Completing the Picture – Attaining a Safe, Sustainable Blood Supply with Pathogen Inactivation

Richard Benjamin
Chief Scientific Officer, CERUS

IPFA PEI, May 17, 2017
Blood Safety and the Cerus Mission

Blood transfusion is a critical supportive therapy for healthcare – for all people
• >70 million transfusions per year

Our Mission

Cerus will establish INTERCEPT as the standard of care for transfused blood components globally and enable our customers to do everything in their power to deliver safe and effective blood products to patients.

Blood should be:
• Available when needed
• Required to be safe for transfusion

Blood transfusion can transmit infectious diseases
• HIV, HBV, HCV, WNV, DENV, CHIKV, ZIKV, etc.

Blood safety standards are evolving based on recommendations from leading industry groups
Emerging Pathogens: Is testing a sustainable solution?
Development time, cost, continual addition of new pathogens

30 years of development = protection against 9 agents
HIV, Hepatitis B, Hepatitis C, HTLV, bacteria, West Nile virus, T. Cruzi, Syphilis, Leukocytes

Cost

$250
$200
$150
$100


RBC price data adapted from B Custer & JS Hoch, Transfusion Medicine Reviews, 23, No 1 (January), 2009: pp 1-12

New pathogens continue to emerge
Risks to Blood Safety and Supply: Emerging Pathogens

- Emergence of Pathogens is Unpredictable\(^1\)–\(^3\)
  - Globalization, climate change (increase spread of *Aedes* spp. and arboviruses)
  - Adaptation of vectors to new areas, hosts
  - Viral mutation - small change in virus could improve mosquito transmission

- Deferrals are the primary mitigation tactic; tests take time to develop.\(^3\)
- Live viral vaccines require one month deferral
- Impacts platelet availability – product importation to affected areas.\(^4,5\)
- Deferrals lead to difficulties in donor retention, recruitment.\(^6\)

### Recent Arboviral Outbreaks in Europe\(^7\)–\(^14\)

<table>
<thead>
<tr>
<th>Year</th>
<th>Area</th>
<th>Arbovirus</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>Nimes, France</td>
<td>Dengue</td>
</tr>
<tr>
<td>2014</td>
<td>Montpellier, France</td>
<td>Chikungunya</td>
</tr>
<tr>
<td>2012/13</td>
<td>Madeira, Portugal</td>
<td>Dengue</td>
</tr>
<tr>
<td>2010</td>
<td>Croatia</td>
<td>Dengue</td>
</tr>
<tr>
<td>2010/2011</td>
<td>Greece</td>
<td>WNV</td>
</tr>
<tr>
<td>2008-2010</td>
<td>Italy</td>
<td>WNV</td>
</tr>
<tr>
<td>2008</td>
<td>Hungary</td>
<td>WNV</td>
</tr>
<tr>
<td>2007</td>
<td>Emilia-Romagna, Italy</td>
<td>Chikungunya</td>
</tr>
</tbody>
</table>

Risks to Blood Safety and Supply: TA-Sepsis is Under Reported Due to Passive vs. Active Surveillance

- Platelets contaminated with bacteria continue to be transfused despite use of early culture.\(^1\)\(^-\)\(^5\)
- Transfusion-related sepsis is greatly under-reported due to passive vs. active surveillance methods. Patient risk is 10- to 40-fold higher when comparing active vs. passive surveillance.\(^5\)


*Apheresis platelet unit

\(\sim 1:2,500\) units is contaminated with bacteria

\(\sim 1:10,700\) units implicated in clinical sepsis

\(\sim 1:1,700\) patients develop clinical sepsis (6 AP* Exposure)
Reactive Approaches Alone Have Limits

Published July 2016

Reactive approaches like testing are problematic:

- Delayed implementation due to development time, regulatory reviews, etc.
- Potential cost/logistics impact due to additive testing

"Interventions are needed that are both precautionary and independent of the specific threat such as PRT for all blood components"  

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Assuring blood safety and availability: Zika virus, the latest emerging infectious disease battlefront

Threats to blood safety from infectious agents, and subsequent public health action, are hardly novel. Transmission of the Prionus pathogen, the etiologic agent of scrapie, was recognized in the early 20th century soon after the first successful transplants, and in response, donor tests for avian-related antibodies were introduced. Later in the 1960s, hepatitis B virus was found to cause posttransfusion jaundice, and sensitive donor screening tests for hepatitis B surface antigen (HBsAg) were added to donor testing in the early 1970s. The AIDS epidemic in the 1980s presented an entirely new kind of challenge to blood safety with the need to respond urgently to a newly emerging blood-borne and sexually transmitted infection with catastrophic implications. A massive scientific and public health response to AIDS resulted in discovery of human immunodeficiency virus (HIV) as the etiologic agent and the licensure of blood donor screening tests a year later. Since the emergence of HIV numerous recognized and emerging blood safety concerns, e.g., human T-lymphotropic virus, hepatitis C virus (HCV), cytomegalovirus, malaria, variant Creutzfeldt-Jakob disease, Q fever disease, and bacterial contamination have been addressed by a multichannel approach comprising donor deferrals through education and risk factor-based screening with questionnaires; a limited physical examination; use of deferral regions to prevent future unsuitable collections; laboratory testing for markers of infection including nucleic acid tests (NATs) for some agents and use of pathogen reduction technolo-
gies (PRTs) for certain blood components, all within a system highly regulated by the US Food and Drug Administration (FDA). Nevertheless, more recently emerging threats, including arboviruses and parasites, have presented novel challenges related to unpredictable local vector-borne spread and have exposed continued vulnerabilities to blood safety that call for urgent action.

Arboviruses, transmitted by arthropods (primarily mosquitoes), are relatively new emerging threats to blood safety and present a particular challenge due to rapid and large-scale epidemics affecting the United States and its territories. While more than 180 arboviral arboviruses are known to exist and some, particularly yellow fever and dengue, have been associated with outbreaks historically in the continental United States, none has caused recent outbreaks before the emergence of West Nile virus (WNV) in 2002. Unlike typical blood-borne viruses such as hepatitis viruses and HCV which establish chronic infections, arboviruses cause predominantly acute infections, thus presenting a threat to blood safety only while a donor is transiently viremic, either during the disease incubation period or with an asymptomatic or a mild, undiagnosed symptomatic infection. The challenge arises from rapid epidemic spread of an arbovirus in new geographic areas, resulting in immediate safety risks to the blood supply and an urgent need for intervention. Additionally, direct viral detection in donated blood, a generally costly measure, is needed since testing for antibodies, which take time to develop after infection and peak, would fail to interrupt most infections and result in defer-
ral of large numbers of acceptable donors with previously exposed infections.

The US WNV epidemic was the first example of a large-scale arboviral threat to the US blood supply, requiring an urgent response across government and nongovernment agencies. Beginning with reports in August 2002 of a WNV infection acquired by organ transplantation, ultimately being linked to a WNV-infected blood transfusion received by the organ donor, awareness of a rapidly spreading vector-borne, transfusion-transmitted agent associated with morbidity (e.g., neurologic disease) and mortality led to calls for blood donor screening tests for WNV. Collaborations among federal agencies, state public health laboratories, blood collection organizations, and test kit manufacturers led to the availability of investigational donor screening tests within 7 months of a November 2002 workshop in which consensus had been reached on the urgency and path forward. Fortunately, WNV isolates had been sequenced and were available for sharing, and technology platforms for NAT of blood donations for HIV and HCV could be readily adapted to WNV by the manufactur-
ers. WNV has since become endemic in the United States, necessitating an indefinite program of donor testing. A decade later, there have been regional out-
breaks of other arboviral diseases, namely chikungunya,
Contents

- Risks to Blood Safety and Sustainability
- Addressing the Need: The INTERCEPT Blood System
- Moving Toward a Complete Solution
- Conclusion
Mechanisms of Action of INTERCEPT Technologies

Platelets & Plasma

Separate technologies to optimize pathogen inactivation with conservation of functional activity through nucleic acid targeting without reactive oxygen species

Red Cells

INTERCEPT RBC are Not Approved for Clinical Use
INTERCEPT Blood System for Platelets & Plasma : Global Status

- More than 10 years of routine use
- Kits sold to produce > 4,000,000 INTERCEPT platelet and plasma units
- Used in >150 Blood Centers in 25 countries

Map showing countries where INTERCEPT is in routine use, commercially available, or has regulatory activity initiated.

Last update: March 2017
The INTERCEPT Blood System: 
Maintaining Safe and Adequate Supply During Arboviral Outbreaks

INTERCEPT has been called upon to sustain platelet availability during arboviral outbreaks:

- 2005 CHIKV epidemic on Ile de La Réunion, France.¹
- 2010 DENV/CHIKV outbreaks in Guadeloupe and Martinique, French Polynesia.²
- 2013/2014 French Polynesia able to proactively address Zika outbreak with PI.²
- 2014 CHIKV and DENV outbreaks in the Caribbean region.³
- 2016 ZIKV outbreak in Puerto Rico.⁴

³ Rico S, et al. BMT Tandem Meeting; February 2016.
⁴ Weiner E, et al. AABB 2016, SP454.
Demonstrated Safety in Routine Use: Hemovigilance Programs

<table>
<thead>
<tr>
<th># INTERCEPT Platelet Transfusions</th>
<th>French National Hemovigilance(^1)</th>
<th>Swiss National Hemovigilance(^2)</th>
<th>Multicenter Cerus HV(^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>214,293(^1)</td>
<td>167,200(^2)</td>
<td>19,175</td>
</tr>
<tr>
<td># Patients Receiving INTERCEPT Platelets</td>
<td>~36,000</td>
<td>~28,000</td>
<td>4,067</td>
</tr>
<tr>
<td>INTERCEPT ATR Rate</td>
<td>~0.3%(^4)</td>
<td>~0.3%(^2)</td>
<td>~0.6%</td>
</tr>
<tr>
<td>Conventional ATR Rate</td>
<td>~0.3%(^4)</td>
<td>~0.4%(^2)</td>
<td>NA</td>
</tr>
</tbody>
</table>

## Integration of Pathogen Reduction into US Policy: As option to replace of certain tests and/or procedures

<table>
<thead>
<tr>
<th>RISK</th>
<th>GUIDANCE OR STANDARD</th>
<th>PATHOGEN REDUCTION TECHNOLOGY (PRT)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bacterial Contamination</strong></td>
<td>FDA Draft Guidance:¹&lt;br&gt;Recommends PRT or bacterial testing</td>
<td>PRT can eliminate the need for primary and secondary testing, including rapid testing.</td>
</tr>
<tr>
<td></td>
<td>AABB Standard 5.1.5.2:²&lt;br&gt;Methods required to detect bacteria or use PRT in platelet components</td>
<td>PRT can be used as an alternative to bacterial detection.</td>
</tr>
<tr>
<td><strong>ZIKA Virus TTI</strong></td>
<td>ECDC Guidance for Zika&lt;br&gt;WHO Guidance&lt;br&gt;Revised FDA Guidance for Zika³&lt;br&gt;Recommend testing, import or PRT</td>
<td>PRT can be used in place of Zika testing for platelet and plasma components.**</td>
</tr>
<tr>
<td><strong>CMV TTI</strong></td>
<td>AABB Standard 5.19.2:²&lt;br&gt;Policy required to reduce the risk of CMV</td>
<td>INTERCEPT PRT demonstrates inactivation of CMV in platelets in PAS-3 with ≥4.9 pfu/mL log reduction.⁶</td>
</tr>
<tr>
<td><strong>TA-GVHD</strong>*</td>
<td>AABB Standard 5.19.3.1:²&lt;br&gt;Methods known to prevent TA-GVHD required; include irradiation or PRT</td>
<td>PRT meets AABB standard which allows for irradiation or Pathogen Reduction.</td>
</tr>
</tbody>
</table>

*Transfusion-Associated Graft vs. Host Disease  
**Data for pathogen reduction of ZIKA by the INTERCEPT Blood System, pathogen reduction system, has not been submitted for FDA review.

Proven Efficacy of INTERCEPT Platelets in Bacterial Sepsis Risk Reduction
French, Belgian and Swiss Hemovigilance Programs 2006 - 2015

Figure 2: Rates Per Million (95% Confidence Intervals) of Bacterial Contamination of Platelet Concentrates Detected by Septic Transfusion Reactions or Bedside Surveillance, and Reported to National Hemovigilance Programs

INTERCEPT Platelets
>2.3 million issued
607,781 HV monitored
0 fatalities

Benjamin et al., 2017 Submitted
Platelet Usage in Belgium has not Increased Concurrent with INTERCEPT Platelet Implementation

<table>
<thead>
<tr>
<th>Year</th>
<th>Platelets Distributed</th>
<th>% INTERCEPT Platelets Distributed</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>65,000</td>
<td>40%</td>
</tr>
<tr>
<td>2011</td>
<td>66,000</td>
<td>40%</td>
</tr>
<tr>
<td>2012</td>
<td>67,000</td>
<td>40%</td>
</tr>
<tr>
<td>2013</td>
<td>69,000</td>
<td>40%</td>
</tr>
<tr>
<td>2014</td>
<td>67,000</td>
<td>43%</td>
</tr>
<tr>
<td>2015</td>
<td>67,000</td>
<td>87.7%</td>
</tr>
</tbody>
</table>
Here, Now: INTERCEPT Platelets, Plasma are Established and Proven in Routine Use
No Increase in Platelet, RBC Utilization with INTERCEPT Routine Use Experience in Innsbruck, Austria

- Platelet and RBC use were comparable between INTERCEPT and control arms.
- Adverse reaction rates were similar between the INTERCEPT and control periods for the general population (C 1.3%, 1.4%), Hem-Onc (C 4.2%, T 4.4%), cardiac surgery patients (C 0, T 0.1%).

### Study Summary

<table>
<thead>
<tr>
<th>Arm (Time Period)</th>
<th># Patients</th>
<th># Transfusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTERCEPT-Treated Platelets (April 2013-Dec. 2014)</td>
<td>1694</td>
<td>7705</td>
</tr>
<tr>
<td>Conventional Platelets(April 2011-Dec. 2012)</td>
<td>1797</td>
<td>8611</td>
</tr>
</tbody>
</table>

### Comparable Utilization of Platelet and RBC Components

<table>
<thead>
<tr>
<th>Patient Population</th>
<th># Platelets Transfused</th>
<th># RBCs transfused</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Conventional Mean ± SD</td>
<td>INTERCEPT-Treated Mean ± SD</td>
</tr>
<tr>
<td>Total</td>
<td>4.8 ± 9.7</td>
<td>4.5 ± 8.9</td>
</tr>
<tr>
<td>Hem-Onc</td>
<td>9.8 ± 15.7</td>
<td>9.0 ± 15.3</td>
</tr>
<tr>
<td>Cardiac Surgery</td>
<td>2.5 ± 4.0</td>
<td>2.6 ± 3.2</td>
</tr>
<tr>
<td>Pediatric</td>
<td>7.3 ± 16.0</td>
<td>4.1 ± 6.4</td>
</tr>
<tr>
<td>Neonate</td>
<td>2.7 ± 3.1</td>
<td>2.8 ± 3.1</td>
</tr>
<tr>
<td>Massive Transfusion</td>
<td>3.0 ± 2.1</td>
<td>3.3 ± 2.0</td>
</tr>
</tbody>
</table>

2. P value > 0.05 for all, with exception of Pediatric population for # platelets transfused (p= 0.02); decrease in # of pediatric patients undergoing HSCT during test period.
Proven Efficacy in Bleeding Patients
Massive Transfusion before and after INTERCEPT Platelet Introduction

• 150 Patients before INTERCEPT
• 156 Patients after INTERCEPT

Massive Transfusions: >1 Platelets plus >10 RBC on a Calendar Day

Nussbaumer et al. Vox Sanguinis 2017 Online early
Proven Efficacy in Bleeding Patients
Massive Transfusion before and after INTERCEPT Platelet Introduction

- 150 Patients before INTERCEPT
- 156 Patients after INTERCEPT

Log rank p-value: 0.374

Massive Transfusions: ≥1 Platelets plus ≥10 RBC on a Calendar Day

Nussbaumer et al. Vox Sanguinis 2017 Online early
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# Robust Pathogen Inactivation with the INTERCEPT RBC System

<table>
<thead>
<tr>
<th>Organism</th>
<th>$\log_{10}$ Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell associated-HIV</td>
<td>$&gt;$5.4</td>
</tr>
<tr>
<td>DHBV</td>
<td>$&gt;$5.1</td>
</tr>
<tr>
<td>BVDV</td>
<td>$&gt;$4.8</td>
</tr>
<tr>
<td>Cell associated-CMV</td>
<td>$&gt;$3.9</td>
</tr>
<tr>
<td>CHIKV</td>
<td>$&gt;$7.1</td>
</tr>
<tr>
<td>DENV</td>
<td>$&gt;$4.4$^1$</td>
</tr>
<tr>
<td>ZIKV</td>
<td>$\geq$5.8$^2$</td>
</tr>
<tr>
<td>Bluetongue</td>
<td>$\geq$4.4</td>
</tr>
<tr>
<td>Calicivirus</td>
<td>$&gt;$6.8</td>
</tr>
<tr>
<td>Adenovirus</td>
<td>$&gt;$5.9</td>
</tr>
<tr>
<td>P. falciparum</td>
<td>$&gt;$7.9</td>
</tr>
<tr>
<td>B. microti</td>
<td>$&gt;$4.9$^3$</td>
</tr>
</tbody>
</table>

$^1$Santa Maria et al. Transfusion, 56, S4, 11A,  
$^2$Laughhunn et al. Transfusion epub 2017,  
$^3$Tonetti et al. Transfusion 56, S4, 195A.
S-303 Inactivation of T-Lymphocytes in RBC with a Limited Dilution Assay

INTERCEPT is more effective at T cell inactivation than irradiation

Log$_{10}$ Inactivation

\[ \begin{array}{c|c|c}
\text{Group} & \text{Number of Proliferating Cells} \\
\hline
\text{Media} & 200 \\
\text{1 x 10}^7 \text{T Cells treated with INTERCEPT} & 150 \\
\text{1 x 10}^5 \text{T Cells treated with Gamma irradiation} & 100 \\
\text{1 x 10}^6 \text{T Cells treated with Gamma irradiation} & 50 \\
\end{array} \]

1 Castro G et al. Vox Sanguinis (2016) 111 (Suppl. 1), 166
INTERCEPT RBC Clinical Trial Overview

Phase 1: Healthy Blood Donors
- Recovery without CAD (n=42)
- Recovery without CAD (Multiple Exposures) (n=28)
- Recovery & Lifespan with CAD (n=30) and Tolerability (n=10)
- Recovery & Lifespan (n=27) Prototype Gen 2 Device
- Recovery & Lifespan (n=26)

Phase 3: Patients
- Acute Transfusion (CV Surgery) (n=148)
- Chronic Transfusion (Thalassemia and Sickle Cell Disease) (n=26)¹

Legend
- Generation 1
- Generation 2

1. Low titer antibody to S-303 treated RBCs observed in two patients with chronic anemia resulting in study stop of the Phase 3 trials with the 1st Generation System and reformulation of the system.
2. Randomized, Double-Blind, Controlled, Parallel Group Study with the INTERCEPT Blood System for Red Blood Cells in Regions at Potential Risk for Zika Virus Transfusion-Transmitted Infections (RedeS).
3. Randomized, Double-Blinded, Controlled, Parallel Group, Non-inferiority, Phase III Study to Evaluate the Efficacy and Safety of the INTERCEPT Blood System for Red Blood Cells in Patients undergoing Complex Cardiac Surgery Procedures (ReCePI).
4. Randomized, Double-Blind, Controlled, Crossover Study to Evaluate the Efficacy and Safety of the INTERCEPT Blood System for Red Blood Cell Pathogen Reduction in Patients with Sickle Cell Disease in an Exchange Transfusion Program (SCient).

**Primary endpoints met successfully:**
- In EU Phase III in acute anemia patients (n=51).
- In US Phase II recovery & survival in healthy subjects.

**Completed enrollment:**
- EU Phase III RBC study in chronic anemia (n=81).

**CE mark submission upon completion of CMC studies**
- Scheduling of TUV submission date.
Thalassemia Study – Status May 8, 2017

SPARC # of Subjects Per Transfusion Cycle

- Total transfusions: 876
- Total RBC Components: 1,838
- Last transfusion estimated November, 2017

No evidence of emergent S-303 antibodies

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Cycle 1</th>
<th>Cycle 2</th>
<th>Cycle 3</th>
<th>Cycle 4</th>
<th>Cycle 5</th>
<th>Cycle 6</th>
<th>Cycle 7</th>
<th>Cycle 8</th>
<th>Cycle 9</th>
<th>Cycle 10</th>
<th>Cycle 11</th>
<th>Cycle 12</th>
<th>Follow-Up #1</th>
<th>Follow-Up #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>81</td>
<td>80</td>
<td>80</td>
<td>78</td>
<td>76</td>
<td>70</td>
<td>63</td>
<td>61</td>
<td>60</td>
<td>57</td>
<td>57</td>
<td>57</td>
<td>57</td>
<td>57</td>
</tr>
<tr>
<td>O5B (Izmir)</td>
<td>67</td>
<td>67</td>
<td>67</td>
<td>65</td>
<td>63</td>
<td>57</td>
<td>50</td>
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<td>45</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>44</td>
</tr>
<tr>
<td>O4C (Orbassano)</td>
<td>7</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>5</td>
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<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>O3B (Cagliari)</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
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</tr>
</tbody>
</table>

Total # of Subjects Per Transfusion Cycle

- Total # of Subjects: 81
- O5B (Izmir): 67
- O4C (Orbassano): 7
- O3B (Cagliari): 7
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Phase 3: Patients

**Acute Transfusion (CV Surgery) (n=148)**

**Chronic Transfusion (Thalassemia and Sickle Cell Disease) (n=26)**

**Recovery without CAD (n=42)**

**Acute Transfusion (CV Surgery) (n=50)** Paper in review

**Chronic Transfusion (Thalassemia) (n=70) Enrolled**

**Recovery & Lifespan (n=26)**

**SPARC**

**Recovery & Lifespan (n=26)**

**Barbara**

**Recovery without CAD (Multiple Exposures) (n=28)**

**Phase 3: Patients**

- Chronic Transfusion (Thalassemia and Sickle Cell Disease) (n=26)

**Legend**

- Generation 1
- Generation 2

**US funding by BARDA** accelerates a comprehensive RBC program

- Base Period and Additional Options (~$180M).
- Major Phase 3 & Phase 4 clinical development effort.
- Manufacturing scale-up and disposable advances.
- PI & in-vitro studies
- PMA submission

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Complete, Comprehensive PI/PRT Solution might Simplify Current Testing Algorithms

### Current Practices

<table>
<thead>
<tr>
<th>DHQs</th>
<th>Donor Deferrals</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBV</td>
<td>HBsAg</td>
</tr>
<tr>
<td></td>
<td>Hbc</td>
</tr>
<tr>
<td></td>
<td>NAT</td>
</tr>
<tr>
<td>HCV</td>
<td>HCV 3.0</td>
</tr>
<tr>
<td></td>
<td>NAT</td>
</tr>
<tr>
<td>HIV</td>
<td>HIV1/2 EIA</td>
</tr>
<tr>
<td></td>
<td>NAT</td>
</tr>
<tr>
<td>Zika*</td>
<td>NAT</td>
</tr>
<tr>
<td>Dengue*</td>
<td>NS1</td>
</tr>
<tr>
<td></td>
<td>NAT</td>
</tr>
<tr>
<td>CHIKV*</td>
<td>NAT</td>
</tr>
<tr>
<td>Bacteria</td>
<td>Culture</td>
</tr>
<tr>
<td>Leukocytes</td>
<td>Gamma Irradiation</td>
</tr>
</tbody>
</table>

* no current commercialized test

** INTERCEPT for Red Cells is in Development

### With Robust PI/PRT

**INTERCEPT BLOOD SYSTEM**

- **Safer Blood**
- **May enable simplification of current testing algorithms**
- while retaining the donor base
In Conclusion…

- Emerging pathogens and their unpredictability call for a proactive measure to effectively mitigate TTI risk, and to maintain blood supply.
- Particularly true with platelets in event of outbreak; susceptible to expiry, which can lead to logistical supply issues, loss of donors & blood shortages.
- Bacteria pose the greatest infectious transfusion risk in platelets, which is often under-reported; culture misses >50% of cases.

The INTERCEPT Blood System provides a comprehensive solution, demonstrated to maintain blood safety and availability.

- Today, INTERCEPT Platelets and Plasma are available to help ensure blood sustainability.
- INTERCEPT RBC System is in active development; provides an opportunity to simplify TTI mitigation strategies (i.e., testing, deferrals, travel, MSM).
- INTERCEPT RBC will bring pathogen reduction technology to all major blood components.
Thank you.
INTERCEPT REGULATORY APPROVALS

United States (FDA)
2014 (platelets and plasma)

Switzerland (Swissmedic)
2009 (platelets), 2010 (plasma)

Germany (PEI)
2007* (platelets), 2011* (plasma)

France (ANSM)
2003 (platelets), 2006 (plasma)

CE mark, Class III
2002 (platelets), 2006 (plasma)

* First blood center marketing authorization approved.

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Use of INTERCEPT is contraindicated in patients with a history of allergic response to amotosalen or psoralens.
No pathogen inactivation system has been shown to inactivate all pathogens.