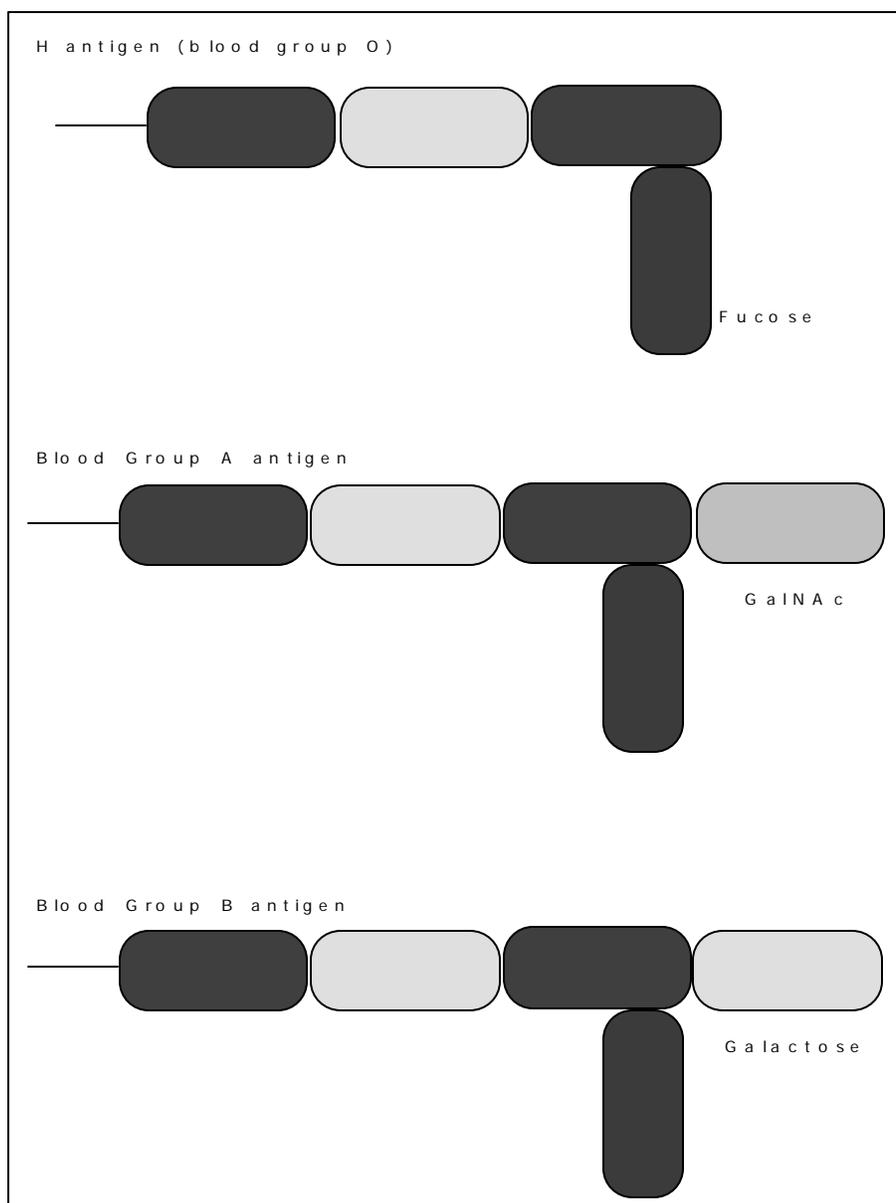


HST 175 Mid-term examination

October 8th 2002

Please answer all questions and write your name on every sheet. Please be as brief as possible!

1. Antigens of the ABO blood group are illustrated below. The fucose residue is essential for the H antigen (in individuals with blood group O). In the absence of the fucose residue, the GalNAC (N-Acetyl galactosamine) transferase enzyme that generates blood group A antigens, and the galactosyltransferase enzyme that generates blood group B antigens have no substrate to work on. Rare individuals who lack the fucosyltransferase that creates the H antigen are classified as belonging to the Bombay blood group.



In the HST 715 class room there are 17 “O” group students (did not inherit either the GalNAc transferase or the galactosyltransferase), 15 “A” group students (inherited the GalNAc transferase but not the galactosyltransferase), 12 “B” group students (inherited the galactosyltransferase but not the GalNAc transferase), and 6 students who are typed as “AB” (inherited both GalNAc transferase and the galactosyltransferase).

a. Serum from a New Pathway student who belongs to the rare Bombay blood group was mixed separately with red blood cells obtained from each of the 50 HST 175 students. The presence of antibodies is revealed by agglutination. What percentage of the HST 175 students would have donated RBCs that are recognized by this Bombay serum? Briefly explain your answer. (5)

b. None of the 12 blood group B students has serum antibodies against blood group B antigens. Briefly explain why this is so, basing your answer on your understanding of B lymphocyte biology. (10)

2. Briefly describe the function of TAP1 and TAP2. What kind of T cell might be missing in an individual born with two defective alleles of TAP1? (10)

3. What in your opinion is the most important type of T cell or T cell subset required for a positive tuberculin skin test? What do you consider to be the most critical cytokine secreted by T cells during this kind of response? (2 +3)

4. What precisely is AID (activation induced deaminase) believed to do during somatic mutation? Be very brief (5).

5. Artemis is defective in patients with radiation sensitive SCID, who are born without B and T cells. In a single sentence indicate what you think the function of Artemis is in developing lymphocytes. (5).

6. High endothelial venules constitutively express a fucose containing ligand called Sialyl Lewis^X which is recognized by a cell surface protein on certain lymphocytes. What organ are these venules in? What is the protein on lymphocytes that binds to Sialyl Lewis^X containing ligands? What type of lymphocytes express this protein? (1+2 +2).

7. Digoxin is a relatively small molecule which is an example of a hapten. Illustrate two distinct conceptual ways in which you could make this hapten immunogenic. Represent digoxin as an oval shape; no details of the actual chemistry are required. (5).