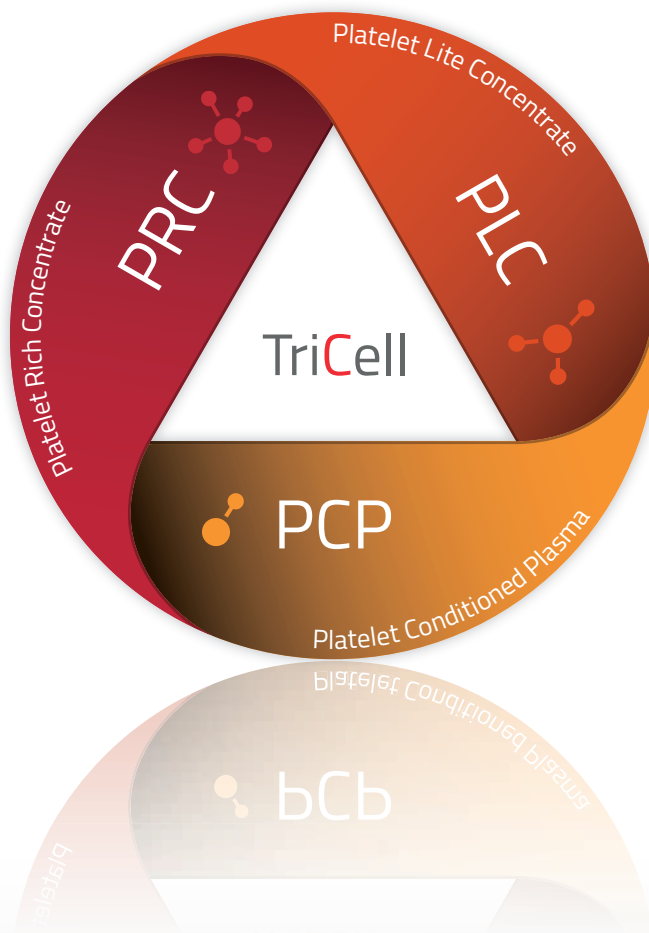


TriCellPRP

Customized
Platelet Plasma Products





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.

WHAT THE EXPERTS REQUIRE

ICMS PLATELET RICH PLASMA GUIDELINES⁽¹⁾

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.



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

ANTI-MICROBIAL PROTECTION

WITH PLATELET PLASMA PRODUCTS

Unique peptides in plasma product with anti-microbial activity against <i>E. coli</i> (Concentration = 200 nmol/ml)	
Peptide	Inhibition (mm)
Fibrinopeptide-A	3,8
Fibrinopeptide-B	2,2
Thymosin-β-4	4,2
Platelet Basic Protein	2,8
CTAP-3	1,9
RANTES	4,8
Platelet Factor-4	2,0

Tang YQ, et al. Antimicrobial peptides from human platelets. Infect Immun. 2002 Dec;70(12):6524-33.

"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."

Overdevest E, et al. Antimicrobial Activity of Platelet Gel against *Staphylococcus Aureus*. 7th European Conference on Perfusion Education and Training. Podium Presentation, 2007

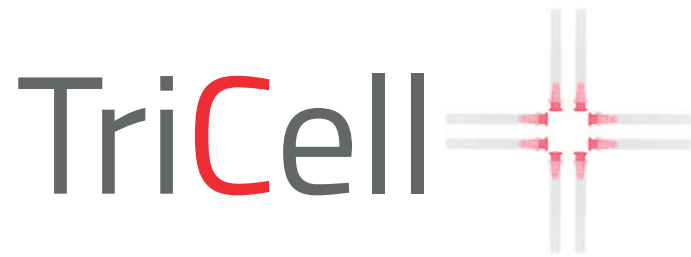
"PRP treatment significantly reduced infection rates for deep sternal wounds for patients undergoing cardiac surgery."

Hamman BL, et al. Relation between topical application of platelet-rich plasma and vancomycin and severe deep sternal wound infections after a first median sternotomy. Am J Cardiol. 2014 Apr 15;113(8):1415-9.

"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."

Bielecki TM, et al. Antibacterial effect of autologous platelet gel enriched with growth factors and other active substances: an in vitro study. J Bone Joint Surg Br. 2007 Mar;89(3):417-20.





REVOLUTIONARY CELL THERAPY & PLATELET PLASMA PRODUCTS for Experts

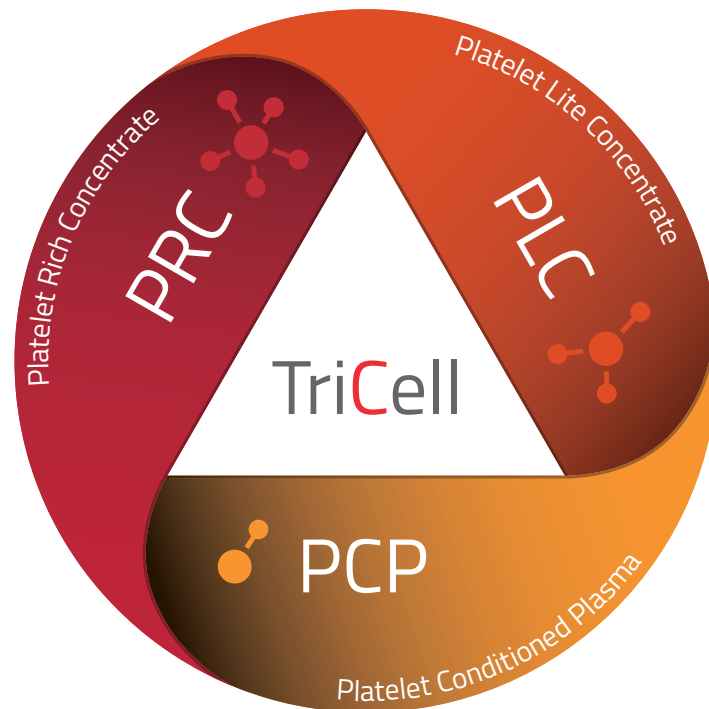
Depending on the patients' treatment requirements, TriCell can produce a plasma product with high or low counts of Platelets, WBC and/or RBC.

The physician has the ability to select how much of the Buffy Coat layer should be re-suspended into the patient's own plasma.

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.

Dial-In The Cells You Desire



1. Inject Blood



2. Adjust Buffy Coat



3. Lock RBC Chamber



4. Select Final Volume



5. Lock Plasma Chamber

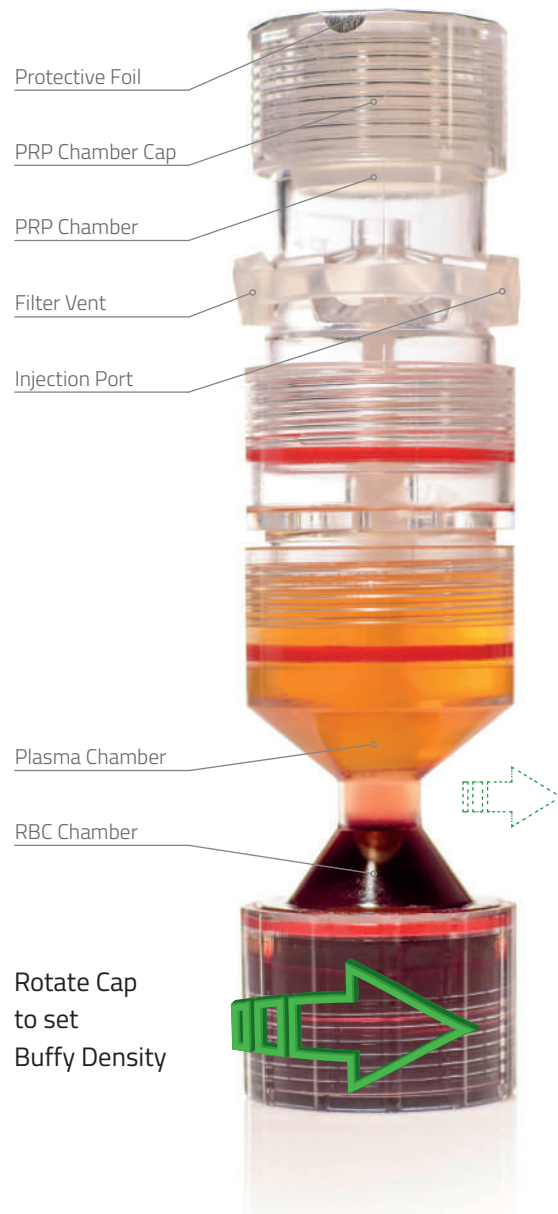


6. Recover Biologic



SELECT YOUR DESIRED PLASMA PRODUCT

SET PATIENT SPECIFIC BUFFY DENSITY



PCP

PLATELET CONDITIONED PLASMA

Partial Buffy to Plasma:

Significantly reduces WBC and RBC counts in final plasma product.

Counts:	A
Platelets ($10^3/\mu\text{L}$)	152 (native)
RBC ($10^6/\mu\text{L}$)	0,04
WBC ($10^3/\mu\text{L}$)	0,1

Growth Factor Expression (pg/ μL):	
FGF	55
PDGF	504
VEGF	19
TGF- β_1	22.667
TGF- β_2	2.664
TGF- β_3	1.420



Small portion of Buffy Coat to Plasma Chamber

PLC

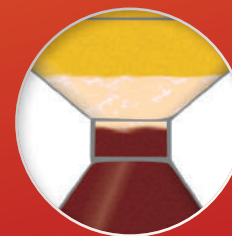
PLATELET LITE CONCENTRATE

Major Buffy to Plasma:

Maintains high platelet yield, while reducing RBC in final plasma product.

Counts:	A
Platelets ($10^3/\mu\text{L}$)	950 (5x)
RBC ($10^6/\mu\text{L}$)	0,037
WBC ($10^3/\mu\text{L}$)	1,9

Growth Factor Expression (pg/ μL):	
FGF	290
PDGF	6.525
VEGF	153
TGF- β_1	87.460
TGF- β_2	3.717
TGF- β_3	3.804



Desired portion of Buffy Coat to Plasma Chamber

PRC

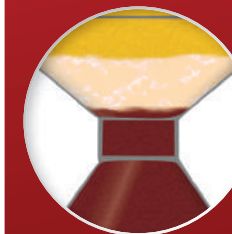
PLATELET RICH CONCENTRATE

All Buffy to Plasma:

Maximum platelet yield—full Buffy Coat to be included in final plasma product.

Counts:	A	B
Platelets ($10^3/\mu\text{L}$)	1.073 (5,5x)	1.950 (9x)
RBC ($10^6/\mu\text{L}$)	0,16	—
WBC ($10^3/\mu\text{L}$)	5,9	—

Growth Factor Expression (pg/ μL):	
FGF	170
PDGF	3.106
VEGF	81
TGF- β_1	69.461
TGF- β_2	3.748
TGF- β_3	3.325



Complete Buffy Coat to Plasma Chamber

A: Seoul Clinical Laboratories, Medical Science Institute; Dec 2015.

Whole blood: Platelets = $193 \times 10^3/\mu\text{L}$; RBC = $4,65 \times 10^6/\mu\text{L}$; WBC = $4,5 \times 10^3/\mu\text{L}$. GF Expression (pg/ μL): FGF = 59, PDGF = 674, VEGF = 24, TGF- β_1 = 20.878, TGF- β_2 = 2.870, TGF- β_3 = 1.509

B: Ajou University Hospital.

Whole blood: Platelets = $213 \times 10^3/\mu\text{L}$

PCP

PLATELET CONDITIONED PLASMA

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.

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 corticosteroid injection in plantar fasciitis, not responsive to conservative means.

Shetty VD, 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.

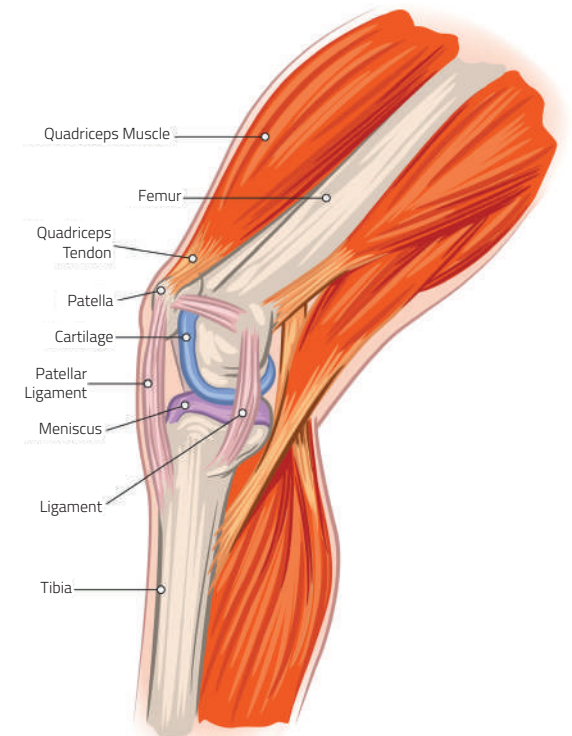
Mishra A, et al. Treatment of tendon and muscle using platelet-rich plasma. Clin Sports Med. 2009 Jan;28(1):113-25.

OSTEOARTHRITIS

TriCell and Hyaluronic Acid bio-polymer combines stimulative 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%).

Smith PA. Intra-articular Autologous Conditioned Plasma Injections Provide Safe and Efficacious Treatment for Knee Osteoarthritis: An FDA-Sanctioned, Randomized, Double-blind, Placebo-controlled Clinical Trial. Am J Sports Med. 2016 Apr;44(4):884-91.



(1) McCarrel TM, et al. Optimization of Leukocyte Concentration in Platelet-Rich Plasma for the Treatment of Tendinopathy. J Bone Joint Surg Am. 2012 Oct 3;94(19):e143(1-8).

(2) Braun HJ, et al. The effect of platelet-rich plasma formulations and blood products on human synovial cells: implications for intra-articular injury and therapy. Am J Sports Med. 2014 May;42(5):1204-10.

(3) Ahmad Z, et al. The role of platelet rich plasma in musculoskeletal science. JRSJ Short Rep. 2012 Jun;3(6):40.

CLINICAL APPLICATION EXPERIENCE



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

AGING IS NATURAL -
ACCELERATE
NATURAL RECOVERY

Hair

ENT

Facial

Shoulder

Eye

Dental

Hip

Elbow

Knee

Ankle

Heel

Wrist

Knuckle



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.

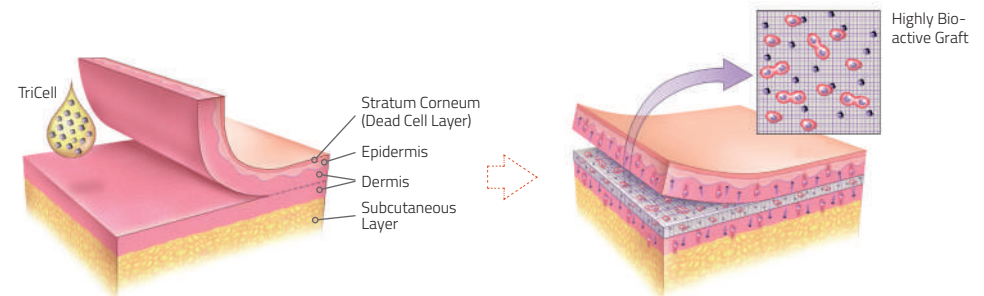
SKIN REJUVENATION

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.

Shin MK, et al. Platelet-rich plasma combined with fractional laser therapy for skin rejuvenation. Dermatol Surg. 2012 Apr;38(4):623-30.

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.

Kim DH, et al. Can Platelet-rich Plasma Be Used for Skin Rejuvenation? Evaluation of Effects of Platelet-rich Plasma on Human Dermal Fibroblast. Ann Dermatol. 2011 Nov;23(4):424-31.



Compared to a standard blood clot, TriCell provides more proteins to stimulate cell division and chemo-attraction within the Graft.

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.

Schiavone G, et al. Platelet-rich plasma for androgenetic alopecia: a pilot study. Dermatol Surg. 2014 Sep;40(9):1010-9

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.


Desai V. Autobiologics in Hair Restoration – The Experts Insight. FACETHETICS 2016: 4th National Conference of the AFAASI, Mumbai/India.


(1) Marx RE, Garg AK (editors). Dental and craniofacial applications of platelet rich plasma. Quintessence Publishing Co 2005, 99:1-75.


CLINICAL APPLICATION EXPERIENCE


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.

Forehead

Glabellar

Crow's Feet

Under-Eye

Cheeks

Smile Lines

Lips

Chin

Neck

Skin

Neckline

Breast

Finger & Hand

*Aging is Natural -
Retain Natural Youth*



PRC

PLATELET RICH CONCENTRATE

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.

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.⁽¹⁾

ORTHOPEDIC SURGERY

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

Dallari D, et al. Enhanced tibial osteotomy healing with use of bone grafts supplemented with platelet gel or platelet gel and bone marrow stromal cells. *J Bone Joint Surg Am.* 2007 Nov;89(11):2413-20.

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.

Kitoh H, et al. Distraction osteogenesis of the lower extremity in patients with achondroplasia/hypochondroplasia treated with transplantation of culture-expanded bone marrow cells and platelet-rich plasma. *J Pediatr Orthop.* 2007 Sep;27(6):629-34.

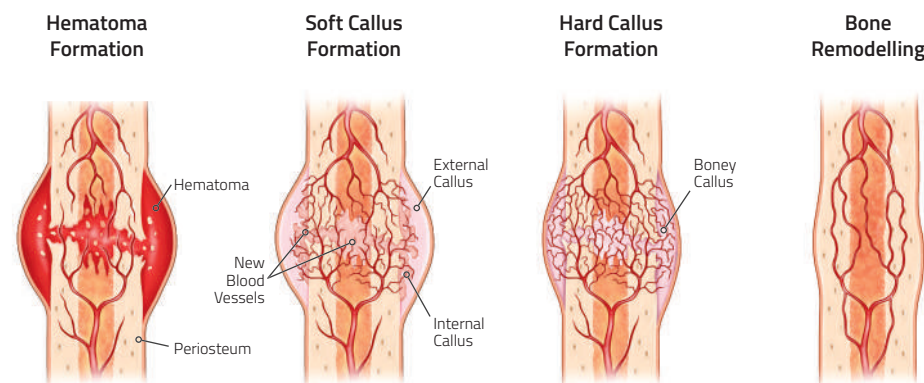
SPORTS MEDICINE

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.

Fitzpatrick J, et al. The Effectiveness of Platelet Rich Plasma in the Treatment of tendinopathy: A Meta-Analysis of Randomized Controlled Trials. *Am J Sports Med.* 2016 Jun 6

Intradiscal 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.

Tuakli-Wosornu YA, Lutz GE, et al. Lumbar Intradiscal Platelet-Rich Plasma (PRP) Injections: A Prospective, Double-Blind, Randomized Controlled Study. *PM R.* 2016 Jan;8(1):1-10; quiz 10.



The mechanism of action in bone healing points to the hierarchical role of creating a vascular network before bone can be formed.⁽²⁾ Creating a microenvironment with vascular sufficiency is a critical first step in bone formation since impaired angiogenesis results in impaired bone formation.⁽³⁾

(1) The International Cellular Medicine Society (ICMS). Platelet Rich Plasma (PRP) Guidelines 2011.

(2) Gómez-Barrena E, et al. Bone fracture healing: cell therapy in delayed unions and nonunions. *Bone.* 2015 Jan;70:93-101.

(3) Harrell DB, et al. Non-Hematopoietic Essential Functions of Bone Marrow Cells: A Review of Scientific and Clinical Literature and Rationale for Treating Bone Defects. *Orthop Rev (Pavia).* 2015 Dec 28; 7(4): 5691.

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



Wound Healing

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



Urology

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

Aging is Natural –
**Nature's
Natural Healer**



TriCellPRP

 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

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