How Platelets are Manufactured

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Shared Services Haematology SpR Training Day
London – 15/08/18

* = amended in order to capture answer given to questions posed during/after the talk.

Shine
PERSONAL AND SKILLS DEVELOPMENT

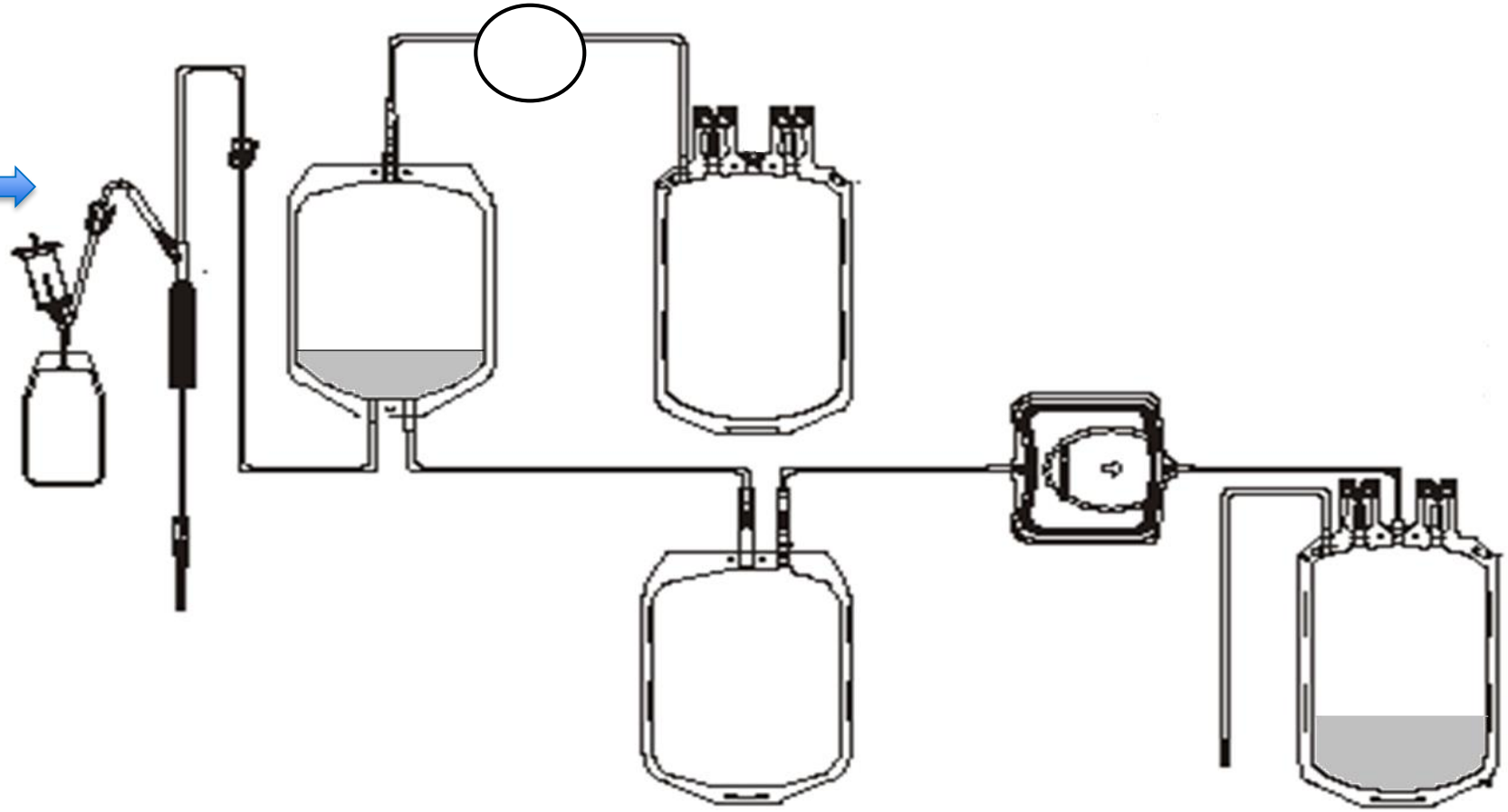
NHS
Blood and Transplant

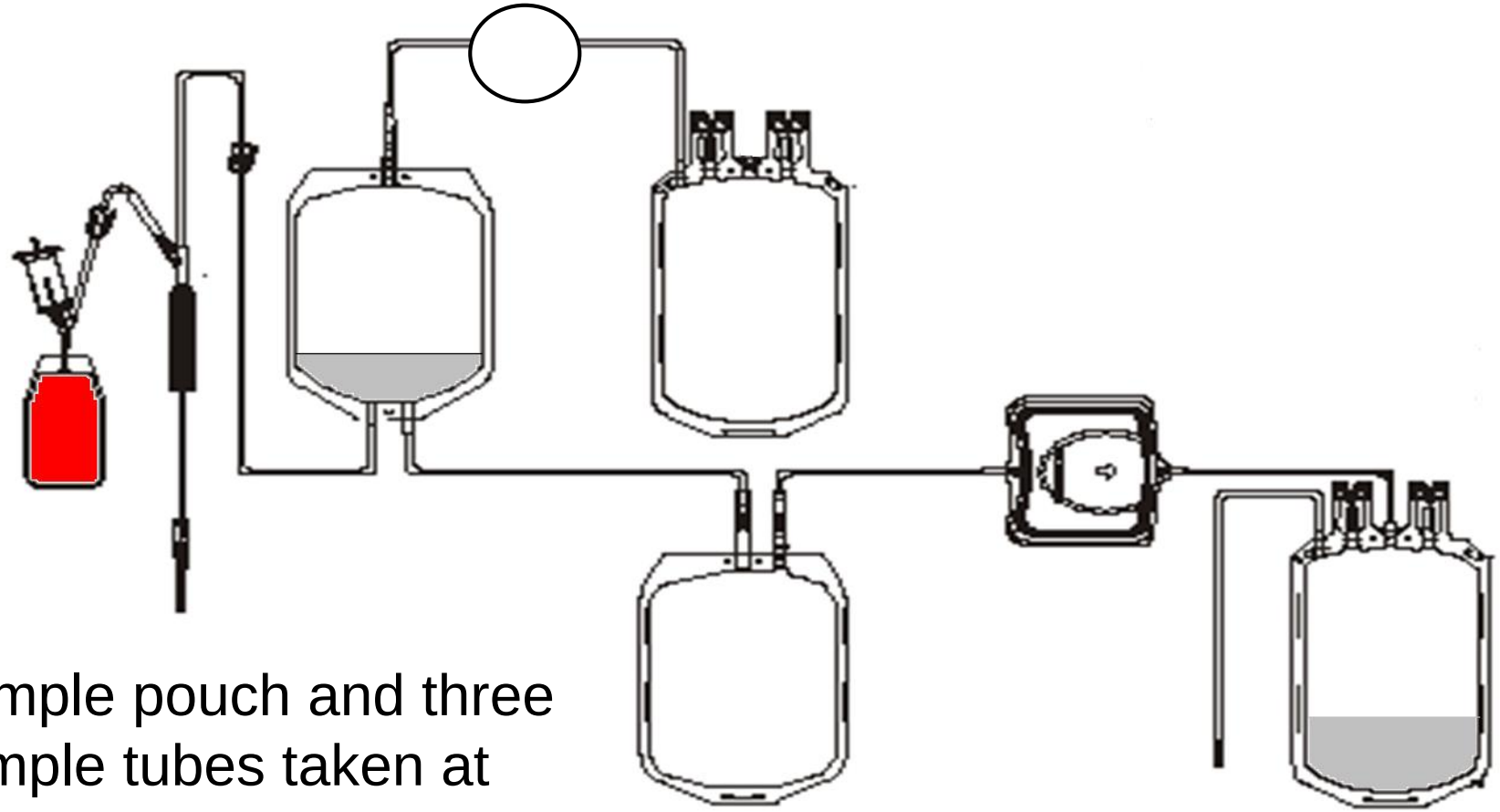
Manufacturing

- Take whole blood donations and process them into their usable components;
- BAT Packs
  - Buffy Coat
    - Pooled Platelets
    - Red Cells
    - Plasma (non clinical unless from inline filter)
- TAT Packs:
  - Red blood cells
  - Fresh Frozen Plasma
    - Cryoprecipitate

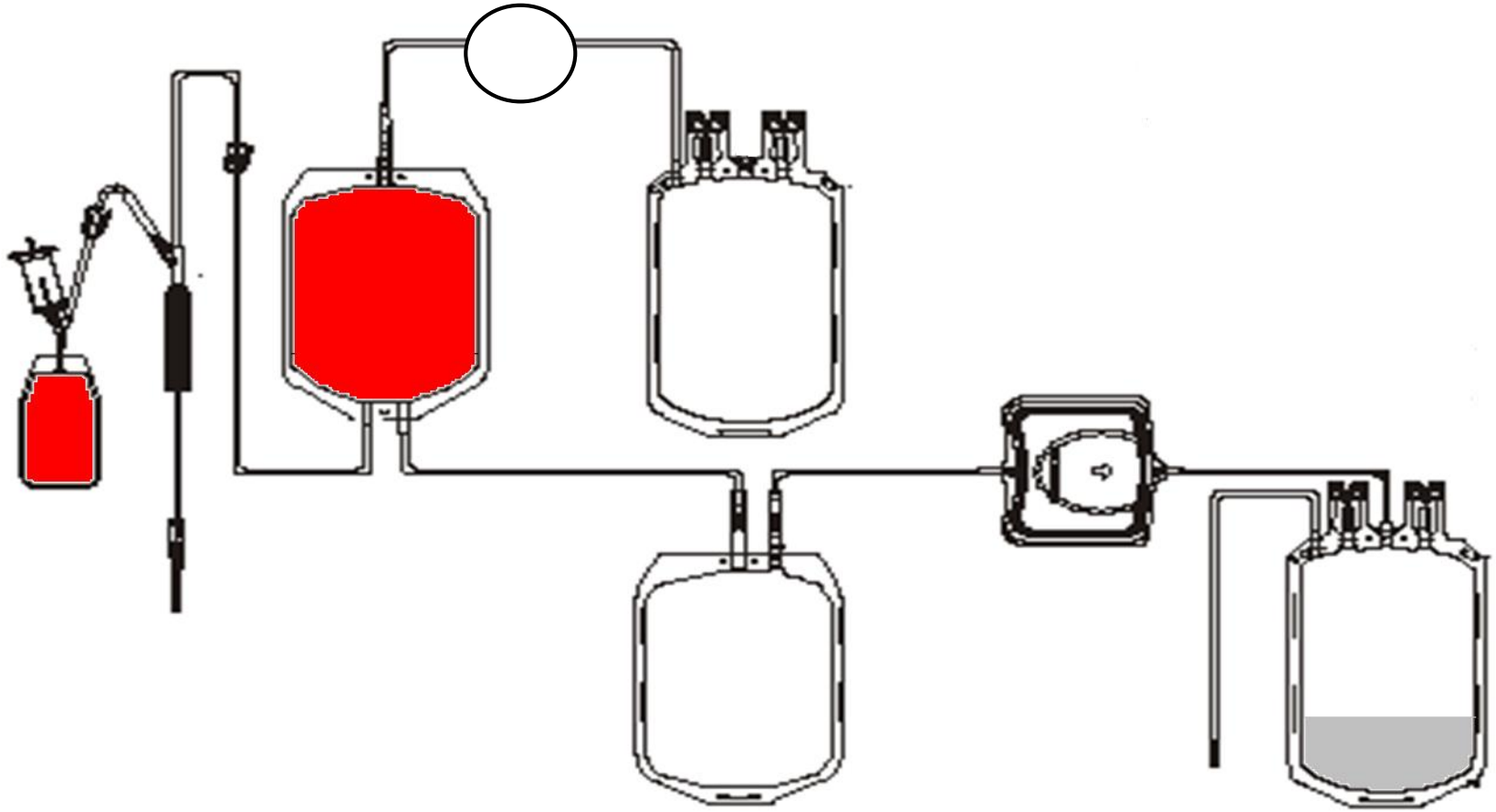
Firstly at Session

Current system – This will change on new blood pack





Sample pouch and three sample tubes taken at this stage



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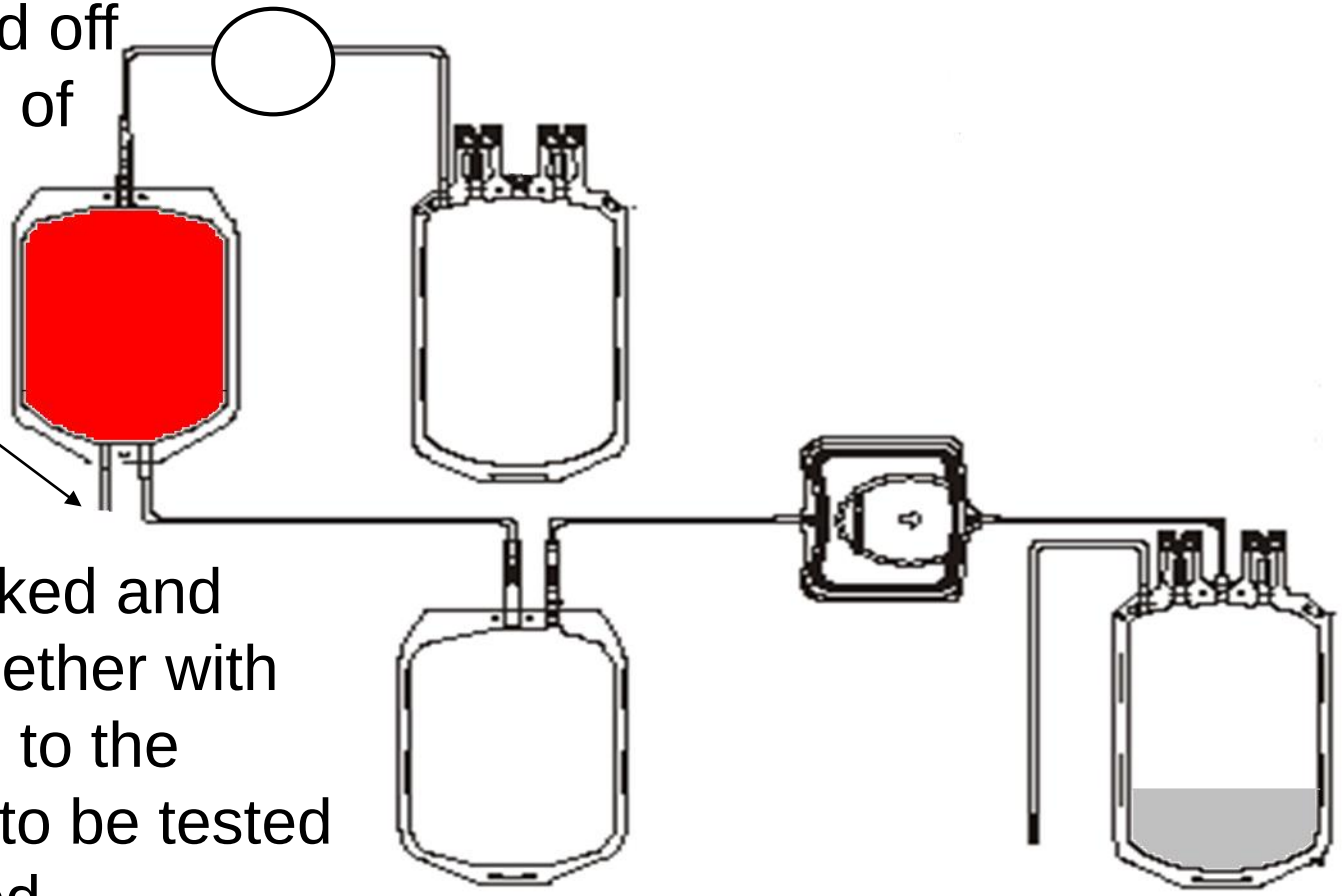
Needle sealed off and disposed of In Sharps bin at session



Carefully packed and sent back together with sample tubes to the Blood centre to be tested and processed

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Session Receipt

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- The units are received back at the Blood Centre from sessions and are recorded into the Pulse system.
- Units are allocated for manufacture into specific components based on characteristics such as previous testing results, gender and blood group, against daily targets.
- Units allocated for BAT production and therefore pooled platelet manufacture (or Granulocyte production) are taken to pods to be manufactured.

Pod Batching

- Once received in the Pods, units are recorded in batches using a specific Pod identifier so these units can be traced to a specific production area (and individual) at a later date if needed.
- Units will then move around the pod taking in various stages of production before the final buffy coats are removed from the Pod.
- See the following slides for a more detailed explanation of this.

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Centrifugation

Fairground ride spun at 10 times a minute

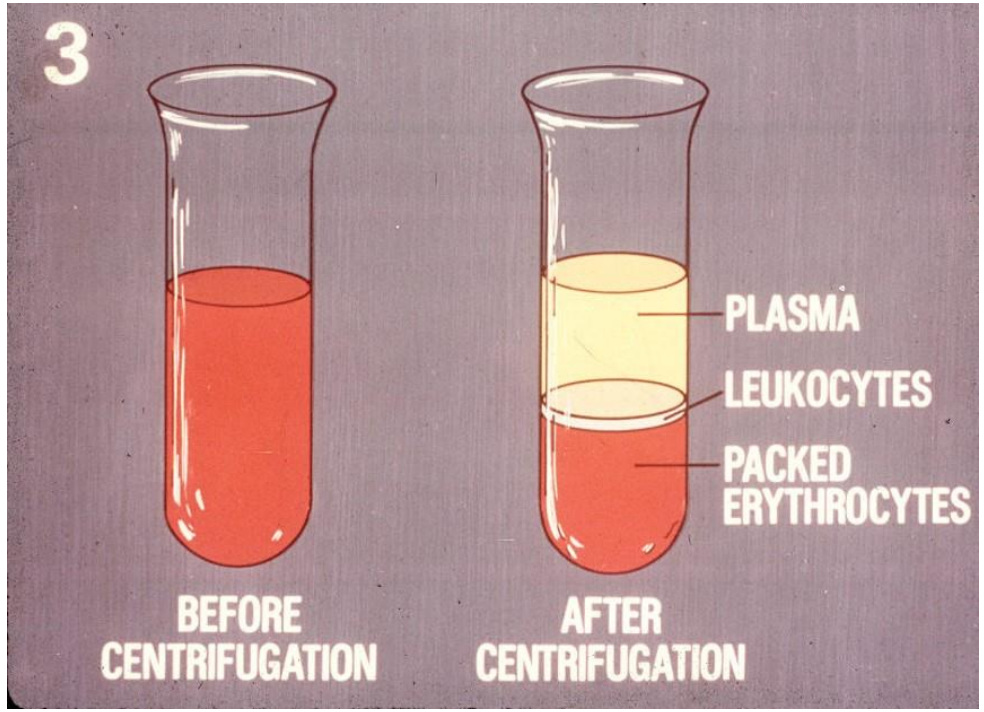
Blood centrifuge spins at between 3150 and 3840 times a minute!

Centrifugation

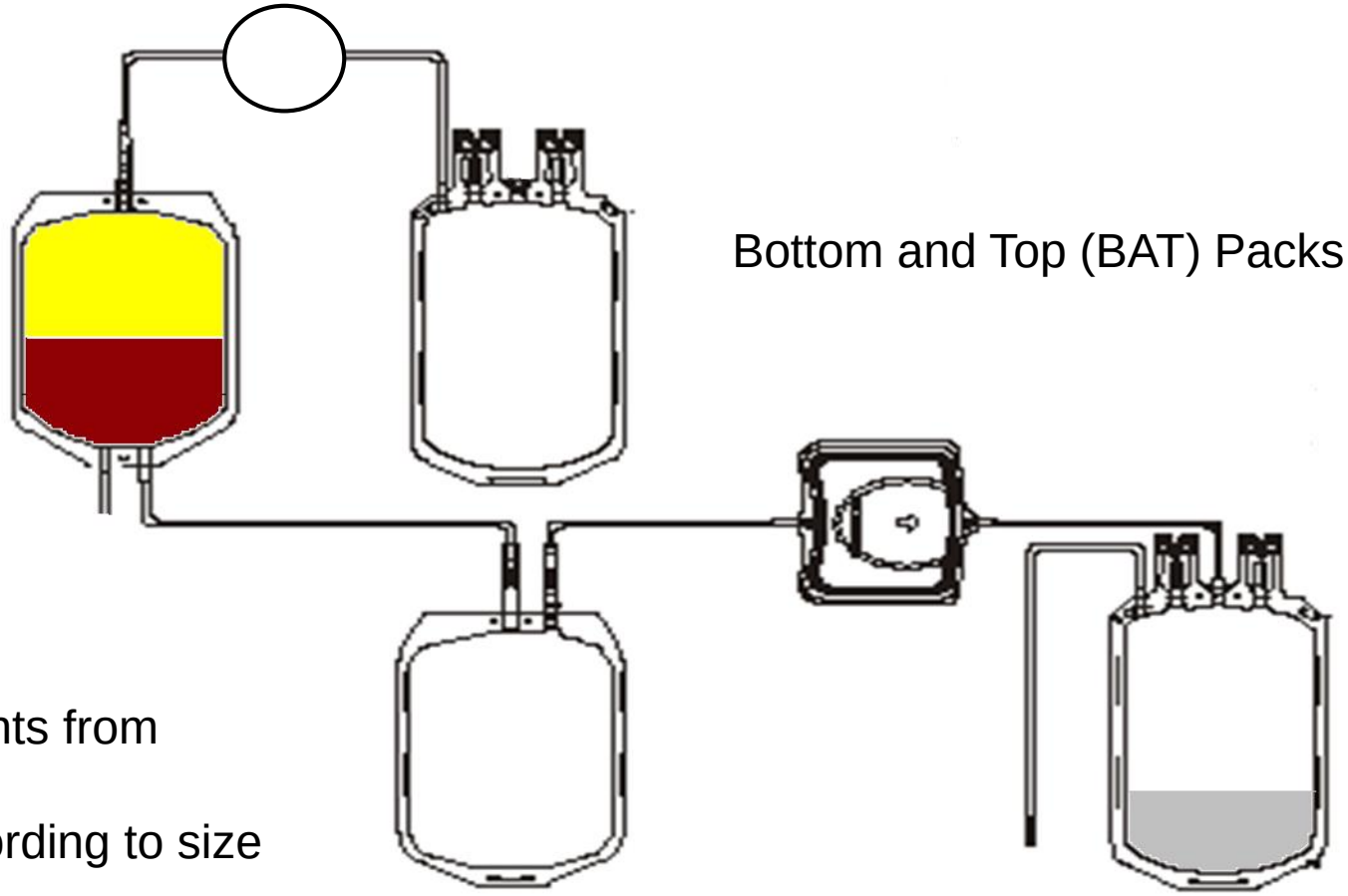
Separates:

- Cellular elements from plasma

- Cell types according to size and density



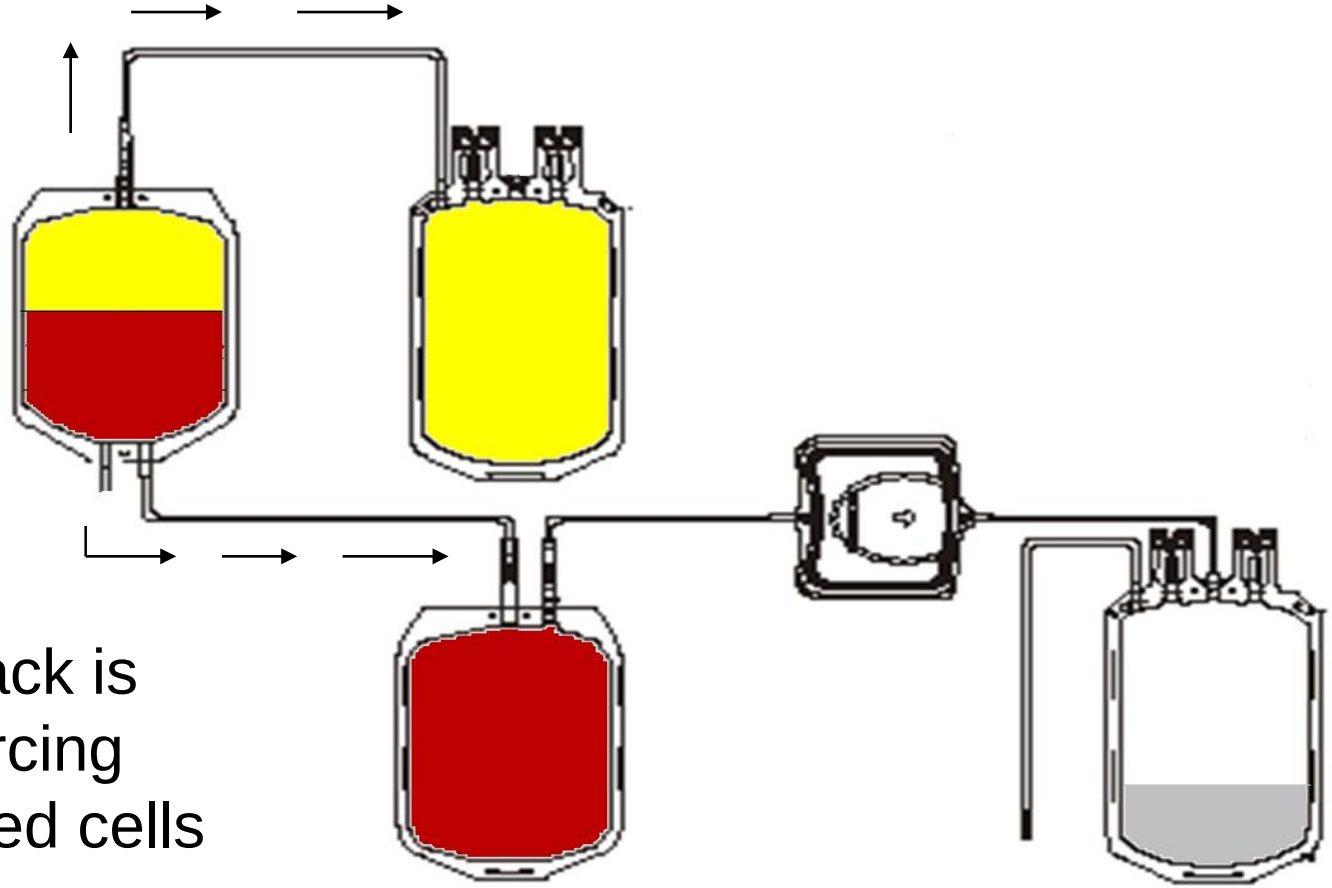
Processing In the Laboratory



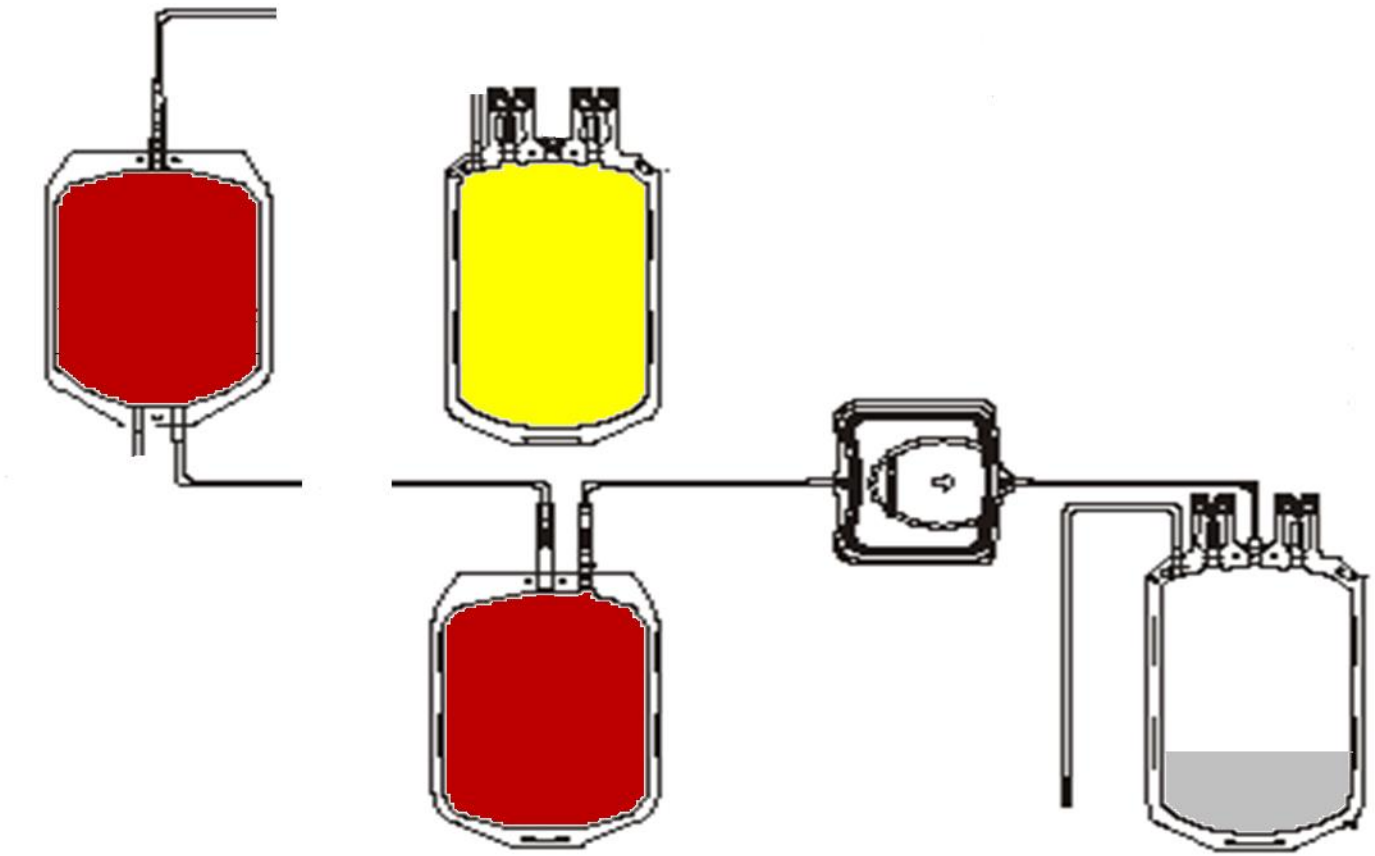
Bottom and Top (BAT) Packs

Separates:
- Cellular elements from plasma
- Cell types according to size and density

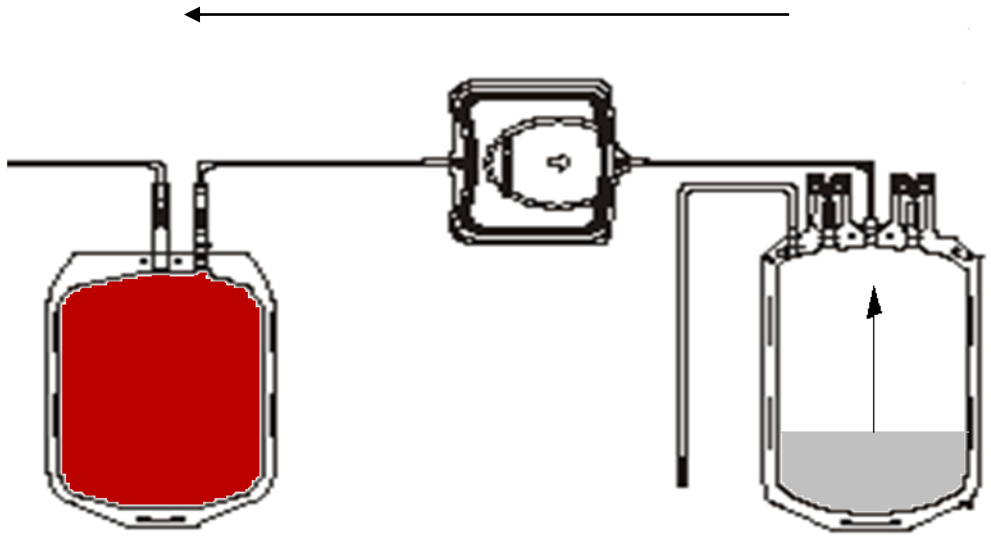
Interface kept at this point during pressing



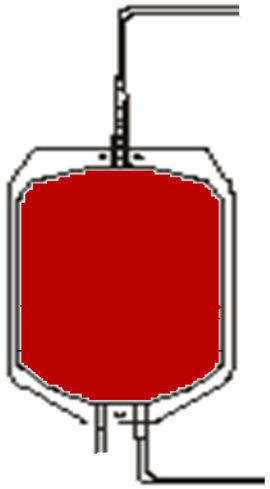
The bleed pack is squeezed forcing plasma up, red cells down



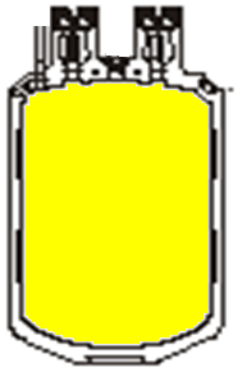
Bottom and Top (BAT) Packs



Bottom and Top (BAT) Packs

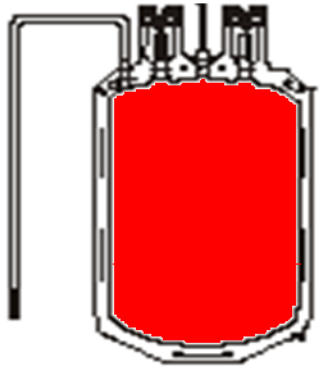


Buffy coat



Plasma

LD Red cells
in SAG-M



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Filtration - Leucodepletion

- Removal of white cells (leukocytes)
- 3,000,000,000 white cells in a blood donation before.
- 5,000,000 after LD.
- >99.8% removal

Filtration occurs before blood pressing for TAT packs and after pressing for BAT packs

Red Blood Cells

- Preserved in SAG-M
- Vol 220 - 340 ml
- Temp 4^0C+/- 2
- Expiry 35 days
- Hb >40g/unit

Uses:

anaemia

- Red Cell loss
- Red Cell shortened life or destruction
- Inability to produce enough

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BAT Processing Stage 2 Pooled Platelet Production

NHS Blood and Transplant

- *4 Buffy Coats + 1 PAS (platelet additive solution)
  65%-70% PAS and 35% - 30% Plasma for the suspension medium.
- *Granulocytes are tested for a number of elements but these are not specification criteria for the product. Residual Platelet count for Granulocytes = Platelet Unit 358 x10^9/Unit
- Same ABO group
- Rh D and CMV only neg if all neg
- Unique pool number generated

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Batching buffy coats to make platelet pools

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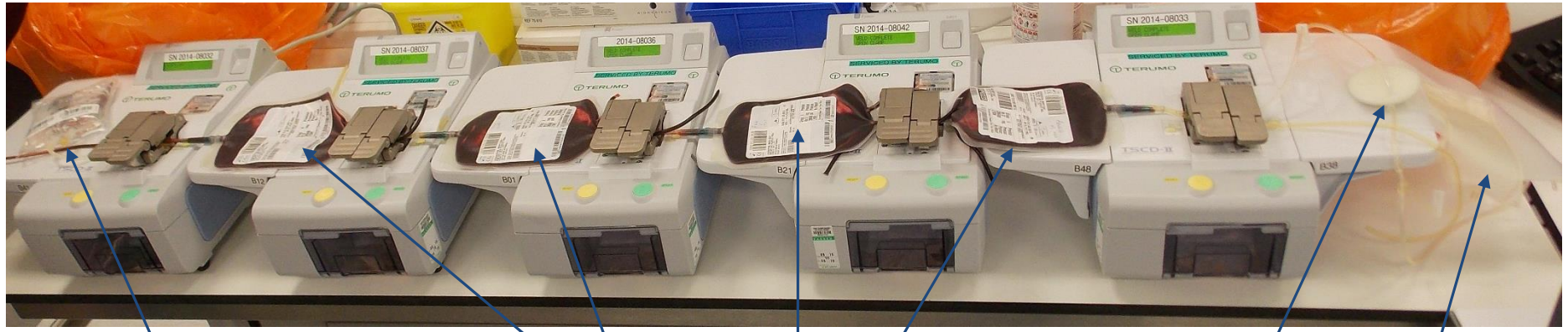
Joining Buffy Coats



Buffy coat packs (original donations bled into these before processing to this stage

Leucocyte filter

Platelet storage bag

PAS (Platelet Additive Solution)

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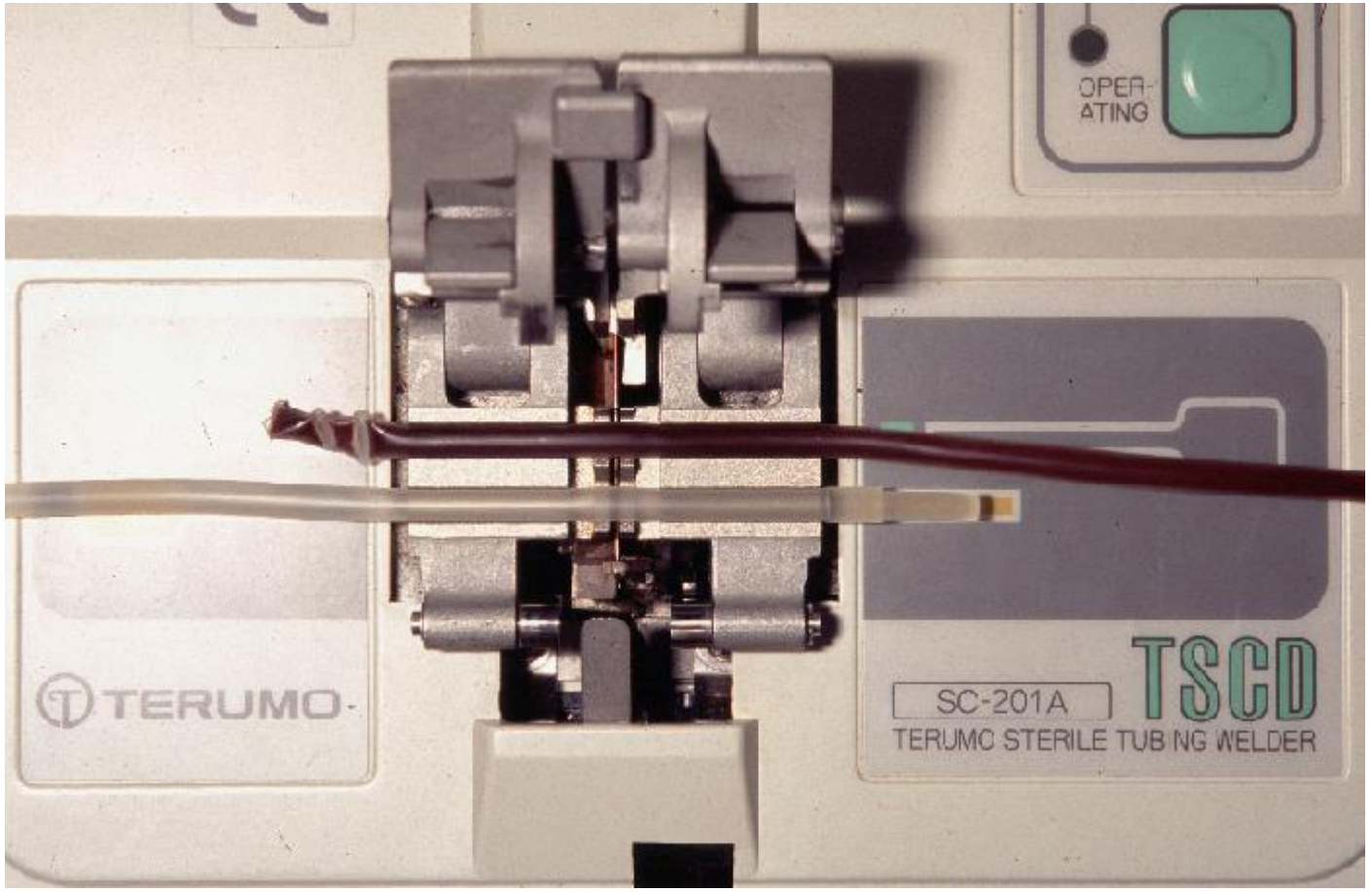
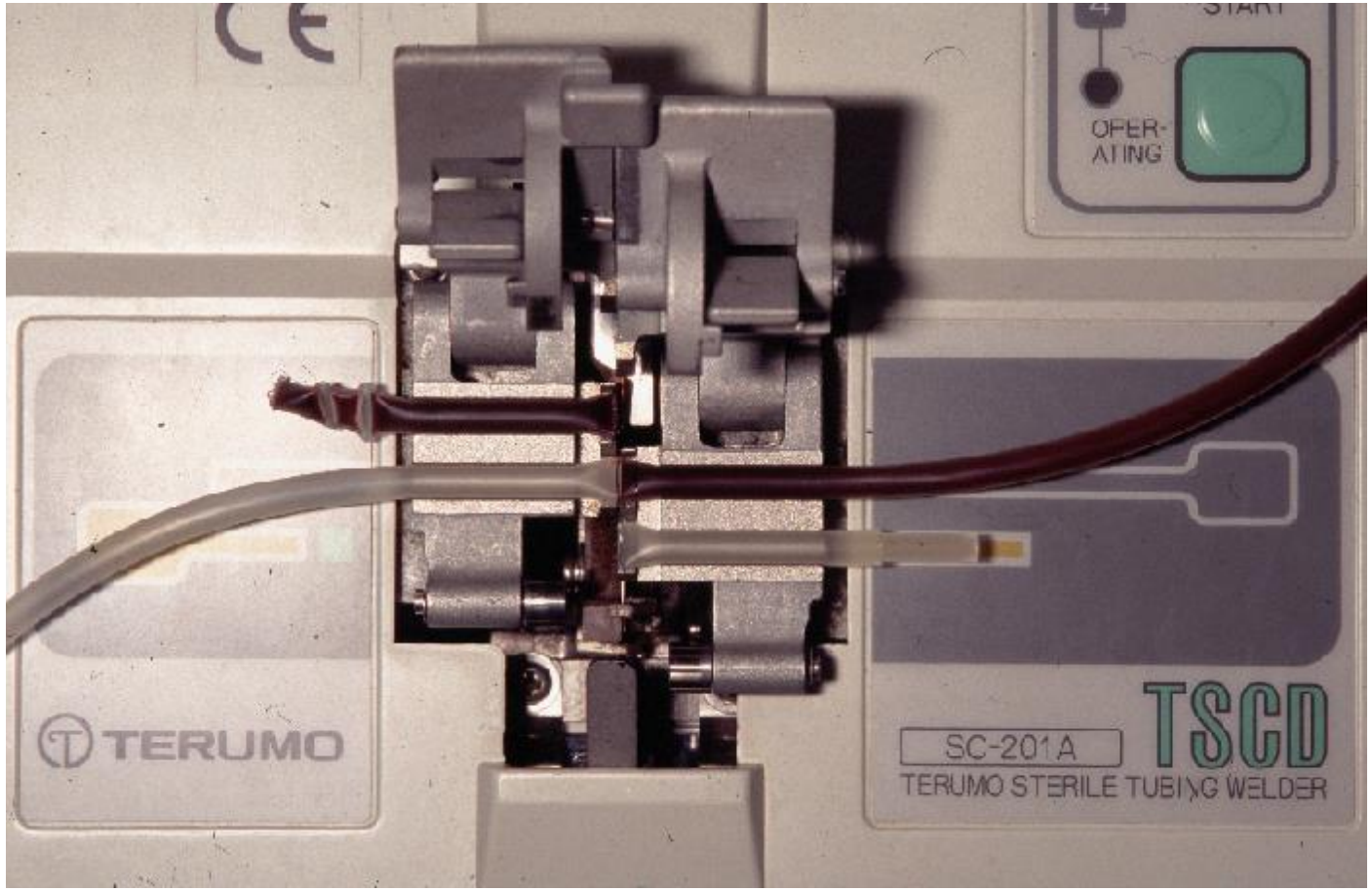
Connecting using a TSCD




OPER-
ATING
TERUMO
SC-201A
TSCD
TERUMO STERILE TUBING WELDER

PAS is drained through the "train" of bags using gravity to pool together the contents of the 4 buffy coat bags into the terminal bag

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Centrifugation - slow spin (1300 rpm)

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Blood Pressing

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1.

2.

3.

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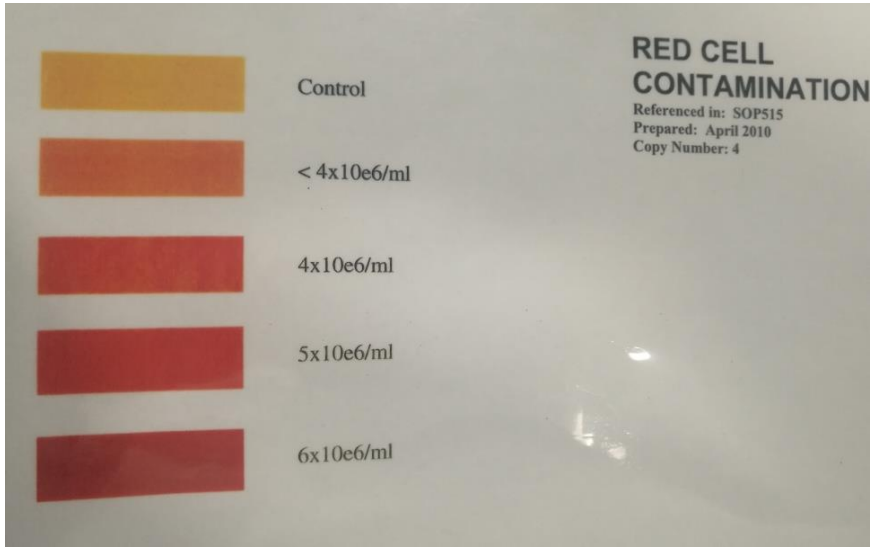
Final Product

- Pooled Platelets
- 7 days (due to bacterial monitoring)
- 22°C +/-2 gently agitate
- *Pools are not tested by Quality monitoring for residual red cells but all pools are visually inspected for RBC contamination and a visual scale used as an aid. Those that fail inspection (i.e. have an estimated red cell count of 4 x 10e6/ml or more are discarded as red cell contamination – See visual scale below



Only the top two on the colour chart are acceptable

Bacterial monitoring

- 16ml samples are taken from each platelet and inoculated in both aerobic and anaerobic broth bottles (8ml each) for the duration of the life of the platelet and stored in incubators (BactAlert).

The bottom of the bottle changes colour due to bacterial growth changing the pH of the bottle and causing the incubator module to alarm confirming a positive result.

Bacterial monitoring

- Platelets are then recalled from either validation, NHSBT Storage or other hospital sites and are sent to NBL in Colindale for testing.
- Consultant's are informed if the units are already transfused

- Mostly false positives due to the sensitive nature of the incubators but confirmed positives tend to be normal flora microbes such as ***P. acnes***

THE END

Thank you for listening

Any questions?

Email: Daniel.Spilsbury@nhsbt.nhs.uk