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, 1989Watkins 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, 1989Paulson, 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, 1980Takasaki et al., 1978Watkins, et al., 1988Finne et al., 1980Karhi & Fukuda, 1980Fukuda & Fukuda, 1981Anstee, 1990Fukuda et al., 1984 and recent publications have structurally verified both N- and O-linked ABH antigen on Glycophorin Podbielska et al., 2000Podbielska et al., 2010Fredriksson et al., 2010. Although it is claimed that the majority of ABO antigens on red cells are on glycoproteins (approximately 70 – 80%) Koscielak, 2001Wilczynska et al., 1980Schenkel-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., 1986Hakomori et al., 1972Clausen et al., 1984Clausen et al., 1985Koscielak et al., 1976Yamakawa & Iida, 953Koscielak, 1963Clausen et al., 1986Miller-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?3(Fuc?2)Gal-R, distinguishable from the B antigen Gal?3(Fuc?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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