What effect does PAS have on the bacterial screening and pathogen inactivation systems?

Alison Couchman
Biomedical Scientist
National Bacteriology Laboratory, NHS Blood & Transplant

NHS
Blood and Transplant

Aims

- PAS background
- NBL Study – Methodology and Results
- Impact on Bacterial Screening (PS) and Pathogen Inactivation (PI) Systems

NHS
Blood and Transplant

PAS Background

NHS Blood and Transplant

Platelet Additive Solution (PAS)

- PAS – nutrient media replace plasma
- Benefits
  - Reduce allergic and febrile transfusion reactions (incl. TRALI)
  - Facilitate ABO-incompatible PLT transfusions
  - Maintain PLT quality
- 2 main commercial products
  - Intersol & SSP+
  - Balanced solution of salts at neutral pH, ± specific sugars and carbon sources

NHS Blood and Transplant

PAS introduction to NHSBT

Feb 2015 NHSBT introduced routine use of 70% PAS: 30% Plasma in Pooled Plt

SaBTO recommendation for pooled and Apheresis platelets re-suspended in PAS as vCJD prevention strategy

Aim of NBL Study

- Limited published studies do not address certain points
- Aim - assess the effect of PAS on bacterial growth in platelet components

NHS Blood and Transplant

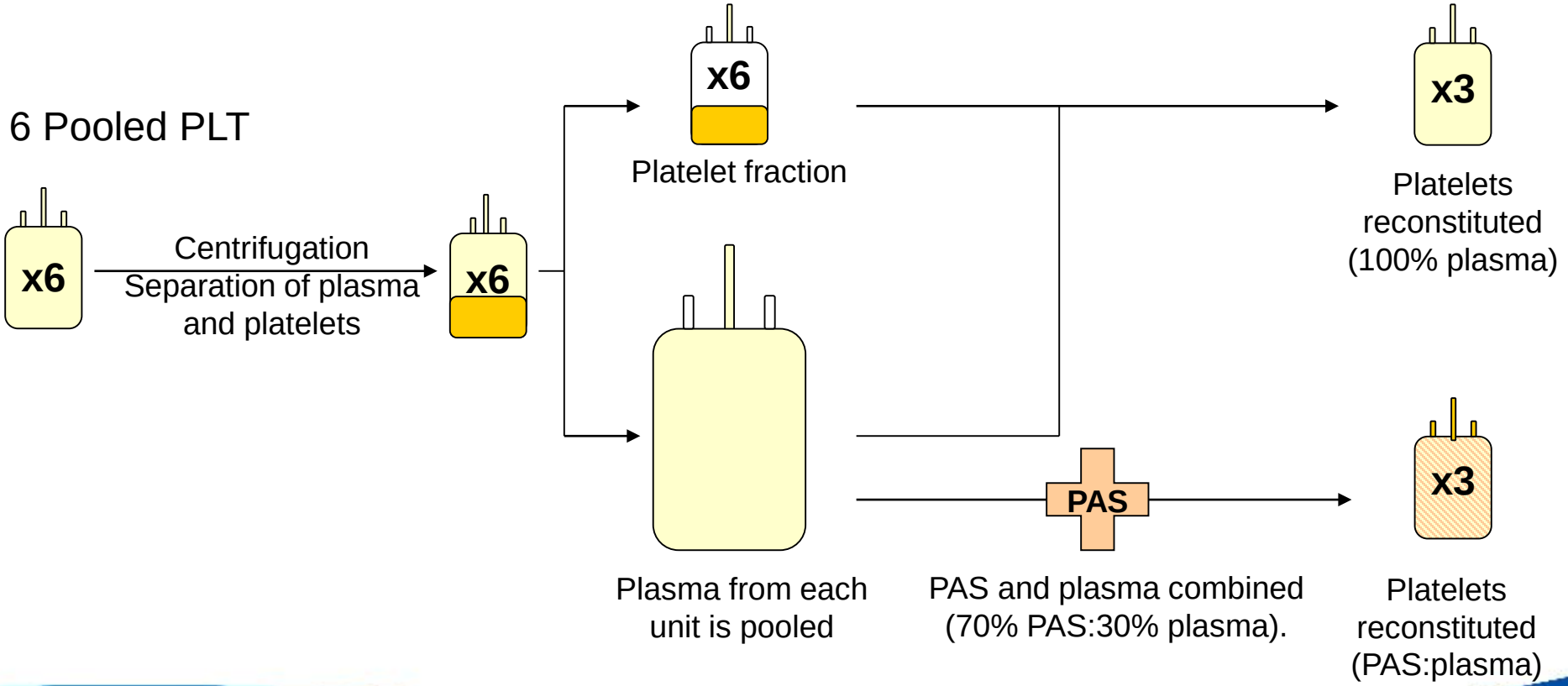
Methodology

NHS Blood and Transplant

Manufacture of Platelets

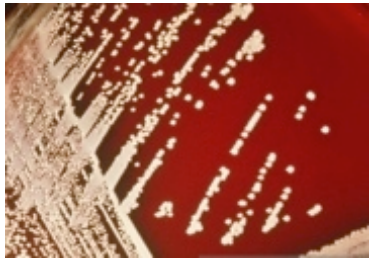
Whole Blood → Filter → Centrifuge → Split into buffy coats and RBC → 4 BC to form 1 pooled unit

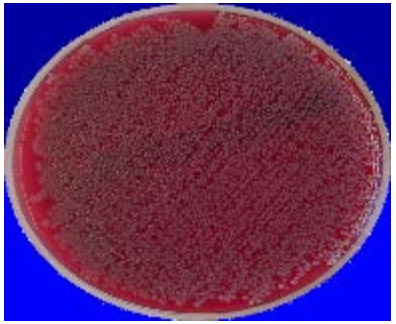
Production PAS/Plasma Units



Methodology

Overnight culture on Blood Agar → Serial Dilution (1 in 10 dilution) → Add 1ml to each pack → Enumerate dilution → Incubate PLT at 22° C for 7 days → Sample every 24 hours to enumerate





NHS Blood and Transplant

Organism Used in Study

Chosen as implicated in transfusion reactions/platelet screening

Staphylococcus aureus

Staphylococcus epidermidis

Klebsiella pneumoniae

Streptococcus oralis

Streptococcus bovis

Escherichia coli

Serratia marcescens

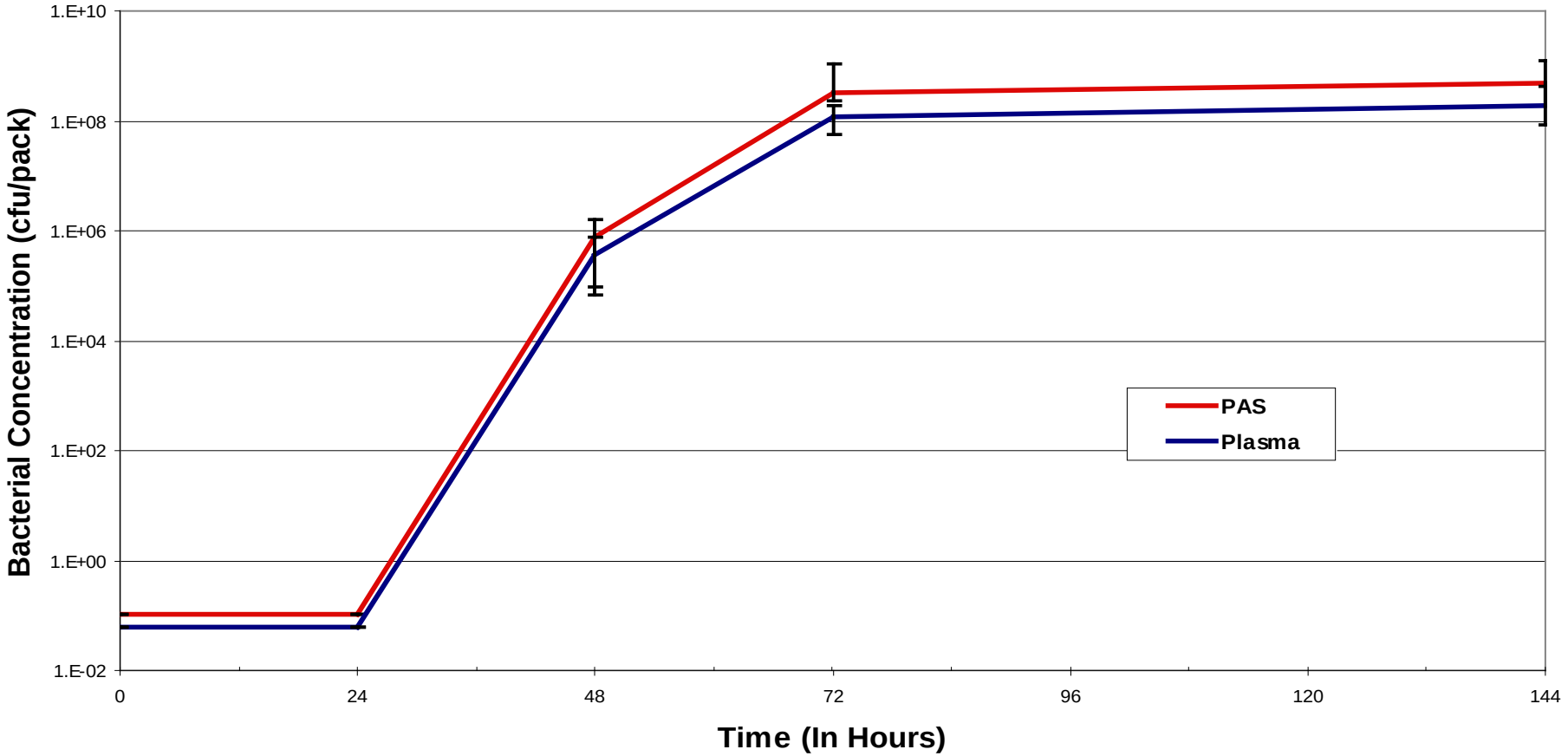
Listeria monocytogenes

Streptococcus dysgalactiae

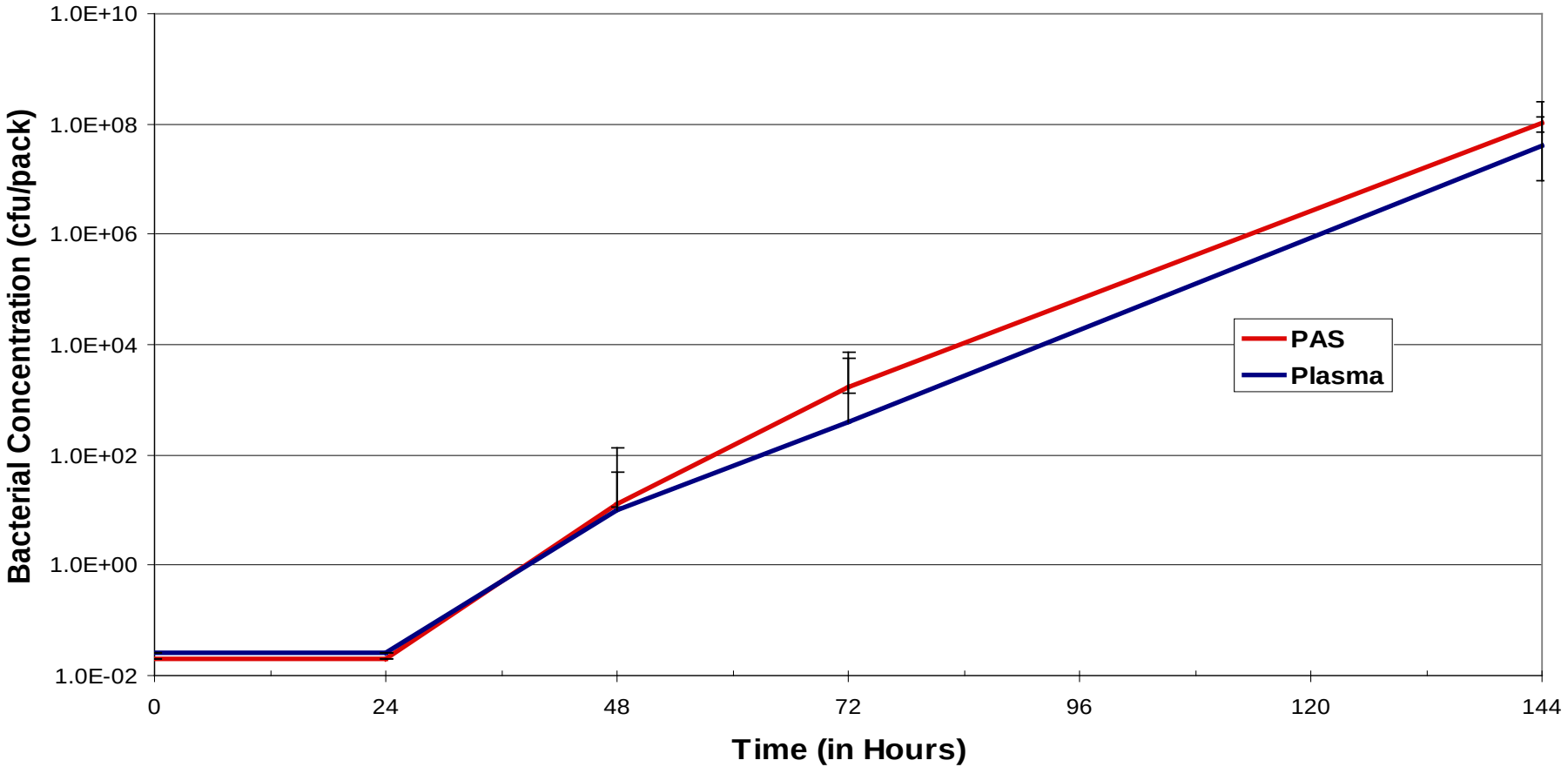
NHS
Blood and Transplant

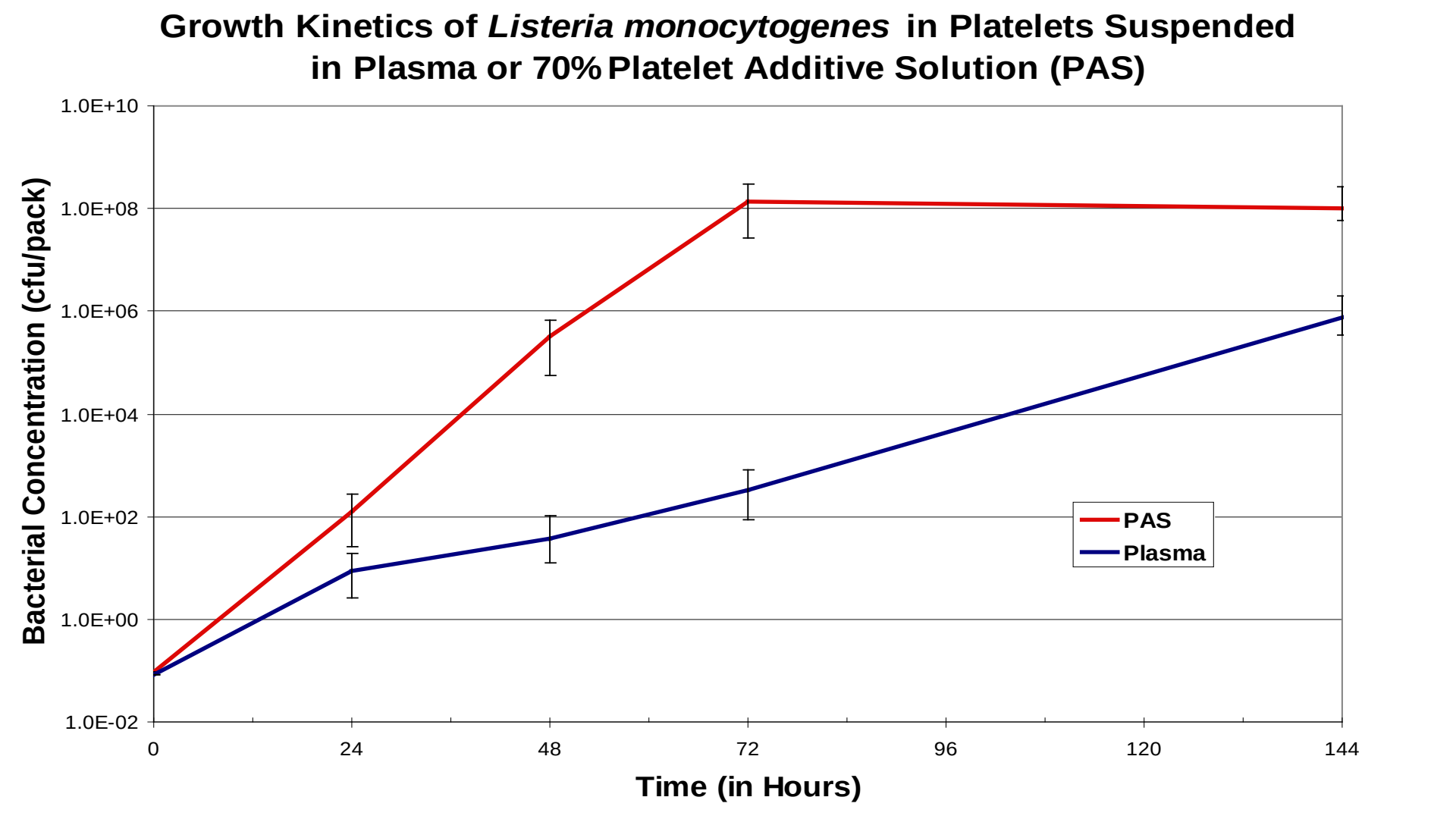
Results

Growth Kinetics of *Staphylococcus aureus* in Platelets Suspended in Plasma or 70% Platelet Additive Solution (PAS)

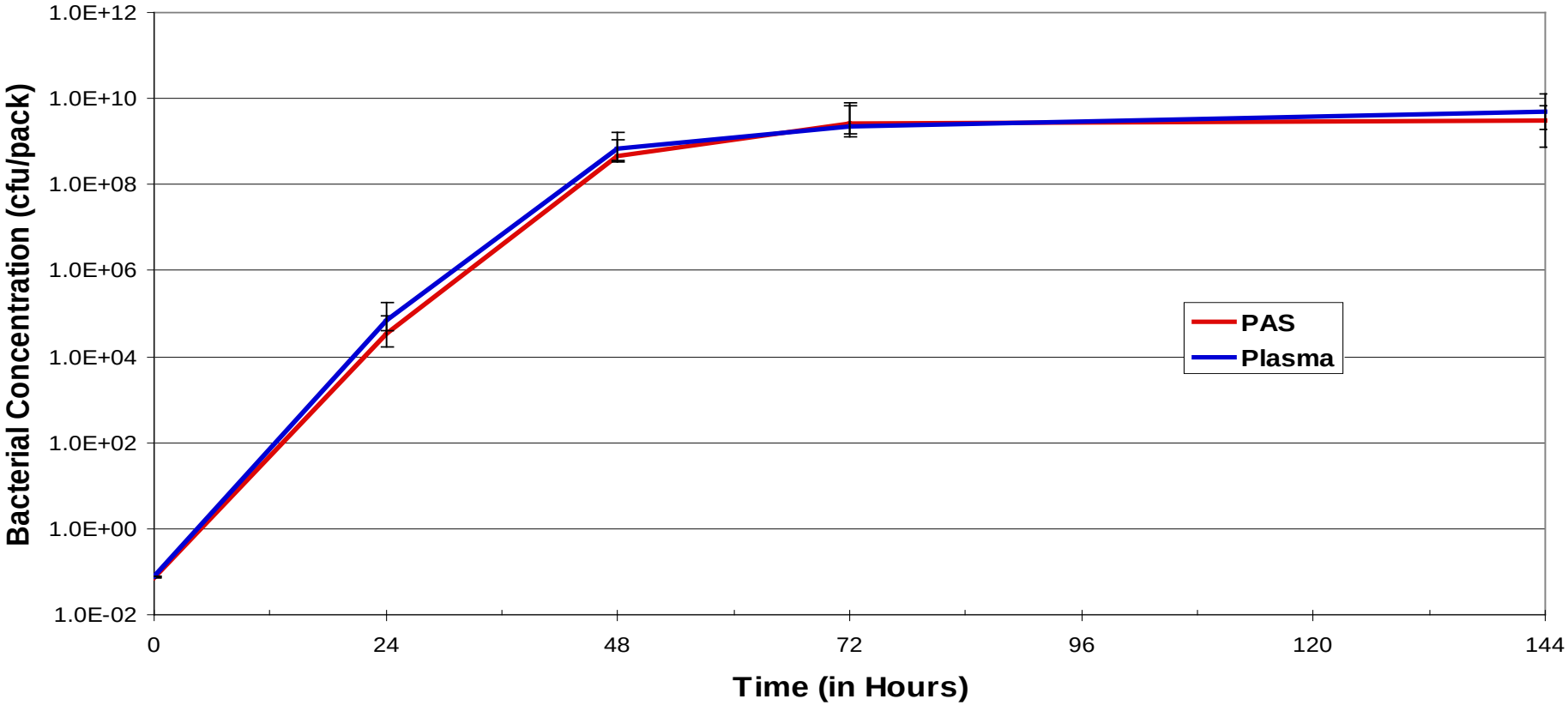


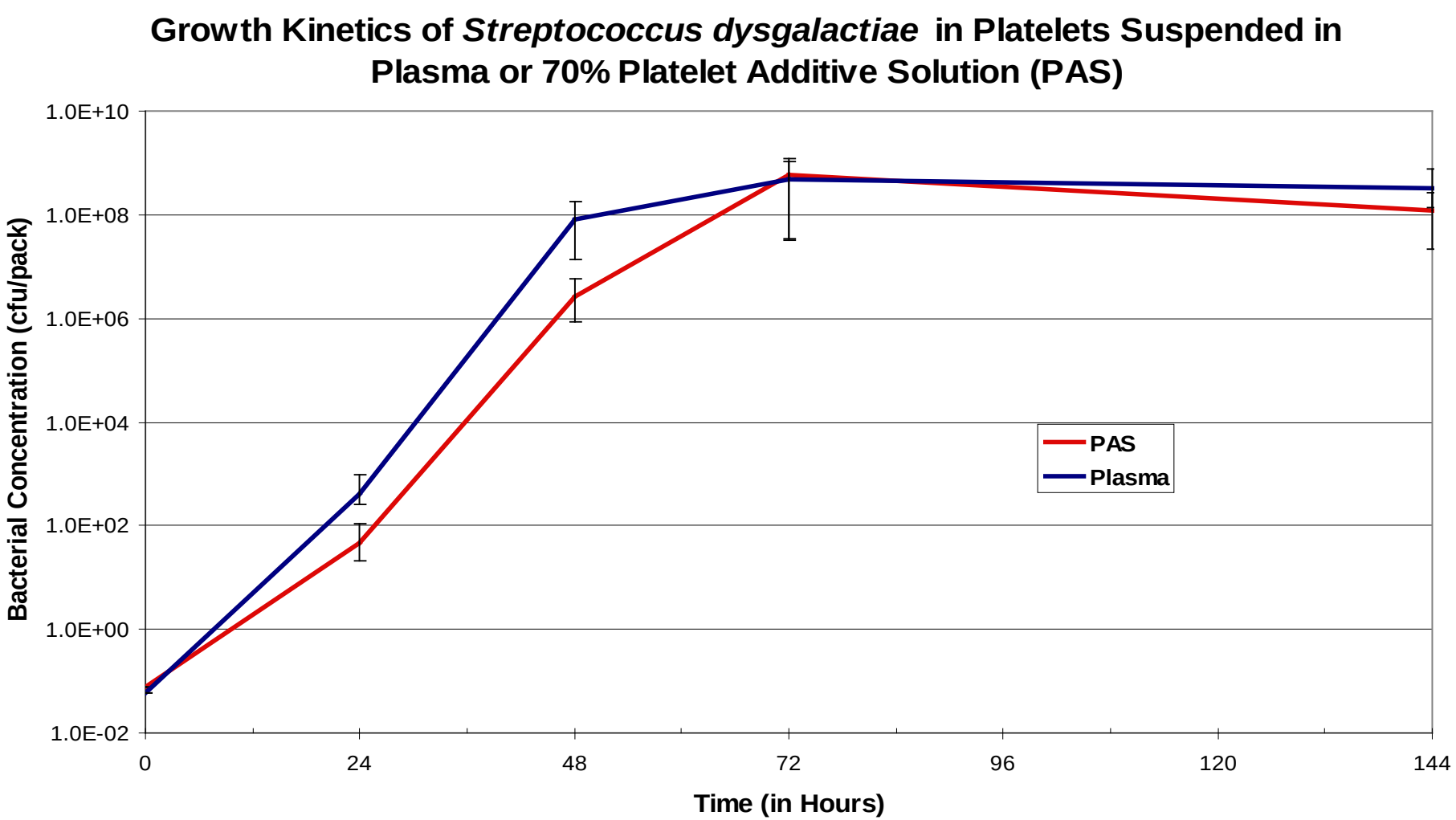
Growth Kinetics of *Staphylococcus epidermidis* in Platelets Suspended in Plasma or 70% Platelet Additive Solution (PAS)




Growth Kinetics of *Listeria monocytogenes* in Platelets Suspended in Plasma or 70% Platelet Additive Solution (PAS)
Bacterial Concentration (cfu/pack)
1.0E+10
1.0E+08
1.0E+06
1.0E+04
1.0E+02
1.0E+00
1.0E-02
0
24
48
72
96
120
144
Time (in Hours)
PAS
Plasma

Growth Kinetics of *Klebsiella pneumoniae* in Platelets Suspended in Plasma or 70% Platelet Additive Solution (PAS)




Growth Kinetics of *Streptococcus dysgalactiae* in Platelets Suspended in Plasma or 70% Platelet Additive Solution (PAS)
Bacterial Concentration (cfu/pack)
1.0E+10
1.0E+08
1.0E+06
1.0E+04
1.0E+02
1.0E+00
1.0E-02
0
24
48
72
96
120
144
Time (in Hours)
PAS
Plasma

Results Summary

NHS Blood and Transplant

No significant difference	Increased growth in PAS	Increased growth in Plasma
Staphylococcus aureus	***Escherichia coli***	***Streptococcus dysgalactiae***
Pseudomonas aeruginosa	***Streptococcus oralis***	
Klebsiella pneumoniae	***Listeria monocytogenes***	
Serrratia marcescens		
Staphylococcus epidermidis		
Streptococcus bovis		

NHS
Blood and Transplant

Impact on PS and PI systems

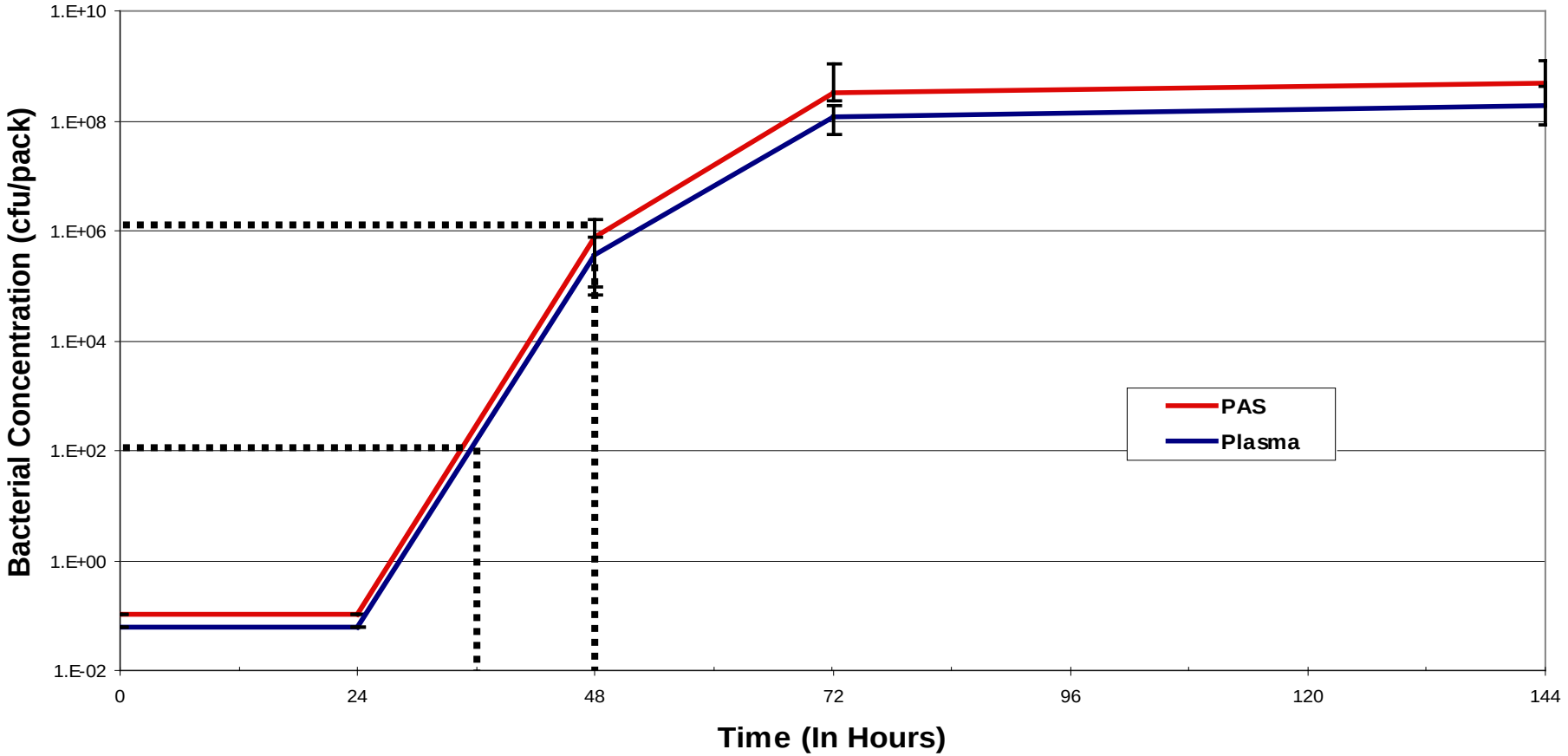
Impact on Bacterial Screening

NHS Blood and Transplant

	2013-2014 (Plasma)		2015-2016 (PAS)	
	Number	Mean time to detection (IR bottle) (hr)	Number	Mean time to detection (IR bottle) (hr)
Propionibacterium spp.	57	110.67	69	93.35
S.saccharolyticus	16	64.20	19	57.8
Coag Neg Staph	2	20.46	12	23.69
Staph aureus	1	12.32	1	18
Streptococcus spp.	4	15.78	3	15.78

Slight increase in Propionibacterium spp. but otherwise no obvious impact on bacterial platelet screening

Growth Kinetics of *Staphylococcus aureus* in Platelets Suspended in Plasma or 70% Platelet Additive Solution (PAS)



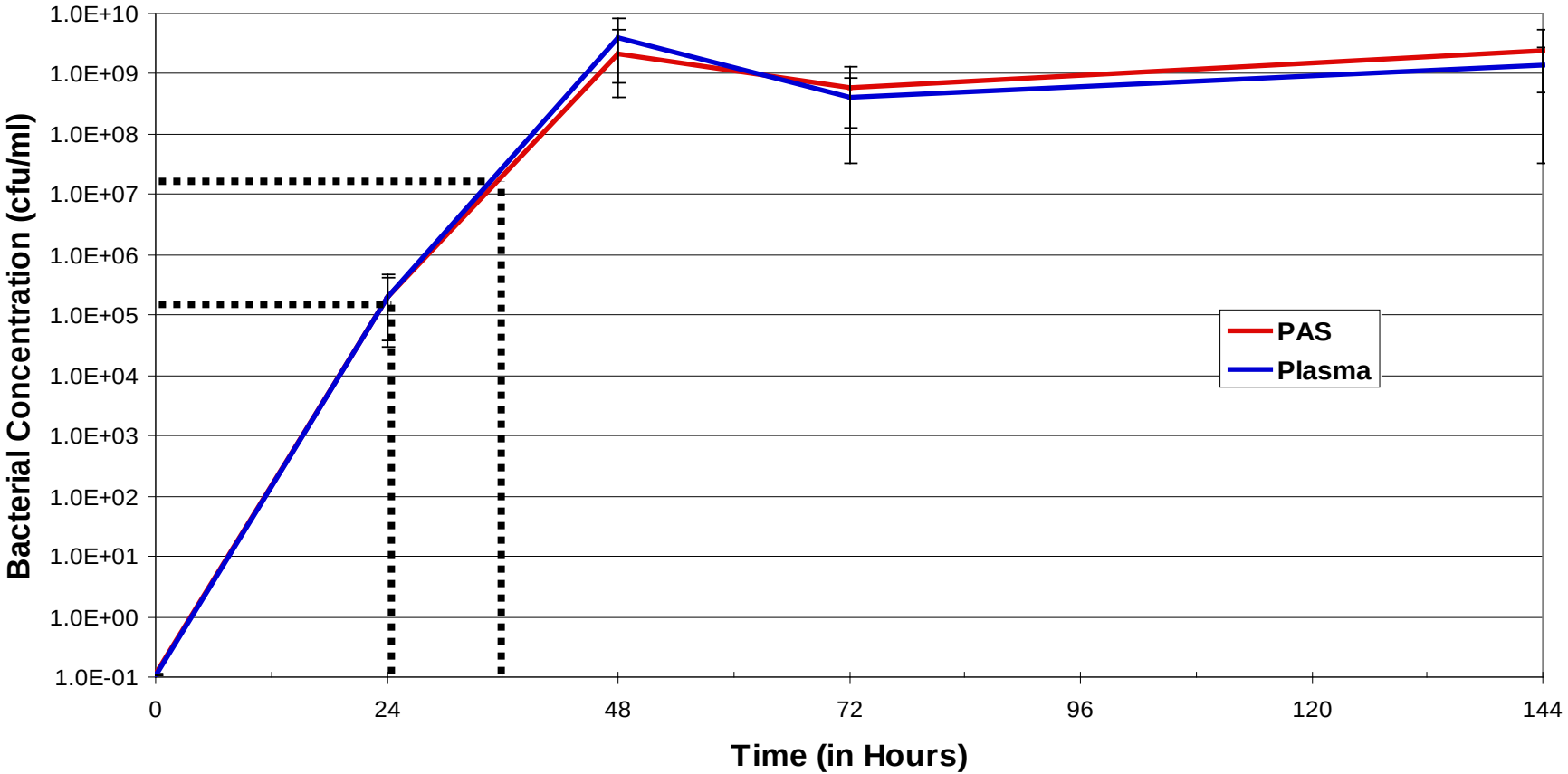
Impact on PI systems

- Intercept specification requires treatment by end of day 1
- Mirasol specification requires treatment 22-32 hours from collection

Areas of concern

- Rapidly growing gram negative organisms

Growth Kinetics of *Serratia marcescens* in Platelets Suspended in Plasma or 70% Platelet Additive Solution (PAS)



Summary – Platelet Screening

NHS Blood and Transplant

- **Majority of organisms show no difference in growth between PAS and Plasma**
- **Increased growth of *E.coli*, *S.oralis*, and *L.monocytogenes* in PAS units**
- ***S.dysgalactiae* showed a reduced rate of growth in PAS units**

Summary - Pathogen Inactivation

- Treat packs as soon as possible to prevent breakthrough of organisms
- Small amount of organisms post treatment will soon multiply to significant levels

NHS
Blood and Transplant

Thank You

alison.couchman@nhsbt.nhs.uk

NHS Blood and Transplant

Acknowledgements

Carl McDonald
Jennifer Allen
Gabrielle Orr
& all NBL Team