A review of samples referred to the Diagnostic Laboratory at the National Blood Centre Irish Blood Transfusion Service for ABO anomaly investigation.

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Background

ABO antigens are carbohydrate antigens. ABO blood groups are determined by the terminal sugar attached to the "H" antigen as depicted in Figure 1.

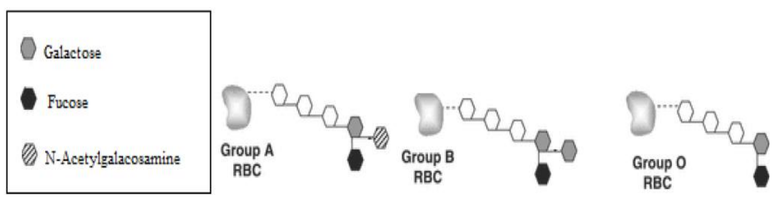


Figure 1: The difference of the terminal sugars of the ABO blood group system.

ABO groups can be further divided into subgroups. The two principal subgroups of A are A_1 and A_2 - based on quantitative and qualitative differences. Subgroups of group A are more commonly encountered than subgroups of group B.

Amongst Caucasians, ~80% of group A individuals are of the A_1 subgroup which has approximately fivefold more A antigen sites per RBC than A_2. The A_2 subgroup is the result of a deletion, causing extension of the reading frame and decreases the activity of the A_2-related glycosyltransferase (Yamamoto *et al.,* 1992).

Other A subgroups are associated with weaker expression of the A antigen and are classified by the degree of red cell agglutination with anti-A, anti-A_1, anti-A,B and anti-H, the presence or absence of anti-A_1 and whether A or H blood group substance is present in the saliva of the patient (Storry & Olsson 2009).

In 2016, it was observed that there had been an increase in the number of samples being referred for ABO anomaly investigation and a review was undertaken.

Aim

To determine the range of subgroups identified during this time and investigate the reason for the rise in referrals.

An example of mixed field agglutination reaction observed with anti-A.

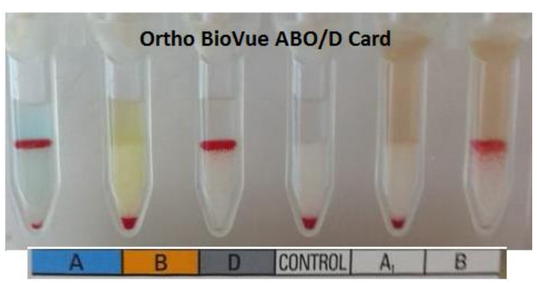


Figure 2: Reaction observed on the Ortho AutoVue Innova.

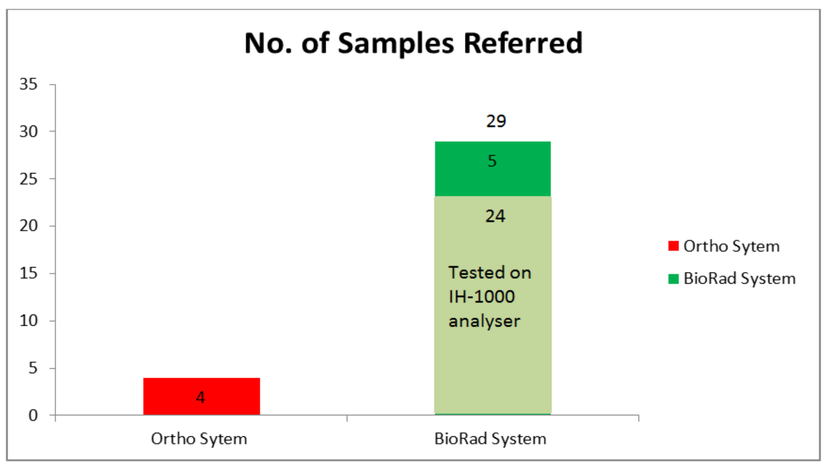
Materials & Methods

Trend analysis was performed using eTraceline, the Laboratory IT system used in the Diagnostic Laboratory.

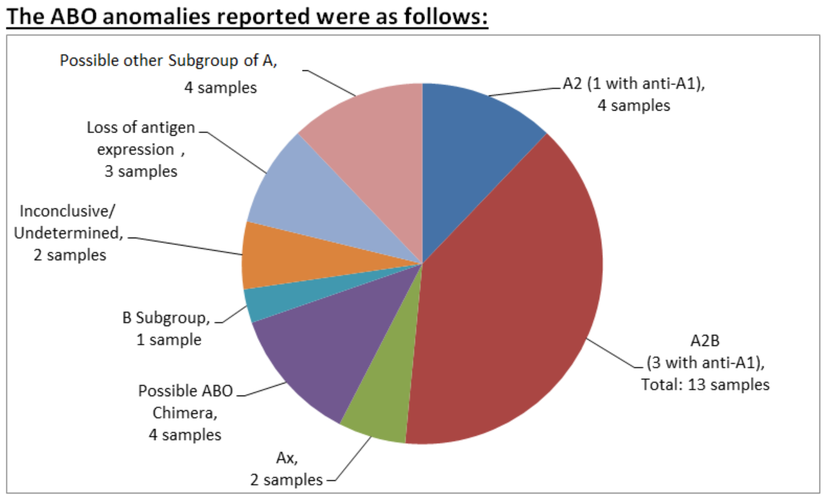
All samples referred for investigation of ABO group were initially tested on Ortho AutoVue Innova analyser. Further investigation was performed using tube technique and with BioRad gel cards. In some situations, the patient's red cells were typed with anti-A_1 (Dolichos biflous) lectin and comparative titres using doubling dilutions of reagent anti-A,B were performed in order to classify the subgroup.

Results

33 samples were referred for ABO anomaly investigation from January 2014 – April 2016. Hospitals were asked which grouping automate was in use. There was a 280% increase in the number of samples received for ABO investigation from 2014 (n=5) to 2015 (n=19).



Of the samples referred, 29 were previously tested on the BioRad system. Of these 29 samples, 24 (72%) were tested on the IH-1000. The remaining 4 samples were tested on the Ortho system. Those tested on the Ortho platform were identified as an A_2B, an inconclusive A subtype, possible A_1/A_2 chimera, and loss of A antigen expression.



A summary of the different types of ABO anomalies detected from January 2014 – April 2016 are illustrated in the pie chart below.

Discussion

In serology mixed field or dual population agglutination suggests the presence of two populations of red cells. This can happen for a number of reasons including :

- Recent transfusion
- Bone marrow transplant
- Feto-maternal blood leak
- Subgroup
- Chimerism

Other causes of mixed field reactivity should be excluded prior to investigation of an ABO subgroup.

Loss or weakened expression of A, B, or H antigens from the surface of red blood cells is a observed in patients with hematologic malignancy.

With regards the recent rise in referrals, the automate manufacturers (BioRad and Ortho) were contacted to investigate whether there had been any change to the reagents or automate. Both manufacturers stated that there was no change to the anti-A clone used in their products.

However BioRad added '*It is possible that the increased number of referrals has more to do with the sensitivity of the camera on the newer instruments*'.

This may explain the rise in samples referred as the BioRad IH-1000 was introduced in a number of hospitals from 2013 onwards and the majority of samples referred 72% (n=24) were initially analysed on this system.

Conclusions

Users should be aware of the sensitivity of the camera on the BioRad IH-1000 analyser.

References

- Storry, J.R. & Olsson, M L, 2009. The ABO blood group system revisited: a review and update. *Immunohematology/ American Red Cross*, 25(2), pp.48-59.
- Yamamoto, F., McNeill, P.D. & Hakomori, S., 1992. Human histo-blood group A2 transferase coded by A2 allele, one of the A subtypes, is characterized by a single base deletion in the coding sequence, which results in an additional domain at the carboxyl terminal. *Biochemical and biophysical research communications*, 187(1), pp.366-74.

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