

Improving apheresis efficiency

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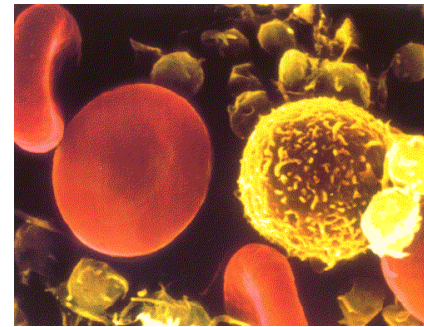
Blood and Beyond

Conflict of interest / disclosures

- None

Outline

- Apheresis
 - Separation
 - Technique within the machine
 - Procedure time



Apheresis

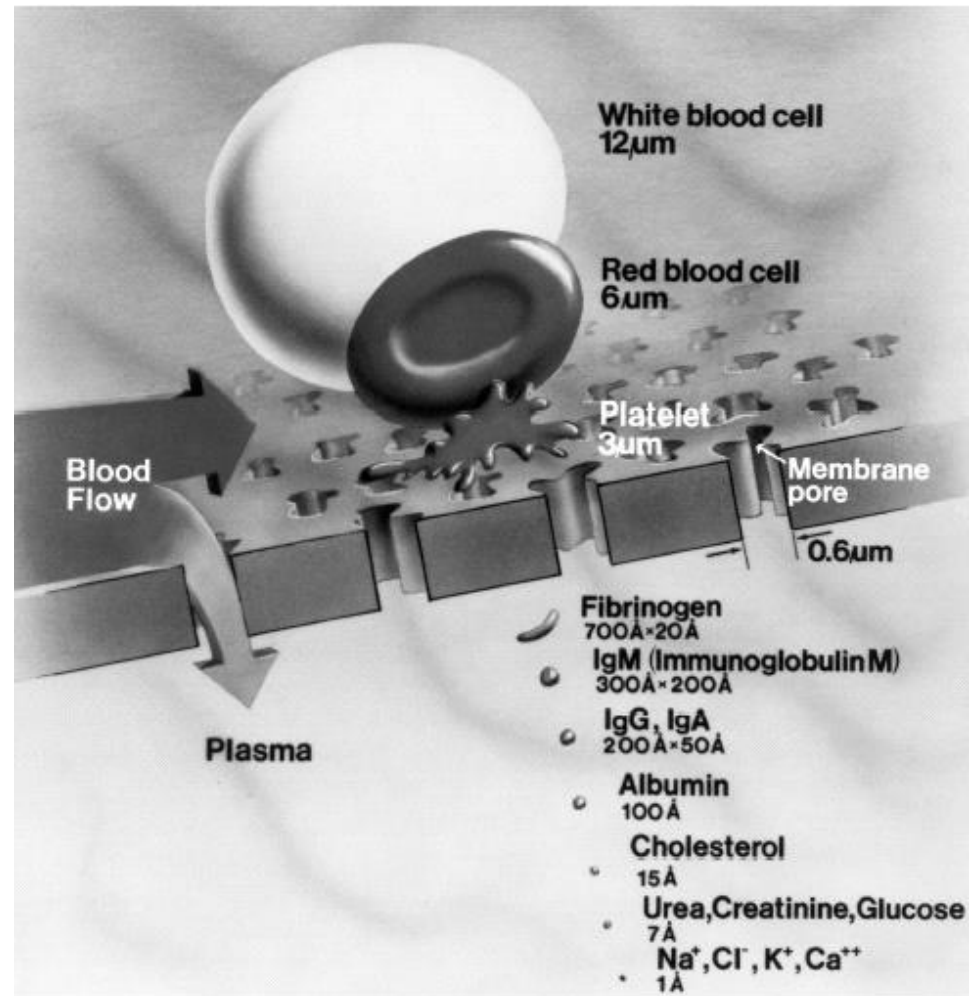
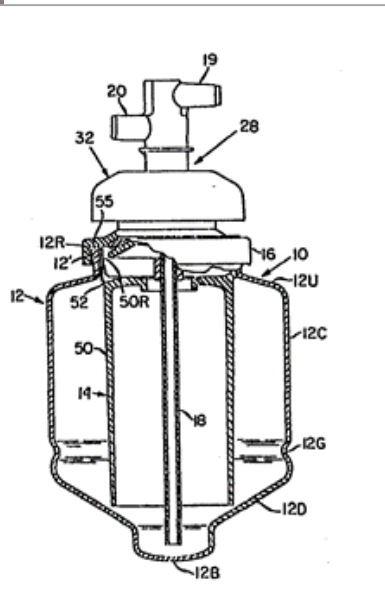
Method of obtaining one or more blood components by machine processing of whole blood in which the residual components of the blood are returned to the donor during or at the end of the process.

Reference

Guide to the preparation, use and quality assurance of blood components
European committee on Blood Transfusion
2017-19th Ed.

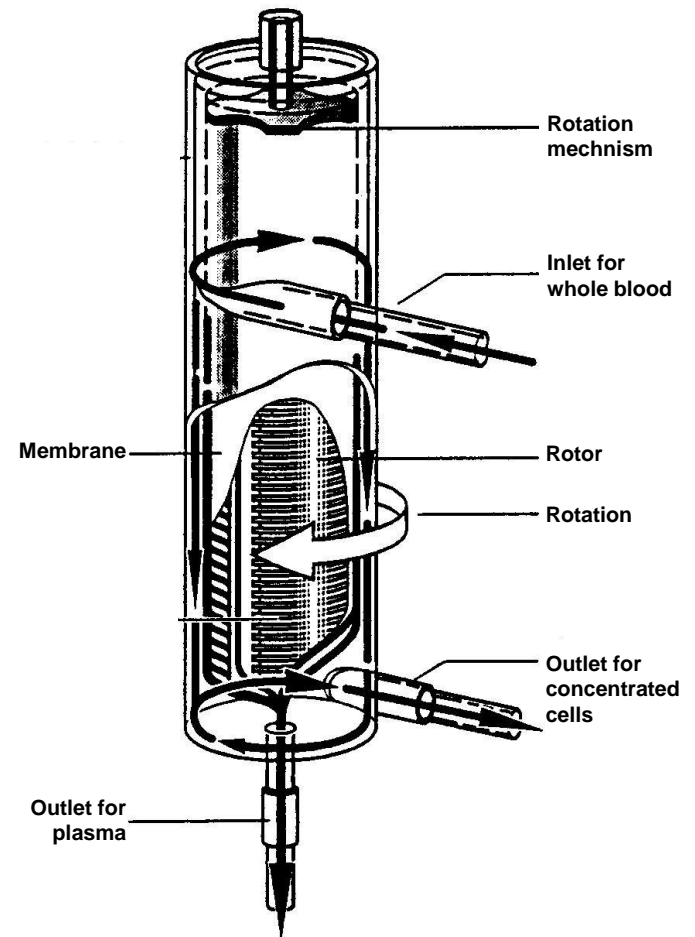
Separation techniques

- Filtration techniques
- Centrifugal techniques



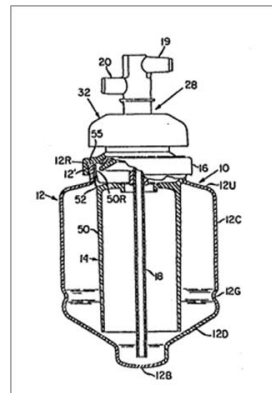
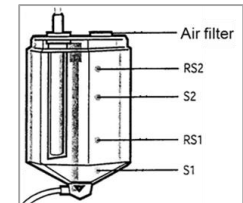
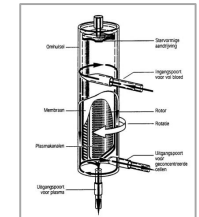
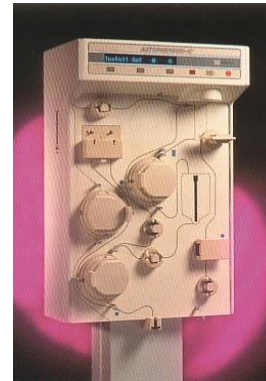
Separation techniques

- Filtration techniques
- Centrifugal techniques
- Combinations



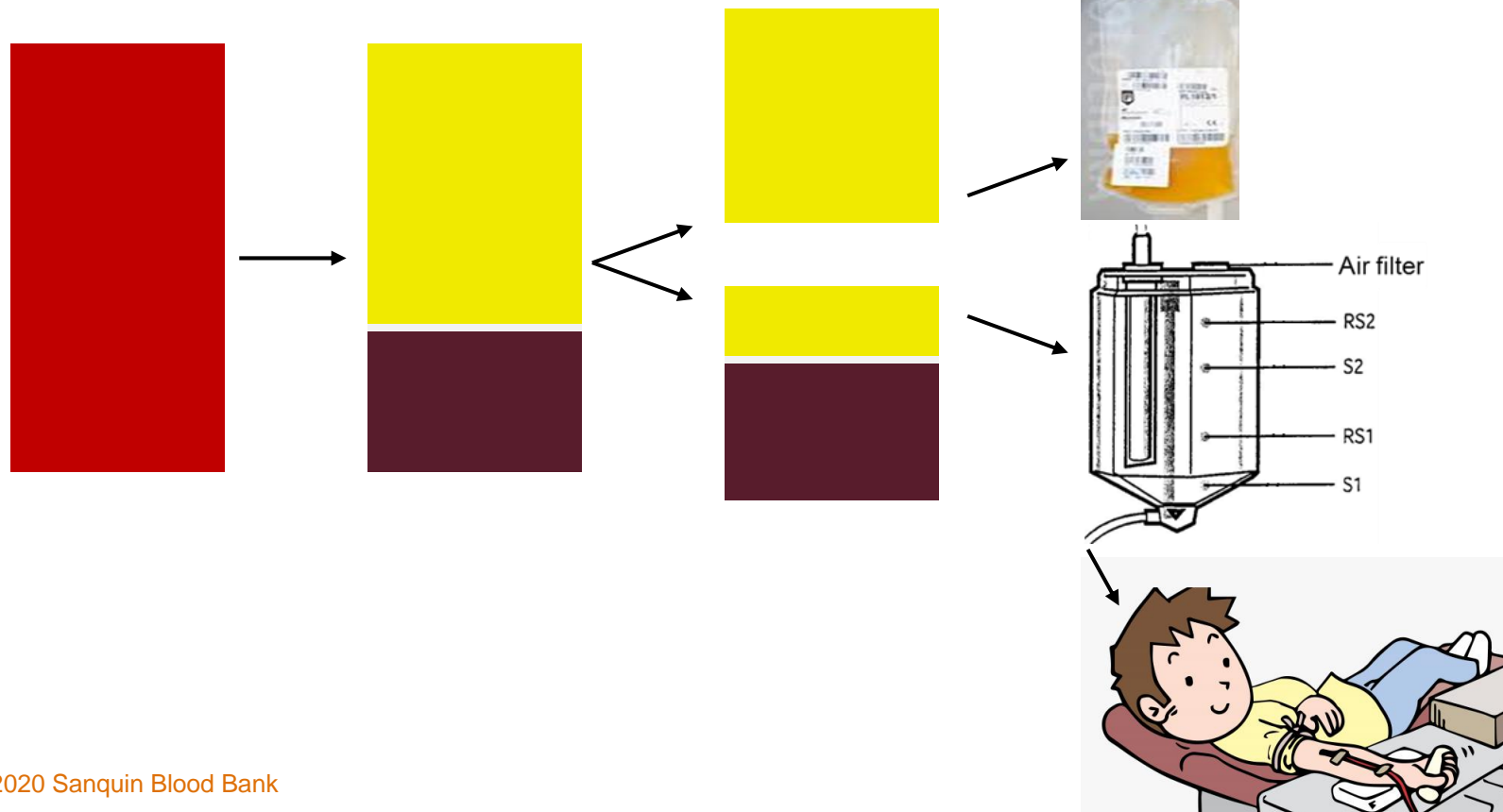
Apheresis equipment (plasmapheresis)

- Fresenius Kabi
- Haemonetics
- Nigale
- Scinomed

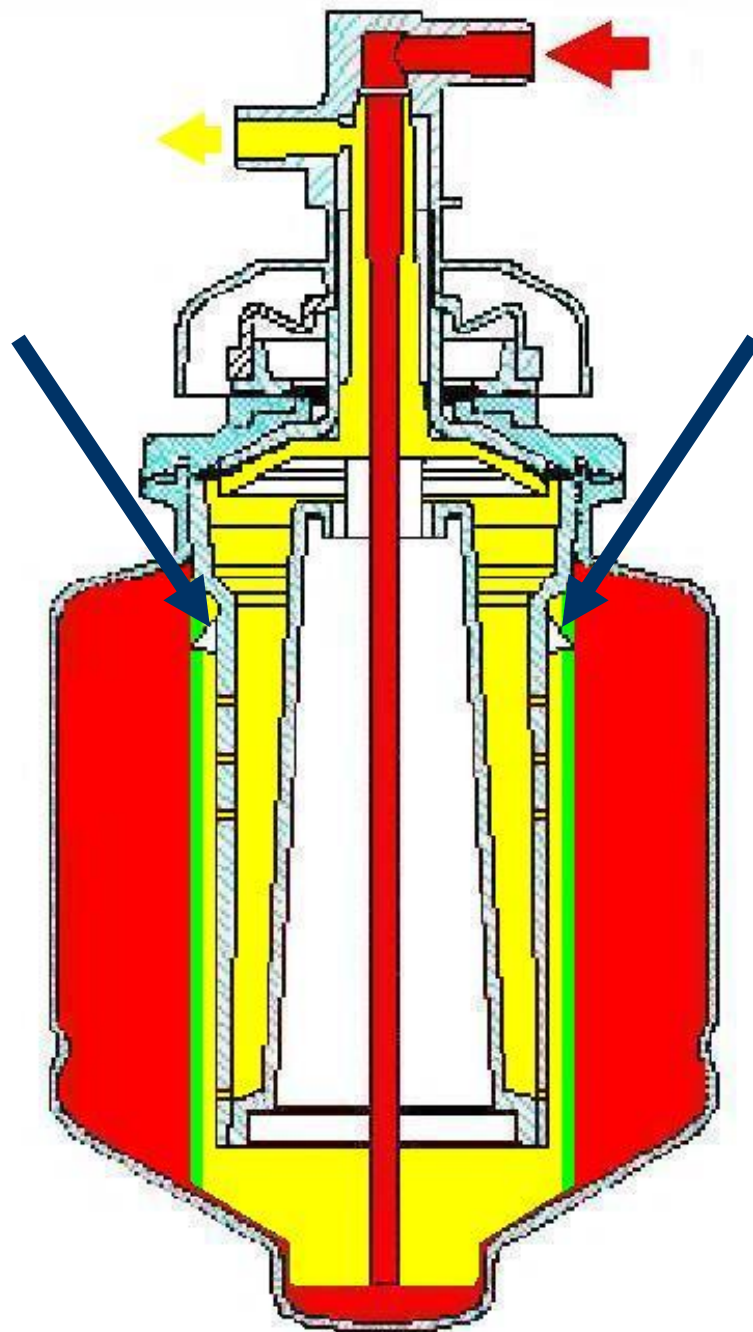


Blood separation

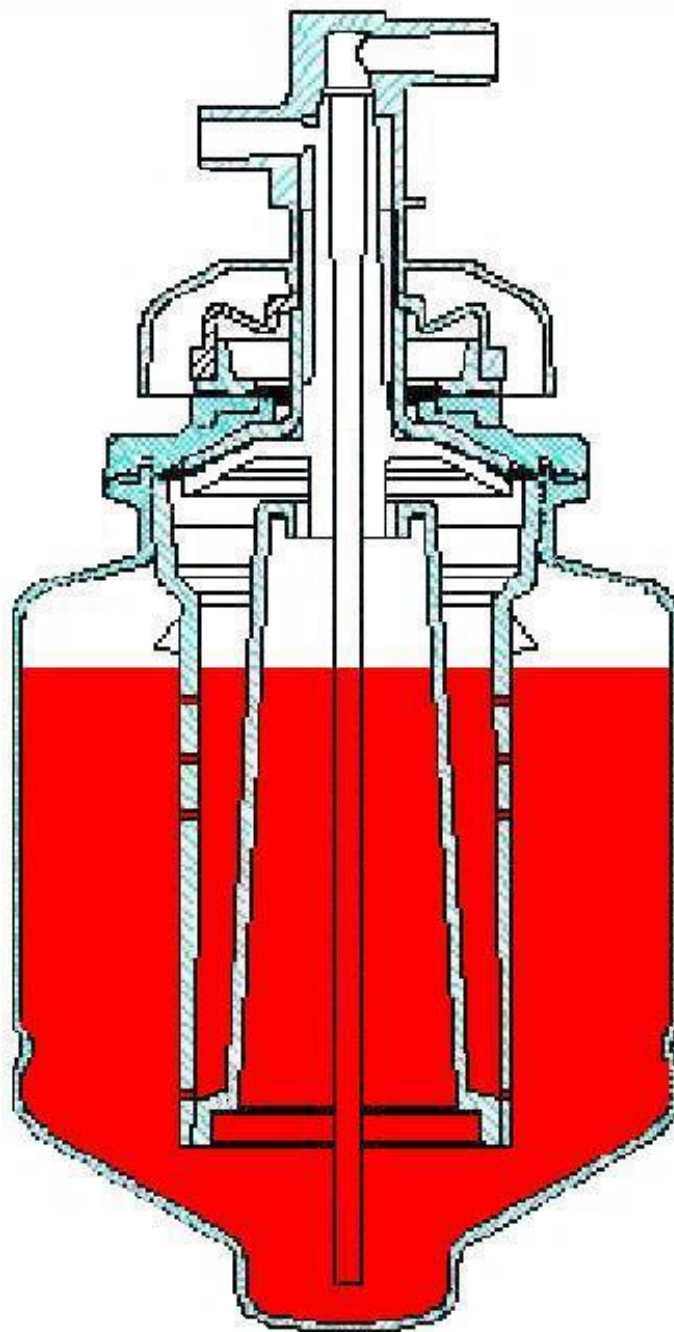
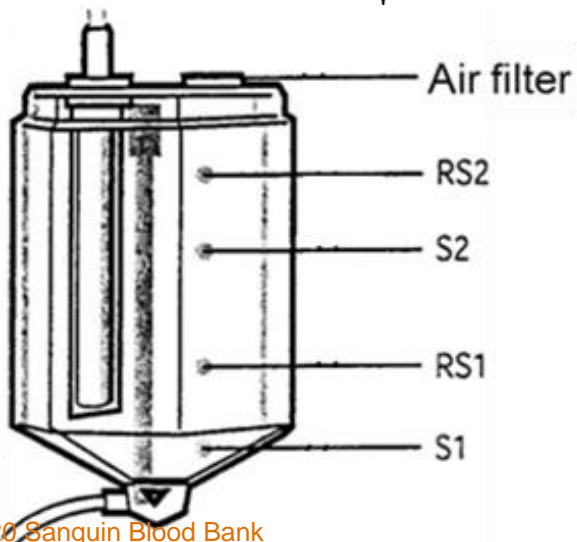
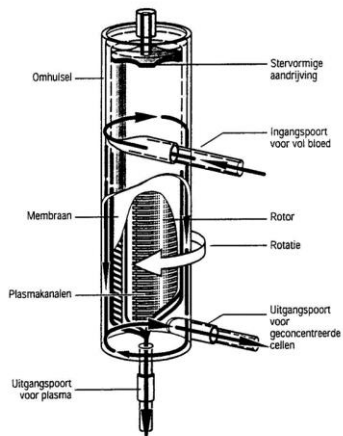
Blood separation → single needle technique



Detection of cells

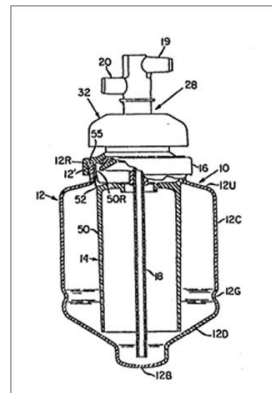
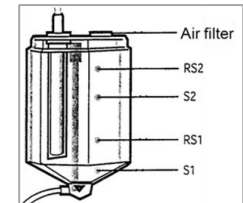
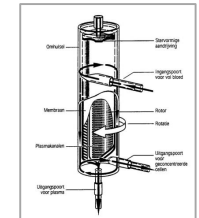
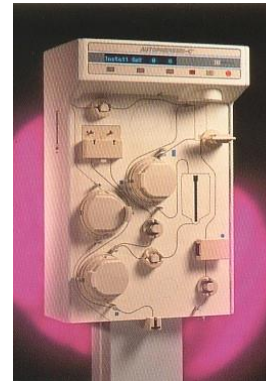


Draw (end)



Apheresis equipment (plasmapheresis)

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- Haemonetics
- Nigale
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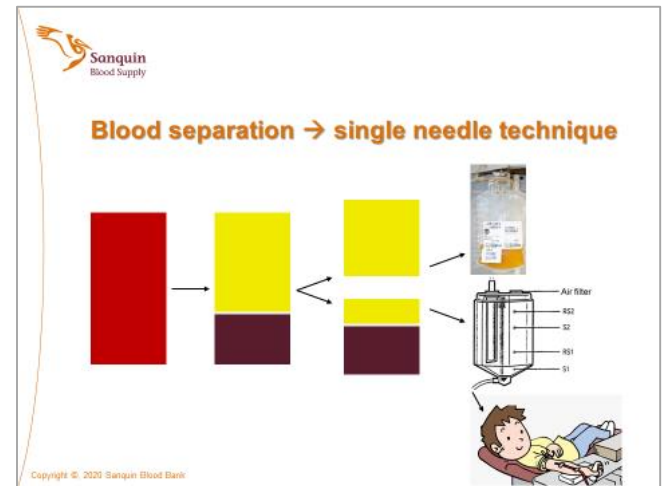
Cycles

1. Filling disposable system
2. Collection plasma until reservoir is full
3. Return content reservoir to donor

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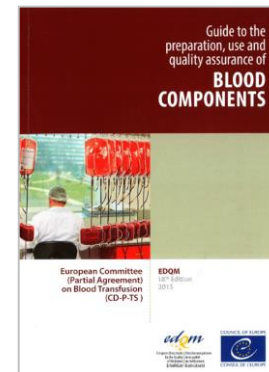


Guide (standards)

“In any apheresis procedure involving collection of plasma, platelets and/or red cells in one apheresis procedure, the total volume of all components collected (plasma, platelets and red cells) must not exceed 16% of total blood volume, with a maximum of 750 mL (exclusive of anti-coagulant), unless fluid replacement is undertaken.”

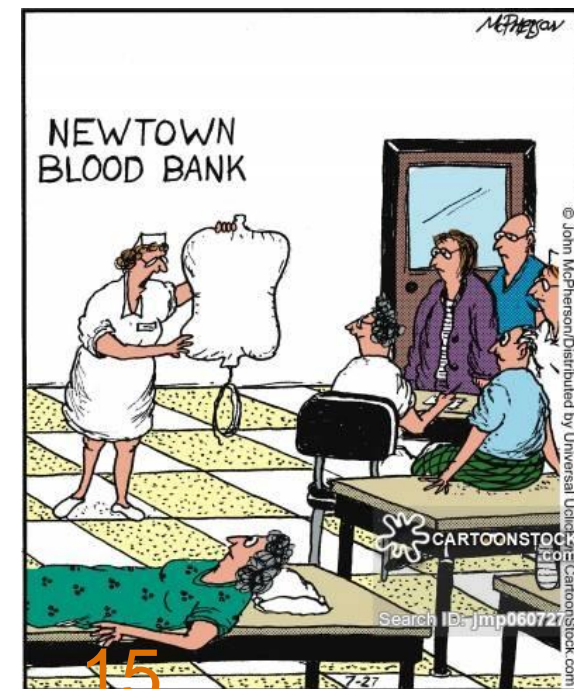
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Standards – plasmapheresis donors

- Max ECV 20%
- Max 16% TBV collected until max 750 mL plasma
- TBV should be calculated based on gender, height and bodyweight (Nadlers formula)
- Max 1.5 L per week
- Max 33 plasmapheresis donations per year
- Max 25 L per year
- Total proteins ≥ 60 g/L



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"OK, who wants to be a hero?!"

Cycles and time

1. Filling disposable system
2. Collection plasma until reservoir is full
3. Return content reservoir to donor

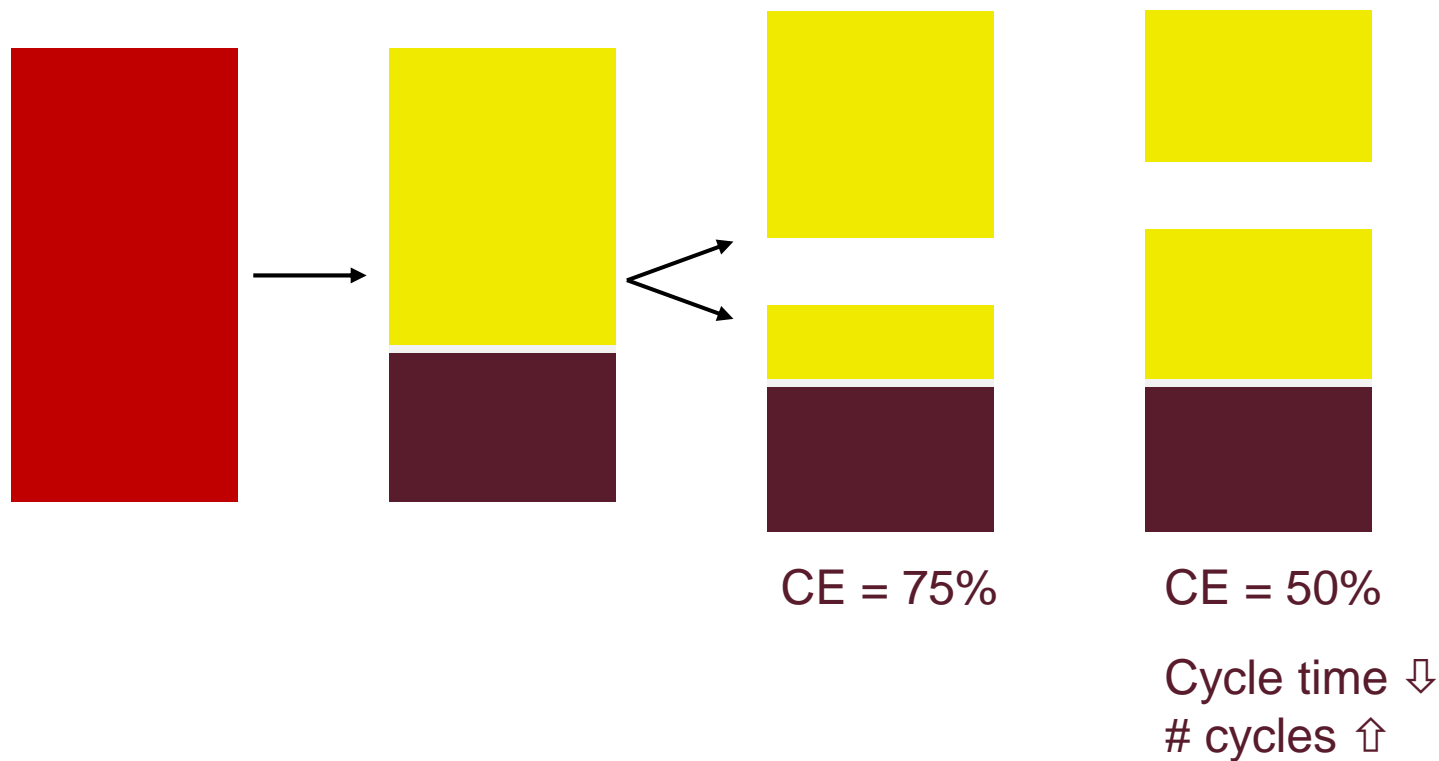
→ Draw speed

→ Size of reservoir

→ Return speed

→ Volume of collected plasma

Blood separation → single needle technique



Cycles and time

1. Filling disposable system
2. Collection plasma until reservoir is full
3. Return content reservoir to donor

→ Draw speed

→ Size of reservoir & CE

→ Return speed

→ Volume of collected plasma

Cycle(s) and time

→ Draw speed

- Collaps / fainting of donor
- Low pressure → vene problems



<https://clipart4biz.com/expl ore/fainted-clipart-love/>

→ Size of reservoir & ~~CE~~

- Collaps / fainting of donor

→ Return speed

- High pressure → vene problems
- Hematoma
- Citrate intoxication



→ Volume of collected plasma

- Collaps / fainting of donor

“Donors who react may not come back”

- Whole blood donors (n=89,587) American Red Cross Blood Services
- Analyzed repeat donation vs. vasovagal reaction
 - one-year follow-up:
 - moderate + severe vasovagal reaction: 50% overall reduction
 - mild vasovagal reaction (97%): 20% reduction FD, 33% RD

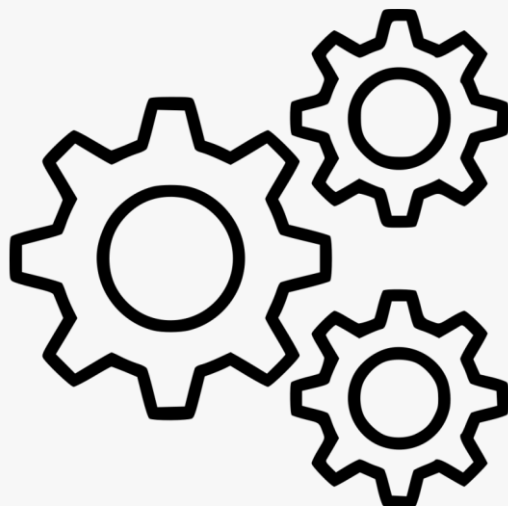
Cycle(s) and time

→ Draw speed

→ Size of reservoir & CE

→ Re

→ Ve



• Coll

• Low

• Coll



<https://www.istockphoto.com/nl/vector/fabrikant-icon-concept-gm1157947251-316126612>

• High

• Hem

• Citra

• Coll



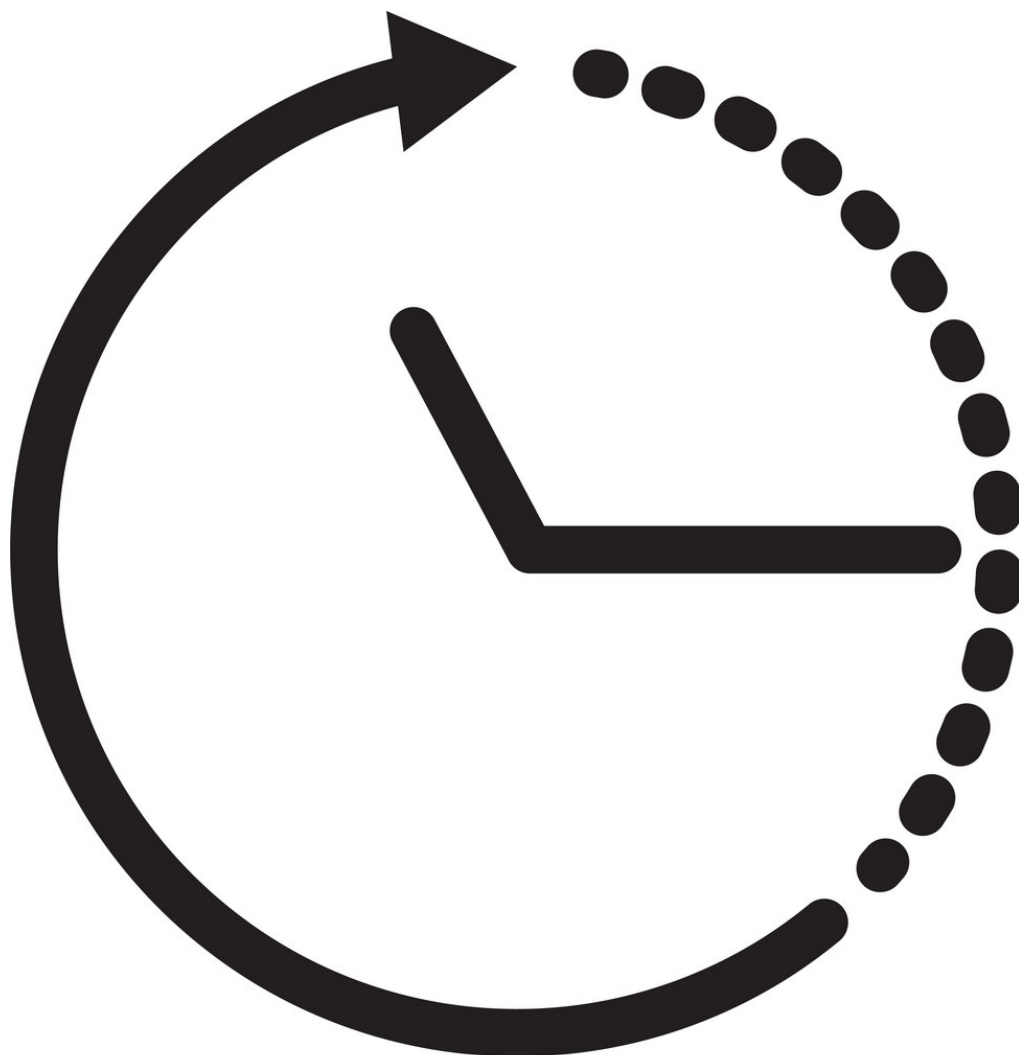
blems



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blems





Procedure time

Procedure time by apheresis machine → needle in – needle out →
“machine time”



•Procedure time	42 min
•Installing disposable	2 min
•Donor sit, disinfection, venipuncture, tubes	7 min
•Removal disp., self test / calibration, paperwork	9 min
•Total	60 min

Cycle(s) and time

- Draw speed
- Size of reservoir ~~& CE~~
- Return speed
- Volume of collected plasma

Plasmapheresis 'machine time'



PT = 42 min → total 60 min



PT = 30 min → total 48 min

- Machine time

Machine time reduction

Parameters	Control group	
	Avg	StDev
Procedure Duration	44.2	7.5
Volume Processed	1924	264
Number of Cycle	3.9	0.8
Donor Hct	41.3	3.1
Net volume before sampling [ml]	789.5	51.2
Red Blood Cell count [$10^6/\mu\text{l}$]	0.00032	0.00081
Platelet count [$10^3/\mu\text{l}$]	24.5	13.2
Leukocytes count [$1/\mu\text{l}$] (Flow cytometer)	22.7	16.3

Plasmapheresis 'machine time'



PT = 42 min → total 60 min



PT = 30 min → total 48 min

•Machine time



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Plasmapheresis procedure time

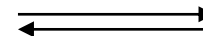


PT = 42 min → total 60 min



PT = 30 min → total 48 min

- Machine time
- Installing disposable
- Donor sit, disinfection, venipuncture, tubes
- Removal disp., self test / calibration, paperwork



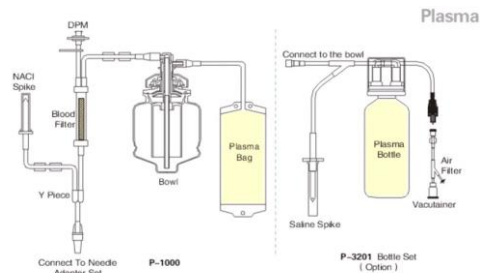
Procedure time efficiency

- Apheresis equipment
- Handling
- Disposable

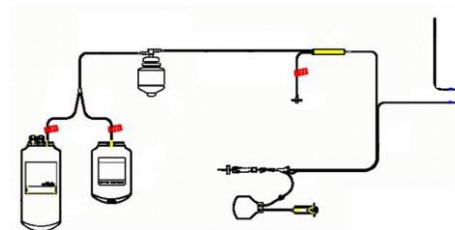
Apheresis Efficiency

Disposable

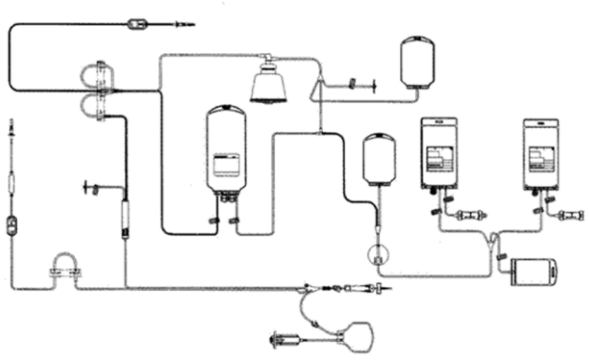
- Unbundled system



- Open system



- Closed system



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In conclusion

For the efficiency to collect plasma by apheresis, you also need to look at the apheresis machine, the disposable and handling at the collection center.