MN CHO Blood Group Collection

Number of antigens 6

Polymorphic	Hu, M_1, Tm, Can, Sext, Sj

Terminology

ISBT symbol (number)	MN CHO (213)
History	Became a Collection in 2010. The antigens are expressed on GPA with altered NeuNAc or GlcNAc levels, and are associated with M or N antigens (MNS [**002**] system).

Carrier molecules

The N-terminal domain of GPA^M or GPA^N when O-glycans contain altered sialic acid (NeuNAc) or GlcNAc[1].

Disease association

It is possible that GlcNAc-containing O-glycans confer a selective advantage against invasion by *Plasmodium falciparum* merozoites.

Reference

[1] Dahr, W., et al., 1991. Studies on the structures of the Tm, Sj, M_1, Can, Sext and Hu blood group antigens. Biol Chem Hoppe-Seyler 372, 573–584.

Hu Antigen

Terminology

ISBT symbol (number)	MN CHO1 (213001 or 213.1)
Obsolete name	Hunter
History	Reported in 1934, and named after Charles Hunter, the name of the donor of the RBCs used for immunizing rabbits[1].

The Blood Group Antigen (3/e). DOI: http://dx.doi.oxg/10.1016/B978-0-12-415849-8.00042-9

Occurrence

Caucasians	1%
African Americans	7%
West Africans	22%

Molecular basis associated with Hu antigen

Predominantly GPA^N when O-glycans contain sialic acid (NeuNAc) or GlcNAc[2].

Effect of enzymes and chemicals on Hu antigen on intact RBCs

Ficin/Papain	Sensitive
Trypsin	Sensitive
α-chymotrypsin	Resistant

In vitro characteristics of alloanti-Hu

Immunoglobulin class	Antibody only found in rabbit plasma immunized with Hu+ RBCs
Optimal technique	RT

Comments

Shows strong association with Sext.

References

[1] Landsteiner, K., et al., 1934. An agglutination reaction observed with some human bloods, chiefly among negroes. J Immunol 27, 459–472.

[2] Dahr, W., et al., 1991. Studies on the structures of the Tm, Sj, M_1, Can, Sext and Hu blood group antigens. Biol Chem Hoppe-Seyler 372, 573–584.

M_1 Antigen

Terminology

ISBT symbol (number)	MN CHO2 (213002 or 213.2)
History	Reported in 1960, and used to describe a strong reaction with anti-M[1].

Occurrence

Caucasians	0.5%
Blacks	16.5%

Molecular basis associated with M_1 antigen

Predominantly GPA^M when O-glycans contain sialic acid (NeuNAc) or GlcNAc[2].

Effect of enzymes and chemicals on M_1 antigen on intact RBCs

Ficin/Papain	Sensitive
Trypsin	Sensitive
α-chymotrypsin	Resistant

In vitro characteristics of alloanti-M_1

Optimal technique	RT

Comments

Some anti-M react only with M_1+ RBCS; however "anti-M_1" and anti-M are not separable by differential absorption. Most anti-M_1 have been found in the plasma of M– people, but a small number were made by people with M+N+ RBCs.
M_1 is expressed only on M+ RBCs but is not simply an enhanced form of M antigen.

References

[1] Jack, J.A., et al., 1960. M_1, a subdivision of the human blood-group antigen M. Nature 186, 642.
[2] Dahr, W., et al., 1991. Studies on the structures of the Tm, Sj, M_1, Can, Sext and Hu blood group antigens. Biol Chem Hoppe-Seyler 372, 573–584.

Tm Antigen

Terminology

ISBT symbol (number)	MN CHO3 (213003 or 213.3)
Obsolete name	Sheerin
History	Reported in 1965, and named "T" because it was next in sequence to S and s, but because "T" had already been used for polyagglutination, "m" was used to denote the association with MN[1].

Occurrence

Caucasians	25%
Blacks	31%

Molecular basis associated with Tm antigen

Predominantly GPA^N when O-glycans contain sialic acid (NeuNAc) or GlcNAc[1]

Effect of enzymes and chemicals on Tm antigen on intact RBCs

Ficin/Papain	Sensitive
Trypsin	Sensitive
α-chymotrypsin	Resistant

In vitro characteristics of alloanti-Tm

Optimal technique	RT

Comments

Many M+N+ Tm+ samples are also M_1+.
When tested against RBCs that have been treated with neuraminidase, anti-Tm appears to have anti-N specificity.

Reference

[1] Issitt, PD., et al., 1965. Anti-Tm, an antibody defining a new antigenic determinant within the MN blood-group system. Vox Sang 10, 742–743.

Can Antigen

Terminology

ISBT symbol (number)	MN CHO4 (213004 or 213.4)
Obsolete name	Canner
History	Reported in 1979, and named after the first antigen-positive proband[1].

Occurrence

Anti-Can reacted with a higher proportion of RBCs from African Americans (60%) than from Caucasians (27%). 87% of the Can+ RBCs were M+.

Molecular basis associated with Can antigen

Predominantly GPA^M when O-glycans contain sialic acid (NeuNAc) or GlcNAc[2]

Effect of enzymes and chemicals on Can antigen on intact RBCs

Ficin/Papain	Sensitive
Trypsin	Sensitive
α-chymotrypsin	Resistant

In vitro characteristics of alloanti-Can

Optimal technique	RT

References

[1] Judd, W.J., et al., 1979. The Can serum: demonstrating further polymorphism of M and N blood group antigens. Transfusion 19, 7–11.
[2] Dahr, W., et al., 1991. Studies on the structures of the Tm, Sj, M_1, Can, Sext and Hu blood group antigens. Biol Chem Hoppe-Seyler 372, 573–584.

Sext Antigen

Terminology

ISBT symbol (number)	MN CHO5 (213005 or 213.5)
History	Reported in 1974, and named after the antibody producer[1]

Occurrence

Caucasians	Not found
Blacks	24% of N+

Molecular basis associated with Sext antigen

Predominantly GPA^N when O-glycans contain sialic acid (NeuNAc) or GlcNAc[2].

Effect of enzymes and chemicals on Sext antigen on intact RBCs

Ficin/Papain	Sensitive
Trypsin	Sensitive
Sialidase	Sensitive

In vitro characteristics of alloanti-Sext

Optimal technique	RT

Comments

Shows strong association with Hu.

References

[1] Giles, C.M., Howell, P., 1974. An antibody in the serum of an MN patient which reacts with the M1 antigen. Vox Sang 27, 43–51.

[2] Dahr, W., et al., 1991. Studies on the structures of the Tm, Sj, M_1, Can, Sext and Hu blood group antigens. Biol Chem Hoppe-Seyler 372, 573–584.

Sj Antigen

Terminology

ISBT symbol (number)	MN CHO6 (213006 or 213.6)
History	Reported in 1968 when the Sheerin serum (anti-Tm) was shown to have a second antibody, which was named “Sj” after two employees at the New York Blood Center, Stenbar and James, who had strongly reactive RBCs[1].

Occurrence

Caucasians	2%
Blacks	4%

Molecular basis associated with Sj antigen

Predominantly GPA^N when O-glycans contain sialic acid (NeuNAc) or GlcNAc[2].

Effect of enzymes and chemicals on Sj antigen on intact RBCs

Ficin/Papain	Sensitive

In vitro characteristics of alloanti-Sj

Immunoglobulin class	IgM
Optimal technique	RT

References

[1] Issitt, P.D., et al., 1968. Sj, a new antigen in the MN system, and further studies on Tm. Vox Sang 15, 1–14.

[2] Dahr, W., et al., 1991. Studies on the structures of the Tm, Sj, M_1, Can, Sext and Hu blood group antigens. Biol Chem Hoppe-Seyler 372, 573–584.