



Platelet Additive Solutions

Platelet Additive Solutions are crystalloid nutrient media that:

- Replace a portion of plasma in platelet components
- Lower risk for allergic transfusion reactions
- Potentially mitigate against TRALI

About Platelet Additive Solutions (PAS)

Platelet Additive Solutions (PAS) are crystalloid nutrient media used in place of plasma for platelet storage. They replace 60-70% of plasma in platelet components, so the amount of storage plasma can be decreased.

PAS provide real and potential benefits

- Additive solutions have been used in platelet storage for more than 10 years.
- Platelets stored in PAS have been demonstrated to have a lower risk for allergic transfusion reactions.¹
- Platelets stored in PAS appear to have equivalent clinical efficacy for controlling bleeding, compared to platelets stored in 100% plasma.
- Theoretically, transfusion of platelets stored in PAS versus plasma could result in a lower incidence of other plasma-associated transfusion reactions, such as ABO hemolytic reactions and transfusion-related acute lung injury (TRALI). To date, there are no published clinical or hemovigilance data to support these theoretical benefits.¹

¹ AABB Association Bulletin #10-06 - Information Concerning Platelet Additive Solutions , October 4, 2010

PAS reduce allergic transfusion reactions

Study 1

- Platelet concentrates pooled from whole blood units were stored in either PAS II (T-Sol™ solution) or plasma.
- Platelets were leukocyte reduced.

Reaction rates are shown in the table below

	Platelets in plasma (n = 354 transfusions)	Platelets in PAS II (n = 411 transfusions)
Adverse reactions (all mild)	13/84 patients 17 reactions (5.5%)	8/84 patients 9 reactions (2.4%) (p=0.04)

Source: Kerkhoffs et al. A multicenter randomized study of the efficacy of transfusions with platelets stored in platelet additive solution II versus plasma. Blood 2006;108: 3210-15

Study 2

- Platelet concentrates from pooled buffy coats were stored in either PAS II (T-Sol™ solution) or plasma for up to 5 days.

Reaction rates are shown in the table below

	Platelets in plasma (n = 192 transfusions)	Platelets in PAS II (n = 132 transfusions)
Adverse reactions (allergic, febrile, other)	10/12 patients 23 reactions (12%)	5/9 patients 7 reactions (5%) (p=0.05)
Allergic reactions	5/12 patients 9 reactions (5%)	0/9 patients 0 reactions
Febrile reactions	5/12 patients 8 reactions (4%)	5/9 patients 6 reactions (5%)

Source: de Wildt-Eggen et al. Reactions and platelet increments after transfusion of platelet concentrates in plasma or an additive solution: a prospective, randomized study. Transfusion 2000;40: 398-403

PAS III meets FDA requirements for pH, recovery and survival:

- PAS III (InterSol solution) received FDA approval for platelet storage.
- At the end of five day storage, the pH of platelets in PAS III was a mean (SD) of 7.2 (\pm 0.1) compared to the control pH of 7.4 (\pm 0.2), n=70.
- PAS III (InterSol solution) platelets were stored for 5 days and compared to fresh autologous whole blood platelet controls in a paired recovery and survival study.¹
- Results showed that PAS III (InterSol solution) platelets are not inferior to the control platelets derived from freshly drawn whole blood.

In vivo parameters	Test Day 5 Platelets Mean (SD)	Control Fresh platelets ¹ Mean (SD)	Test/Control²	FDA Requirement³
Recovery (%)	46.4 (11.9)	58.0 (10.7)	80.5%	> 66%
Survival (days)	5.7 (1.4)	8.0 (1.4)	72.1%	> 58%

- On average, the PAS III (InterSol solution) platelets demonstrated 80.5% of the recovery and 72.1% of the survival of the fresh control platelets.²
- Paired non-inferiority analyses demonstrated that PAS III (InterSol solution) platelet recovery was statistically at least 66% and that PAS III (InterSol solution) platelet survival was statistically at least 58% of fresh control platelets.³

Source: Vassallo RR, Adamson JW, Gottschall JL, Snyder EL, Lee W, Houghton J, Elfath MD. In vitro and in vivo evaluation of apheresis platelets stored for 5 days in 65% platelet additive solution/35% plasma. Transfusion 2010

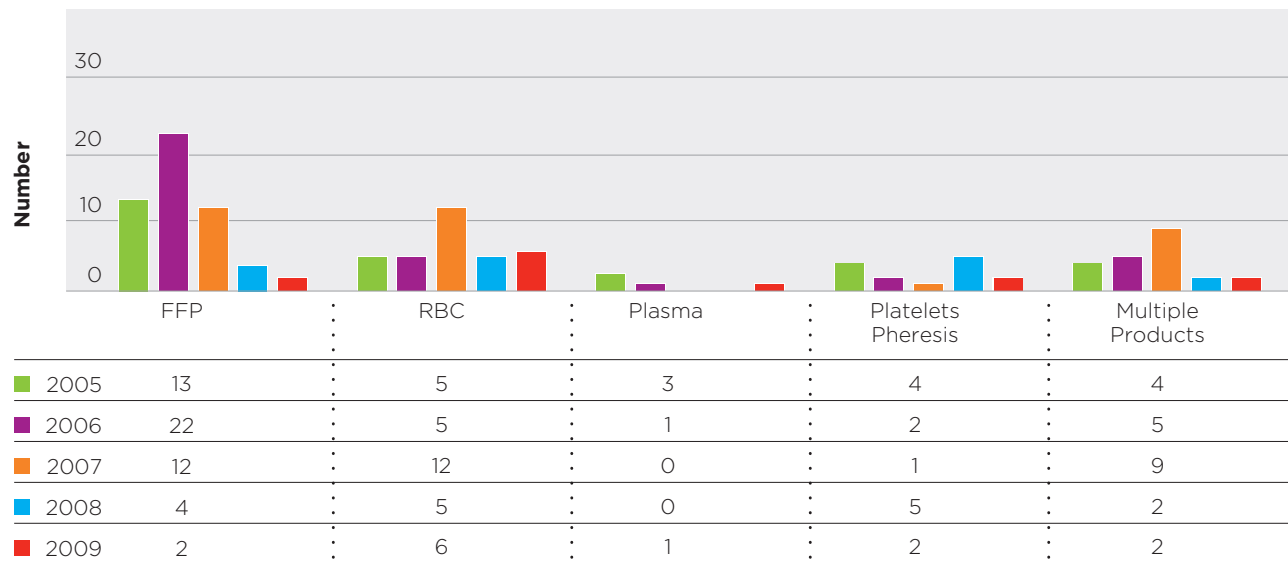
Snyder summarized reported ranges of recovery and survival of platelets stored five days in plasma, from a variety of studies:

- Recovery range = 35% - 71%
- Survival range = 4.5 - 7.0 days

Source: Snyder et al. Recovery and life span of indium-radiolabeled platelets treated with pathogen inactivation with amotosalen HCl (S-59) and ultraviolet A light. Transfusion 2004;44: 1732-1740

PAS have been used as a TRALI mitigation strategy

- Plasma is determined to be the cause of the majority of TRALI fatalities.
- AABB Bulletin #06-07 stated that storing platelets in additive solutions is a “potential strategy” for TRALI mitigation.
- AABB recommended that TRALI mitigation strategies for FFP be implemented by November 2007.



Blood Product

Source: Fatalities Reported to FDA Following Blood Collection and Transfusion: Annual Summary for Fiscal Year 2009, U.S. Food and Drug Administration, accessed December 7, 2010, [http://www.fda.gov/BiologicsBloodVaccines/Safety Availability/ReportaProblem/TransfusionDonationFatalities/ucm204763.htm](http://www.fda.gov/BiologicsBloodVaccines/SafetyAvailability/ReportaProblem/TransfusionDonationFatalities/ucm204763.htm)

Platelets in additive solution function like conventional platelets in patients

Recent PAS III (InterSol solution) studies found that, "there were no significant differences in transfusion responses between PAS III-PC and Plasma-PC."

Patient corrected count increments: PAS III and control*

	Platelets in plasma	Platelets in PAS III
No. of patients	(n)=99	(n)=94
CCI-1 h, mean \pm SD	17.1 \pm 7.3	15.3 \pm 6.7
Mean difference (97.5% CI)**		-10% (-23%; 4%)
CCI-24 h, mean \pm SD	12.5 \pm 7.7	11.7 \pm 7.6
Mean difference (97.5% CI)**		-4% (-24%; 16%)

* In a per protocol analysis

** Derived from a mixed model regression analysis

Source: Kerkhoffs et al. Clinical effectiveness of leucoreduced, pooled donor platelet concentrates, stored in plasma or additive solution with and without pathogen reduction. British Journal of Hematology April 2000

Platelets in additive solution have no impact on 20 or 24-hour CCIs

While PAS (PAS II) have shown CCI differences from plasma platelets, there were no observations of significant differences with regard to bleeding complications or the consumption of PCs and red-cell concentrates.

"Although the platelet content in PAS II PCs was significantly (approximately 5%) lower compared with plasma PCs, this small difference is not clinically relevant and the transfused dose per kilogram (or per square meter) in both groups was similar."

Patient corrected count increments: PAS II and control

	Platelets in plasma (n = 192)	Platelets in PAS II (n = 132)
1 hour CCI (mean)	20.7	17.1 (p=0.001)
20 hour CCI (mean)	11.5	9.5 (p=0.05)

Source: de Wildt-Eggen, et al. Transfusion 2000;40: 398-403

	Platelets in plasma (n = 354)	Platelets in PAS II (n = 411)
1 hour CCI (mean)	13.9	11.2 (p=0.004)
24 hour CCI (mean)	8.4	6.8 (p=0.9)

Source: Kerkhoffs et al. A multicenter randomized study of the efficacy of transfusions with platelets stored in platelet additive solution II versus plasma. Blood 2006;108: 3210-15



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