

The antigen on the erythrocytes

Description

The ABH antigens of red cells are carried by both glycoproteins and glycolipids on a variety of peripheral cores that influence their antigenicity Clausen & Hakomori, 1989 Watkins et al., 1988. It should be noted that there is also a range of internal core structures on O-linked proteins using different terminology ; but these do not directly influence the structure of the ABH antigen Clausen & Hakomori, 1989 Paulson, 1989. The membrane protein Band 3 (highly branched N-linked) and Band 4.5 are the main glycoprotein carriers of ABH determinants and the sialoglycoproteins (glycophorins) also carry some ABH antigens Finne, 1980 Takasaki et al., 1978 Watkins, et al., 1988 Finne et al., 1980 Karhi & Fukuda, 1980 Fukuda & Fukuda, 1981 Anstee, 1990 Fukuda et al., 1984 and recent publications have structurally verified both N- and O-linked ABH antigen on Glycophorin Podbielska et al., 2000 Podbielska et al., 2010 Fredriksson et al., 2010. Although it is claimed that the majority of ABO antigens on red cells are on glycoproteins (approximately 70–80%) Koscielak, 2001 Wilczynska et al., 1980 Schenkel-Brunner, 1980, the relative contribution of glycolipids/glycoproteins is not certain, particularly as it is claimed that macroglycolipids may be major contaminants in many glycoprotein preparations Dejter-Juszynski et al., 1978. Macroglycolipids (or polyglycosylceramides) bearing ABH antigens with an average of 30 sugars and as many as 60 sugars are an important component of the red cell membrane Koscielak, 2001.

Most structural information relating to ABH antigens on red cells comes predominantly from glycolipids with less than 15 sugars as they are relatively structurally less complex than glycoproteins, easier to isolate to homogeneity are usually representative of a single biosynthetic process Clausen et al., 1986 Hakomori et al., 1972 Clausen et al., 1984 Clausen et al., 1985 Koscielak et al., 1976 Yamakawa & Iida, 1953 Koscielak, 1963 Clausen et al., 1986 Miller-Podraza, 2000. All-the-same biosynthesis of glycolipids and glycoproteins have known differences, but whether there are substantial terminal ABO glycosylation differences directly influencing red cell phenotypes is still unresolved. The relative contribution of the various ABO antigen-bearing structures both glycoprotein and glycolipid to the serological phenotypes is largely unknown. Large gaps in our knowledge still exist and only by the extensive study of ABO glycosylation, in particular, membrane-bound glycoproteins (and macro/poly glycolipids), will this be able to be resolved.

The minimum and defining glycan epitope (glycotope) of the A antigen is the trisaccharide GalNAc β 3(Fuc α 2)Gal-R, distinguishable from the B antigen Gal β 3(Fuc α 2)Gal-R only by the terminal saccharide. In other words, the only chemical difference between the immunodominant sugars of blood group A and B is an N-acetyl residue instead of a hydroxyl group (NHCOCH₃ cf OH) on carbon 2 of the terminal sugar. Due to an inactive enzyme, blood group O do not have either a terminal galactose or N-acetyl galactosamine and thus the difference between blood group A, B and group O is much more structurally significant.

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