International Society of Blood Transfusion Committee on Terminology for Red Cell Surface Antigens: Cape Town report

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**Introduction**

The Committee met in Cape Town during the 2006 International Society of Blood Transfusion (ISBT) Congress (see Appendix 1 for Committee members). Some changes to the classification documented in Blood Group Terminology 2004 [1] were agreed and are described below. The full updated classification can be found on the Blood Group Terminology website at http://www.blood.co.uk/ibgrl. New antigens were added to the MNS, Kell, Scianna, Cromer, Indian, Knops, and JMH systems (Table 1). In line with convention, amino acid positions are numbered with the translation-initiating methionine as 1, although the more traditional numbering for glycophorin A, with number 1 representing the first amino acid of the mature protein, is also provided.

**MNS system**

Three new antigens were added to the MNS system: two of high incidence and one of low incidence. MNS44 is defined by an antibody produced by an individual with MNS:−44 red cells, which also express MNS32 (DANE) [2]. The rare MNS:−44
phenotype results from heterozygosity for M\(^6\) and for a novel GYP(A-B-A) hybrid gene, which is identical to that encoding GP.Dane apart from lacking the substitution predicted to convert I65 (I46 when amino acid 1 is the first residue of the mature protein) of glycoporphin A (GPA) to N64 (N45) in GP.Dane [2,3].

MNS45, defined by an antibody from a patient with the rare MNS-45 phenotype, results from homozygosity for a single nucleotide polymorphism (SNP) encoding V81G (V62G) in GPA [4].

Expression of the rare MNS46 antigen results from heterozygosity for an SNP in GPA encoding a T36R (T17R) substitution in GPA [5]. Anti-MNS46 was found in 0·02% of Japanese blood donors [5].

Kell system

Two antigens of high incidence and one of low incidence were added to the Kell system. KEL29 and KEL30 are defined by antibodies produced by individuals with the rare KEL-29 and KEL-30 phenotypes, which resulted from homozygosity for SNPs in KEL encoding R623K and D305N, respectively [6]. KEL31 expression results from heterozygosity for a KEL SNP encoding R292G [7]. The only example of anti-KEL31 was found in a Japanese blood donor [7].

Scianna system

SC5 (STAR), described in the 2004 report [1], has now been published in full [8]. The two new antigens of the Scianna system, SC6 and SC7, are of high incidence. SC-6 and SC-7 phenotypes result from SNPs in ERMAP, encoding R81Q and G35S substitutions in ERMAP, respectively [9]. Anti-SC6 and -SC7 were previously reported as antibodies to high incidence antigens that were absent from SC-1, -2, -3 red cells [10].

Cromer system

Two new antigens of high incidence were added: CROM14 and CROM15. CROM-14 arose from homozygosity for an SNP in CD55 encoding E156K in the second complement control protein (CCP) domain of CD55 and CROM-15 from homozygosity for an SNP encoding Q247R in the fourth CCP domain of CD55 [11,12]. Antibodies to both antigens were present in the sera of the propositi, whose red cells lacked the corresponding antigens.

Indian system

Two new antigens of the Indian system, IN3 and IN4, are of high incidence. IN-3 and IN-4 phenotypes result from homozygosity for SNPs in CD44 encoding H85Q and T163R in CD44, respectively [13]. Anti-IN3 and -IN4 have been produced by three and two individuals, respectively, whose red cells lack the corresponding antigen.

Knops system

KN9 was identified by several antibodies, originally identified incorrectly as anti-KN3 (McC\(^2\)). KN9, which has an incidence of about 98% in Caucasians and 20% in West Africans, results from an SNP in exon 29 of CR1 encoding I1615 in place of V1615 in CD35 [14].

JMH system

Four new antigens were added to the JMH system, each defined by alloantibodies to high incidence antigens that do not react with JMH-1 red cells. Absence of these antigens is associated with homozygosity for SNPs in CD44 encoding H85Q and T163R in CD44, respectively [13]. Anti-IN3 and -IN4 have been produced by three and two individuals, respectively, whose red cells lack the corresponding antigen.

Gene terminology

A few changes were made affecting recommended terminology for blood group genes. The commonly used symbols FY\(^*\)A, FY\(^*\)B, JK\(^*\)A, etc. are acceptable alternatives to FY\(^1\), FY\(^2\), JK\(^1\), etc. In the Rh system, the recommended DCE terminology for alleles of RHCE is RHCE\(^*\)Cc, RHCE\(^*\)Ce, RHCE\(^*\)CE, etc., and for variants of RHDA is RHDA\(^*\)DVI, RHDA\(^*\)DFR, etc.
Additional information on blood group genes and proteins

The Human Genome Organization (HUGO) Gene Nomenclature Committee (HGNC) (http://www.gene.ucl.ac.uk/nomenclature/index.html) approves names and symbols for human genes. These symbols are based, where possible, on the functions of the products of the genes and are listed in Table 1 of the 2004 report [1], although three changes have subsequently been made: FY to DARC; DO to ART4; and DAF to CD55. The HGNC symbol (e.g. DARC) should be used in all circumstances except when referring to serologically defined alleles or molecularly defined alleles that represent a serologically defined antigen (e.g. FY*1 or FY*A, but not DARC*1 or DARC*A).

The Dombrock glycoprotein, ADP-ribosyltransferase 4 (ART4), is CD297 (http://mpr.nci.nih.gov/PROW).

Future considerations

A new collection containing antigens on GPA that are determined primarily by glycosylation of the protein will be established. These will include Hu, M, T, S, and J. Other matters to be discussed are blood group allele terminology and common or consensus alleles for each blood group gene.

References

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