***Lecture 6 Blood transfusion***

**Subgroups:**

Blood group A can be divided into a number of sub groups (A, A1, A2, A3, A4, A5) of which A1 and A2 are the most relevant clinically A2 is weaker than A1.

***ABO antibodies:***

See table

|  |  |  |
| --- | --- | --- |
| Antibody in serum | Antigen on RBCs | Blood group |
| Anti-B | A + H | A |
| Anti- A | B + H | B |
| None | A+B+H | AB |
| Anti-A, Anti- B, Anti-A,B | H | O |

ABO antibodies are generally IgM (cold –reacting antibodies, do not cross placenta, bind complement ) with minor portion of IgG or IgA antibodies. The immune form (IgG) produced by individuals exposed to foreign red cell stimulation, either by transfusion or pregnancy. Serum from group O individuals contains not only anti-A, and anti-B and it is generally IgG (can cross placenta). Although the IgM anti-A and anti-B called (natural antibodies), but they produced after delivery, and the titer are too low for detection until the individual is 3-6 months of age, they are produced or stimulated by chemical substance similar to ABO antigen and distributed widely in nature. These antibodies are powerful hemolyzing antibodies and currently cause the most serious Hemolytic transfusion reaction.

These antibodies are always present in normal, healthy individual patients older than 65 years of age usually have low titer, so those antibodies may be undetectable in the reverse grouping.

***Inheritance of the ABO Blood Groups***

One position, or locus, on each chromosome number nine is occupied by either an A,B, or an O gene. The O gene is considered an amorph gene.

The designation Aor B refers to phenotype, whereas AA, BO and OO denote genotypes. In the case of an O individual, both phenotype and genotype are the same,because that individual would have to be homozygous for the O gene.

The inheritance of ABO antigens, follows simple Mandelian genetic. ABO, like most other blood group system is co-dominant in expression (both genes expressed).

|  |  |  |
| --- | --- | --- |
| Offspring(phenotype and genotype) | Matinggenotype | Mating phenotypes  (M x F) |
| AB(AB)  AB(AB) or B(BO)  AB(AB) or A(AO)  AB(AB) or A(AO) or  B(BO) or O (OO) | AAxBB  AOxBB  AAxBO  AOxBO | AxB |
| O(OO) | OOxOO | OxO |
| A(AO)  A(AO) or O(OO) | AAxOO  AOxOO | AxO |

***ABO Grouping:***

It consists of **forward grouping** and **reverse grouping**.

Forward grouping : is defined as using known sources of reagent anti-sera (antibodies) to detect antigens on an individualʼs red cells.

Reverse grouping : is defined as using reagent cells with known ABO antigens and testing the serum of the patient (or donor) for ABO group antibodies, see table

***Summary of Forward and Reverse Grouping:***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Result** | **Serum tested with** | | Result | **Cells tested with** | | **Donor** |
|  | B cells | A cells |  | Anti B | Anti A |  |
| O | Posit | Posit | O | Neg | Neg | 1 |
| AB | Neg | Neg | AB | Posit | Posit | 2 |
| A | Posit | Neg | A | Neg | Posit | 3 |
| B | Neg | Posit | B | Posit | Posit | 4 |

**ABO Discrepancy:**

ABO discrepancies are usually technical in nature and can be simply resolved by correctly repeating the testing and carefully checking reagents. Occasionally, the discrepancy may be due to a real problem with patients ABO group.

***Some of the causes of discrepancies are:***

1-Newborns

2-Elderly patient

3-Patient with hypogamaglobulinaemia (lymphoma, immunosuppressive drugs, bone marrow transplantation)