

Recent Advances in Transfusion Medicine

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The range and variety of new developments in the numerous fields of transfusion medicine is too large to be covered in a lecture. Therefore, only some selected areas will be covered:

- **Reduction of the risk of transfusion-transmitted infection:** greater emphasis on donor selection and self-exclusion; assessment of the assays that aim at shortening the window period of infectivity of viral infections (e.g., genomic screening); appearance of new viruses (e.g., GBV-C) and assessment of their transmissibility by blood transfusion; emergence of new agents (e.g., new variant CJD) which may or may not be transmitted by blood transfusion; inactivation of viruses in fractionated blood products and fresh frozen plasma (FFP); inactivation of microbial agents in platelet concentrates (e.g., psoralens + UVA) or in red cells (e.g., FRALES).
- **Donors:** worldwide difficulties in the recruitment of unpaid, voluntary, altruistic blood donors; allogeneic peripheral blood stem cell (PBSC) donors and the ethics of G-CSF administration to such donors; cord blood banking and cord blood transplantation; collection of double doses of red cells or platelets by apheresis from selected donors; near-donor processing (collection of different “tailor-made” blood components, including red blood cells at the bedside); expansion of activities of blood transfusion services into tissue collection and tissue banking.
- **Impact of molecular genetics:** in antenatal diagnosis: genotyping for Rh, Kell, HPA; growth factors in reducing allogeneic blood exposure: G-CSF, EPO; genetically engineered coagulation factors and other plasma proteins; in microbial screening of blood donations.
- **The development of monoclonal antibodies and “new” engineered antibodies:** used now routinely in blood grouping and platelet typing. Also, high hopes for anti-D in Rh prophylaxis.
- **Gene Therapy:** blood transfusion services are in a privileged position to become involved in this area in view of their tradition of compliance with good manufacturing practice, total quality, experience in blood storage and cell culture, etc.
- **Blood Substitutes:** current, but slow, progress with haemoglobin solutions and recombinant Hb to reduce toxicity and lengthen half-life in the circulation. Platelet substitutes of several kinds are also being developed (e.g., red cells coated with fibrinogen, synthetic phospholipids, liposomes bearing haemostatic agents, fibrinogen-coated albumin particles).
- **Pharmacologic and anaesthetic approaches aimed at reducing allogeneic blood exposure** (e.g., aprotinin, DDAVP, fibrin glue, haemodilution, hypotensive anaesthesia).
- **Progress in the knowledge of the pathophysiology of haemolytic and non-haemolytic transfusion reactions:** role of complement, cytokines and other mediators.
- **Increased interest in clinical Transfusion Medicine:** clinical audit of the appropriateness of transfusion therapy; hospital transfusion committees; lowering of pre-operative Hb triggers, etc.
- **Progress in immunotherapy, both cellular** (e.g., donor-derived lymphocytes) **and humoral.**
- **Methods to modulate the antigenicity of red cells** (e.g., mpeg).
- **Novel platelet-derived products** (e.g., dehydrated lyophilised platelets, platelet membrane micro-particles).
- **Preservative solutions that will enable the storage of platelets at 4° C, thus decreasing the risk of bacterial contamination.**

The gap between (i) the current advanced level of transfusion medicine, aiming at the never achievable “zero risk” in industrialised, developed countries and (ii) the reality of the unacceptably substandard practice of transfusion medicine in many countries in Latin America, Africa and Southeast Asia is becoming wider and wider. For example, in Europe, many countries are performing microbial screening of plasma donations (and even blood donations) by PCR, yet there are places in Africa and Southeast Asia where patients are dying due to lack of blood and where those who are transfused have a high risk of acquiring viral or parasitic infections by transfusion.