

The New Technology for Safe Platelet Activation

PRP Activator



INDEX

- I. Components and Functions of Blood**
- II. What is PRP Therapy?**
- III. Growth Factors Present in PRP**
- IV. Application Fields of PRP**
- V. How are Platelets Activated?**
- VI. PRP Activator Features**
- VII. PRP Activator Manual**
- VIII. Validation Evaluation**
- IX. Comparison Chart**
- X. References**

Components and Functions of Blood



💧 Plasma – 55% of Total Blood Volume

- **91% Water**
 - Solvent
- **7% Blood Proteins** (Fibrinogen, Albumin, Globulin, etc.)
 - Osmosis balance, pH buffer, Anticoagulant, Defense
- **2% Nutrients** (Amino acids, Sugars, Lipids, etc.)
 - Hormones** (Erythropoietin, Insulin, etc.)
 - Electrolytes** (Sodium, Potassium, Calcium, etc.)
 - Osmosis balance, pH buffer, control membrane permeability

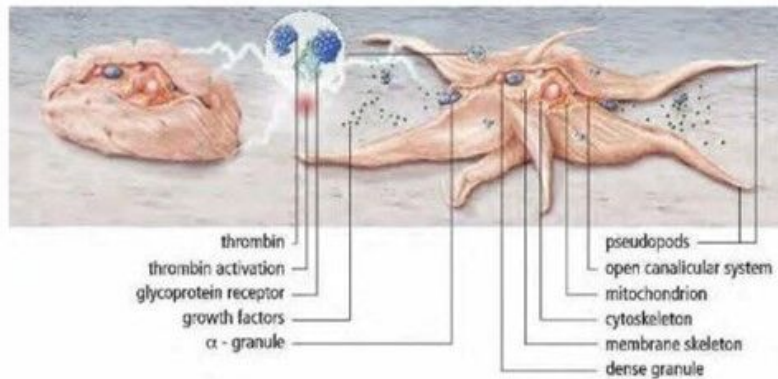
💧 Cellular Components – 45% of Total Blood Volume

- **Platelets** (~400,000/ μl of blood) → Coagulation/Growth Factors
- **White Blood Cells** (~10,000/ μl of blood) → Defense, Immune reaction
- **Red Blood Cells** (~6,000,000/ μl of blood) → Carry Oxygen and Carbon Dioxide

What is PRP (Platelet Rich Plasma) Therapy?

Platelet is one of the blood elements that usually flows along the blood stream as an inactivated form. But when it gets activated by wounds or damages of tissues, it performs its original functions of blood clotting and wound healing. A method that maximizes these abilities by concentrating the platelets and applying it to treatments is called **PRP therapy**.

Since there are a lot of Growth Factors in platelets, PRP can be used for various types of treatments by triggering cellular proliferation, collagen production, hyaluronic acid production, epidermal cell growth, angiogenesis, and etc.



Platelets are shaped like small plates in their non-activated form. But **on activation** (e.g., by thrombin), platelets change their shape with the development of pseudopods to **promote platelet aggregation** and subsequent **release of granule content** through the open canalicular system (GF, glycoprotein).

Thus, the activation of platelets is recommended to maximize the effect of PRP therapy.

Until now, our main focus on PRP Therapy was extracting higher amounts of platelets, but the most important factor is **the quantity of Growth Factors found within the platelets**.

With PRP combined with the use of our PRP-Activator, the number of Growth Factors (EGF, VEGF, FGF-2, PDGF, etc.) in platelets can be multiplied greatly allowing accelerated healing and reconstruction.

Growth Factors Present in PRP

Growth Factor	Source	Function
Transforming Growth Factor-beta (TGF- β)	Platelets, extracellular matrix of bone, cartilage matrix, activated TH ₁ cells and natural killer cells, macrophages/monocytes and neutrophils	<u>Stimulates undifferentiated mesenchymal cell proliferation</u> ; regulates endothelial, fibroblastic and osteoblastic mitogenesis; regulates collagen synthesis and collagenase secretion; regulates mitogenic effects of other growth factors; stimulates endothelial chemotaxis and angiogenesis; inhibits macrophage and lymphocyte proliferation
Basic Fibroblast Growth Factor (bFGF)	Platelets, macrophages, mesenchymal cells, chondrocytes, osteoblasts	<u>Promotes growth and differentiation of chondrocytes and osteoblasts</u> ; mitogenetic for mesenchymal cells, chondrocytes and osteoblasts
Platelet Derived Growth Factor (PDGFa-b)	Platelets, osteoblasts, endothelial cells, macrophages, monocytes, smooth muscle cells	Mitogenetic for mesenchymal cells and osteoblasts; stimulates chemotaxis and mitogenesis in fibroblast/glia/smooth muscle cells; <u>regulates collagenase secretion and collagen synthesis</u> ; stimulates macrophage and neutrophil chemotaxis
Epidermal Growth Factor (EGF)	Platelets, macrophages, monocytes	Stimulates endothelial chemotaxis/ <u>angiogenesis</u> ; <u>regulates collagenase secretion</u> ; stimulates epithelial/mesenchymal mitogenesis
Vascular Endothelial Growth Factor (VEGF)	Platelets, endothelial cells	<u>Increases angiogenesis and vessel permeability</u> , stimulates mitogenesis for endothelial cells
Connective Tissue Growth Factor (CTGF)	Platelets through endocytosis from extracellular environment in bone marrow	<u>Promotes angiogenesis, cartilage regeneration</u> , fibrosis and platelet adhesion

Application Fields of PRP

DENTAL MEDICINE

- Dental extraction
- Dental implantation

SURGERY

- Cardio-vascular surgery
- Abdominal surgery
- Maxillo-facial surgery
- Orthopedic surgery
- Plastic & cosmetic surgery/dermatology
- Treatment of severe burns

RESEARCH & DEVELOPMENT

- Healing remodeling
- Autologous cell culture
- Autologous stem cell culture
- Cell differential
- Tissue regeneration
- Cell Separation


DERMATOLOGY INTERNAL MEDICINE GERONTOLOGY

- Cutaneous reconstruction and transplantation
- Re-implantation of Autologous cells, extemporaneous or cultivated in-vitro
- Ulcer and chronic wound therapy (e.g. after radio-therapy)

How are Platelets Activated?



How are Platelets Activated?

Activation Factor	Chemical agonist	Physical stress
Type	Calcium Chloride, Thrombin, ADP, Collagen, Peptide, etc.	Capillary stress
Advantages	Can activate platelets by simply adding agonists	- Safety - Overcame adverse effects of chemical substances
Drawbacks	- Calcium has no effects when injected in cartilage as it gets neutralized, and it could cause skin rashes, redness, and pain when injected in subcutaneous fat - Thrombin and Collagen are substances that apply directly to form thrombus, so they could act as potential risk factors if not perfectly separated before injection - Impossible clinical application in some countries	No commercialized product in the market 

Developed "PRP Activator" using Capillary Stress

PRP Activator Features



Conception

- Based on the idea of how Platelets become activated through narrow blood vessels in fast bloodstream.

Special Features

- ◆ No Chemicals Included! Uses Capillary Stress (physical method) only to activate Platelets
→ **100% full autologous therapy! No Side effects!**
- ◆ Quantitative increase of Growth Factors:
→ **Maximizes the PRP Therapy effects**
- ◆ Relatively reduce the volume of blood required:
→ **Increases patient's convenience**
- ◆ Expected to work as an important differentiation factor in enlarging the PRP business

PRP Activator Manual

1) PRP Extraction v

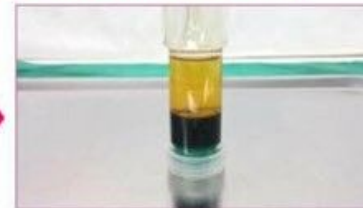
"The following is only an example to show how to extract PRP with **"PRO-PRP"**. Users can choose any type of PRP kits to conduct the activation process with "PRP Activator."



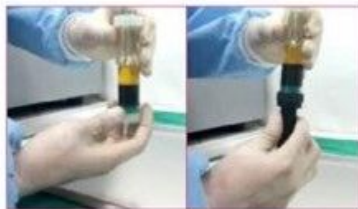
① Inject the prepared blood into the kit by using at least an 19 gauge needle.



② Place the kit in the centrifuge with a counterbalancing tube, and centrifuge them at 1700G (RCF) for 5 minutes



③ Results divided into 3 different layers



④ Take out the **PRO-PRP Kit** and replace the kit's bottom cap with Buffy controller's screw.



⑤ Turn the bottom of the Buffy controller counterclockwise until Plasma reaches the top.



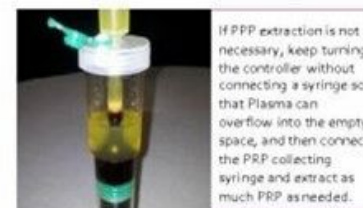
⑥ Connect a PPP collecting syringe, and rotate the controller until the RBC layer reaches the "1.0" line on the kit.



⑦ Connect a PRP collecting syringe, and rotate the pusher until the RBC layer reaches the top.



⑧ PPP (left) and PRP (right) extraction finished.



If PPP extraction is not necessary, keep turning the controller without connecting a syringe so that Plasma can overflow into the empty space, and then connect the PRP collecting syringe and extract as much PRP as needed.

2) PRP

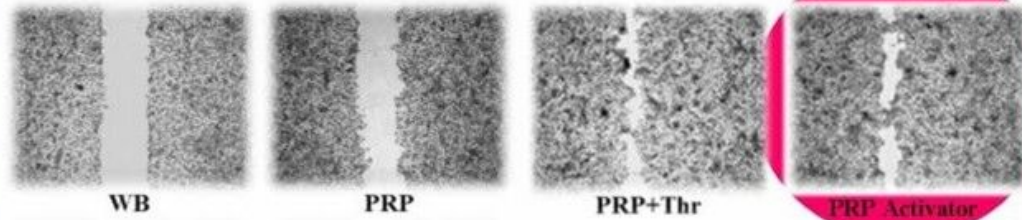
Activati

on

" The size of syringes here can vary according to the treatment plan as long as they are luer-lock syringes."

Validation Evaluation

♦ Wound Healing Assay

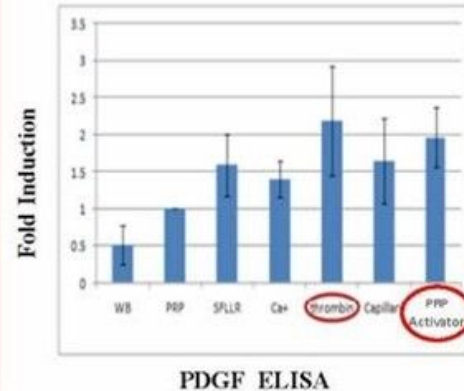


♦ In-vivo Validation Evaluation (Wound Healing Model)

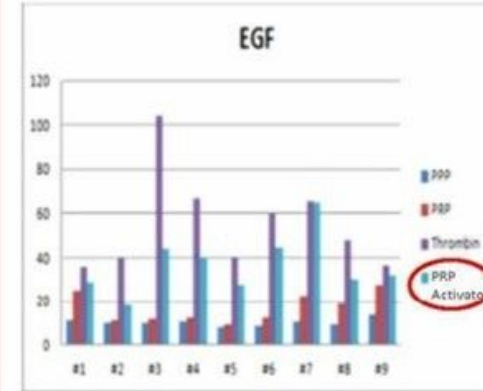


Validation Evaluation

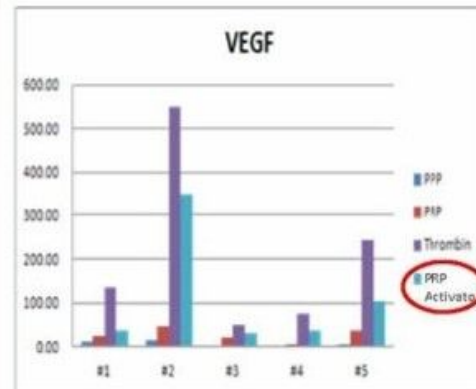
♦ Preliminary Experiment



♦ Epidermal Growth Factor



♦ Vascular Endothelial Growth Factor



* **PDGF:** Mitogenetic for mesenchymal cells and osteoblasts; stimulates chemotaxis and mitogenesis in fibroblast/glial/smooth muscle cells; regulates collagenase secretion and collagen synthesis; stimulates macrophage and neutrophil chemotaxis

* **EGF:** Stimulates endothelial chemotaxis/ angiogenesis; regulates collagenase secretion; stimulates epithelial/mesenchymal mitogenesis

* **VEGF:** Increases angiogenesis and vessel permeability, stimulates mitogenesis for endothelial cells

* Evaluated by Suncheonhyang Hospital

Comparison Chart

	PRP Activator	A Product	D product	P Product
Origin	Korea	Hong Kong	Korea	Italy
Human Injection Possibility	○	X	○	○
Use of Chemical Substances	X	X	○	○
Activator Type	Capillary stress	Photo-activation (LED)	Atelocollagen	Batroxobin and Calcium Gluconate
Preparation Time	3 min	10 min	5 min	15 min
Drawbacks	PRP-A is the ONLY product in the market that does not use chemical substances, but physical stress. Thus, it could eliminate the possibility of outbreak of adverse effects that can occur from using chemical ingredients.	Not intended for clinical application	<ul style="list-style-type: none"> - Fast retraction - Possible side effects due to the use of chemical substances 	<ul style="list-style-type: none"> - Air contamination possibility - Possible side effects due to the use of chemical substances

PRP treatment with PRP Activator is a NEW GENERATION PRP with much higher efficacy compared to conventional PRP



References

- (1) Ballermann, Barbara, et al. *Kideny International* (1988) 54, S100-S108.
- (2) Otto, Jacques. *Dermal Volumetric Rejuvenation Utilizing Autologous Platelet-Rich Plasma*, January 2009.
- (3) Williams, Marlene. "What are platelets and Why are They Important?" Johns Hopkins Medicine, Aug. 2013.