TRANSFUSION IN A RARE CASE OF PARA-BOMBAY PHENOTYPE

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Background

Individuals with Bombay phenotype (H-deficient, non-secretor) are characterized by the absence of ABH blood group antigens both on the surface of red blood cells (RBCs) and in secretions resulting from silenced mutations in *FUT1* (*h*/*h*) and *FUT2* (*se*/*se*) genes, respectively. In contrast, para-Bombay phenotype retains some H antigen on RBCs either induced from a weakly active (*H+weak*/*H+weak;* H-partially deficient, non-secretor) or completely silenced *FUT1* gene (*h*/*h;* H-deficient, secretor*).* The latter is mandatory linked with an active *FUT2* gene (*Se*/*Se* or *Se*/*se*) enabling synthesis of ABH-antigens in secretions which may be adsorbed from the plasma onto RBCs surface (1, 2). The anti-H in para-Bombay individuals is usually weak and often does not react above room temperature.

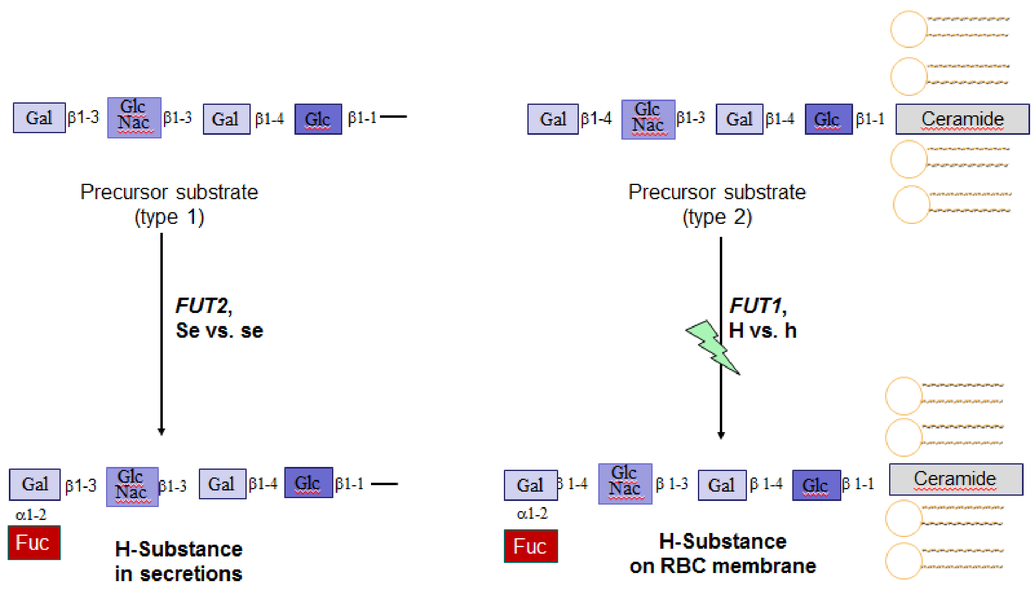

Figure 1: Origins for Bombay and para-Bombay phenotypes - Genes and Biochemistry.

Aims

A 61 year old Thai female with metastatic pancreatic cancer was hospitalized due to clinical deterioration with radiologically confirmed progression under palliative chemotherapy. A blood sample was referred to our laboratory for ABO grouping. Here we describe the serological and genetic work-up which revealed AB para-Bombay phenotype and subsequent patient transfusion management.

Methods

Standard serologic techniques were used to detect ABH and Lewis (Le) antigens on RBCs (BioRad, Cressier, Switzerland; Biotest AG, Rupperswil, Switzerland). In addition, a very potent anti-A/B serum (Medion Grifols Diagnostics, Duedingen, Switzerland) was used to reveal traces of A and B antigens. Compatibility testing was performed using the indirect antiglobulin test (IAGT) at 37^{0}C. Molecular ABO type was defined using a commercially available test kit (inno-train GmbH, Kronberg i.T., Germany). Sequencing was performed for coding exons of *FUT1, FUT2* and *FUT3* genes.

Results

The routine anti-A, -B and -A/B failed to detect the respective antigens and, most notably, no H-antigen was traceable. The RBCs showed only weak agglutination with the potent anti-A/B serum (Grifols). Only anti-H, but no anti-A or anti-B, was identified in the serum. Initial ABO genotyping by sequence-specific priming (PCR-SSP) resulted in AB genotype. In order to confirm serological H-deficient phenotype a more detailed analysis was performed including sequencing of *FUT1* and *FUT2* which revealed an active secretor status (*Se*/*Se*) but homozygosity for the *FUT1*01W.09* allele (c.658C>T, p.Arg220Cys). Latter is common in Taiwanese population and allows only weak expression of ABH-antigen on RBCs (3), consistent with our observations. In the interests of completeness serological Le(a-b-) phenotype was confirmed by *FUT3* sequencing (*FUT3*le(59G)* I *FUT3*le(59G, 508A)).*

	Haemagglutination									Genotype		
	Anti-A*	Anti-B*	Anti-AB*	Anti-AB**	Anti-H	Anti-hel	Anti-Lea	Anti-Leb	Anti-H in serum	*ABO*	*FUT1*	*FUT2*
Thai patient	-	-	-	(+)	-		-	-	+	*AB*	*FUT1*01W.09* I *FUT1*01W.09*	*FUT2*Se (357T)* I *FUT2*Se(357T)*

* BioRad, Cressier, Switzerland, ** Medion Grifols Diagnostics, Duedingen, Switzerland

Table 1: Serological and molecular results of the para-Bombay patient.

Summary

In summary, our serological tests were in line with the characteristics of para-Bombay phenotype and confirmed by identification of the homozygous weakening mutation c.658C>T in the *FUT1* gene. However, if low level of ABH-antigens on erythrocytes is determined by partially active *FUT1* or normal secretor status is a matter of debate. Shortly after final diagnostics our patient developed acute gastrointestinal bleeding, requiring transfusion (Hb 53 g/l), fluid resuscitation and anticoagulation cessation. As we have no access to Bombay or para-Bombay blood in an emergency situation one A1B whole blood unit with negative cross-match was transfused uneventfully and short-term stabilization was achieved. Due to the malignant primary disease her general condition further deteriorated and she died shortly thereafter under end-of-life care. In conclusion, we support the option to transfuse para-Bombay individuals with normal ABO blood group units, compatible by IAGT, when Bombay or para-Bombay blood is not available (4).

References

(1) Storry *et al*., 2006
(2) Luo *et al*., 2013
(3) Yu *et al*.,1997
(4) Lin-Chu *et al*., 1990

This abstract was also presented at the 27th Regional Congress of the ISBT, June 17 – 21, 2017, Copenhagen, Denmark