



# SmartPR<sub>2</sub>P<sup>®</sup>

THE OPTIMAL PLATELET RICH PLASMA COMPOSITION

**HARVEST**<sup>®</sup>  
TERUMO

Developing technologies for **accelerating healing, naturally<sup>®</sup>**

# SmartPReP 2: The Gold Standard

Harvest Technologies is the leader in developing point-of-care cellular platforms to isolate and concentrate autologous growth factors, stem cells, and accessory cells that may help optimize conditions for healing. A decade ago, we introduced the SmartPReP 2 Platelet Concentrate System, making the use of autologous growth factors practical in the hospital and clinic setting for the first time.

The SmartPReP 2 System (and former Symphony 2 system) has been used in over 1 Million procedures to date and counting. Today, the SmartPReP platform is the gold standard in PRP technology.



## The SmartPReP 2 System<sup>1</sup>:

- :: Delivers the optimal composition of a concentrated platelet product<sup>3</sup>
- :: Recovers the highest percentage of platelets and corresponding growth factors – up to 80% of available platelets
- :: Contains increased concentration of stem cells
- :: Generates the greatest level of reproducibility – only a 5% coefficient of variance
- :: In the shortest amount of time – 15 minutes or less from start to finish
- :: Considered the simplest and easiest system to use

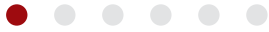
Harvest's mission is to further  
expand and enhance the use  
of autologous bioactive cells  
that may help optimize the  
conditions for healing and  
improved patient outcomes.\*

\*see back panel for indications for use

# Harvest Technologies

Developing Cellular platforms that may help optimize conditions for healing orthopedic sites

## Unlocking the Biologic Potential



### What is the Optimal Composition of an Autologous Platelet Concentrate (APC)?

**It has been documented in the literature that effective cellular therapy requires a scaffold for cell migration, progenitor cells which can be converted into bone or soft tissue, and signal proteins to modulate the repair and regeneration process. These key biologic cells are located in the “buffy coat” layer.**

The buffy coat is a rich source of cells and proteins that may help optimize the conditions for healing, including:

#### Platelets

- ⌘ Mediate cell-to-cell adhesion through the release of various adhesion molecules and growth factors

#### Growth Factors

- ⌘ Platelet Derived Growth Factors (PDGF): Chemoattractive for stem cells and endothelial cells
- ⌘ Transforming Growth Factor Beta (TGF- $\beta$ ): Promotes cell mitosis and differentiation for connective tissue and bone
- ⌘ Vascular Endothelial Growth Factors (VEGF): Stimulates angiogenesis and chemoattractive for osteoblasts

#### White Blood Cells (WBC's)

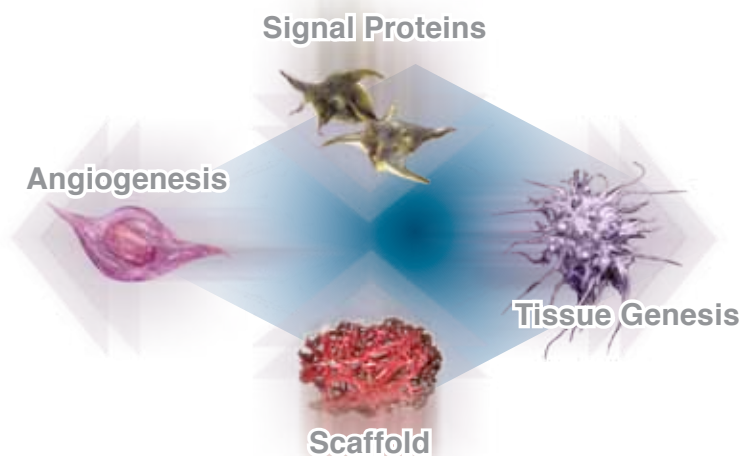
- ⌘ The WBC composition of the Harvest APC is primarily mononuclear as compared to whole blood which contains primarily granulocytes.<sup>1</sup>
- ⌘ **CD34<sup>+</sup>** cells as a stem cell marker have been identified in the Harvest concentrated platelet product (APC)<sup>1</sup>

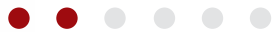
#### Cytokines and Adhesion Molecules

- ⌘ Stromal Derived Factor-1 Alpha (SDF-1 $\alpha$ ): Actively modulates migration and homing of stem cells to the repair site



## Essential Healing Factors





## What is the Optimal Platelet Concentration?

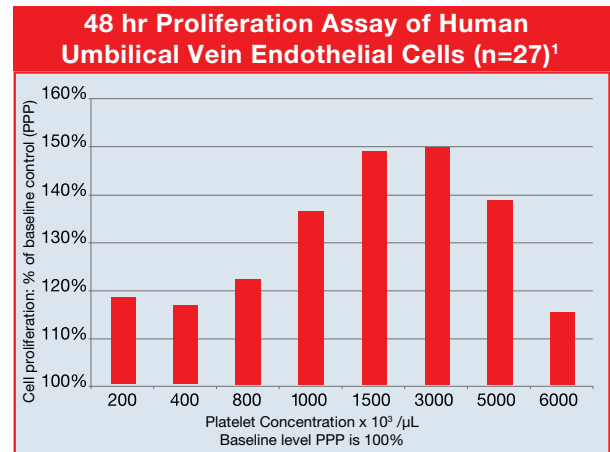
**An Autologous Platelet Concentrate not only accelerates migration of stem cells to the repair site but also stimulates proliferation in the microenvironment.**

Physicians recognize that re-establishing blood flow is critical for healing.<sup>2</sup> Platelets, WBC's, and accessory cells contain critical cytokines such as VEGF which is well known to stimulate angiogenesis and SDF-1 $\alpha$  which actively mobilizes and navigates stem cells to the repair site.

Recent studies indicate the optimal platelet concentration to stimulate angiogenesis ranged from 1.5 to 3.0 x 10<sup>6</sup> platelets/ $\mu$ L (1.5 million to 3.0 million platelets per microliter).<sup>1,3</sup>

Furthermore, proliferative assays showed:

- :: No PRP device can achieve platelet concentrations that inhibit angiogenesis<sup>1</sup>
- :: WBC's do not inhibit cell proliferation<sup>1</sup>
- :: Platelet concentrations less than 500 x 10<sup>3</sup>/ $\mu$ L support proliferation no better than platelet poor plasma (PPP)<sup>1</sup>



## What is the Value of White Blood Cells?

**Some contend that concentrated WBC's may produce an unintended inflammatory response or inhibit cell proliferation. Not true. What most fail to recognize is the importance of the composition of the WBC fraction in the concentrated platelet product.**

Unlike other systems, the SmartPreP's patented separation process produces a WBC composition that contains 100% more mononuclear (lymphocytes and monocytes) cells while reducing the granulocyte cells by 60% as compared to the whole blood sample.

- :: This composition may help optimize conditions for healing.
- :: Lower than baseline granulocyte levels limits inflammation while delivering a proportionately greater number of stem cells.
- :: More importantly, **CD34<sup>+</sup>** cells are markers for stem cells and these cells reside in the mononuclear fraction.
- :: The predominance of mononuclear and CD34<sup>+</sup> cells found in the SmartPreP's concentrated platelet product indicates the presence as well as the concentration of stem cells.

In addition to the significant reduction of granulocytes, APC's have also been shown to significantly suppress inflammation by generating endogenous anti-inflammatory compounds such as lipoxins.<sup>4,5,6</sup>

SmartPreP Performance <sup>1</sup>		
	Whole Blood	SmartPreP PRP
Platelets	250 x 10 <sup>3</sup> $\mu$ L	1,500 x 10 <sup>3</sup> $\mu$ L
SDF-1 $\alpha$ pg/ml	1,000	2,663
PDGF-AB ng/ml	30	398
TGF- $\beta$ 1 ng/ml	43	319
VEGF pg/ml	55	600
WBC Count	5.7 x 10 <sup>3</sup> $\mu$ L	20.1 x 10 <sup>3</sup> $\mu$ L
Mononuclear	37.5%	75.1%
Granulocyte	62.5%	24.5%
CD34 <sup>+</sup> (Total Cells Delivered)		171,571 (64% Yld.)



## How do Stem Cells home to the Repair Site?

**Clinically effective Autologous Platelet Concentrate contains both stem cells and their homing agent.**

Migration of stem cells throughout the body requires active navigation, a process called homing. Homing is a multistep process modulated by SDF-1 $\alpha$ .<sup>7</sup>



## What about “Closed Systems” and Product Sterility?

**Biologic Closed System – “A chemical or biological system that exchanges no matter or energy with the outside environment”<sup>8</sup>**

### AABB and FDA/CBER Guidelines For Transfusion Therapy

While no system is completely closed, the SmartPreP system was designed to follow AABB guidelines for cell separation.

Instead of using luer connectors that can be easily contaminated and cannot be disinfected, SmartPreP disposables incorporate re-sealable injection ports that can be aseptically disinfected with alcohol prior to needle entry. The SmartPreP 2 is the closest system to a closed system on the market today.

### Sterility Testing

Harvest Technologies meets state of the art requirements for sterility testing. Prepared with the SmartPreP system, PRP aliquots were incubated, cultured and sub-cultured over 18 days aerobically and anaerobically. All cultures were negative. Harvest Technologies has documented sterility of the concentrated platelet product when following the manufacturer's instructions for use.<sup>9</sup>

## All PRP Is Not Created Equal<sup>1</sup>

**The technique used for isolating and concentrating platelets has a direct impact on growth factor availability and functionality.<sup>10</sup>**

Test tube systems, Lab centrifuges and many other so called “PRP” systems fail to achieve the threshold of platelet concentration and white blood cell composition required.<sup>1</sup>

The SmartPreP 2 system consistently and reproducibly generates the optimal platelet concentration that may help optimize the conditions for healing. While no system is fully automated, **SmartPreP is as simple as 1,2,3.**



Draw blood



Concentrate



Deliver



# SmartPReP 2: A System You Can Trust to Consistently Deliver

## SmartPReP 2 Platelet Concentrate System

- :: Point-of-care, multifunction platform for concentrating autologous cells
- :: More than a decade of proven reliability
- :: One-button operation
- :: 15-minute automated process

## APC+® Procedure Packs:

- :: All inclusive procedure packs based on clinical need
- :: Patented floating shelf technology ensures consistency and highest level of reproducibility
- :: Delivers the optimal concentrated platelet product and WBC composition

The Harvest Technologies PRP separation system is designed to be used for the safe and rapid preparation of autologous platelet rich plasma (PRP) from a small sample of blood at the patients point of care. The PRP can be mixed with autograft and allograft bone prior to application to an orthopedic surgical site as deemed necessary by the clinical use requirements.

Use of platelet rich plasma can facilitate the handling characteristics of the graft material, particularly of cancellous bone, and the natural adhesion effect of platelets consolidates the graft material facilitating fixation of the grafting material to the defect site. Increasing the concentration of platelets at the graft site above native levels may also help to optimize the conditions for healing as platelets' natural physiologic function is to release proteins that can promote cell migration and growth.

The SmartJet bone grafting liquid applicator is designed to facilitate pre mixing of allograft, autograft or synthetic bone graft materials for application to an orthopedic surgical site, with I.V. fluids, autologous blood, plasma, platelet rich plasma, or other specific blood component(s) as deemed necessary by the clinical use requirements.

The SmartJet grafting liquid applicator is intended for the application of fluids, as deemed necessary by the surgeons determination of the clinical use requirements, to facilitate the preparation of soft tissue autograft or allograft material prior to the application of the graft material to a repair site.

## SmartPReP2 Ordering Information

<b>SMP-2</b>	<b>SmartPReP 2 Platelet Concentrate System</b> 110V-50/60 Hz
<b>WS-2</b>	<b>SmartPReP 2 Workstation</b>
<b>RC-2</b>	<b>SmartPReP 2 Rolling Transport Case</b>
<b>APC-30</b> <b>NEW</b>	<b>APC+ Procedure Pack for SmartPReP 2</b> Generates 3-4ml APC+. 6/case.
<b>APC-60</b>	<b>APC+ Procedure Pack for SmartPReP 2</b> Generates 5-10ml APC+. 3/case.
<b>APC-120</b>	<b>APC+ Procedure Pack for SmartPReP 2</b> Generates 10-20ml APC+. 2/case.
<b>LK/2</b>	<b>SmartJet® Liquid Applicator Kit</b> 2 in.(50mm) Liquid delivery system. 6/case.
<b>LK/4</b>	<b>SmartJet® Liquid Applicator Kit</b> 4 in.(102mm) Liquid delivery system. 6/case.
<b>LK/7</b>	<b>SmartJet® Liquid Applicator Kit</b> 7 in.(178mm) Liquid delivery system. 6/case.
<b>SK/S</b>	<b>SmartJet® Spray Applicator Kit</b> Spray delivery system. 6/case.

### References

- (1) Data on file
- (2) Street, J et al, VEGF stimulates bone repair by promoting Angiogenesis and bone turnover, PNAF 2002.
- (3) Giusti, I, et al, Identification of an Optimal Concentration of Platelet Gel for Promoting Angiogenesis in Human Endothelial Cells, *Transfusion*, 2009; 49:771-778
- (4) Kusumanto, Y, et al, Platelets and Granulocytes, in Particular the Neutrophils, form Important Compartments for Circulating Vascular Endothelial Growth Factor, *Angiogenesis*, 2003; 6:238-287
- (5) El-Sharkawy, H, et al, Platelet-Rich Plasma: Growth Factors and Pro- and Anti-Inflammatory Properties, *J Periodontol*, 2007; 7:661-669
- (6) Fiore S, et al, Lipoxin A4 Receptor Activation is Distinct from that of the Formyl Peptide Receptor in Myeloid Cells: Inhibition of CD11/18 Expression by Lipoxin A4-Lipoxin A4 Receptor Interaction, *Biochemistry*, 1995; 34:16678-16686
- (7) Massberg, S., et al, Platelets Secrete Stromal Cell-Derived Factor-1 $\alpha$  and Recruit Bone Marrow-Derived Progenitor Cells to Arterial Thrombi in Vivo, *JEM*, 2006; 203:1221-1233
- (8) Perry, R., Green, D., Perry's Chemical Engineers' Handbook, 7th edition, 1997, 4-3, McGraw-Hill
- (9) Center for Blood Research Laboratories, Sterility of Platelet Concentrates Collected with the SmartPReP System and Disposables, TR-063, 2001
- (10) Kevy, et al, Comparison of Methods for Point of Care Preparation of Autologous Platelet Gel, *JECT*, 2004; 36:28-35

**To arrange an evaluation or for more information, call toll free 877.8.HARVEST (877.842.7837) or visit us at [www.harvesttech.com](http://www.harvesttech.com)**



Developing technologies for **accelerating healing, naturally®**

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### CE Mark Authorized

BSI Registered Firm  
ISO 13485 Registered

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In less than **15 minutes**, 60 mL of  
peripheral blood provides  
**10 mL of an Autologous Platelet  
Concentrate with the  
optimal cellular composition  
and concentration.**

# Delivery Options



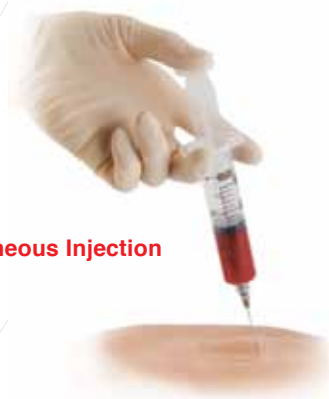
**Topical Spray**  
(SK/S Shown)



**Liquid Application**  
(LK/2 Shown)



**Enriched Bone Grafts**



**Percutaneous Injection**