NHS
Blood and Transplant

Evaluating Whole Blood for Civilian Use

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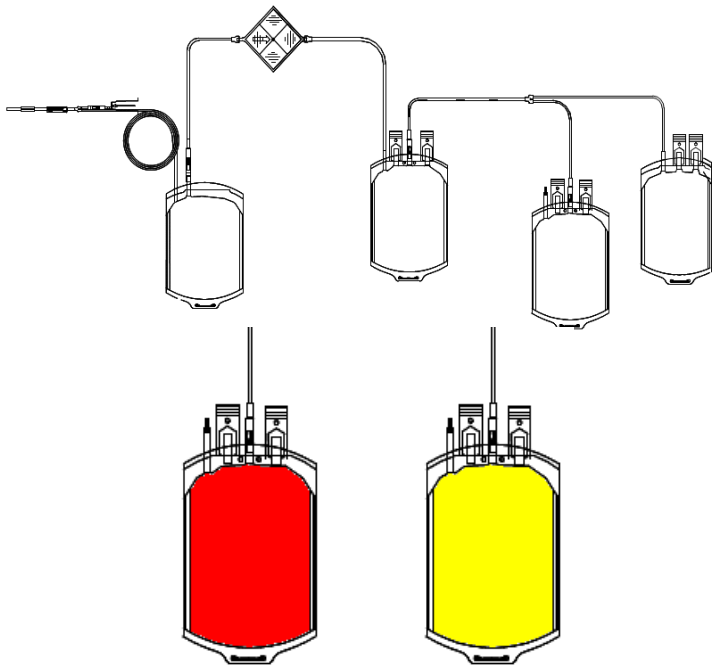
Current status in UK

- We do not provide WB for civilian use
- Interest from UK hospitals in WB in pre-hospital setting/ and possibly in trauma centres
  - To enable rapid transfusion of plasma & platelets, not just red cells
  - Logistical benefits c/f flying with & administering multiple bags/types of components
  - Raised as a priority by hospitals for consideration
- Undertaking a programme of work to assess this

Currently LD WB does not contain platelets

Current

Leucodepletion filter removes platelets

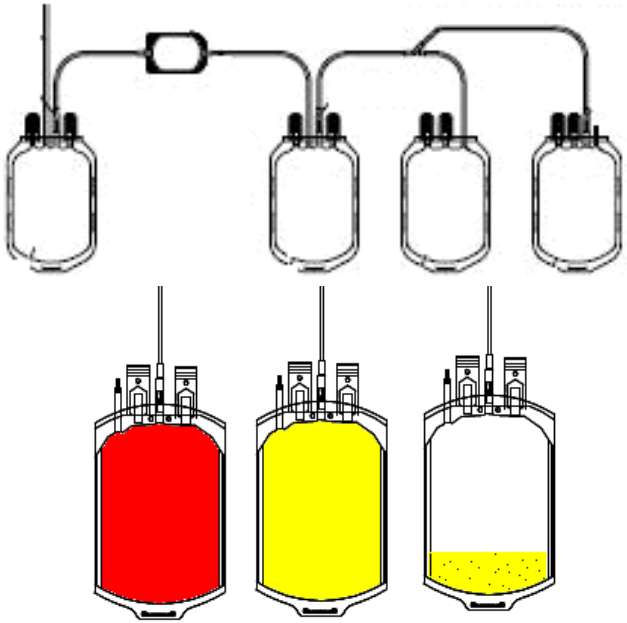


Red cells

Plasma

Alternative

Leucodepletion filter saves platelets



Red cells

Plasma

¼ unit of platelets

Research plan

Two staged approach

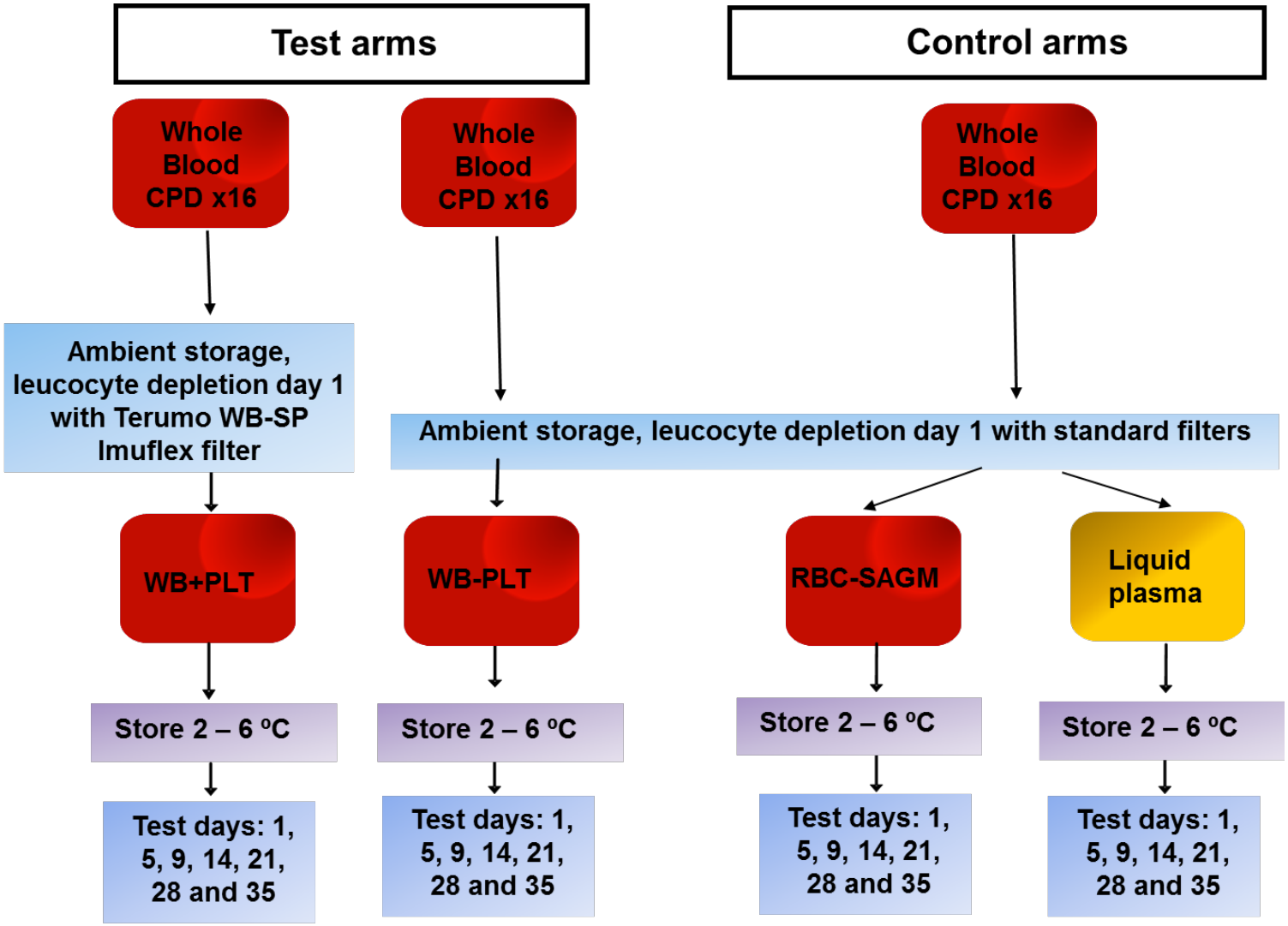
- 1) WB-PLT
  - Look at current product (CPD LD WB; red cells in plasma)
  - Lab studies to consider shelf-life
    - Currently mainly based on viability of red cells – what about plasma
    - Key as unlikely to be able to ‘recycle’ blood under current UK blood regulations
  - Feasibility study & assessment of logistics-Royal London
- 2) WB+PLT
  - Consider how best to achieve the ‘product’
  - Lab studies of platelet function
  - RCT

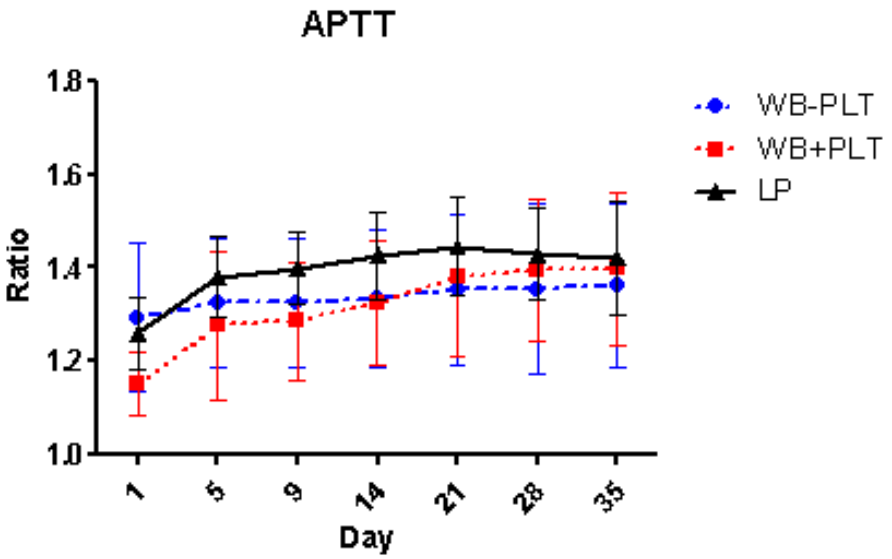
How should we set the shelf-life of WB –PLT?

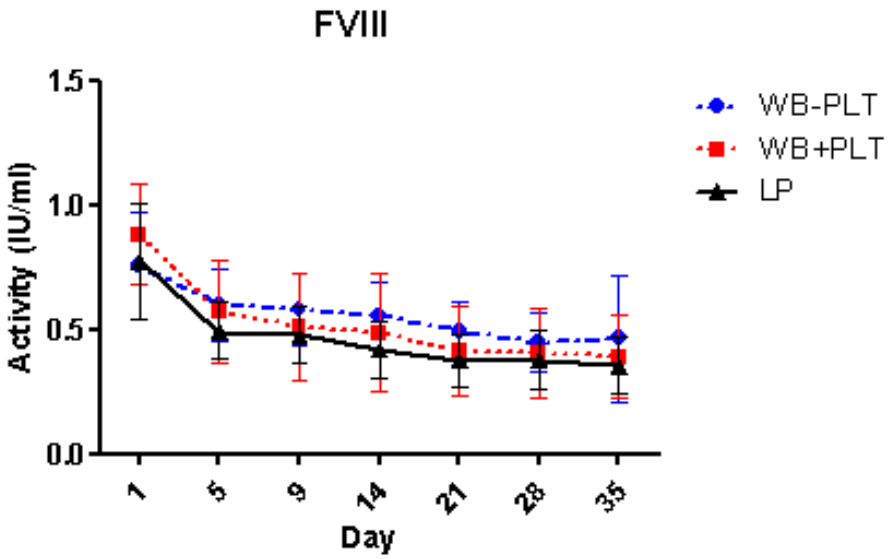
Discussion with our UK standing advisory committee on blood components prior to study

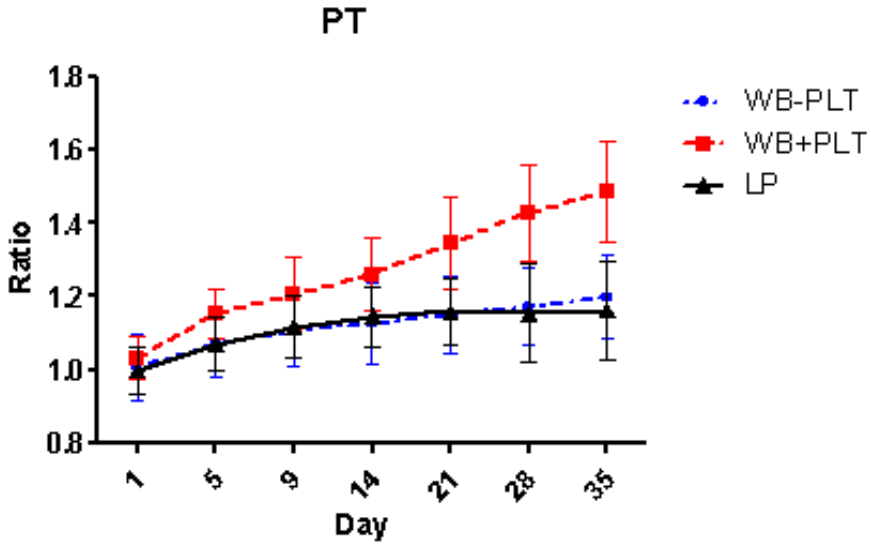
- Red cells
  - Viability of red cells in CPD WB already known
  - Lab data no worse than day 35 red cells in SAGM – i.e max permitted current standard of care
- Plasma
  - Do not want to set the bar ‘too high’
  - Relevant comparators for MH
    - Day 5 thawed plasma (approved in UK for MH)
    - LP -previous work suggested UK would set shelf-life of 7-14 days

Study design




APTT
Ratio
1.8
1.6
1.4
1.2
1.0
1
5
9
14
21
28
35
Day
WB-PLT
WB+PLT
LP


FVIII
Activity (IU/ml)
1.5
1.0
0.5
0.0
1
5
9
14
21
28
35
Day
WB-PLT
WB+PLT
LP


PT
Ratio
1.8
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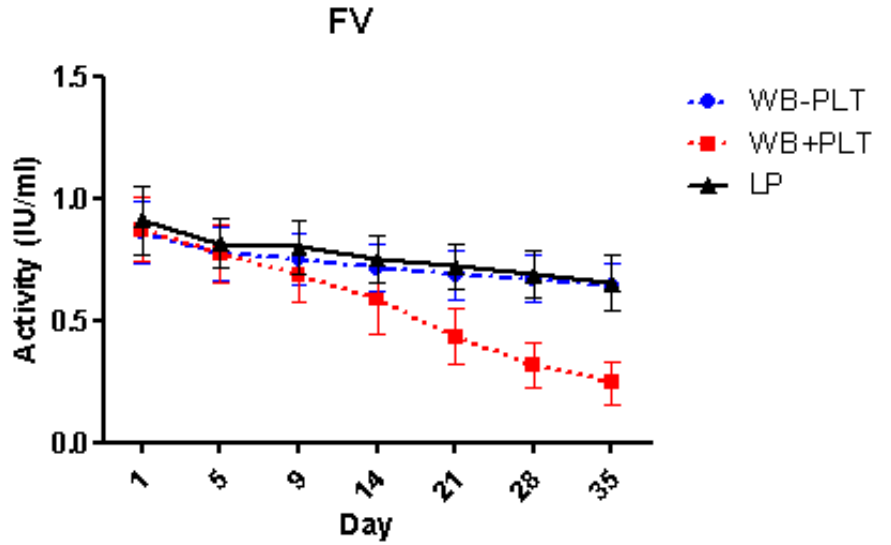
WB+PLT
LP


FV
Activity (IU/ml)
1.5
1.0
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Day
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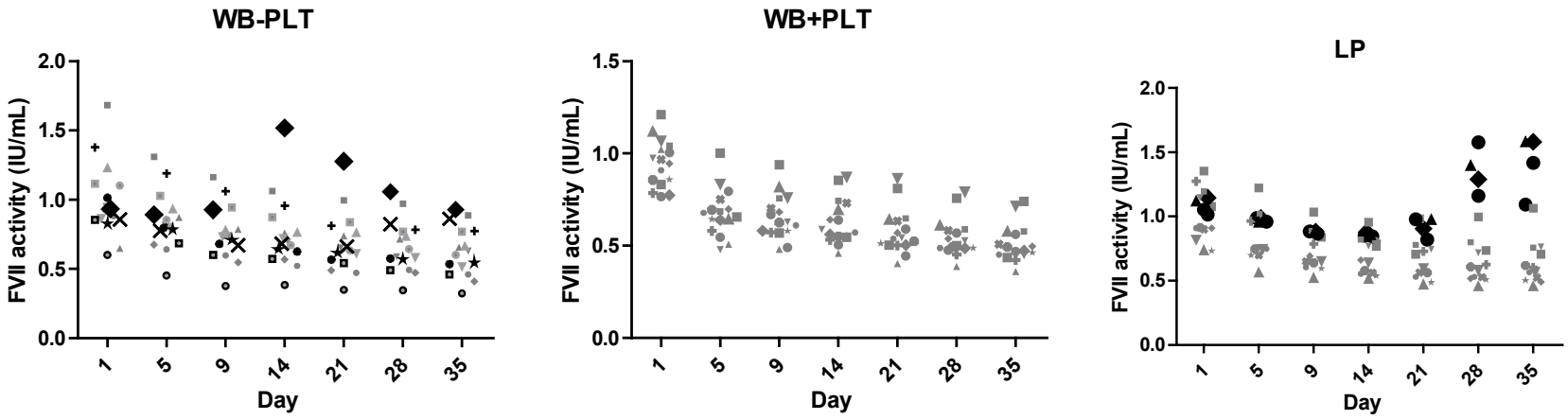
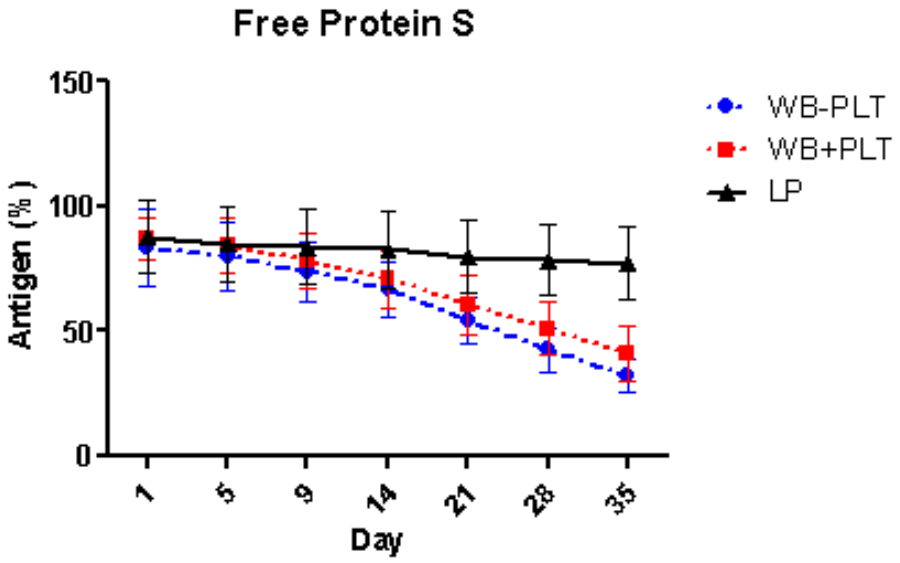
LP

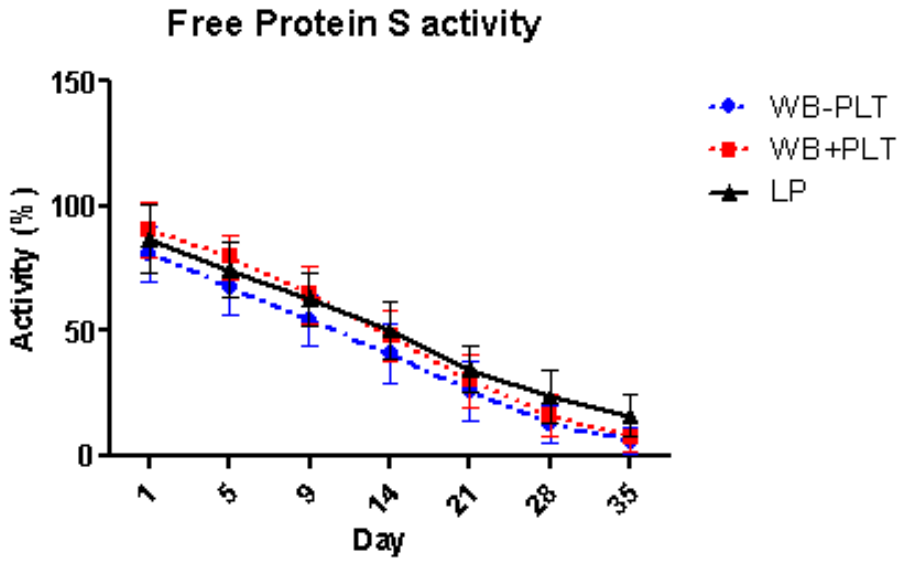
Contact Activation



- increase rates of S-2302 substrate turnover suggesting contact activation in
- **4/16** LP units, **2/16** WB-PLT units and **0/16** WB+PLT units
- These units also had increased FVII activity & reduced INR.

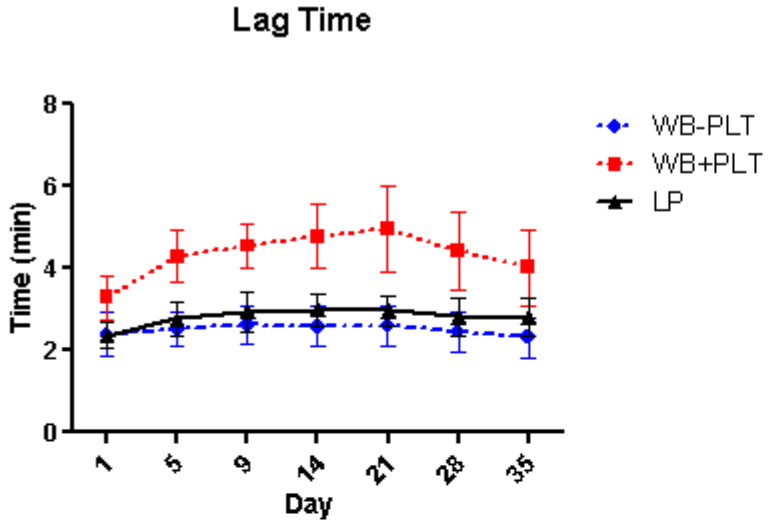
Protein S

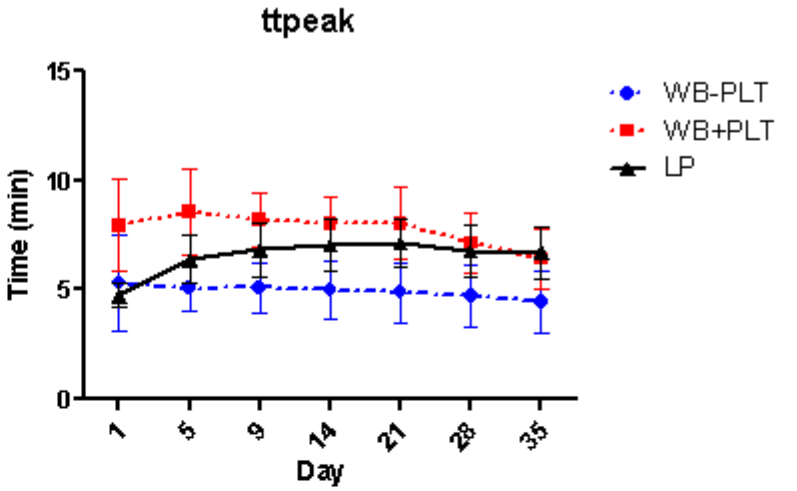


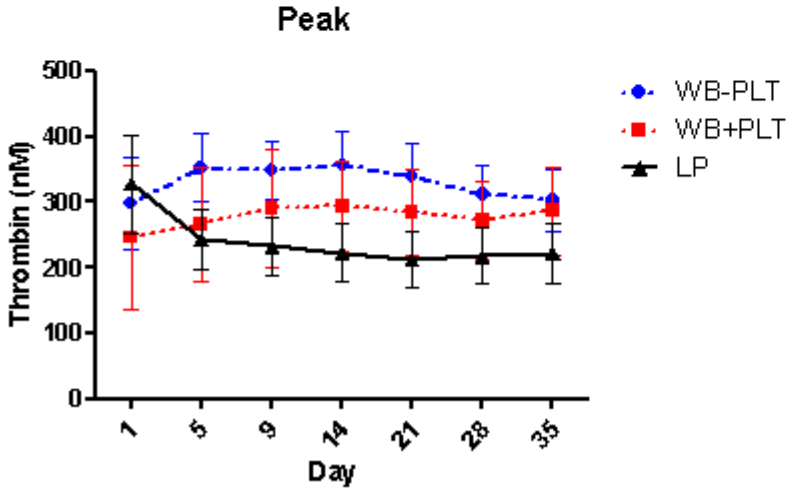


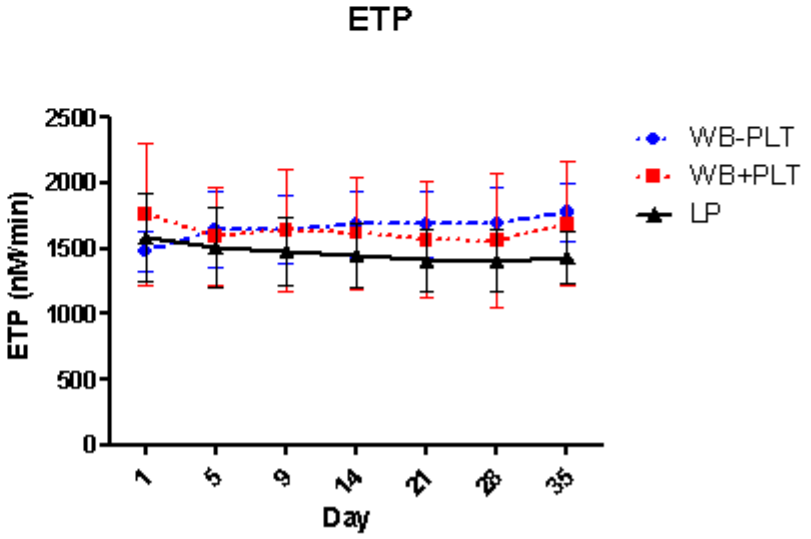
- Free protein S antigen decreased significantly in WB-PLT and WB+PLT compared with LP by day 9 and day 14.
- There was significant loss of protein S activity in all components.

Thrombin generation









Summary

- FVIII, FV, FVII, a2-AP and free protein S antigen remained on average > 0.50 IU/ml or 50 %, as appropriate, at day 14 in WB-PLT
- Protein S activity remained on average > 40% at day 14 in WB-PLT
- Thrombin generating potential of components remained stable
- Contact activation was demonstrated in 12.5 % of WB-PLT units beyond day 14.
- The presence of platelets makes a difference to plasma

Considerations for shelf-life

- For red cells would set the shelf-life at 21 days.
- Plasma
  - As for LP <14 days to prevent contact activation
  - At day 10 all >0.50 IU/ml
  - At 14 d all >0.50IU/ml on average except PS (0.40)
- Shelf-life of WB-PLT (red cells in plasma) agreed at 14 days to support feasibility studies
- We have not yet assessed the platelet function of platelets stored in whole blood compared to on their own

Feasibility study of RBC & Plasma

- October 2018 RC&Plasma component will replace RBC transfusion in the pre-hospital setting in London.
- **Population**: all trauma patients requiring blood in the pre-hospital setting in London.
- **Comparators**:
  - trauma patients who have been transfused RBC in the pre-hospital setting in London (March 2015 - Aug 2018).
  - Trauma patients who have received RBC and FFP in the pre-hospital setting in Oxford and Newcastle

Feasibility study of RBC & Plasma

- **PRIMARY objective**

- Percentage of days of “On Time in Full“ (OTIF) delivery
- wastage level in hospital

- **Secondary objectives**
  - Resuscitative effect (base excess, lactate) & coagulation
  - Haemolysis
  - Patient outcomes
  - NHSBT logistics of manufacturing and supply, future demands & mitigation to reduce waste
  - Practical advantages of transfusing RC&Plasma in pre-hospital setting

Future development

- Assessment of platelet function in WB+PLT v platelet concentrates (RT or 4oC).
- Determine shelf-life of WB+PLT
- Understand demand for such a product
- Consider relevant clinical studies of WB+PLT

Ackowledgements

NHS Blood and Transplant

LONDON'S AIR AMBULANCE

Queen Mary University of London

b+tlc BARTS CHARITY

NHS Barts Health NHS Trust