Paper: Blood Banking.

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Q 1: Define hemovigilance? Discuss the benefits and limitations of hemovigilance?

Hemovigilance:

Monitoring of possible adverse effects associated with blood transfusion therapy. It is directed at improving blood transfusion safety.

**Benefits :**

**Hemovigilance** plays an essential role in ensuring patient safety with regard to blood transfusions. The data generated through the **hemovigilance** system helps in framing important changes in the whole blood transfusion process which are useful for better patient safety.

**Limitations**

A number of international databases are well-known and useful tools for professionals in blood transfusion. The advent of national hemovigilance registries and an international focus on transfusion practice and transfusion safety has led individuals and organisations to collect and compare data. This has led to the development of internationally useful indicators, for instance figures for the numbers of red cell products transfused per 1000 in the population. An international database of hemovigilance data [STARE] is currently being developed by the International Hemovigilance Network. In the pilot phase, it is seen that differences exist between the rates of adverse reactions and events. The remaining variability might then generate hypotheses of areas or types of increased risk, which would need to be further investigated in specific projects**.**

**Q 2: What is the purpose of cross match? Discuss the procedure of cross match?**

A crossmatch is performed prior to administration of blood or blood products (e.g. packed red blood cells). The purpose of the crossmatch is to detect the presence of antibodies in the recipient against the red blood cells of the donor. These antibodies attach to the red blood cells of the donor after transfusion. An incompatible transfusion can result in a severe hemolytic anemia and even death. In dogs and horses, naturally occurring antibody against important hemolytic red blood cell antigens (e.g. DEA 1.1 and 1.2 in the dog, and Qa and Aa in the horse) are not found. Therefore, these animals require sensitization to the red cell antigen, before a hemolytic reaction will occur. This sensitization usually occurs from a previous blood transfusion.

For a crossmatch procedure,we do 3 types of crossmatches:

* **Major crossmatch:** This is the most important one. In this procedure, we are looking for antibodies in the recipient against transfused red blood cell antigens (from the donor). Therefore, we need serum from the recipient and red blood cells from the donor.
* **Minor crossmatch:** This detects antibodies in the donor serum to the recipient's red blood cells. Therefore, for this we need serum from the donor and red blood cells from the recipient.
* **Autocontrol:** We also perform an auto-control with our crossmatches, i.e. recipient serum with recipient red blood cells.

**Q 3: What is the pathogenesis of HDN?**

* The exposure of the Rh-negative mother to Rh-positive red cells occurs as a result of asymptomatic fetomaternal hemorrhage during pregnancy. The Kleihauer-Betke acid elution technique that determines the proportion of fetal RBCs in maternal circulation has shown the incidence of fetomaternal hemorrhage to be 75% of all pregnancies. Incidence and degree of such hemorrhage appears to increase with gestation. Fetomaternal hemorrhage has been documented in 7%, 16%, and 29% of mothers during their first, second and third trimesters, respectively. Risk is also increased in pregnancies complicated by placental abruption, spontaneous or therapeutic abortion, and toxemia, as well as after cesarean delivery and ectopic pregnancy.
* Procedures such as amniocentesis, chorionic villus sampling, and cordocentesis also increase the risk of alloimmunization. Because the transplacental hemorrhage is less than 0.1 mL in most pregnancies, most women are sensitized as a result of small, undetectable fetomaternal hemorrhage.

**Q 4: Describe the function of Duffy antigen?**

The Duffy glycoprotein is also called the Duffy-Antigen Chemokine Receptor (DARC). As a chemokine receptor, it binds to the chemicals that are secreted by cells during inflammation and recruits other blood cells to the area of damage. These chemokines include C-X-R (acute inflammation chemokine) and C-C (chronic inflammation chemokine), IL-8 (interleukin 8), and RANTES (regulated on activation, normal T-expressed and secreted) ([6](https://www.ncbi.nlm.nih.gov/books/NBK2271/#ch09Duffy.EN.6)).

Animal studies suggest that the function of Duffy as a chemokine receptor is not physiologically important because mice that lacked the mouse homolog of the Duffy gene (Dfy) were not more susceptible to infection than mice that expressed Dfy ([7](https://www.ncbi.nlm.nih.gov/books/NBK2271/#ch09Duffy.EN.7)). Indeed, individuals with the null Duffy phenotype appear to have normal RBCs and a normal immune system.

**Q 5: How is coombs reagent prepared? Write down the procedure of IAT?**

A **Coombs test**, also known as **antiglobulin test** (**AGT**) is either of two [blood tests](https://en.m.wikipedia.org/wiki/Blood_test) used in [immunohematology](https://en.m.wikipedia.org/wiki/Immunohematology). They are the direct and indirect Coombs tests. The two Coombs tests are based on anti-human [antibodies](https://en.m.wikipedia.org/wiki/Antibody) binding to human antibodies, commonly [IgG](https://en.m.wikipedia.org/wiki/Immunoglobulin_G) or [IgM](https://en.m.wikipedia.org/wiki/Immunoglobulin_M). These anti-human antibodies are produced by [plasma cells](https://en.m.wikipedia.org/wiki/Plasma_cell) of non-human animals after immunizing them with [human plasma](https://en.m.wikipedia.org/wiki/Human_plasma). Additionally, these anti-human antibodies will also bind to human antibodies that may be fixed onto [antigens](https://en.m.wikipedia.org/wiki/Antigen) on the surface of [red blood cells](https://en.m.wikipedia.org/wiki/Red_blood_cell) (RBCs). In the appropriate test tube conditions, this can lead to [agglutination](https://en.m.wikipedia.org/wiki/Agglutination_(biology)) of RBCs and allowing for visualisation of the resulting clumps of RBCs. If clumping is seen, the Coombs test is positive; if not, the Coombs test is negative.

Common clinical uses of the Coombs test include the preparation of blood for [transfusion](https://en.m.wikipedia.org/wiki/Blood_transfusion) in [cross-matching](https://en.m.wikipedia.org/wiki/Cross-matching), atypical antibodies in the [blood plasma](https://en.m.wikipedia.org/wiki/Blood_plasma) of [pregnant](https://en.m.wikipedia.org/wiki/Pregnant) women as part of [antenatal care](https://en.m.wikipedia.org/wiki/Obstetrics), and detection of antibodies for the diagnosis of immune-mediated [haemolytic anemias](https://en.m.wikipedia.org/wiki/Haemolytic_anemia).

Coombs tests are performed using RBCs or serum (direct or indirect, respectively) from venous whole blood samples which are taken from patients by [venipuncture](https://en.m.wikipedia.org/wiki/Venipuncture). The venous blood is taken to a laboratory (or blood bank), where trained scientific technical staff do the Coombs tests. The clinical significance of the result is assessed by the [physician](https://en.m.wikipedia.org/wiki/Physician) who requested the Coombs test, perhaps with assistance from a laboratory-based [hematologist](https://en.m.wikipedia.org/wiki/Hematologist).

**Procedure of IAT:**

**Indirect Antiglobulin Test (IAT)**

IAT is used to detect and identify antibodies. The test uses antihuman globulin (AHG) to detect in vitro sensitization of red cells. Patient serum or plasma is incubated with reagent red cells with known antigen phenotypes. If an antibody is present in the serum, it will bind to the reagent red cells with the corresponding antigen. Because IgG molecules are incapable of producing macroscopic agglutination, AHG is needed to act as a bridge. The AHG used in the IAT is Anti-IgG. Anti-IgG will bind to the patient's IgG antibody if present and facilitate macroscopic agglutination. IgG antibodies present in the patient's serum or plasma are considered clinically significant.