TriCell PRP

Customized Platelet Plasma Products
The application of Platelet Rich Plasma (PRP) has been documented in many fields ranging from Orthopedics, Sports Medicine, Dentistry, Neurosurgery, Ophthalmology, Urology, Wound Healing, Cosmetic, Cardiothoracic, and Maxillofacial Surgery.

The initial popularity of PRP grew from its promise as a safe and natural alternative to surgery. PRP advocates promoted the procedure as an organically based therapy that enabled healing through the use of one’s own natural growth factors.

Studies suggest that platelets contain an abundance of growth factors and cytokines that can affect inflammation, post-operative blood loss, infection, osteogenesis, wound, muscle tear, and soft tissue healing.

Research shows that platelets also release many bioactive proteins responsible for attracting macrophages, mesenchymal stem cells, and osteoblasts that not only promote removal of degenerated and necrotic tissue, but also enhance tissue regeneration and healing.

Types of Platelet Plasma Products:
Platelet Plasma Products containing White Blood Cells (WBC) will have different biologic activity than Platelet Plasma Products in which they are absent.

WHAT THE EXPERTS REQUIRE
ICMS PLATELET RICH PLASMA GUIDELINES

Composition of Whole Blood:

Plasma:
Constitutes about 52-62% of whole blood. Plasma is a fluid, composed of ~92% water, 7% vital proteins such as albumin, gamma globulin, clotting factors, and 1% mineral salts, sugars, hormones, fats, and vitamins.

Buffy Coat:
Contains White Blood Cells (WBC) and Platelets, which constitute less than 1% (each) of whole blood. WBC, or leukocytes, are one of the body’s defenses against disease. Platelets, or thrombocytes, are small, colorless cell fragments in the blood whose main function is to interact with clotting proteins to stop or prevent bleeding. Platelets also contain growth factors, necessary for stem cell attraction.

Red Blood Cells (RBC):
RBC, or erythrocytes, constitute approx. 38-48% of whole blood. These cells carry oxygen from the lungs to the body’s tissue and take carbon dioxide back to the lungs to be exhaled.

Source: American Red Cross
Image shows TriCell PRP Kit after 1st centrifugation

Lower Platelet Count Products
Two Component Fraction:
- Plasma/Platelet Suspension
- Cellular Components

Higher Platelet Count Products
Three Component Fraction:
- Plasma
- Buffy Coat
  (Platelets & WBC)
- Red Blood Cells

“PRP is effective in preventing Pseudomonas and S. aureus bacterial growth. PRP also has a bactericidal effect which makes it a valuable asset to wound maintenance and healing.”

Isaly J, et al. An In-Vitro Determination of Platelet Gel Efficacy as Prevention of Post-Operative Bacterial Infections. The Ohio State University School of Allied Medicine, 2005.

“PRP has significant antimicrobial activity against S. aureus bacterial growth. PRP appears to be a potentially useful prophylactic strategy against postoperative infections.”


“PRP treatment significantly reduced infection rates for deep sternal wounds for patients undergoing cardiac surgery.”


“Platelet-rich gel inhibited the growth of S. aureus and was also active against Escherichia coli. A combination of the inductive and antimicrobial properties of platelet-rich gel can improve the treatment of infected delayed healing and nonunion.”

The TriCell Platelet Plasma Kit is designed to produce Platelet Plasma Products that can be individualized to meet specific therapeutic demand. The unique dial-in hourglass technology allows the physician to determine the appropriate plasma product for customized treatment protocols.

Depending on the patients’ treatment requirements, TriCell can produce a plasma product with high or low counts of Platelets, WBC and/or RBC. The physician has the ability to select how much of the Buffy Coat layer should be re-suspended into the patient’s own plasma.

**Dial-In The Cells You Desire**

- **PRC** (Platelet Rich Concentrate)
- **PLC** (Platelet Lite Concentrate)
- **PCP** (Platelet Conditioned Plasma)

**Steps:**

1. Inject Blood
2. Adjust Buffy Coat
3. Lock RBC Chamber
4. Select Final Volume
5. Lock Plasma Chamber
6. Recover Biologic

Note: Abbreviated instructions overview. Refer to package insert for detailed instructions for use.
SELECT YOUR DESIRED PLASMA PRODUCT
SET PATIENT SPECIFIC BUFFY DENSITY

### PLATELET CONDITIONED PLASMA

**Partial Buffy to Plasma:**
Significantly reduces WBC and RBC counts in final plasma product.

<table>
<thead>
<tr>
<th>Counts:</th>
<th>A Platelets (10^9/µL)</th>
<th>152 (native)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RBC (10^9/µL)</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td>WBC (10^9/µL)</td>
<td>0.1</td>
</tr>
</tbody>
</table>

**Growth Factor Expression (pg/µl):**
- FGF: 55
- PDGF: 504
- VEGF: 19
- TGF-β1: 22.667
- TGF-β2: 2.664
- TGF-β3: 1.420

### PLATELET LITE CONCENTRATE

**Major Buffy to Plasma:**
Maintains high platelet yield, while reducing RBC in final plasma product.

<table>
<thead>
<tr>
<th>Counts:</th>
<th>A Platelets (10^9/µL)</th>
<th>950 ns</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RBC (10^9/µL)</td>
<td>0.037</td>
</tr>
<tr>
<td></td>
<td>WBC (10^9/µL)</td>
<td>1.9</td>
</tr>
</tbody>
</table>

**Growth Factor Expression (pg/µl):**
- FGF: 290
- PDGF: 6.525
- VEGF: 153
- TGF-β1: 87.460
- TGF-β2: 3.717
- TGF-β3: 3.804

### PLATELET RICH CONCENTRATE

**All Buffy to Plasma:**
Maximum platelet yield—full Buffy Coat to be included in final plasma product.

<table>
<thead>
<tr>
<th>Counts:</th>
<th>A Platelets (10^9/µL)</th>
<th>1.073 (5x)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RBC (10^9/µL)</td>
<td>0.16</td>
</tr>
<tr>
<td></td>
<td>WBC (10^9/µL)</td>
<td>5.9</td>
</tr>
</tbody>
</table>

**Growth Factor Expression (pg/µl):**
- FGF: 170
- PDGF: 3.106
- VEGF: 81
- TGF-β1: 69.461
- TGF-β2: 3.748
- TGF-β3: 3.325

Complete Buffy Coat to Plasma Chamber
WHAT THE EXPERTS REQUIRE

The immune system depends on white blood cells to fight infection, but the cells’ role in Platelet Rich Plasma therapy is unclear. Some experts suspect that white blood cells inhibit tissues’ ability to heal, perhaps promoting inflammation, scar tissue, and damage to nearby tissues.\(^{(1)}\)

Clinicians should consider using leukocyte-poor, RBC-free formulations of Platelet Rich Plasma when administering intra-articularly.\(^{(2)}\)

**The role of Platelet Rich Plasma in musculoskeletal science:**\(^{(3)}\)

The idea of using PRP in medicine has been around since the 1970s. Platelet Rich Plasma in musculoskeletal science has received much media attention being used by many celebrity sports athletes for musculoskeletal injuries. Therefore it is important for the musculoskeletal practitioner to be aware of the concepts surrounding its use and application:

- Which Platelet Plasma Product?
- PRP preparation and administration?
- Potential clinical applications?
- What is discussed in current literature in the various areas of musculoskeletal science?

SPORTS MEDICINE

**ACL Repair:** Our study demonstrated that this surgical technique of ACL primary repair utilized in selected patients with acute partial ACL lesions offer improved clinical outcomes. Gobbi A, et al. Biological Augmentation of ACL Refixation in Partial Lesions in a Group of Athletes: Results at the 5-Year Follow-up. Techniques in Orthopaedics: June 2013; Vol 28 Issue 2:180-184

**Plantar Fasciitis:** PRP injection is safe and can be an excellent alternative to cortico-steroid injection in plantar fasciitis, not responsive to conservative means. Shetty V, et al. A study to compare the efficacy of corticosteroid therapy with platelet-rich plasma therapy in recalcitrant plantar fasciitis: a preliminary report. Foot Ankle Surg. 2014 Mar;20(1):10-3.

**Jumper’s Knee:** No severe adverse events were observed, and statistically significant improvements in all scores were recorded. The results suggest that this method may be safely used for the treatment of jumper’s knee, by aiding the regeneration of tissue which otherwise has low healing potential. Filardo G, Kon E, Marcacci M et al. Use of platelet-rich plasma for the treatment of refractory jumper’s knee. International Orthopaedics 2010 Aug;34(6):909-15.

**Achilles Tendon:** PRP is autologous and is prepared at the point of care, it also has an excellent safety profile. It may have the ability to transform the care of muscle and tendon injuries in both elite and recreational athletes. Mishra A, et al. Treatment of tendon and muscle using platelet-rich plasma. Clin Sports Med. 2009 Jan;28(1):113-25.

OSTEOARTHRITIS

TriCell PCP virtually eliminates leukocytes (WBC) and erythrocytes (RBC) to provide clear conditioned plasma.

TriCell PCP maintains a stable platelet concentration, while providing the physician the ability to determine how much of the Buffy Coat layer to re-suspend in the patient’s own plasma.

TriCell and Hyaluronic Acid bio-polymer combines stimulatory properties of growth factors provided by PRP for tissue repair while HA restores visco-elastic properties of synovial fluid in osteoarthritic joints.

**Knee Arthritis:** Subjects receiving a leukocyte poor PRP improved overall benefits for pain relief and increased WOMAC scores by 78% versus Placebo (7%).


---


Orthopedics & Trauma
- Arthroplasty
- Implants and Prosthesis
- Vertebral Fusion
- Fracture Treatment
- Bone Defects
- Bone Grafting
- Articular Chondral Degeneration
- Intra-Articular Injections
- Osteoarthritis

OMF Surgery
- Mandibular Reconstruction
- Bone Grafts
- Sinus Reconstruction
- Dental Implants
- Alveolar Cleft Reconstruction
- Membrane Sealing

Abrasions & Burns
- Skin Grafting
- Donor Graft Site
- Dermal/Epidermal Regeneration

Ophthalmology
- Epithelial Regeneration
- Epithelial Reconstruction
- Corneal Abrasions/Ulcerations
- Dry Eye
- Macular Degeneration
- Corneal Wounds
- Macular Hole Treatment

CLINICAL APPLICATION EXPERIENCE

Aging is Natural - Accelerate Natural Recovery
PLC

**PLATELET LITE CONCENTRATE**

TriCell PLC maintains a high platelet concentration yield, the full Buffy Coat layer, while virtually eliminating the erythrocytes (RBC) to provide Amber PRP.

---

**WHAT THE EXPERTS REQUIRE**

Blood contains Plasma, Red Blood Cells (RBC), White Blood Cells (WBC), and Platelets.

**Plasma** is the liquid component of blood, made mostly of water and acts as a transporter for cells. Plasma also contains fibrinogen, a protein similar to a net that entraps platelets at the wound site to form a clot.

**RBC** transport oxygen from the lungs and deliver it to other body cells, while removing carbon dioxide.

**WBC** fight infection, kill germs, and carry off dead blood cells.

**Platelets** are responsible for hemostasis, construction of new connective tissue, and revascularization.

Typically, a blood specimen contains 93% RBC, 6% Platelets and 1% WBC. (1)

The rationale for Platelet Rich Plasma benefit lies in reversing the blood ratio by decreasing RBC to 5%, which are less useful in the healing process, and increasing platelets to 94% to stimulate recovery.

---

**SKIN REJUVENATION**

PRP combined with fractional laser increased subject satisfaction, skin elasticity, and decreased erythema index. PRP increased the length of dermo-epidermal junction, amount of collagen, and number of fibroblasts. PRP combined with fractional laser treatment combination amplifies skin rejuvenation. Keratinocyte, fibroblast proliferation and collagen production can explain the capacity of PRP to increase dermal elasticity.


PRP promotes tissue remodelling in aged skin and may be used as adjuvant treatment to lasers for skin rejuvenation in cosmetic dermatology. PRP increased the expression of Type I collagen, MMP-1 protein, and mRNA in human dermal fibroblasts.


---

**HAIR RESTORATION**

Sixty-four consecutive patients were randomized, some improvement was seen in all patients. The proportion of patients reaching clinically important difference was 54.7%. Evidence shows treatment may induce a degree of clinical advantage for male and female pattern baldness.


PRP is an effective therapy in follicular regeneration. PRP has a positive influence on follicular mortality, density and regeneration. This study underscores the need to apply PRP in the early stages of androgenic alopecia for the most effective results. Global standards and protocols need to be established.


---

Using TriCell Plasma Products together with other therapeutic options is considered more effective than single modality therapy. The co-application provides numerous advantages with a simple, cost effective, autologous, safe method with improved synergistic effects.

- **Mesotherapy Plus:** Consists of Micro Needling and TriCell as a combination therapy exemplifying the stimulation of new collagen synthesis and cell formation exactly where it is needed, right at the dermal layer.

- **Hyaluronic Acid:** The combination of HA and TriCell combines the hydration effects of HA bio-polymer with the stimulative properties of PRP. HA acts as a temporary dermal substitute while PRP stimulates surrounding cells. The 3D scaffolds are then colonized by fibroblasts to promote an ordered reconstruction of the dermal tissue.

- **Adipose Graft** enriched with TriCell provides a solution to boost stem cell survival, supports proliferation and differentiation, and enhances graft survival.

- **Laser Therapy** in combination with TriCell produces objective improvement in skin elasticity, a lower erythema index, and an increase in collagen density.

- **Collagen** is a natural platelet activator which can increase average growth factor release. When combined with TriCell and injected into the skin, it acts as a matrix that promotes activation, collagen growth, while regenerating tissue.

---

**Aging is Natural - Retain Natural Youth**
TriCell PRC contains the maximum platelet yield, the full Buffy Coat layer and a small amount of erythrocytes (RBC), to ensure the maximum concentration of platelets is achieved.

**PLATELET RICH CONCENTRATE**

**WHAT THE EXPERTS REQUIRE**

Platelet Rich Plasma must contain a higher concentration of platelets than baseline, however an increase in platelets is a very broad description of PRP and does not accurately describe the variability among different types of PRP.

Platelet count is one variable to consider. Absolute platelet count varies depending on the platelet concentration in the subjects’ peripheral blood. It would seem intuitive that a higher platelet count would yield more growth factors and better clinical results, however, this has not yet been fully determined.

There are several other parameters that should be taken into account when considering Platelet Rich Plasma, including:
- Platelet Concentration,
- Leukocyte Inclusion,
- Anticoagulation,
- Exogenous Activation.

Macrophages, the tissue form of the circulating monocytes, are responsible for the removal of debris and also have a role in balancing the pro- and anti-inflammatory aspects of the healing process.[3]

**ORTHOPEDIC SURGERY**

Adding a platelet gel or a platelet gel combined with bone marrow stromal cells to lyophilized bone chips increases the osteogenic potential of the scaffold and may be a useful tool in the treatment of patients with massive bone loss.


Transplantation of BMC and PRP shortened the treatment period by accelerating new bone regeneration during DO of the lower extremity in patients with ACH and HCH, especially in the femoral lengthening.


**SPORTS MEDICINE**

The most significant clinical outcomes were observed in groups treated with a highly cellular leukocyte-rich Platelet Rich Plasma. Evidence supports the use of a single injection of leukocyte-rich PRP under ultrasound guidance in tendinopathy.


Intracanal PRP injections showed significant improvements across all standardized rating scores for pain and patient satisfaction, which were maintained throughout at least 1 year follow-up.


CLINICAL APPLICATION EXPERIENCE

General Surgery
- Abdominal Surgery
- Hepatic Lobectomy
- Pancreas Surgery
- Hernia Repair
- Splenectomy
- Gastrectomy
- Enterocutaneous Fistulas

Cardiac Surgery
- Coronary Artery Bypass Grafting
- Valve Reconstruction/Substitution
- Broncho-Pleural Fistulas
- Sternal or Costal Reconstruction
- Sealing of Media-Stinum

Urology
- Prostatectomy
- Hemi-Nephrectomy
- Node Dissection
- Nephrectomy
- Retro-Peritoneal Resection
- Hemostasis

Wound Healing
- Venous Ulcers
- Diabetic Ulcers
- Neuropathic Ulcers
- Bedsores
- Bite Wounds

Aging is Natural - Nature's Natural Healer
TriCell PRP

- 100% Customizable
  - dial-in the cell composition you require
- 100% Natural
  - utilizes autologous blood
- 100% Volume Control
  - dial-in the volume you require
- 0% Contamination
  - single use closed system
- <10min Process
  - rapid point of care processing

Distributed by:

REV-MED International GmbH
Einsteinstraße 167
81677 München
Germany
Tel.: +49 89 237 625-40
Fax: +49 89 237 625-41
Email: info@rev-med.com

REV-MED, Inc.
#301, 464, Dunchon-daero, Jungwon-gu,
Seongnam-si, Gyeonggi-do,
Republic of Korea, 13229
Tel.: +82 31 741 0996
Fax: +82 31 741 0976
Email: info@rev-med.co.kr

This brochure is for international use only and is not for distribution in the USA. It is intended for the sole use and benefit of the REV-MED sales force and physicians; it is not to be redistributed, duplicated or disclosed without the express written consent of REV-MED International. All trademarks herein are the property of REV-MED unless otherwise indicated. For detailed product information, including surgical techniques, indications, contraindications, warnings, precautions and potential adverse effects please contact your REV-MED sales partner or visit our website at www.rev-med.com.