Table 1 Blood group-active proteins – abundance and function where known

Blood group system	Protein product(s)	Function	Blood group (null) phenotype	Functional lesion in null phenotype red cells	Abundance ($\times 10^3$/cell)
DI	Band 3	Anion transport	Band 3 Coimbra	Hereditary spherocytosis	1000
MNS	Glycophorin A	Facilitates membrane assembly of Band 3	MkMk	No lesion	1000
	Glycophorin B				250
RH	D polypeptide	Facilitates Band 3/RhAG complex assembly	Rhnull	Hereditary stomatocytosis	100–200
	CE polypeptide				
RHAG	RhAG (Rh associated glycoprotein)	Neutral Gas transport	Rhnull	Hereditary stomatocytosis	100–200
GE	Glycophorin C	Maintains red cell shape through interaction with protein 4.1	Leach phenotype (Ge-)	Hereditary elliptocytosis	200
	Glycophorin D				
CO	Aquaporin 1	Water/CO_2 transport	Co(a-b-)	Impaired water transport	200
FY	Duffy glycoprotein (DARC)	Chemokine receptor for proinflammatory cytokines	Fy(a-b-)	Absence of chemokine binding	10–12
KEL	Kell Glycoprotein	Zinc endopeptidase	KO	No lesion	4–18
JK	Urea transporter (UT-B)	Urea transporter	Jk(a-b-)	Reduced urea transport	10–13
CROM	Decay accelerating factor (CD55)	C3 convertase inhibitor	Inab phenotype	No lesion	10–20
LU	Lutheran glycoprotein	Ligand for Laminin 511/512	Lu(a-b-)	No lesion	1·5–8
LW	LW glycoprotein (ICAM-4)	Ligand for integrins	LW(a-b-)	No lesion	3–5
XK	Kx glycoprotein	Amino acid transport?	McLeod phenotype	Acanthocytosis	n.k.
DO	ADP-ribosyltransferase	Ectoenzyme	Do(a-b-)	No lesion	n.k.
RAPH (MER2)	Tetraspanin (CD151)	Facilitates assembly of laminin binding integrin complex	MER2−	No lesion	n.k.
SC	Erythrocyte membrane-associated protein (ERMAP)		Sc:-3	No lesion	n.k.
IN	CD44	Adhesion molecule binds hyaluronic acid	n.k.	n.k.	5–10
XG	Xg^a glycoprotein		n.k.	n.k.	0·1–9
KN	CR1 (CD35)	Binds immune complexes	n.k.	n.k.	< 1
OK	EMMPRIN (CD147)	Adhesion molecule regulates matrix Metalloprotease production	n.k.	n.k.	n.k.
YT	Acetylcholinesterase	Ectoenzyme	n.k.	n.k.	3–10
JMH	Semaphorin 7A	Adhesion molecule involved in cell migration	n.k.	n.k.	n.k.
GIL	Aquaporin 3	Glycerol transporter	Gil negative	n.k.	n.k.

Compiled from references 4,8,9,13,14,32,71.
n.k., not known.

4 Anstee DJ: The nature and abundance of human red cell surface glycoproteins. J Immunogenet 1990; 17:219–225

8 Endeward V, Musa-Aziz R, Cooper GJ, et al.: Evidence that aquaporin 1 is a major pathway for CO2 transport across the human erythrocyte membrane. FASEB J 2006; 20:1974–1981

9 Burton NM, Anstee DJ: Structure, function and significance of Rh proteins in red cells. Curr Opin Hematol 2008; 15:625–630

13 Anstee DJ, Cartron JP: Toward an understanding of the red cell surface; in Garratty G (ed): Applications of Molecular Biology to Blood Transfusion Medicine. Bethesda, MD, USA, American Association of Blood Banks, 1997: 17–49

14 Klein HG, Anstee DJ: Mollison's Blood Transfusion in Clinical Medicine, 11th edn. Oxford, Blackwell Science, 2005

32 Bruce LJ: Red cell membrane transport abnormalities. Curr Opin Hematol 2008; 15:184–190

71 Gardner B, Anstee DJ, Mawby WJ, et al.: The abundance and organization of polypeptides associated with antigens of the Rh blood group system. Transfus Med 1991; 1:77–85