Medical devices for PRP preparation:

Technology	Device name	Concentration factor	Platelet recovery	Blood vol.	vol. of PRP	Specific apparatus	Product
Floating buoy or shelf	Biomet GPS III	6-9X	70 %	27 ml	3 ml	yes	Buffy coat product: concentrated platelets, concentrated white blood cells and variable amount of red blood cells
	Harvest SmartPrep2	4 X	70 %	18 ml	3 ml	yes	
Computer aided systems	Cytomedix Angel	4 X	70 %	40 ml	4 ml	yes	
	Arteriocyte Magellan	5 X	65 %	26 ml	6 ml	yes	
Separating gel	Cascade Fibrinet Selphyl	1.2 X	65 %	8 ml	4.5 ml	no	Platelet suspension in plasma, physiological or lower value of white blood cells, very low contamination of red blood cells
	RegenTHT	1.7 X	**> 95 %**	8 ml	4.5 ml	no	
	RegenBCT	1.6 X	**> 80 %**	8 ml	4.5 ml	no	
Centrifugation and manual aspiration	Arthrex ACP	2 X	< 60 %	10 ml	3 ml	yes	No physical separation of red blood cells. Operator dependant results
	BTI PRGF Endoret	2-3 X	< 50 %	8 ml	4 ml	no	

Regen Lab SA
En Budron B2
CH-1052 Le Mont-sur-Lausanne
SWITZERLAND

T. + 41 21 864 01 11
F. + 41 21 864 01 10
info@regenlab.com
www.regenlab.com

Platelets: Are more really better?

PRP with near physiological concentration show better results for wound healing than too highly concentrated PRP:

"Those methods with lower concentrations of platelets – 1 to 3 times baseline – showed more robust healing rates than those with higher concentrations of 3 to 8 times baseline."

Rappl LM et al. Effect of platelet-rich plasma gel in a physiologically relevant platelet concentration on wounds in persons with spinal cord injury. Int Wound J 2011; 8:18.7–195.

Animal studies show negative effect of too high platelet concentration:

"the use of highly concentrated platelet preparations appeared to have an inhibitory influence on osteoblast activity. Possible reasons could be unwanted inhibitory and cytotoxic effects of growth factors at such high concentrations."

Weibrich G. et al., Effect of platelet concentration in platelet-rich plasma on peri-implant bone regeneration. Bone 2004; 34:665-671.

"PRP might exert positive effects on intestinal anastomotic healing in a dose-dependent manner up to a certain level, but adverse effects occur when it is highly concentrated."

Yamaguchi R. al., Effects of Platelet-Rich Plasma on Intestinal Anastomotic Healing in Rats: PRP Concentration is a Key Factor. J Surg Res. 2012 Apr;173(2):258-66.

In vitro studies reach the same conclusion:

"Optimal results were observed at a platelet concentration of 2.5 X", "Increased concentrations resulted in a reduction in proliferation and a suboptimal effect on osteoblasts function."

Graziani F. et al.,The in vitro effect of different PRP concentrations on osteoblasts and fibroblasts. Clin. Oral. Impl. Res. 17, 2006; 212–219.

Regen Lab SA
En Budron B2
CH-1052 Le Mont-sur-Lausanne
SWITZERLAND

T. + 41 21 864 01 11
F. + 41 21 864 01 10
info@regenlab.com
www.regenlab.com

White blood cells in PRP

The content of white blood cells in PRP depend on the device used:

Devices	White blood cell (WBC) content
BiometGPS III Harvest SmartPrep2 Cytomedix Angel Arteriocyte Magellan	4 to 8 X higher than blood basal level, (granulocytes and mononuclear cells)
RegenTHT	35% WBC recovery. 70% mononuclear cell recovery **85% depletion of granulocytes**
RegenBCT	11% WBC recovery, 27% mononuclear cell recovery **96.5% depletion of granulocytes**

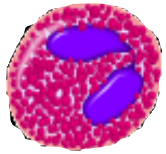
Regen Lab SA
En Budron B2
CH-1052 Le Mont-sur-Lausanne
SWITZERLAND

T. + 41 21 864 01 11
F. + 41 21 864 01 10
info@regenlab.com
www.regenlab.com

White blood cells in PRP

In the full blood, white blood cells (WBC)
can be distinguished in 2 groups:

- **Granulocytes (~ 65%)**:
  - **Neutrophils** (~ 60%)

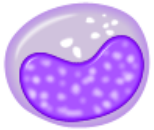


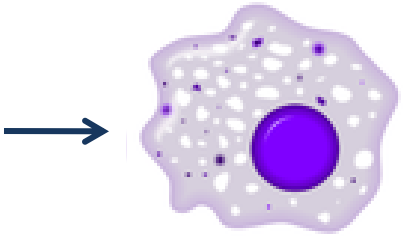
  - Eosinophils (~ 5%)

  - Basophils (< 1%)

- **Mononuclear cells (~ 35%)**:
  - **Lymphocytes** (~ 30%)

  - **Monocytes** (~ 5%)
    (macrophage precursors)





2012- SV

http://en.wikipedia.org/wiki/White_blood_cell

Regen Lab SA
En Budron B2
CH-1052 Le Mont-sur-Lausanne
SWITZERLAND

T. + 41 21 864 01 11
F. + 41 21 864 01 10
info@regenlab.com
www.regenlab.com

White blood cells in PRP

NEUTROPHILS:

Neutrophils are associated with the inflammatory response. Their prime role is to **defend the body against infectious agents or foreign substances** that may enter through a wound.

They release a large variety of highly active antimicrobial substances and proteases.
Uncontrolled release of these factors **can cause severe damage to the tissues** of the host (Eming et al. 2009) and **delay rates of healing** and **increase risk of scar** (Brubaker et al. 2011).

The negative effect on healing of neutrophils has been confirmed by Dovi et al.(2003) who observed **accelerated wound closure in neutrophil-depleted mice**.

“In clean surgical wounds, neutrophils are undesirable because they delay wound closure and cause additional tissue damage” (Dovi et al., 2004)

Regen Lab SA
En Budron B2
CH-1052 Le Mont-sur-Lausanne
SWITZERLAND

T. + 41 21 864 01 11
F. + 41 21 864 01 10
info@regenlab.com
www.regenlab.com

White blood cells in PRP

MONOCYTES:

Monocytes, in wound, rapidly differentiate into **macrophages**. Like neutrophils they play an important role in **fighting infection**. As soon as the wound is cleared, the macrophages **switch to an anti-inflammatory phenotype and support the healing process.**

By their phagocytic activity, they **clear the wounds** from apoptotic neutrophils, erythrocytes, fibrin and other miscellaneous debris.

They **induce fibroblast proliferation** (Leibovich and Ross, 1975).

They secrete **growth factors** (**VEGF and TGFβ**) and other **proangiogenic** and **antiangiogenic factors** that play an essential role in **neo vascularization and granulation tissue formation.** They are also involved in **matrix remodeling** and **resolution of fibrosis,** regulating the transition between granulation and the scar tissue maturation . (Brancato and Albina, 2011)

Specific macrophage depletion at the time of wounding results in delayed reepithelialization, **reduced collagen deposition, impaired angiogenesis, and decreased cell proliferation**. (Mirza et al., 2009)

Regen Lab SA
En Budron B2
CH-1052 Le Mont-sur-Lausanne
SWITZERLAND

T. + 41 21 864 01 11
F. + 41 21 864 01 10
info@regenlab.com
www.regenlab.com

White blood cells in PRP

T LYMPHOCYTES:

T lymphocytes are predominant in the **remodeling phase of injury**.

They are capable of producing and exporting the potent **angiogenic and fibrogenic factor, bFGF**.

Depletion of T lymphocytes delays healing, reduces collagen secretion, and results in more fragile scar tissue (Scott et al., 2004).

T cells play **a dual role in wound healing**:

an **early stimulatory role** on macrophages, endothelial cells, and fibroblasts, a late **counter regulatory role**, which may be responsible for the **orderly completion of wound repair** (Barbul et al., 1989).

Regen Lab SA
En Budron B2
CH-1052 Le Mont-sur-Lausanne
SWITZERLAND

T. + 41 21 864 01 11
F. + 41 21 864 01 10
info@regenlab.com
www.regenlab.com