier.

The standard technique, conventional hemagglutination, is a lengthy procedure and involves only a limited range of antigen testing. In this antibody-based agglutination, RBCs suspended in liquid collect into clumps when bound by the antigen-specific antibody. Dr. Brès adds, "In the French Blood Service, the Etablissement Français du Sang (EFS), blood donation qualification laboratories test all blood donations for A, B, O, Rhesus (RH1), and KEL (KEL1) blood groups, but only 5% to 10% of donations are tested for other clinically significant antigens."

The investigators therefore developed a new flexible DNA microarray platform for molecular blood group typing. This includes two robotic workstations that allow processing from blood sample to the genotype. A pilot study shows promising results for responding to blood donor laboratories' requirements for simple, low-cost screening.

For small batch production, the cost of genotyping, including genomic DNA extraction, labor, and equipment, was less than $2.60 per single-nucleotide polymorphism (SNP) for a multiplex set of eight SNPs – four times lower than the per-antigen cost using serologic methods.

"High-throughput DNA typing could facilitate support for patients undergoing long-term transfusion who are at high risk of alloantibody production, such as patients with sickle cell disease, thalassemia, or autoimmune hemolytic anemia. Another application would be donor identification to obtain rare blood units for specific patients and improve the ability to supply rare blood types," says Dr. Brès. "The availability of high throughput DNA-based blood group genotyping would be a great boon for transfusion medicine." He continues, "In addition to providing more fully antigen-matched RBCs and allowing better identification of rare donor blood types, this technology will reduce adverse reactions and decrease the relative cost of analysis."

More information: "Flexible automated platform for blood group genotyping on DNA microarrays," by Sandra Paris; Dominique Rigal; Valérie Barlet; Martine Verdier; Nicole Coudurier; Pascal Bailly; and Jean-Charles Brès, dx.doi.org/10.1016/j.jmoldx.2014.02.001. The *Journal of Molecular Diagnostics*, Volume 16, Issue 3 (May 2014)

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