Pathogen Reduced Platelets

Background

Blood products are one of the most commonly prescribed life-saving therapies[1] but are produced from humans and therefore can carry infectious disease risk and potential harm to patients. To mitigate this risk and meet compliance for enhancing the safety of platelet transfusions, Versiti provides leukocyte-reduced apheresis platelets that are treated with an FDA-approved pathogen reduction system (INTERCEPT™ Blood System, Cerus Inc.). Unlike leukocyte-reduced apheresis platelets, the pathogen reduction system results in broad spectrum inactivation of viruses, bacteria, and parasites (Figure 1). The process also inactivates donor T-lymphocytes that may cause transfusion-associated graft-versus-host disease (TA-GVHD).

Figure 1. Pathogens Reduced by INTERCEPT Blood System[2]

	**Enveloped viruses**	HIV-1, HIV-2, HBV, HCV, HTVL-I, HTVL-II, DHBV, BVDV, CMV, WNV, SARS, Vaccinia, Chikungunya, Dengue, Influenza A
	**Non-enveloped viruses**	Bluetongue virus, type 11 Feline calicivirus Parvovirus B19 Human adenovirus 5
	**Gram-negative bacteria**	Klebsiella pneumoniae Yersinia enterocolitica Escherichia coli Pseudomonas aeruginosa Salmonella cholaraesuis Enterobacter cloacae Serratia marcescens Anaplasma phagocytophilum Orientia tsutsugamushi
	**Leukocytes**	T-cells
	**Spirochetes**	Treponema pallidum Borrelia burgdorferi
	**Gram-positive bacteria**	Listeria monocytogenes Streptococcus pyogenes Staphylococcus epidermidis Staphylococcus aureus (including methicillin-resistant) Corynebacterium minutissimum Bacillus cereus (vegetative) Lactobacillus sp. Bifi dobacterium adolescentis Propionibacterium acnes Clostridium perfringens
	**Protoza**	Trypanosoma cruzi Plasmodium falciparum Leishmania sp. Babesia microti

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Pathogen Reduced (PR) Platelets are achieved by:

- Amotosalen (psoralen* derivative) is added to the apheresis platelet bag. Amotosalen is a chemical that binds to nucleic acids within the cells of pathogens or T-lymphocytes present in the bag.
- Platelet bag then undergoes UV-A illumination to induce crosslinking of the amotosalen between the nucleic acids. This results in damage to the nucleic acids preventing replication and growth of the cells.
- Treated platelets are then transferred to a specialized container with a Compound Adsoption Device (also known as CAD) to absorb any residual unreacted amotosalen and free photoproducts released during the illumination step.
- Platelets are transferred to a final storage container for distribution to the hospitals or storage at 20-24°C with continuous agitation for up to 5 days from the time of collection.[2]

Indications

Indications for transfusion of PR platelets are similar to other platelet products. PR platelets may be given for prophylactic reasons, such as severe thrombocytopenia (e.g. platelet count <10,000/μL), or therapeutic intervention (e.g. active platelet-related bleeding). Refer to *Versiti Blood Utilization Guidelines, Apheresis Platelets* section for more information on indications and best practice for platelet transfusions.

Although PR platelets are not labeled as "CMV negative", they are **considered equivalent to CMV seronegative platelets** due to inactivation of CMV by the pathogen reduction technology.[3]

Like irradiation, PR processing inactivates T-lymphocytes, which reduces the risk of transfusion-associated graft-vs-host disease (TA-GVHD). **PR platelets do not require irradiation** and are approved for prevention of TA-GVHD in at-risk patients.[4]

Clinical Efficacy

In patients receiving PR platelets, post-transfusion platelet count increments are known to be lower and there may be shorter interval between platelet transfusions. However, several studies have demonstrated that PR platelets are similar to conventional platelets with respect to control of bleeding and clinical outcomes.[4]

Safety

Early adoption of pathogen-reduced platelets in other countries provides insight into the safety of the product. Since 2006, international hemovigilance programs reported over 300,000 pathogen reduced platelet transfusions in France and Switzerland with no reported bacterial transfusion transmitted infections (TTIs) or sepsis-related fatalities (Table 1).[5]

Table 1. Summary of Hemovigilance Adverse Events

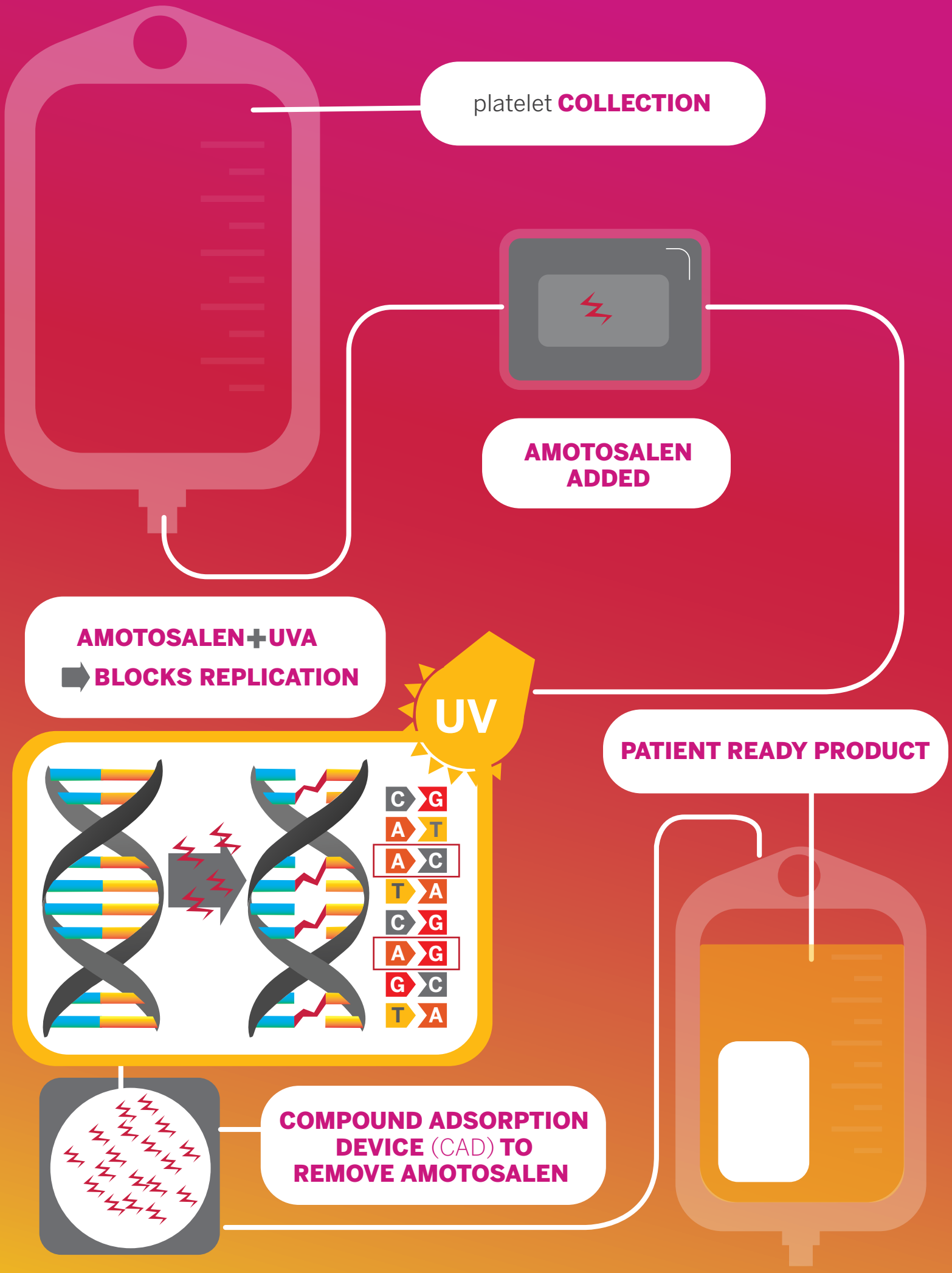
Country	Untreated Platelets		INTERCEPT™ Platelets	
	# Transfused	TTIs (fatalities)	Transfused	TTIs (fatalities)
France 2006–2015[3]	2,398,227	47 (9)	186,884	0 (0)
Switzerland 2010–2015[3]	158,502	16 (3)	130,785	0 (0)

TTI = Transfusion Transmitted Infection

Contraindications / Side effects

- Contraindicated for patients with a history of hypersensitivity reaction to amotosalen or other psoralens*.
- Potential rare risk of erythema if PR platelets transfused to neonates treated with phototherapy devices that emit peak energy wavelength less than 425nm or lower bound of the emission bandwidth less than 375nm.
- Hematologic or solid tumor patients receiving PR platelets may be at increased risk for development of adult respiratory distress syndrome.[4,6] Although, there were no reports of TRALI in over 32,000 transfusions of PR platelets from active hemovigilance programs both in Europe and the US.[7,8]

*Psoralens are chemicals found in certain plants that absorb UV-A light and can act like ultraviolet radiation.


platelet COLLECTION
AMOTOSALEN ADDED
AMOTOSALEN + UVA
BLOCKS REPLICATION
UV
PATIENT READY PRODUCT
C G
A T
A C
T A
C G
A G
G C
T A
COMPOUND ADSORPTION DEVICE (CAD) TO REMOVE AMOTOSALEN

Product Specifications for Pathogen Reduced Platelet Products

Product Specifications	
Platelet Source	Trima Apheresis
Suspension Medium	100% Plasma
Product Volume	175 – 390 mL
Platelet Count	3.0 – 4.8x10^{11}
Platelet Concentration	0.9 – 2.0x10^{9}/mL

Labeling Requirements and ICCBBA Product Codes

Labeling requirements will include the attribute "psolaren-treated".

Unique product codes for pathogen reduced platelets have been assigned by ICCBBA (International Council for Commonality in Blood Banking Automation). A complete list can be found on ICCBBA webpage: http://www.iccbba.org

For additional information please contact your local Hospital Relations Specialist.

References

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