TRANSFUSION IN A RARE CASE OF PARA-BOMBAY PHENOTYPE

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Background

Individuals with Bombay phenotype 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)* or completely silenced *FUT1* gene (*h*/*h).* 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.

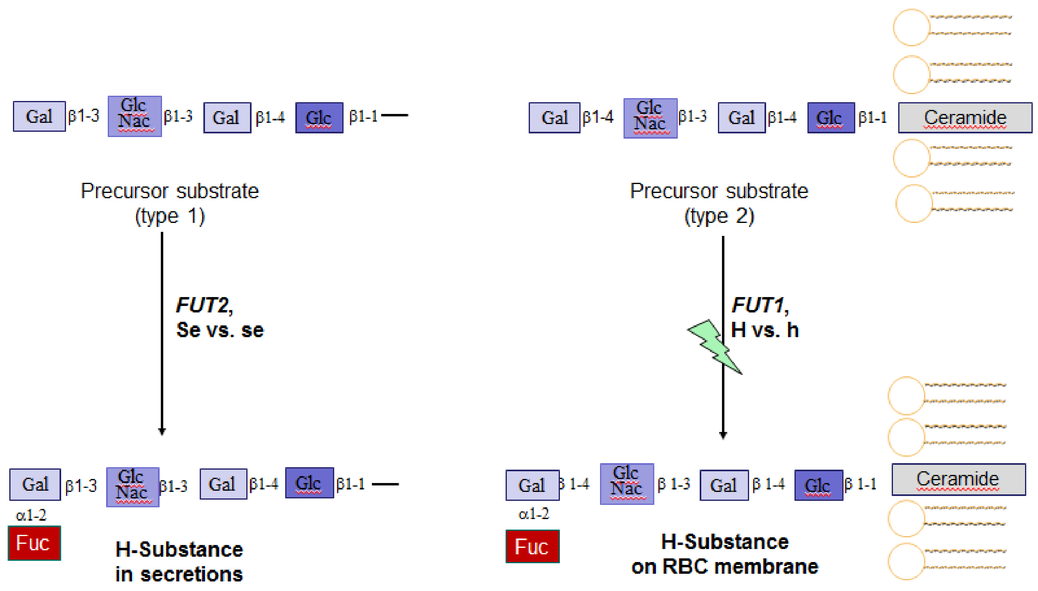

Figure 1: Origins for Bombay and para-Bombay phenotypes - Genes and Biochemistry.

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 AB0 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 37ºC. 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 A_1B 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