

Blood storage and transportation

Blood management

Éva Földi MD

Hungarian National Blood Transfusion Service

Department of Szeged

fodi.eva@ovsz.hu

Blood storage and transportation

- Storage conditions for blood components are designed to preserve optimal viability and functionality during the entire storage period
 - Collection of blood into anticoagulant preservative and additive solutions
 - The function and viability of the components are only guaranteed if they are stored and transported in the correct temperature range

Anticoagulant preservative solution

- The anticoagulant solutions used in blood collection have been developed to prevent coagulation and to permit storage of red cells for a certain period of time
- The volume of anticoagulant depends on the amount of whole blood collection
- Our bag systems are designed to collect 450 ml \pm 10% of whole blood, so the primary bag contains 63 ml of CPD

Red cell additive solutions

- Red cell concentrates are suspended in additive solution to improve storage and shelf life
- Composition of SAGM:
 - **S**aline: the fluid in which the red cells are suspended to provide the desired flow rate conditions
 - **G**lucose (or dextrose): provides the basic nutrients for glycolysis
 - **A**denine and **m**annitol: assist in the process of ATP generation
- 450 ml donations need 100 ml SAGM

Storage lesion

- the physiological properties of the stored blood change over time:
 - oxidative damage to red cells leading to increased free haemoglobin and reactive oxygen species
 - rapid fall in 2,3-DPG (2,3-bisphosphoglyceric acid), the red cells increase their affinity for oxygen and lose some viability
 - reduction in intracellular ATP in the stored red cells
 - fall in nitric oxide levels which plays a critical role in vascular reactivity due to the potent vasodilatory effect of nitric oxide
 - lactate accumulation and release of cytokines
 - damage to red cell membranes and cytoskeleton and reduced deformability of the red cells
 - haemolysis and release of potassium from the red cells

Pre-processing storage temperature

- After collection, whole blood should be placed in a controlled environment at $22\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ for the first 24 hours
 - For preparing platelet units from whole blood using the buffy coat method, whole blood donations should be processed within 24 h of collection
 - (using the platelet-rich-plasma (PRP) method, whole blood donations should be processed within 8 h of collection)

Blood bags cooling system (Compocool)

- Each cartridge refrigerated to 4°C can cool up to 8 blood units to 20°C in 3 hours
- Can keep that temperature for 12-24 hours (depending on the room temperature)
- Suitable for the transportation of whole blood donations

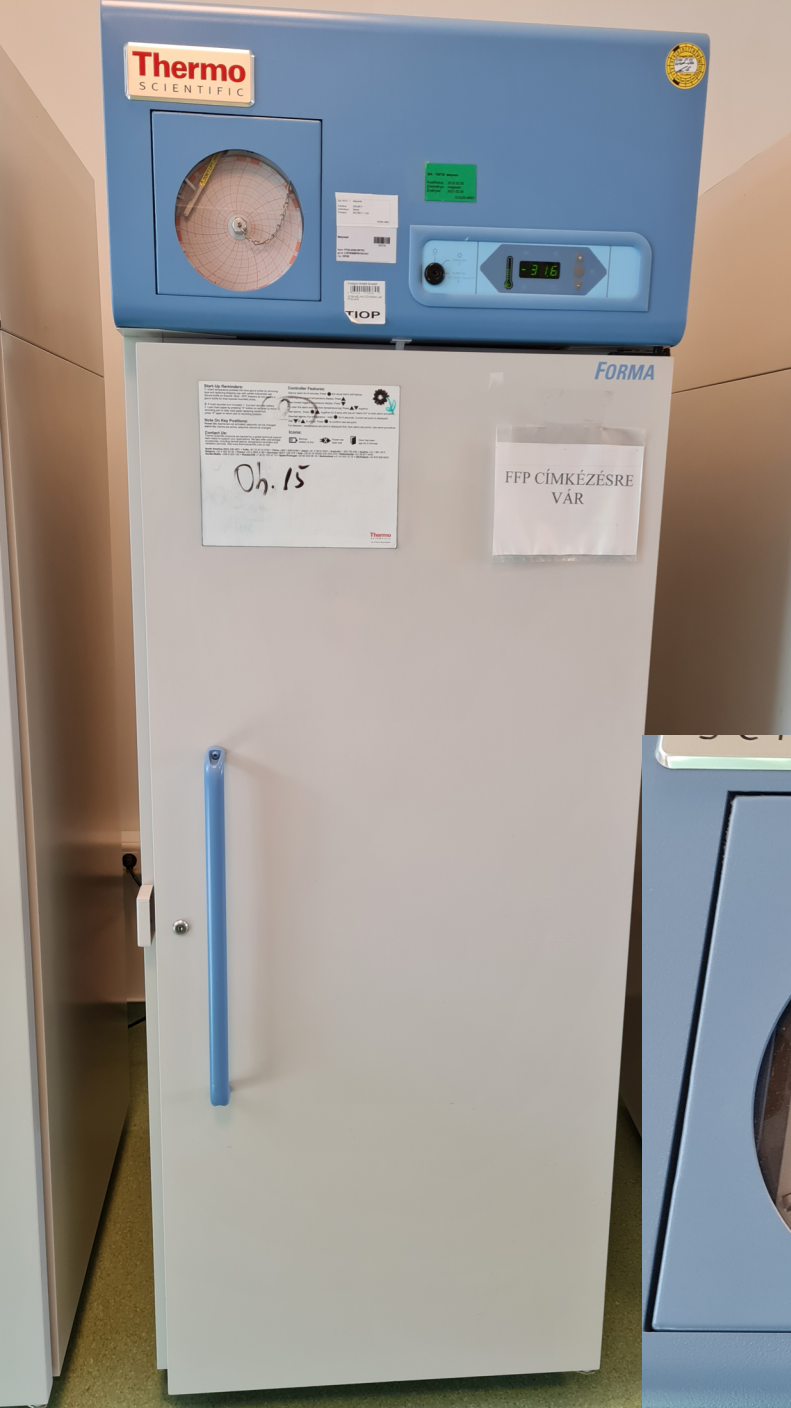


Shelf life and storage temperature of RCC

- Red blood cell concentrates must always be stored and transported at $4\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$
- Storage in refrigerators, the red cell products are grouped by ABO and Rh blood type
 - Using FIFO stands for “First-In, First-Out”
 - So on the freezer shelf, the oldest product is at the front and the youngest at the back
- Shelf life (from the date of donation):
 - RCC, bc-removed, in additive solution: 35 days
 - RCC, filtered: 28 days
 - RCC, washed: 48 h from producing

Shelf life and storage temperature of FFP:

- Storage: under -25°C
- Expiration date: 24 months from the date of donation



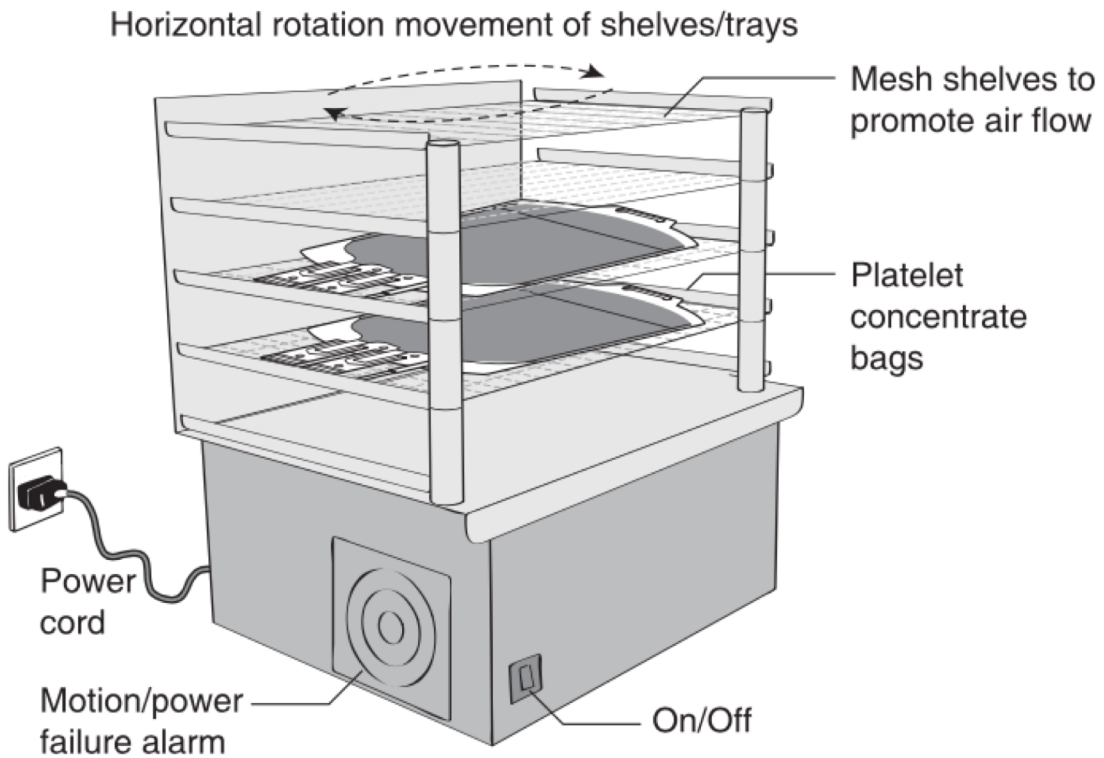
Blood storage refrigerators and freezers

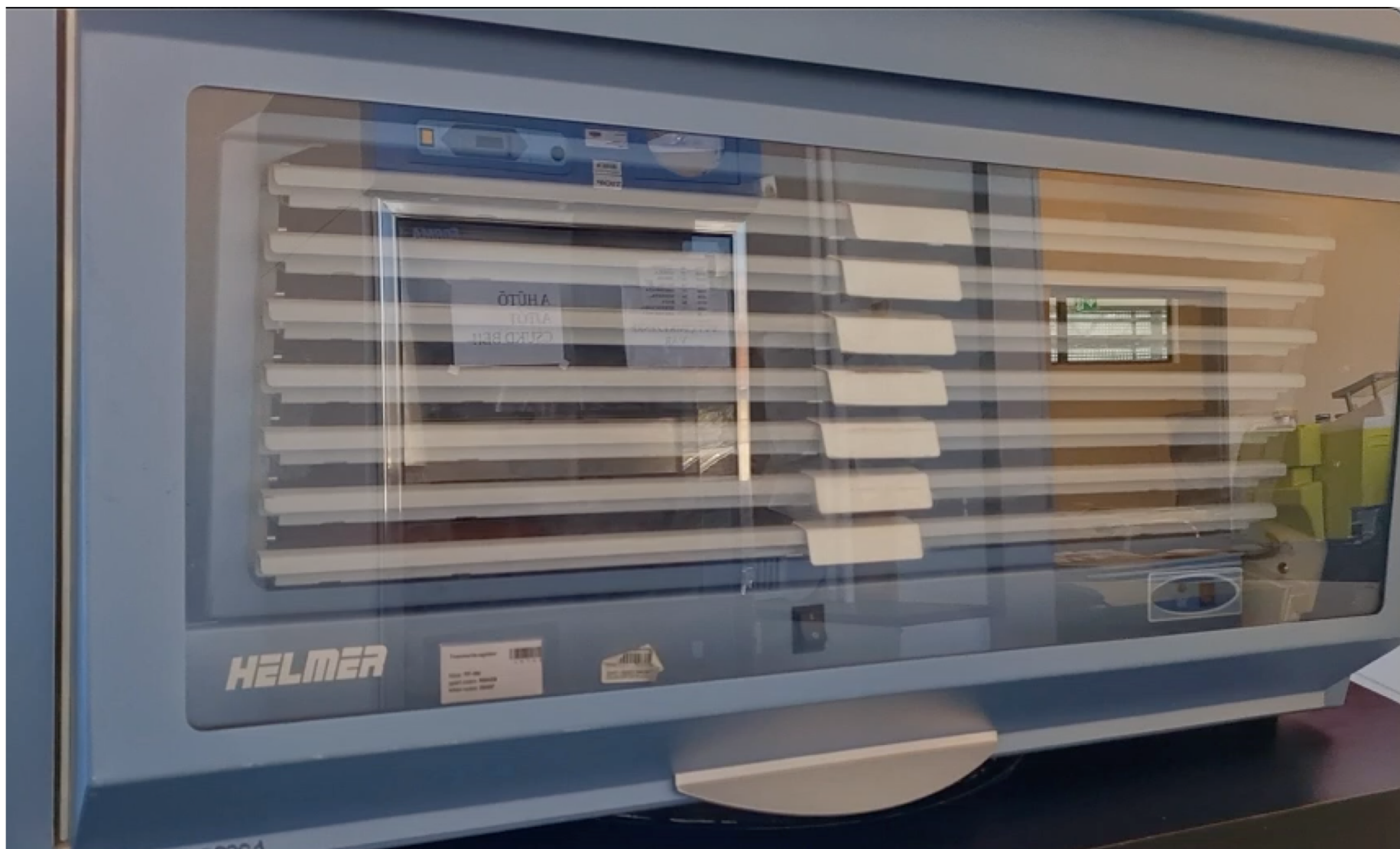
- Refrigerators and freezers used for blood storage shall contain only donor blood
- Equipments should have temperature recording and alarm devices
 - activate if temperature is not ideal
 - reaction before blood components reach an unacceptable temperature

Shelf life and storage temperature of platelet concentrates

- Platelet concentrates (pooled or apheresis) are stored in a gas-permeable bag at $22^{\circ}\text{C} \pm 2^{\circ}\text{C}$ with continuous gentle agitation to prevent platelet activation
- Shelf life: 5 days (filtered has also)
- Additive solution is SSP+ (70% SSP+ 30% plasma):
 - reducing the risk of plasma-related adverse transfusion reactions (FNHTR, TRALI)
 - reduces the risk of adverse reactions due to ABO minor incompatibility

Platelet agitator and incubator





Transportation of blood components

- Storage conditions mostly relate to maintaining temperature from collection, through processing, testing, labelling and transportation
- This is called "cold chain management"
- Using heat-insulated bag or crate with cooling elements
- Red cell concentrate and platelet product cannot be in direct contact with the cooling elements
- Platelet concentrate can be transported without cooling element in room temperature

Blood management

Hungarian National Blood Transfusion Service (HNBTS)

- regulated by Government Decree 323/2006. (XII. 23.)
- throughout the country - as a state task - ensures the planning and organization of the blood supply, issuing of blood products to health care institutions,
- maintenance of the donor registry,
- collecting of the haemovigilance data,
- operating the unique quality system and performs the central organization of all organ harvesting calls in Hungary and organ donations from Eurotransplant, and the related rescue tasks
- operates the Central Waiting List through the Central Waiting List Office
- operates the Hungarian Stem Cell Donor Register, which includes the register of stem cell donors and the selection of the best matching donor.
- perform screening tests and transplant immunogenetics tests

Departments of the HNBTS

- Lead Centre

- Regional Blood Centres:

- In Budapest, Debrecen, Győr, Pécs and Szeged
 - Collecting and processing of blood

- Regional Blood Supply Stations (24)

- After collection, the whole blood is transported to the regional centre

- Hospital Transfusion Wards

- After collection, the whole blood is transported to the regional centre

- Hospital Blood Depots

- are located in large hospitals to ensure an immediate supply of blood products to patients

Departments of the HNBTS

- a common IT systems is used in all departments (eProgesa, TraceLine)
 - Records of donors and donations
 - Records of patients (results of serological test)
 - Records of blood products on self, under processing, or already given for transfusion
- blood processing is only done in Regional Blood Centres
- blood products are also organised by the regional centre

Requesting and issuing of blood products

- What need?
 - a blood sample tube from the patient labelled with their personal data
 - blood product request form filled with the data of the patient
 - the indication for transfusion is decided by the doctor
 - For what, why and how many units are needed - PBM!
 - Each blood sample and request form is given a unique identification number
 - Issuing the selected blood products for the patient is recorded in IT system

Blood depot in Szeged

- main functions:
 - Reception of samples and forms
 - Administrate the requestions of blood products
 - Issuing of blood products
 - immediate blood supply in urgency case
 - about 100 units of RCC in stock
 - Issuing blood group serological reports



Thank you for your attention!