Platelet Activation Status and Its Impact on Clinical Outcomes

HAABB 2019-04-10

Why are platelets

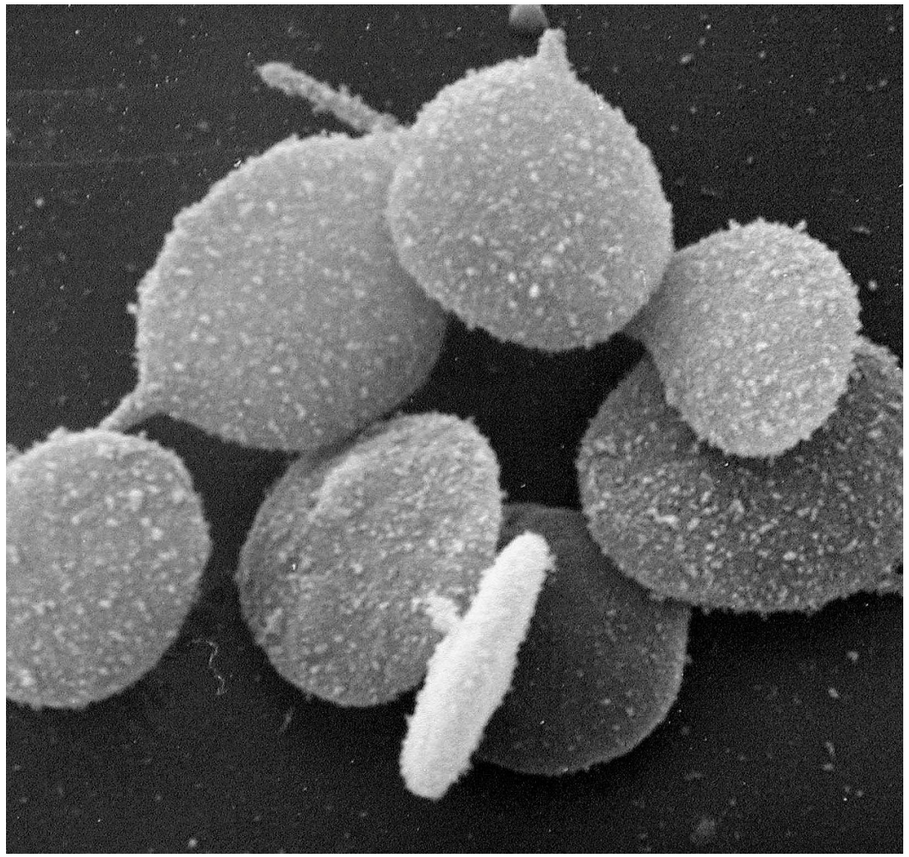
- kept at room temperature
- with agitation
- in breathable containers
- for only 5-7 days?

To minimize platelet activation & improve efficacy for prophylactic use.

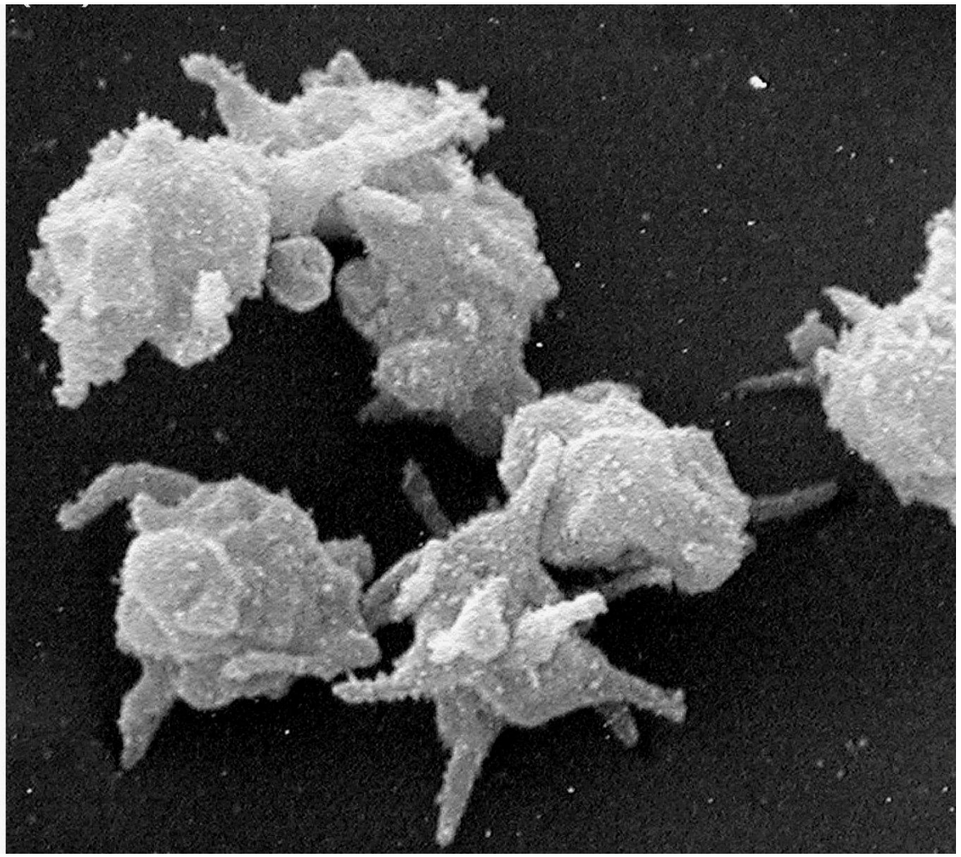
Holme S, Murphy S. J Lab Clin Med 1983;101: 161-74.
Rinder HM er al. Transfusion 1991;31: 409-14.

Platelet activation status

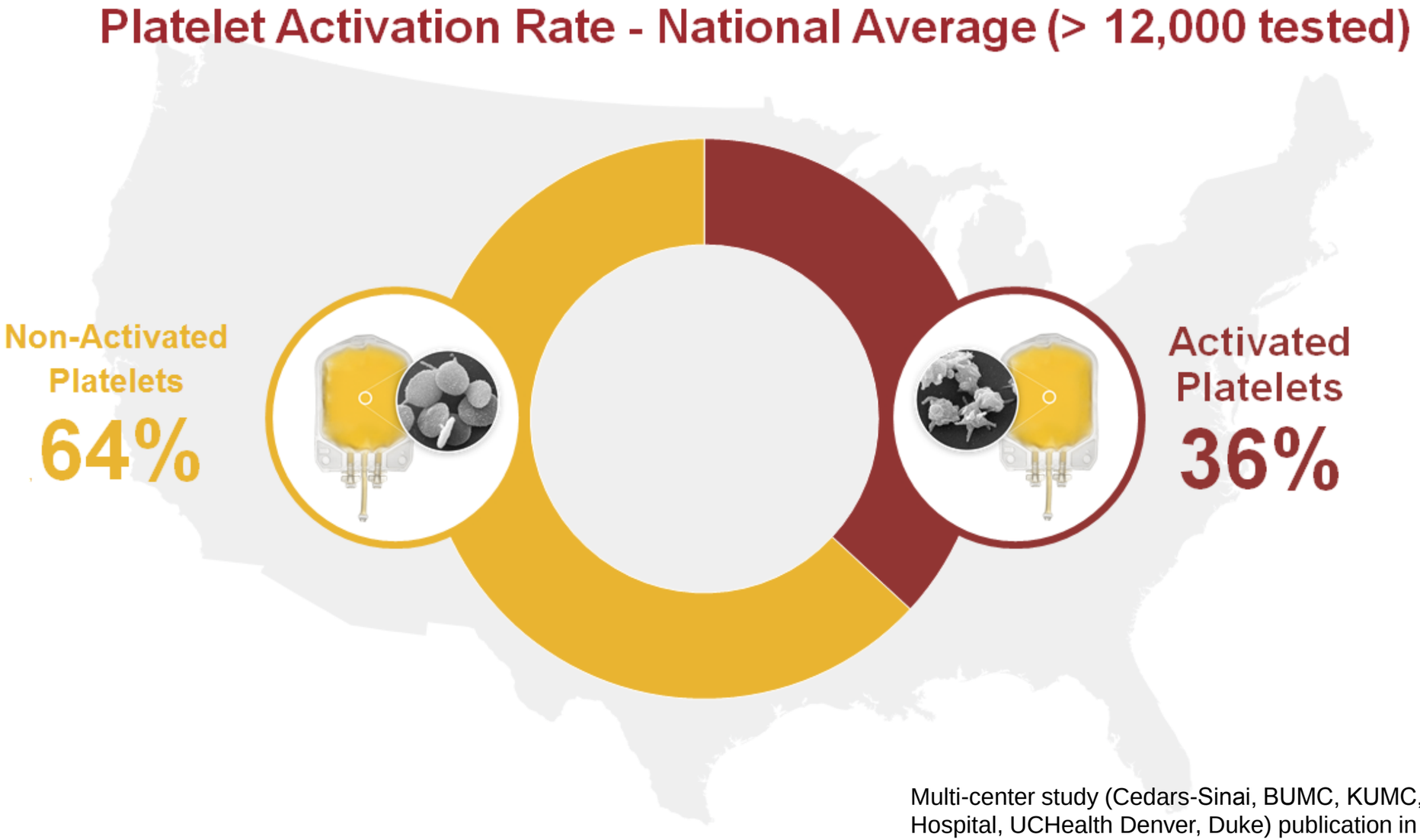
Non-activated



Activated

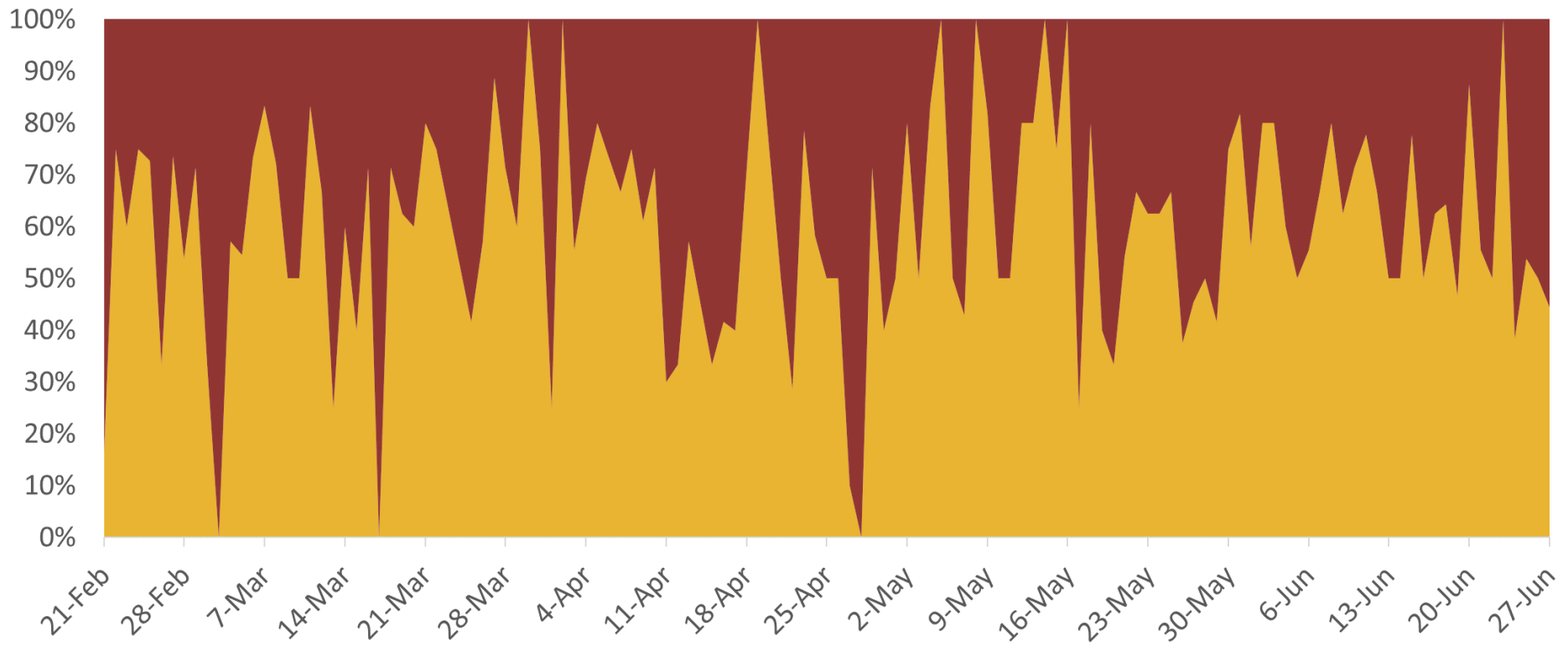


Platelet activation in US supply



Multi-center study (Cedars-Sinai, BUMC, KUMC, Dallas Children's Hospital, UCHealth Denver, Duke) publication in preparation

Activation – Daily variation

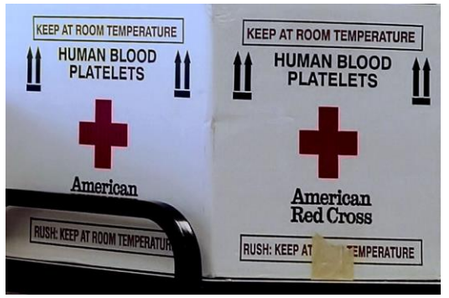


Activated

Non-Activated

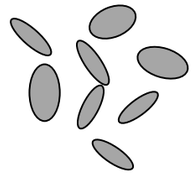
Dallas Children's Hospital, publication in preparation

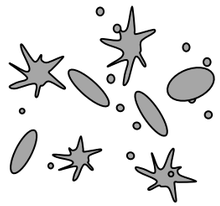
Where do activated platelets come from?



Determine activation of supply to increase efficacy

Non-activated platelet → stress → Activated platelet and microparticle (MP) fragments





Non-Activated

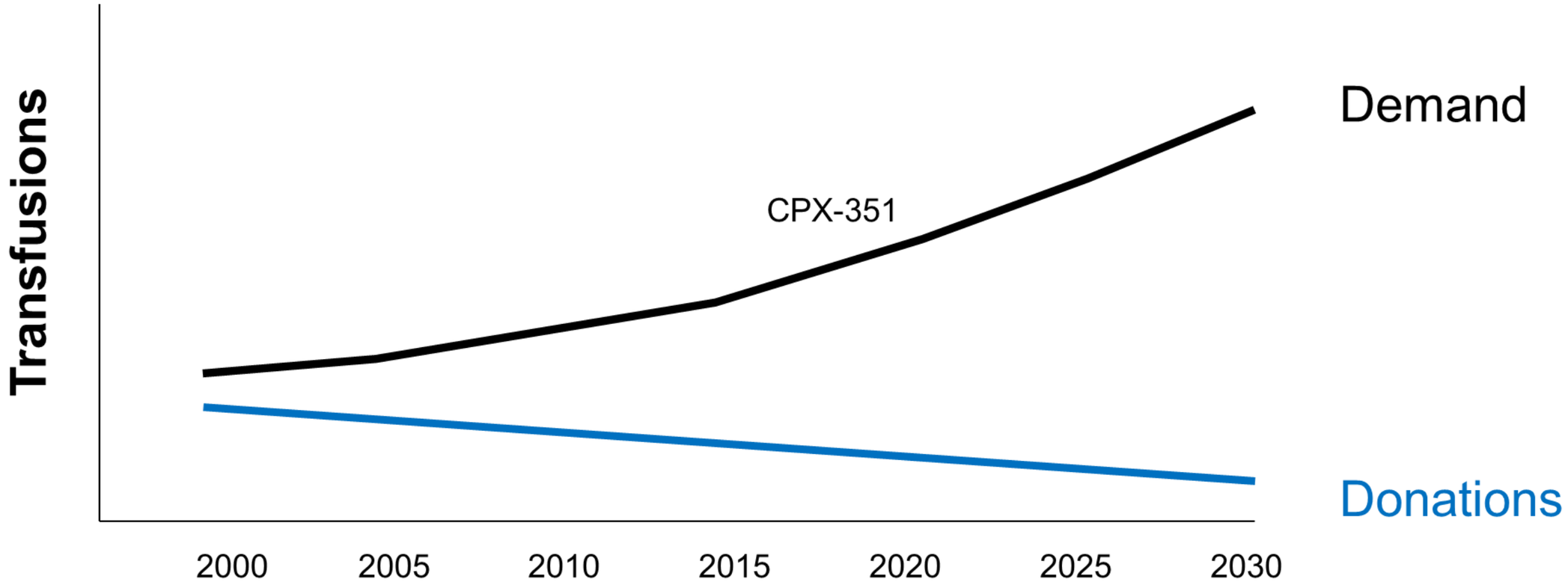
Activated

Cancer

Surgery/Trauma

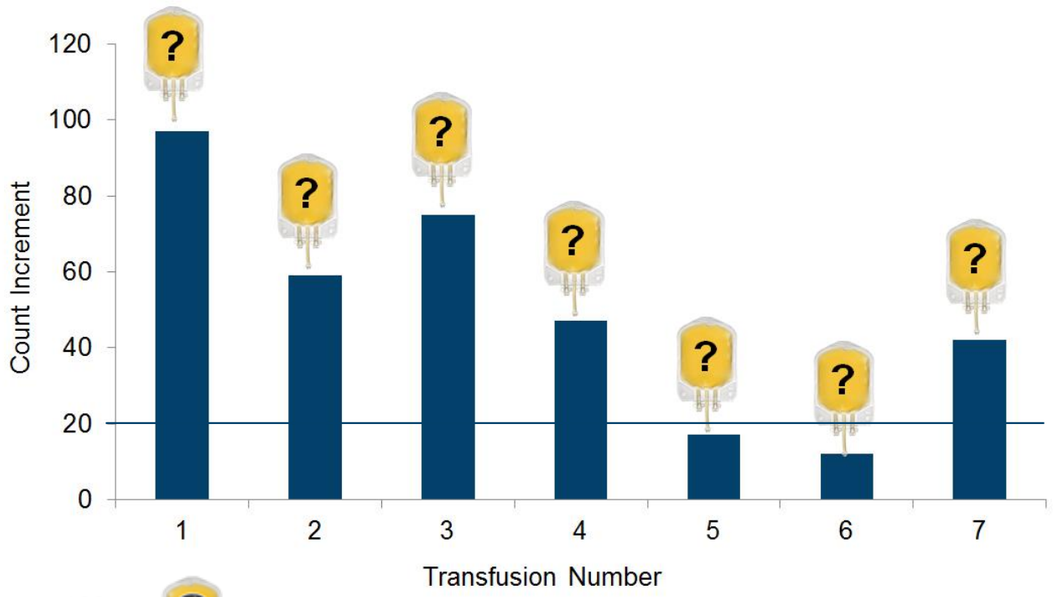
Does platelet supply match the demand?

Supply & demand

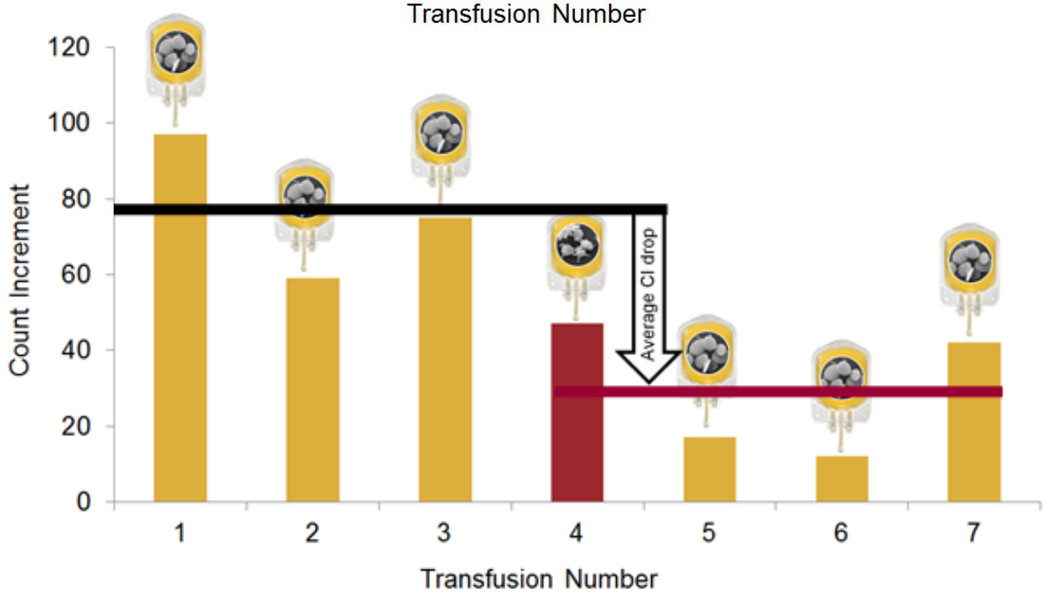


Activated platelet transfusions affect clinical outcome

Current practice:
Platelet activation status unknown



QI practice:
Platelet activation status known



88-day pragmatic study at KUMC

Baseline

112 Patients

592 Transfusions

Feb 2017 Mar 2017 Apr 2017 May 2017

Platelet management

116 Patients

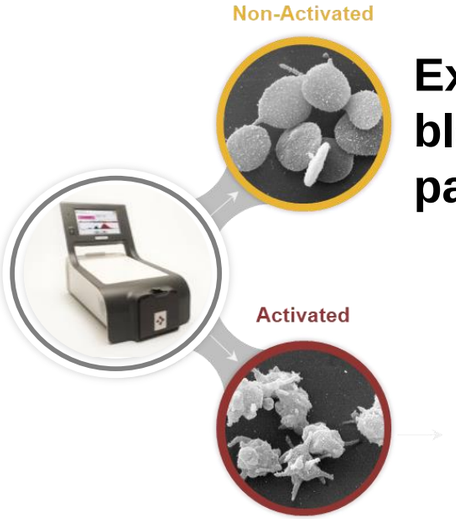
554 Transfusions

Feb 2018 Mar 2018 Apr 2018 May 2018

Random bags to blood cancer patients

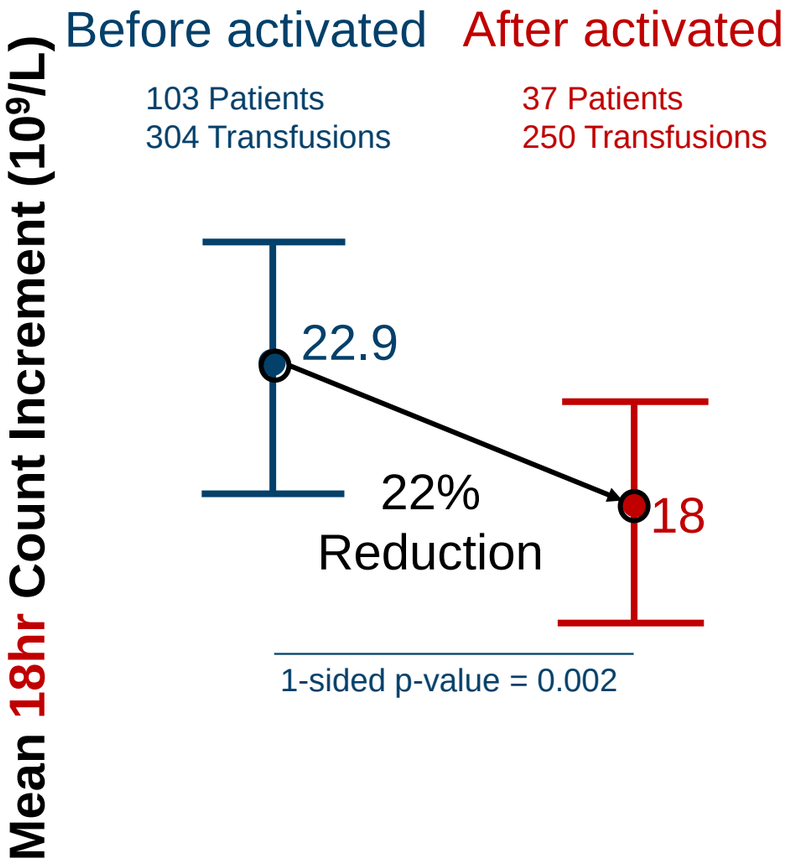
Complex case:
5/10 transfusions in any 30-day window

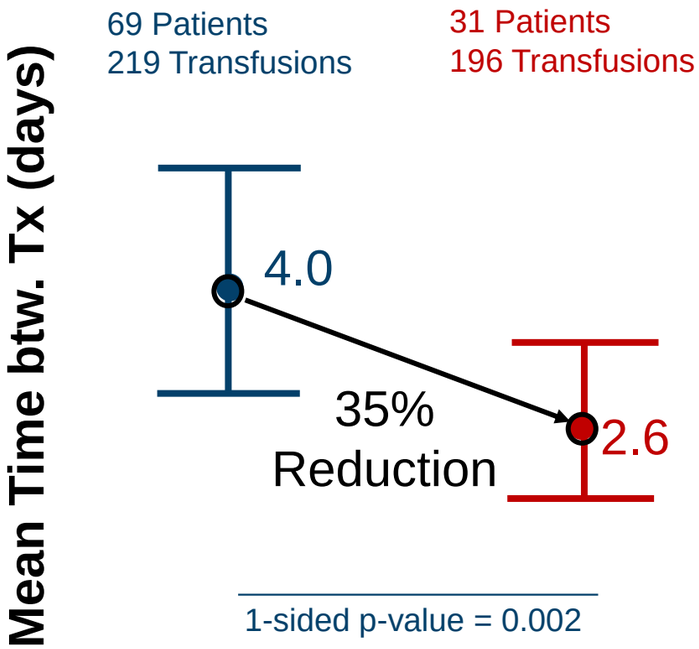
Non-compliance:
1 activated platelet transfusion



Exclusive to blood cancer patients

Benefit of non-activated platelet transfusions at KUMC





Kansas University Medical Center, publication in preparation
Data analysis performed by Emmes Canada.

100-day pragmatic study at UCHealth Denver

Baseline

111 Patients

1208 Transfusions

Oct 2017 Nov 2017 Dec 2017 Jan 2018

Platelet management

122 Patients

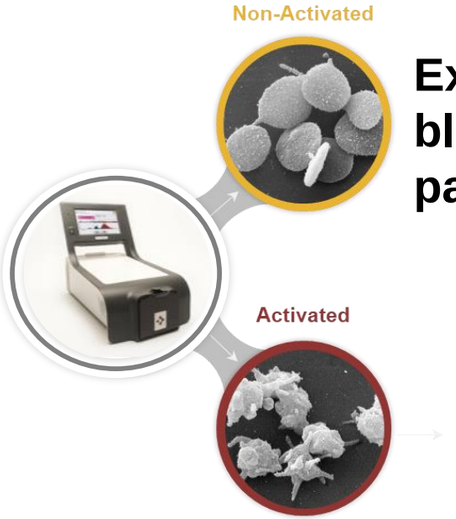
1296 Transfusions

May 2018 Jun 2018 Jul 2018 Aug 2018

Random bags to blood cancer patients

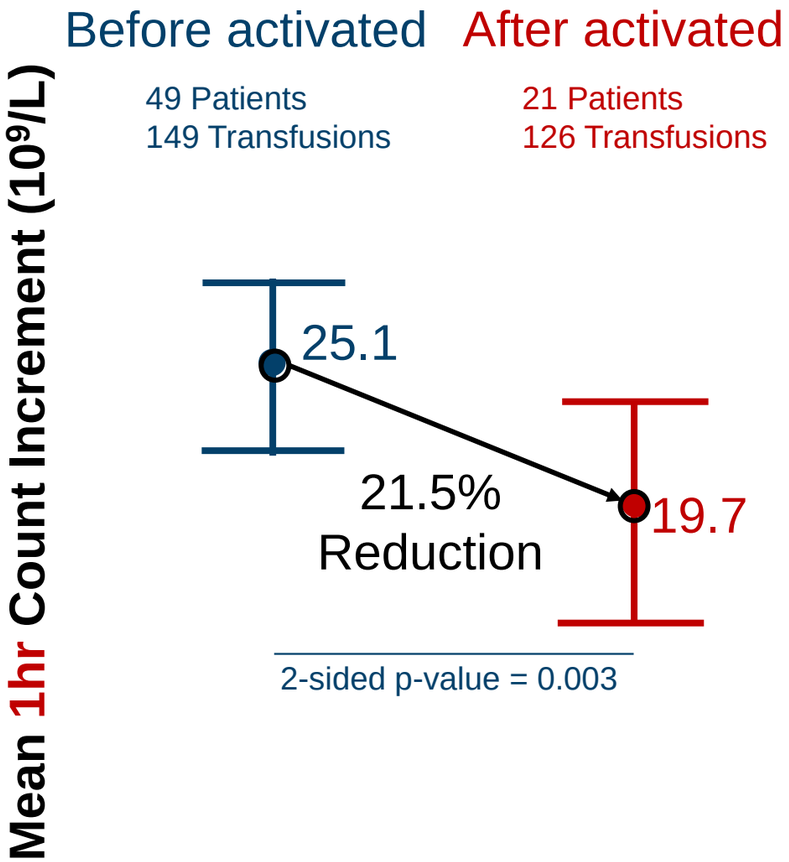
Complex case:
5/10 transfusions in any 30-day window

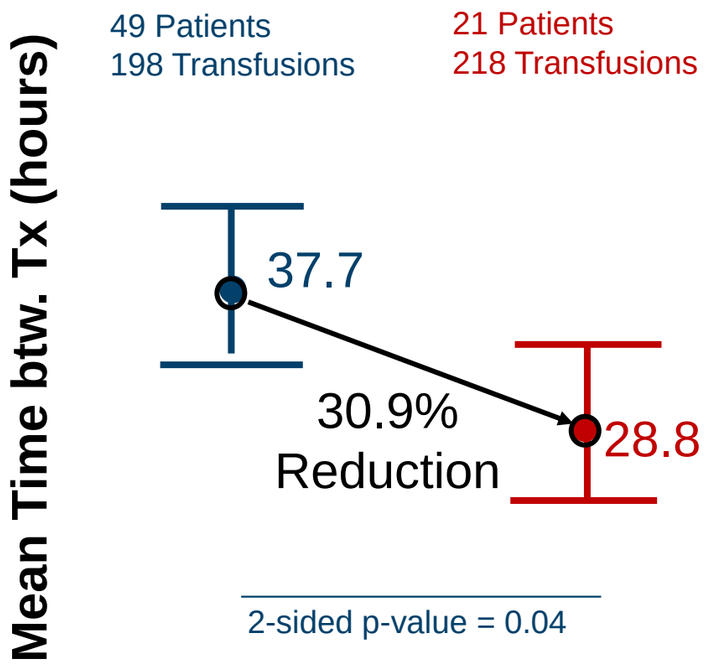
Non-compliance:
1 activated platelet transfusion



Exclusive to blood cancer patients

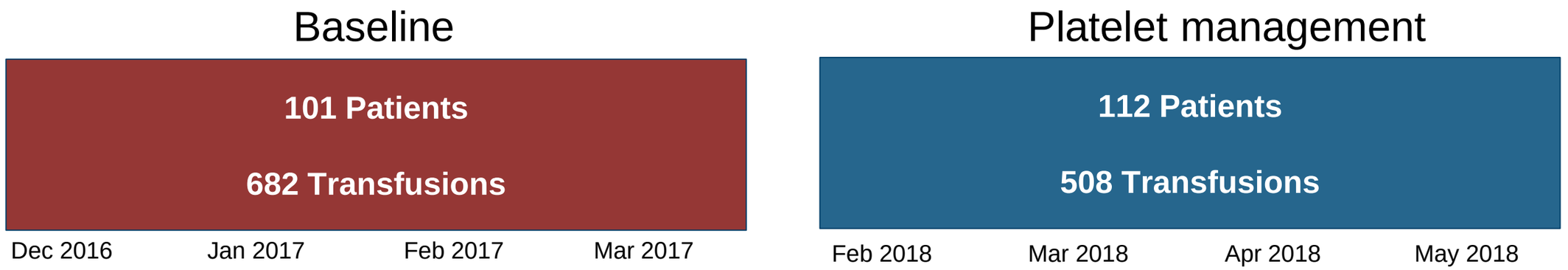
Benefit of non-activated platelet transfusions at UCHealth





UCHealth Denver, publication in preparation
Data analysis performed by Emmes Canada.

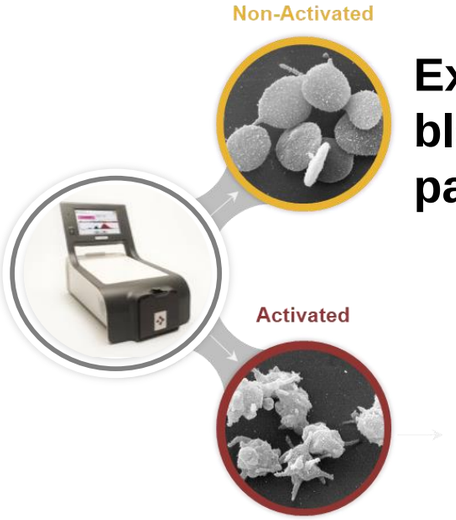
4-Month pragmatic study at Dallas Children's



Random bags to blood cancer patients

Complex case:
10 transfusions in any 30-day window

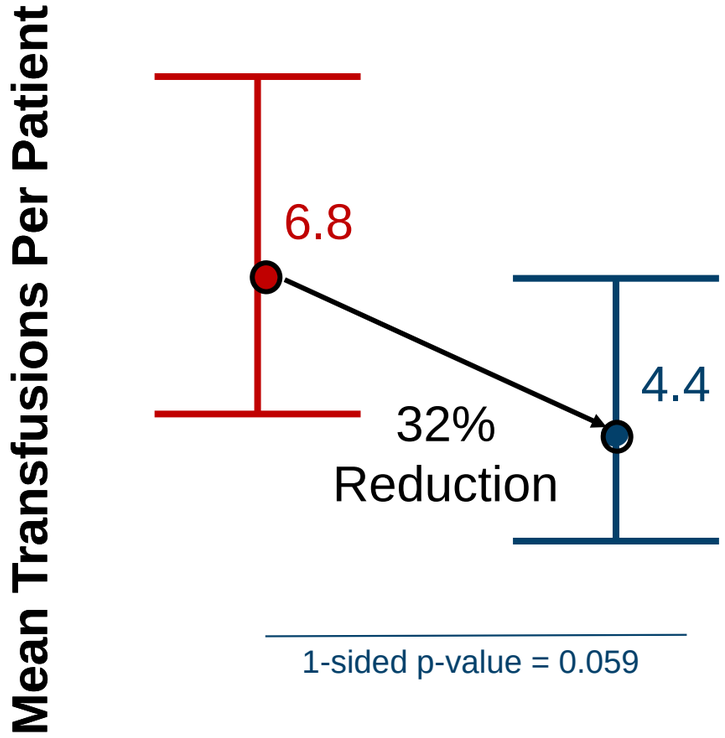
Non-compliance:
3 consecutive activated platelet transfusions

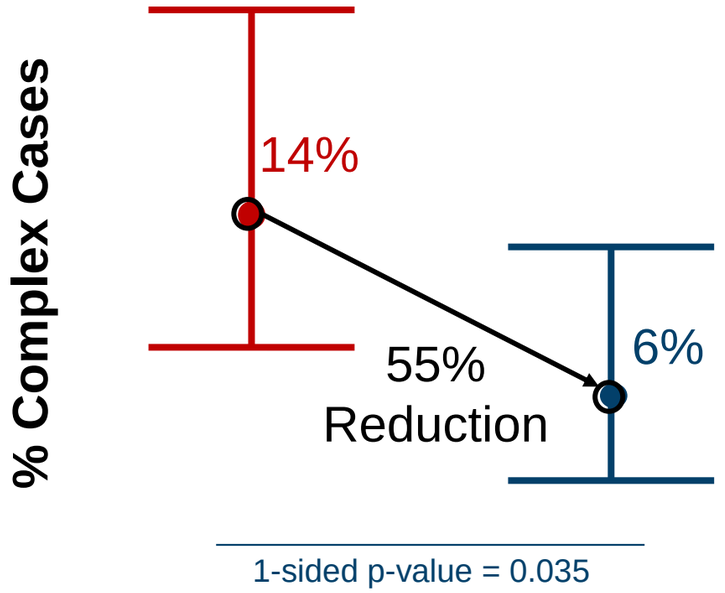


Exclusive to blood cancer patients

Severity of cases in Baseline and Study Period were the same.

Improvements in pediatric hospital





Baseline
101 Patients
682 Transfusions

ThromboLUX
112 Patients
508 Transfusions

Dallas Children's Hospital, publication in preparation
Data analysis performed by Emmes Canada.

Benefit of activated platelet transfusions

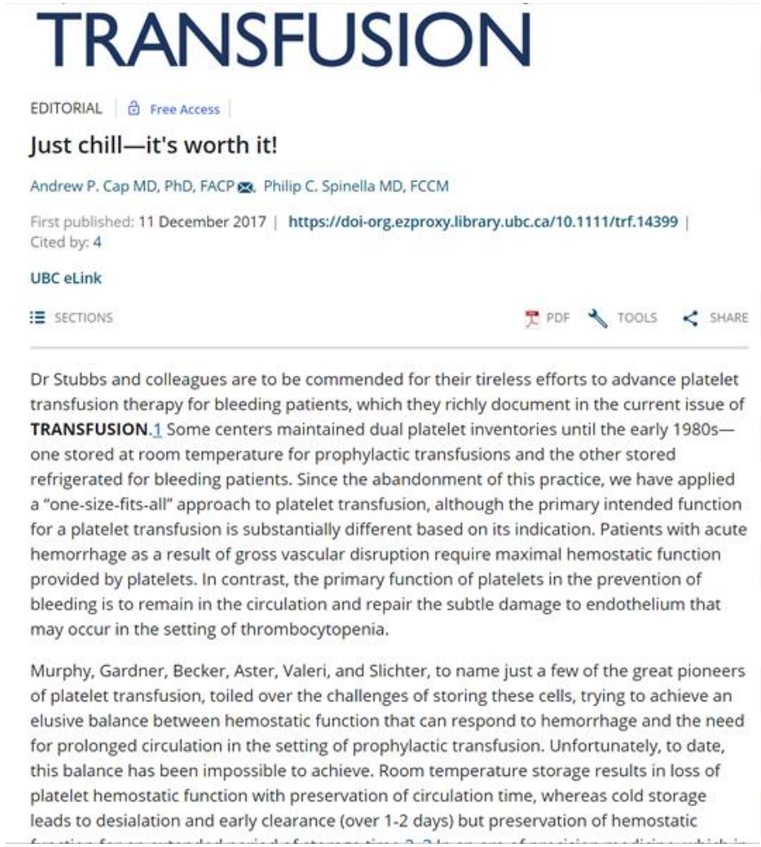
Blood 1991;77: 930-6.

Comparison of the Hemostatic Effects of Fresh Whole Blood, Stored Whole Blood, and Components After Open Heart Surgery in Children

By Catherine S. Manno, Kathleen W. Hedberg, Haewon C. Kim, Greta R. Bunin, Susan Nicolson, David Jobes, Elias Schwartz, and William I. Norwood

Group II. Twenty-four- to 48-hour-old blood was whole blood collected 24 to 48 hours before transfusion and was stored at 4 to 6°C until used.

fresh blood from directed, family donors. Our current practice is to use screened, refrigerated 24- to 48-hour-old whole blood for early blood replacement requirements following complex OHS with CPB in children. Another approach to decreasing blood loss after OHS suggested by the results of this study might include finding ways to improve the function of the platelets in stored platelet concentrates.


TRANSFUSION

EDITORIAL | Free Access

Just chill—it's worth it!

Andrew P. Cap MD, PhD, FACP, Philip C. Spinella MD, FCCM

First published: 11 December 2017 | https://doi-org.ezproxy.library.ubc.ca/10.1111/trf.14399 | Cited by: 4

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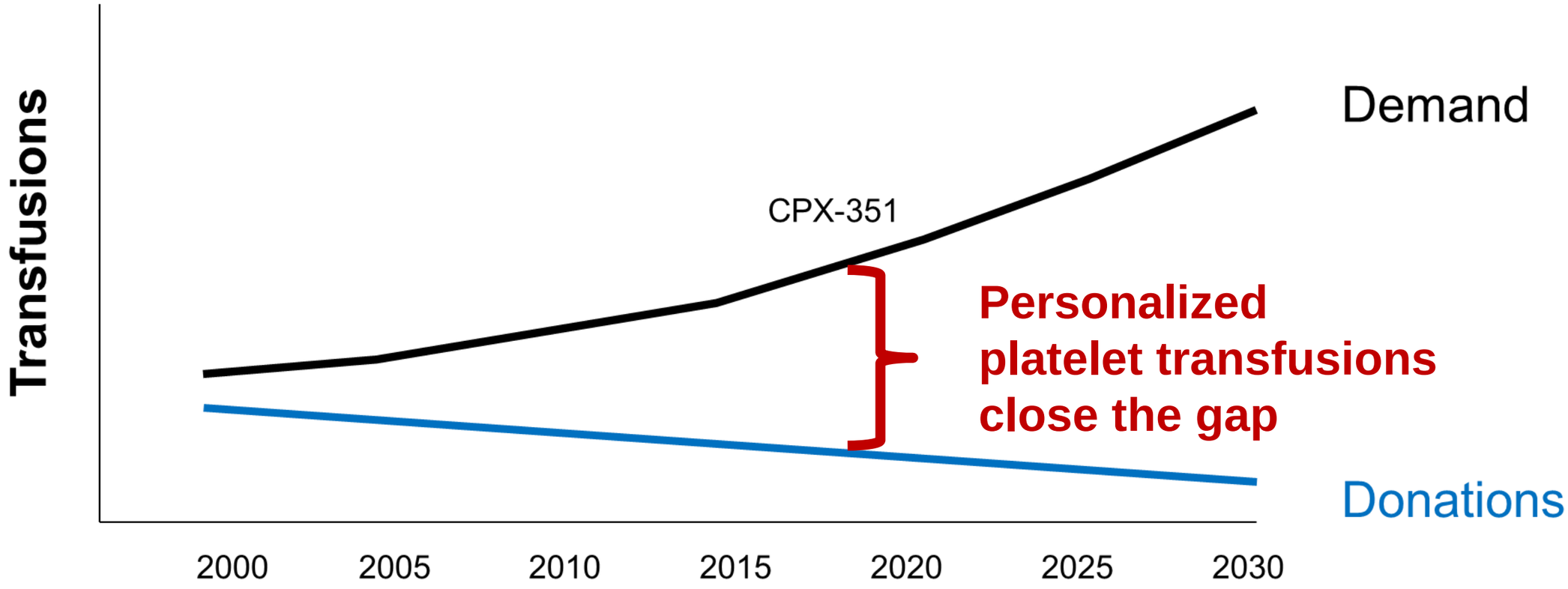
Dr Stubbs and colleagues are to be commended for their tireless efforts to advance platelet transfusion therapy for bleeding patients, which they richly document in the current issue of **TRANSFUSION**.1 Some centers maintained dual platelet inventories until the early 1980s—one stored at room temperature for prophylactic transfusions and the other stored refrigerated for bleeding patients. Since the abandonment of this practice, we have applied a "one-size-fits-all" approach to platelet transfusion, although the primary intended function for a platelet transfusion is substantially different based on its indication. Patients with acute hemorrhage as a result of gross vascular disruption require maximal hemostatic function provided by platelets. In contrast, the primary function of platelets in the prevention of bleeding is to remain in the circulation and repair the subtle damage to endothelium that may occur in the setting of thrombocytopenia.

Murphy, Gardner, Becker, Aster, Valeri, and Slichter, to name just a few of the great pioneers of platelet transfusion, toiled over the challenges of storing these cells, trying to achieve an elusive balance between hemostatic function that can respond to hemorrhage and the need for prolonged circulation in the setting of prophylactic transfusion. Unfortunately, to date, this balance has been impossible to achieve. Room temperature storage results in loss of platelet hemostatic function with preservation of circulation time, whereas cold storage leads to desialation and early clearance (over 1-2 days) but preservation of hemostatic

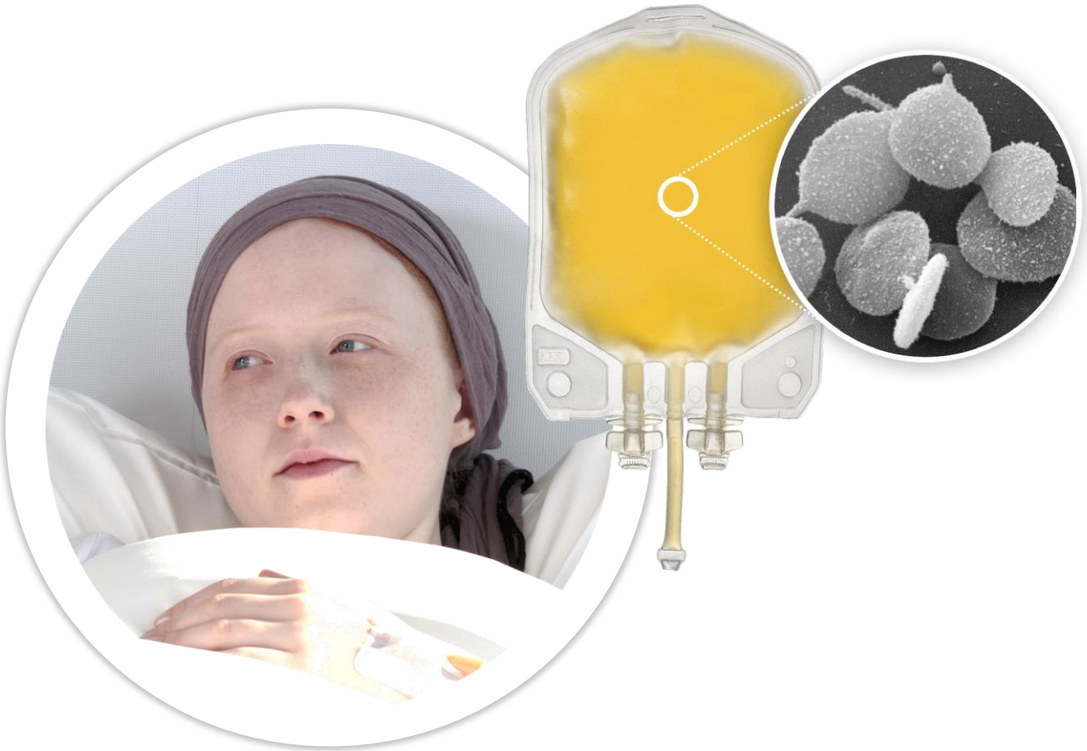
Stubbs JR, Tran SA, Emery RL, et al. Cold platelets for trauma-associated bleeding: regulatory approval, accreditation approval, and practice implementation—just the "tip of the iceberg." Transfusion 2017;57:2836-44.

Supply & demand solution



Personalized platelet transfusions

Cancer



Surgery/Trauma

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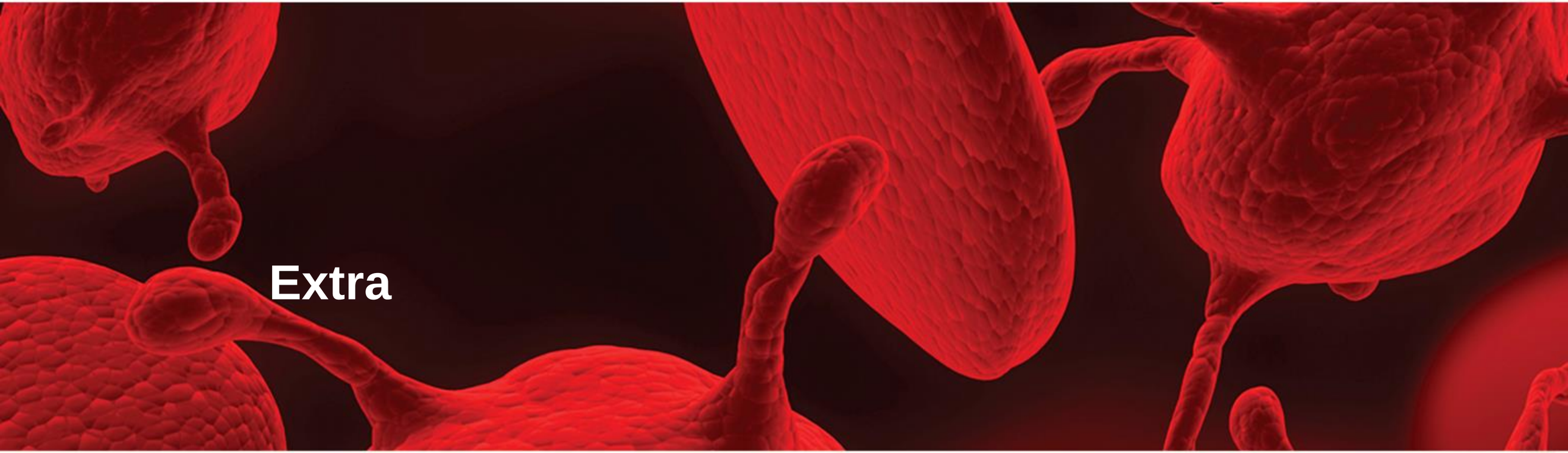
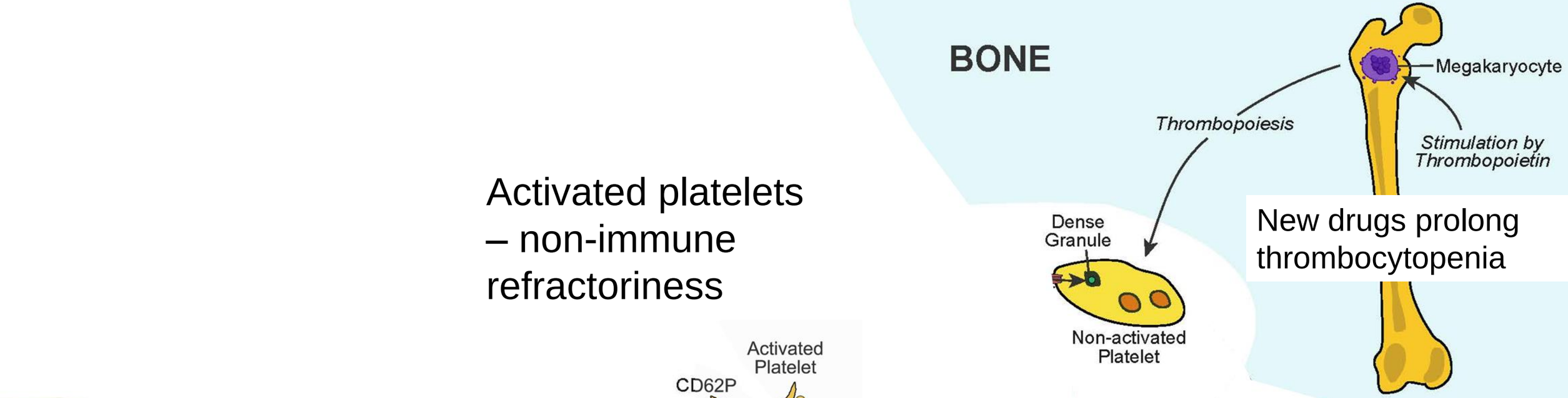


Extra

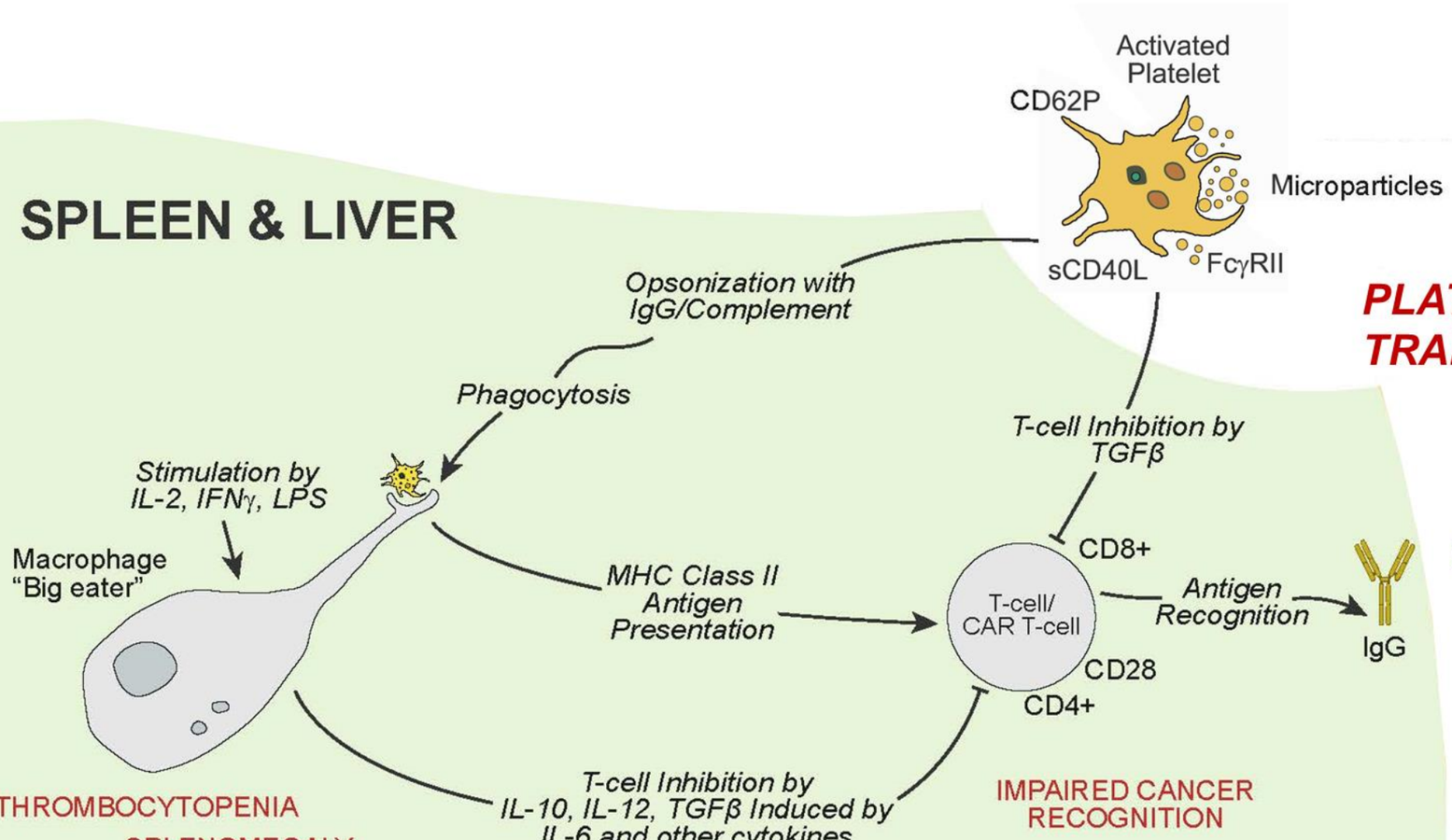
Activated platelets – non-immune refractoriness

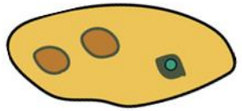


New drugs prolong thrombocytopenia

THROMBOCYTOPENIA

PLATELET TRANSFUSION





HLA mismatch – immune refractoriness