

# SHOT Experience and UK Initiatives on TRALI prevention

Lorna M Williamson

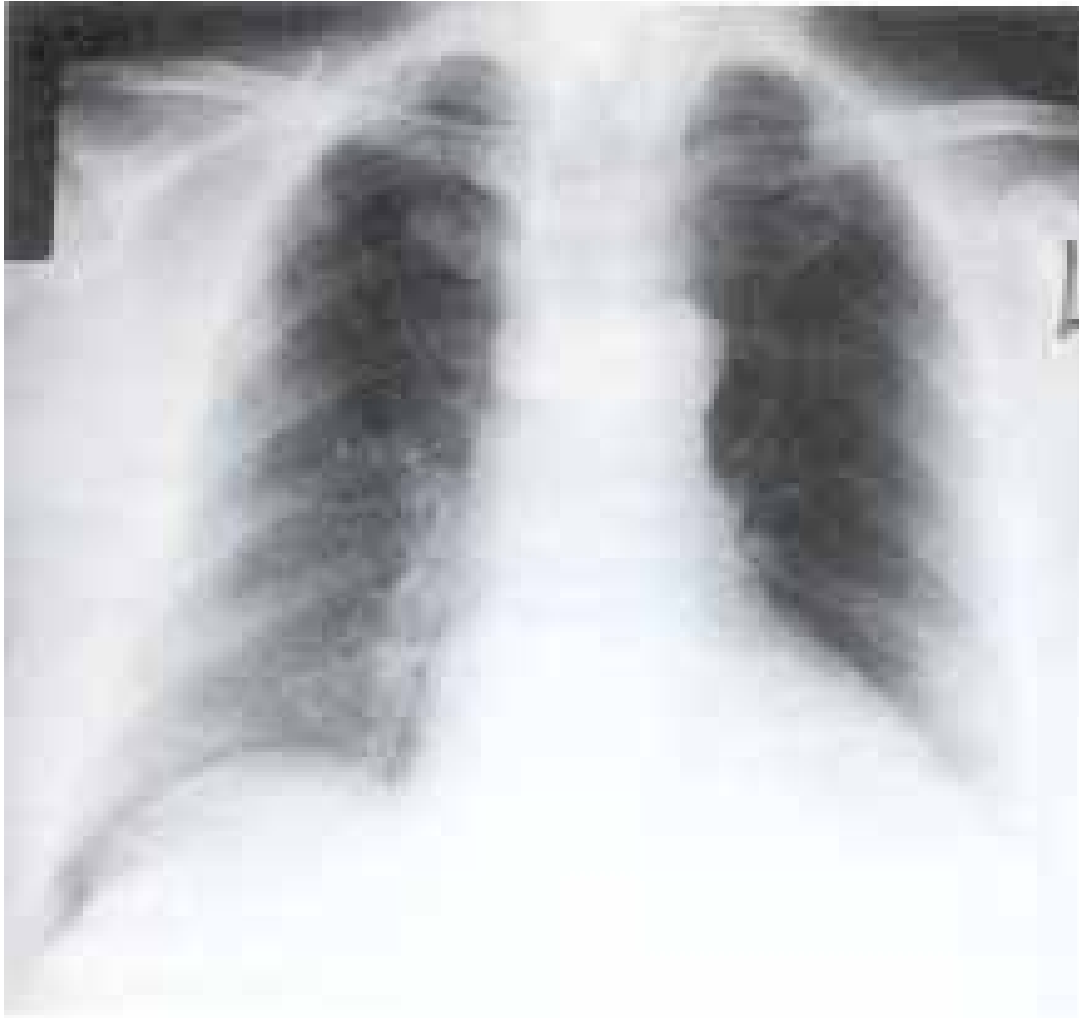
University of Cambridge/National Blood  
Service

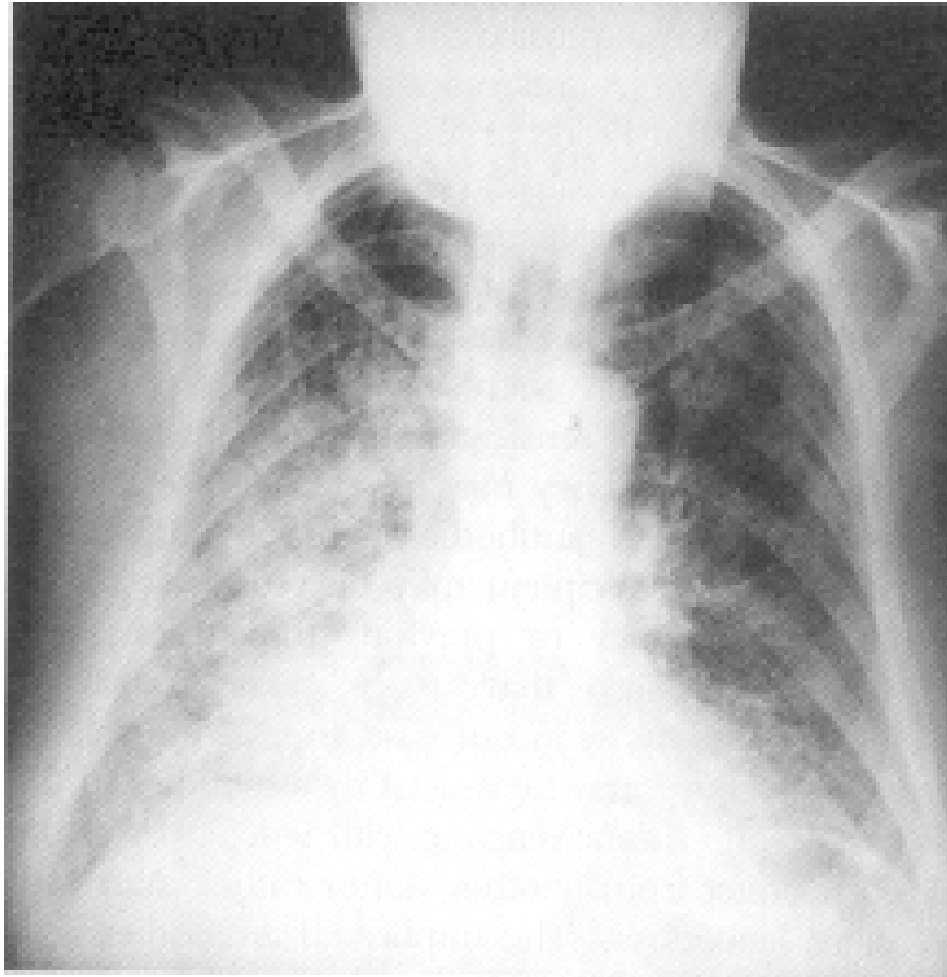


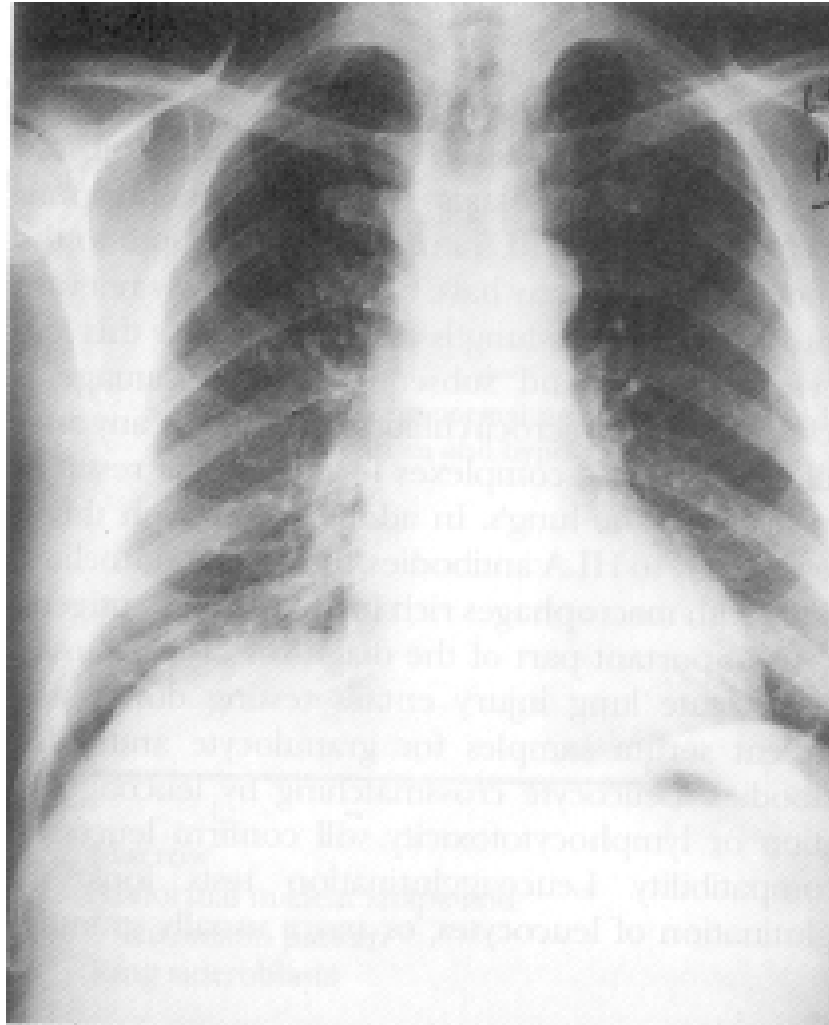
# TRANSFUSION-RELATED ACUTE LUNG INJURY (according to SHOT)

ACUTE DYSPNOEA WITH HYPOXIA  
AND BILATERAL PULMONARY  
INFILTRATES OCCURRING DURING  
OR IN THE 24 HOURS AFTER  
TRANSFUSION, WITH NO OTHER  
APPARENT CAUSE





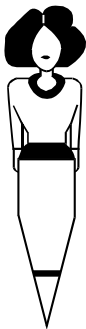




# One major cause of TRALI is leucocyte antibodies in donor plasma- either to HLA or HNA.

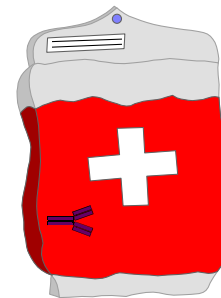


A male (or female) donor with a history of blood transfusion



A female donor with history of pregnancy -antibodies in 10-15%, of which 50% specific.

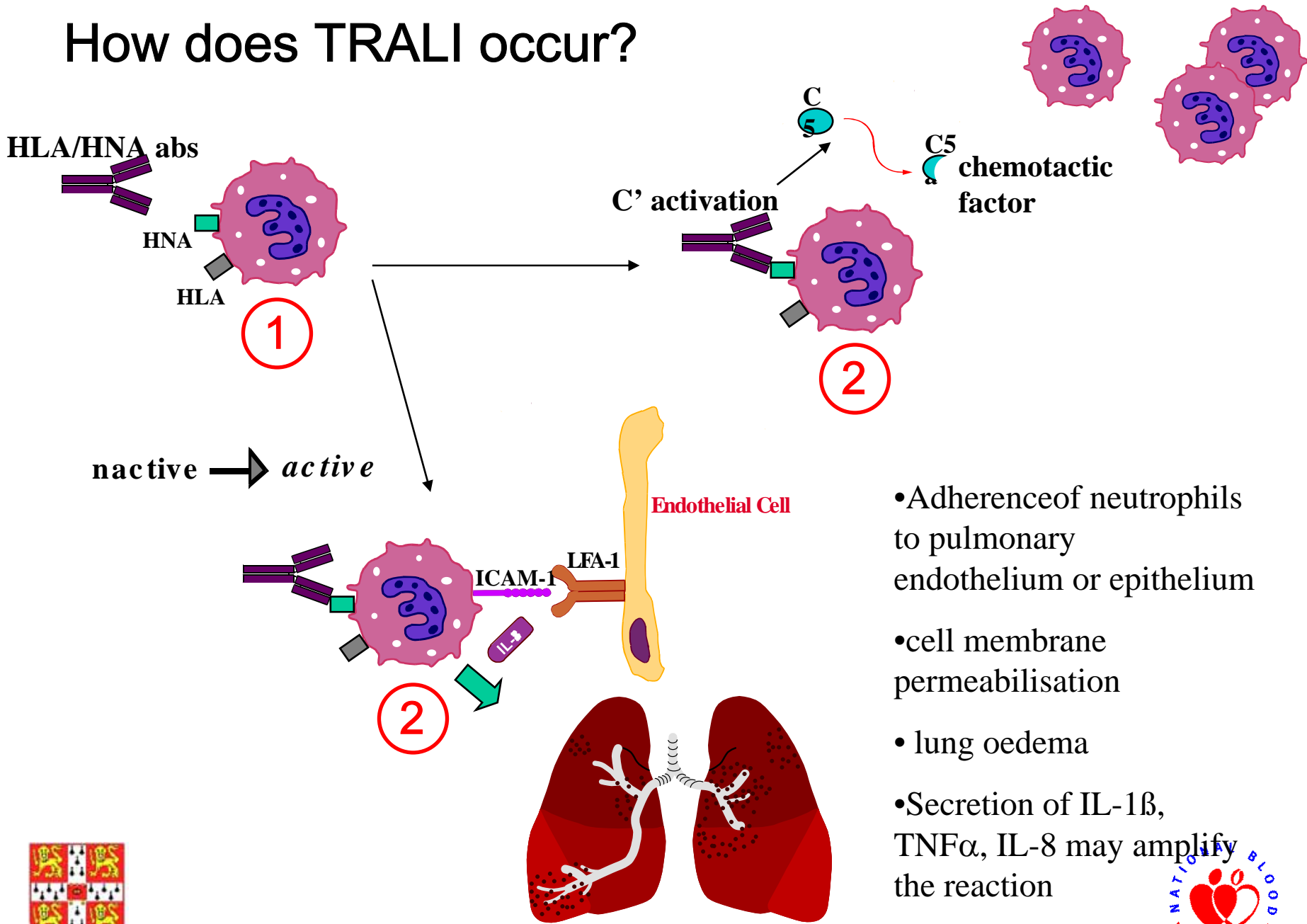
(MacLennan, Navarrete Lucas et al 2004)



HLA/HNA antibodies



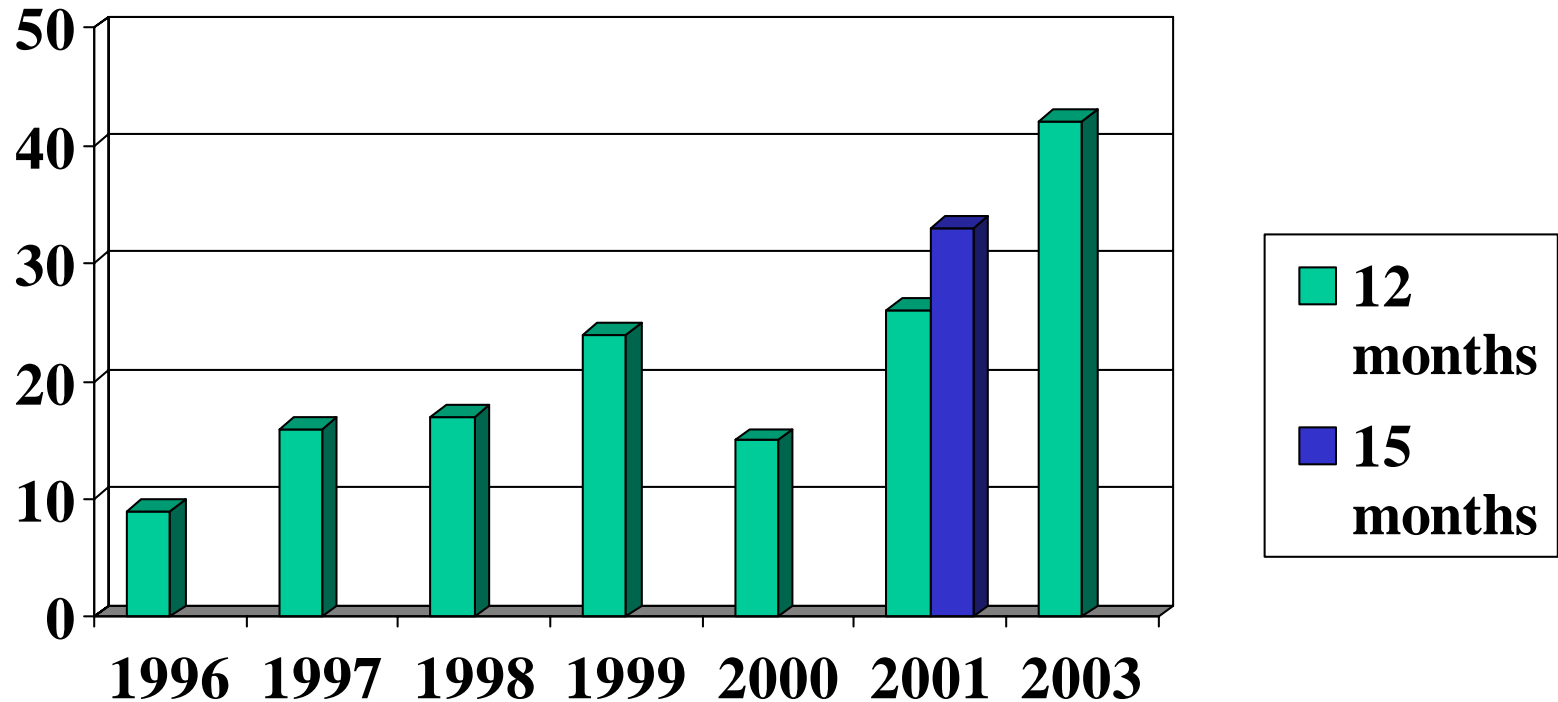
# How does TRALI occur?



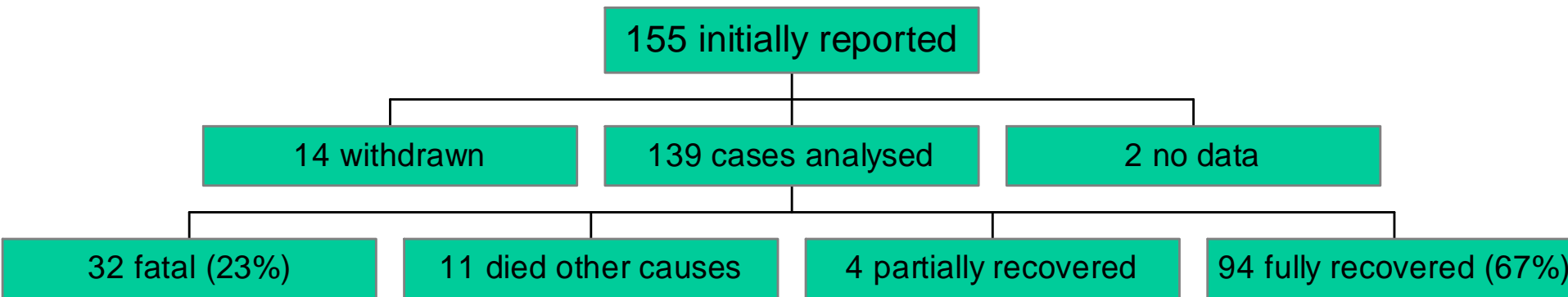
- Adherence of neutrophils to pulmonary endothelium or epithelium
- cell membrane permeabilisation
- lung oedema
- Secretion of IL-1 $\beta$ , TNF $\alpha$ , IL-8 may amplify the reaction



# TRALI cases reported to SHOT (n = 155)



# 155 cases of reported TRALI



# Other diagnoses with a similar clinical picture to TRALI

- fluid overload
- respiratory distress syndrome secondary to infection, trauma etc
- lung infection
- acute reaction to blood component



# TRALI investigations looking for leucocyte antibodies

- Refer to 1 of 3 specialist consultants in NBS
- Recall donors for fresh serum samples - females and transfused males first
- Patient: serum, DNA and cells for X-matching
- HLA antibodies: class I and II, specificity
- Granulocyte antibodies: HNA systems
- IgG and IgM X-match between donor serum and patient leucocytes (if available)

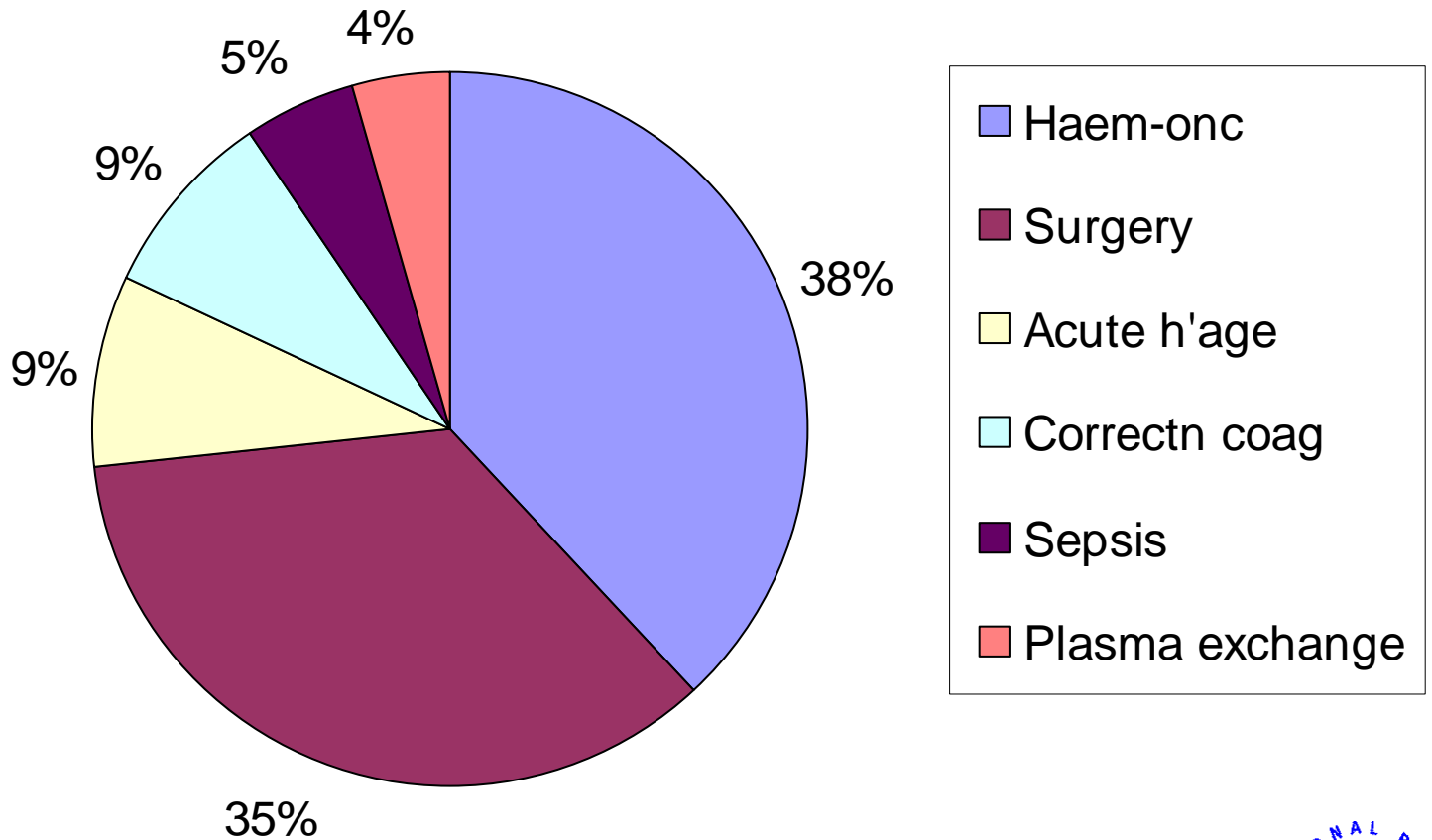


# Profile of 139 TRALI cases

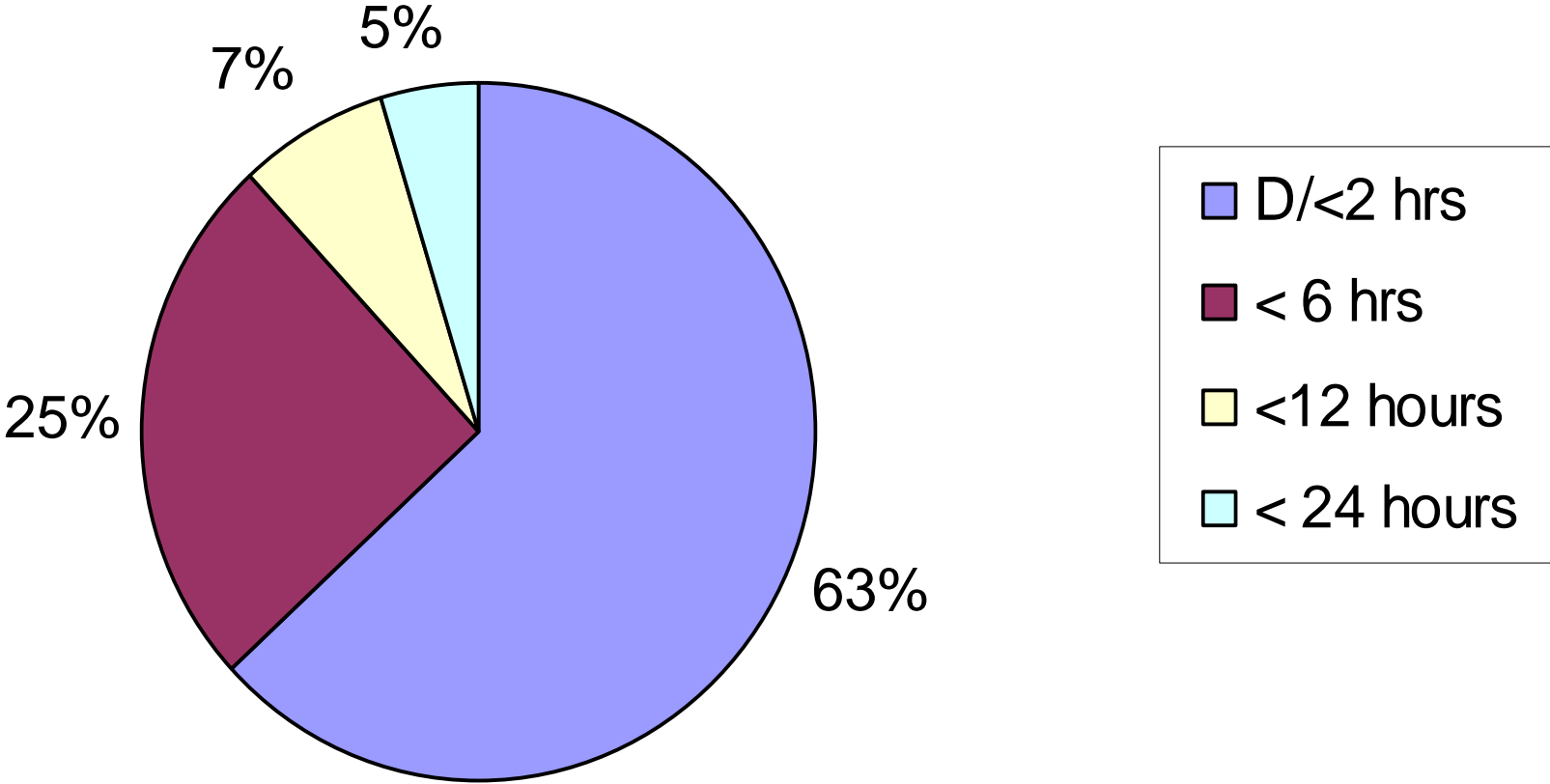
- Age range 26 d-79 yrs (median = 60)
- 12 children
- M:F = 43:57
- 48% became hypotensive
- 40% developed fever/rigors
- 72 (52%) required ICU admission  
+ 25 (18%) were on ICU already
- 32 died - TRALI implicated



# TRALI cases by diagnosis (n = 139)



# Timing of onset of symptoms (n = 108)



# Components implicated (n = 139)

- FFP/cryosupernatant 45
- Red cells 34
- Platelets 27
- Whole blood 2
- Cryoprecipitate 2
- Other 4 (SDFFFP, I/V IgG, MBFFP, buffy coat)
- Unassignable 25



# Components implicated/total issues (n = 139)

## HIGH PLASMA (300 MLS)

FFP /CSP 45/ 2.6 million = 1: 58,000

Platelets 27/ 1.7 million = 1: 63,000

## LOW PLASMA (30 MLS)

Cryoppt 2/ 0.6 million = 1: 300,000

Red cells 34/17.8 million = 1: 523,000

**Risk from 'high plasma' components was 5-8 times higher than from 'low plasma' components.**



# Imputability score since 1999 (1) (n = 100)

## Highly likely:

- good history + incompatibility = 36

## Probable:

- good history + wk or neg serology

**OR**

- weak history + incompatibility or strong specific antibody = 18

54% in these categories!



# Imputability score since 1999 (2) (n = 100)

## Possible:

- history/serology compatible but  
couldn't exclude other causes = 31

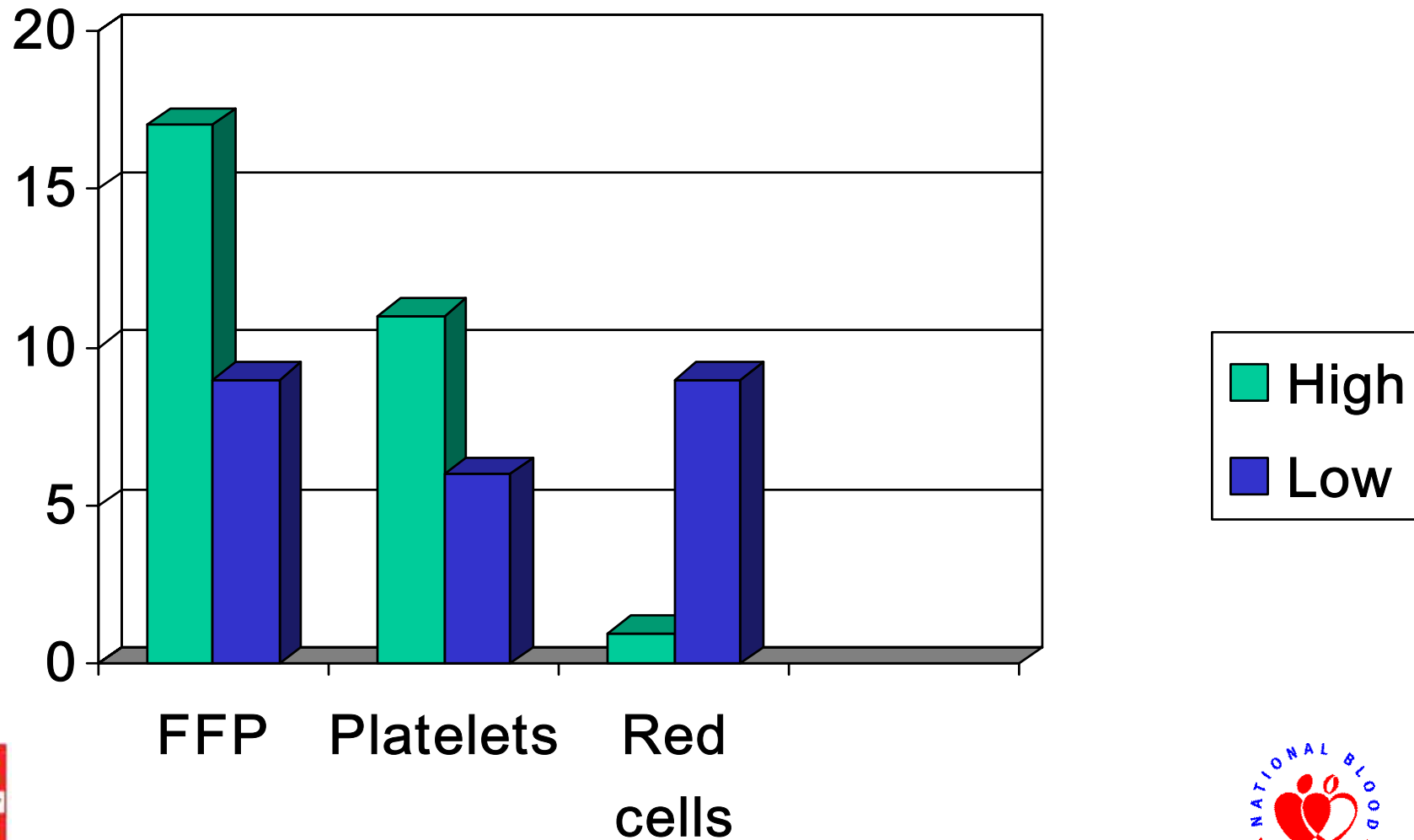
## Unlikely:

- negative serology + other diagnosis  
to explain symptoms = 15

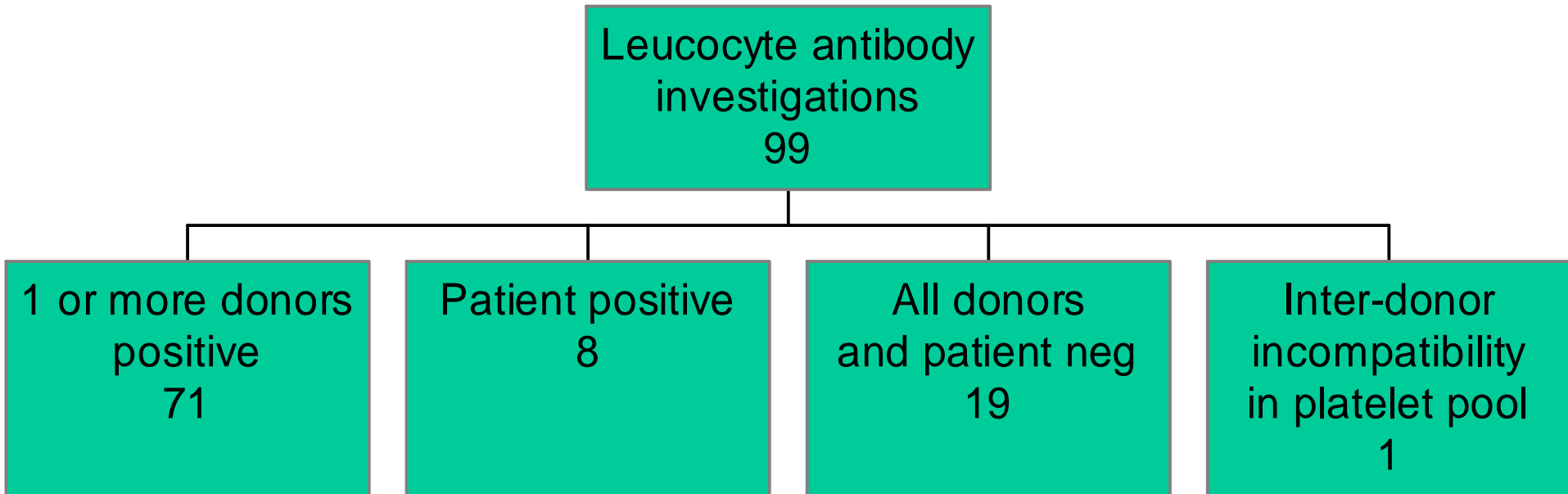
46% in these categories!



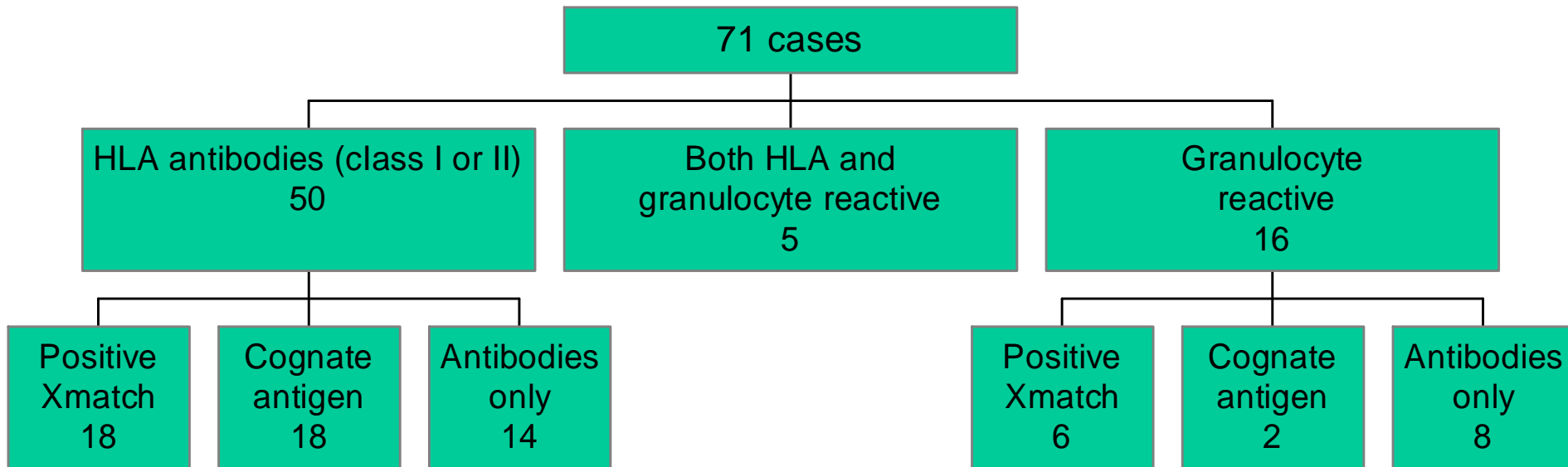
# Probability of TRALI according to component implicated



# Serological investigations 1998-2003



# Positive serological investigations in donors 1998-2003 (n = 71)



# Serology by component 1998-2003

	RED CELLS	FFP/PLTS
Cases	19	56
Ab pos donor	5	47
	26%	84%
Female	2	37/37
Incompatible	1	31
	20%	54%
Female	?	<b>29/29</b>



	<b>Donor selection: untransfused males/never pregnant females</b>	<b>Donor selection: males only</b>	<b>Screening for HLA antibodies</b>	<b>Platelet additive solution</b>	<b>Pooling</b>
<b>FFP</b>	Yes	Yes	No	No	Yes (SDFFP)
<b>Pooled platelets (plasma component)</b>	Yes	Yes	No	Yes	No
<b>Apheresis platelets</b>	No	No	Yes	Yes	No
<b>Non-OAS blood for large transfusion in neonates</b>	Yes	Yes	Yes	No	No



# NBS TRALI PREVENTION PROJECT

Plea from donor care staff

No more new questions!!



SO - Oct 2003- male donations  
marked M & directed for FFP  
production

From 5th April -previously  
transfused donors excluded  
(vCJD)



# Costs of male FFP

- LD filters for plasma
- sterile connectors- disposables
- staff costs- longer days

= £2.1 million/year

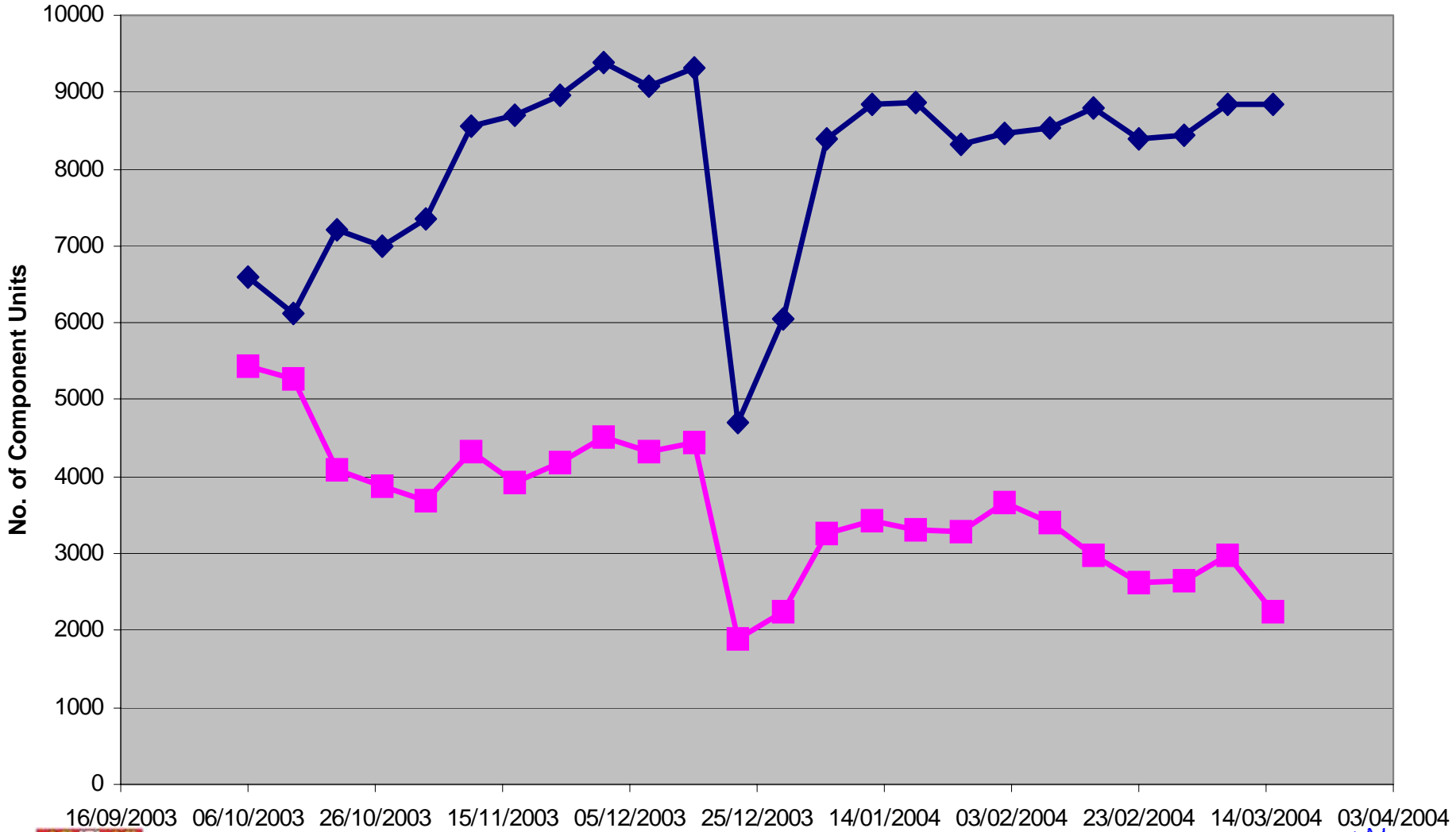
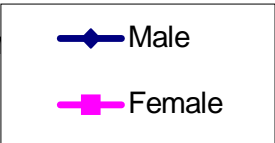
(SDFFP = £25 million/year)



NB- all imported FFP for children is from male donors



# NBS Plasma Component Production



# Could platelet additive solution reduce TRALI risk?

- Need to retain 30% plasma - ? extent of risk reduction
- No systems yet for apheresis
- Linkage with bacterial screening:-
  - Need to confirm that additives solutions can support 7 day storage



# Leucocyte antibody screening of apheresis donors

- Can we afford to lose 7% of donors?
- What to do with positives?
  - Resign completely?
  - Carry on as donors of red cells in additive solution



# Large volume transfusion in neonates and infants

- How likely is TRALI in this age group?
- Would it be recognised?
- New BSCH Guidelines recommend non-SAGM blood for large volume transfusion-exchange, ECMO, cardiac surgery.



# Acknowledgements

## **SHOT**

Liz Love, Hilary Jones,  
Hannah Cohen, Cath Chapman,  
Cynthia Beatty

## **TRALI REDUCTION PROJECT**

Michelle Ashford, Gordon Nicholson,  
Lindsey Lewis, Neil Beckman

## **LEUCOCYTE ANTIBODY DATA**

Cristina Navarrete, Sheila MacLennan,  
Geoff Lucas



# Donor serology - other findings

- HLA class II antibodies frequently implicated in TRALI
- No cases clearly associated with transfused males
- Inter-donor platelet incompatibility as a cause of TRALI is rare  
(1 reported in 1.4 million platelet doses)



# SHOT AND TRALI PREVENTION

- ➔ 1999: A view should be taken regarding importance of TRALI in relation to other blood safety steps
- ➔ 2001: consider excluding female FFP donors
- ➔ 2002: UK Transfusion Services should take all steps possible to reduce the risk of TRALI from blood components especially FFP & platelets
- ➔ 2003: UKTS should continue with these.



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