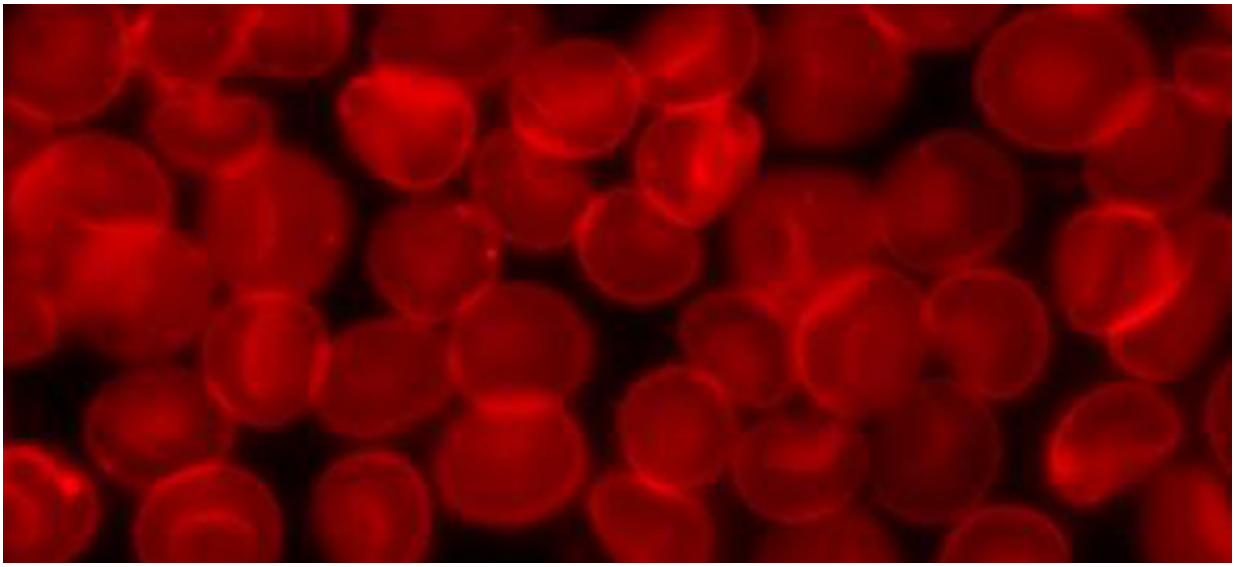
How 1000 new genetic variants were discovered in blood groups

January 26 2017



Credit: Wikimedia Commons

1000 new mutations in the blood group genes—that is what physician and former programmer Mattias Möller found in his research study in which he developed new software and investigated blood group genes in 2,504 people. This discovery from Lund University in Sweden was published recently in the journal *Blood Advances*.

Genomes from 2504 people

The international project 1000 Genomes is so far the world's largest mapping of human genetic variants. By creating a new computer program, Mattias Möller processed the genomes of 2504 people. He imported these genomes to his newly developed database Erythrogene, and matched them against previously known genetic variants. The result was the discovery of 1000 hitherto unknown mutations that could have a negative effect in the case of blood transfusions, for example.

"Never before has there been a worldwide mapping of blood group genes in healthy individuals. Most previously known blood group variants were discovered when a blood transfusion failed, i.e. when it didn't work between the donor and the recipient. I started from the genes instead, to find variations in DNA which might give rise to a new antigen, likely to cause problems in case of transfusion, for example," explains Mattias Möller, doctoral student at the Department of Laboratory Medicine.

Mismatch can lead to death

On the surface of the red blood cells are proteins and sugar molecules, in which small differences give rise to different antigens. The ability to identify and match blood group types is important for blood transfusions, but also in pregnancy and before certain types of transplantion. A transfusion with mismatched blood can lead to a transfusion reaction. This type of reaction can be mild and barely noticeable, or so strong that the blood cells rupture and, in the worst cases, the patient dies.

Mattias Möller's study showed that 89 per cent of the genetic variants were previously known, but among the remaining 11 per cent were a total of 1 000 different mutations which were absent from official catalogues of known blood group variants.

"Of course not all variants lead to new antigens. But we need to go on

and conduct further analyses to investigate how the genetic expression changes, i.e. how the molecules on the surface of the cell are affected."

Undiscovered antigens in Africa

There are currently 352 mapped antigens, but the research has so far mainly focused on populations in Europe and North America. A future research field is Africa, where there is greater variation between different population groups. As research on African populations increases, in combination with blood transfusions becoming more common there, many new antigens are likely to be discovered.

"The new online database enables researchers to study a specific blood group and see where in the world it occurs. It has been incredibly exciting to combine my knowledge as a programmer and researcher to design this database in a format which is easy to use in transfusion medicine. Now researchers can dig deeper into the results, and it is also easy to extend the database with other genes responsible for human disease or data from new major genetic mapping projects," concludes Mattias Möller.

More information: M. Mo ller et al. Erythrogene: a database for in-depth analysis of the extensive variation in 36 blood group systems in the 1000 Genomes Project, *Blood Advances* (2016). DOI: 10.1182/bloodadvances.2016001867

Provided by Lund University