In the May 2005 issue of Transfusion, Professor David Anstee published an editorial entitled “Goodbye to agglutination and all that” in which he discussed the apparent revolution of genotype testing that was taking place in blood centers across the Western world[1]. In that issue of Transfusion, four different research groups published results of genotyping analysis, three of which were predominantly for blood group allele prediction [2-4], and a fourth that was for platelet antigen prediction. All four papers described different platforms, of which three subsequently have been developed commercially. Beiboer et al.[3] described an in-house-developed oligonucleotide microarray-based technique that was in large part developed commercially by the EU-funded BloodGen Consortium. Development has not stood still and techniques such as MALDI-TOF, [5], nanofluidics [6], etc. are being applied to the field of blood group genotyping while real-time PCR analysis performed on free fetal DNA isolated from maternal plasma has become the gold standard for fetal phenotype prediction, at least in Europe [7].

Despite the promise of medium and high-throughput techniques, adoption has been relatively slow both in North America and in Europe, most likely based on perceived increase in healthcare costs, although it remains to be seen if they are any higher than current strategies for matching blood for patients. Also, in the USA, there is apparent reluctance of the FDA to approve any of the currently available platforms until it has a clear regulatory pathway; although expressed interest in the form of a sponsored forum.[8] Two platforms are CE-marked in Europe: that is, they meet the requirements of the In Vitro Diagnostics Directive (IVDD) standards for testing. These are i) BloodChip (Progenika BioPharma SA), which received its CE mark in two phases: for blood group alleles other than ABO and RHD in 2008 and for RHD in 2009; and BioArray (BioArray Systems, Immucor Inc.), which received its CE mark in 2010.

In North America and Brazil, blood group genotype platforms are used primarily for phenotype prediction in blood centers with the driving force being the provision of matched blood for multiply-transfused (and heavily immunized) patient groups, particularly sickle cell disease patients [9, 10] or the chronically transfused. This is a great motivator and the health costs/savings can be relatively easily justified. Identification of rare antigen-negative blood donors has also been a side benefit although there are platforms that target identification of such donors [11].

It has been somewhat harder to introduce genotyping platforms into more widespread use in Europe despite innovation that has stemmed from the continent [12]. However, more widespread is the use of genotyping analysis for the prediction of fetal RhD status, which has been introduced into many laboratories [13], initially for fetal RhD determination in mothers who were already sensitised. However, more recently screening protocols have been introduced in several countries of all RhD-negative pregnant women to determine fetal RhD type, with the premise of reducing unnecessary RhIg prophylaxis[14, 15].

While the end of agglutination may not be in sight, the future of genotyping within the realms of Transfusion Medicine seems firmly rooted now and we can expect that it will become routine practice.
References

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