THE POWER OF PLATELET-RICH PLASMA

What Is PRP?
Platelet-rich plasma (PRP) is a biological product created from autologous blood plasma that is centrifuged and separated to achieve a platelet concentration above the baseline. In addition to the high platelet concentration, PRP contains the full complement of clotting factors typically at their normal, physiologic levels. Platelets contain more than 1,100 different proteins with numerous post-translational modifications, resulting in over 1,500 protein-based bioactive factors. Platelets may directly kill the bacteria by producing microbial proteins or by aggregating around the bacteria and "trapping" them for elimination. 

Why PRP?

Autologous product: PRP is prepared from the patient’s own blood, minimizing concerns about the risk of cross-contamination, disease transmission or immune reactions. Growth factors and proteins: These stimulate the healing process, a key factor in PRP’s widespread clinical use. Increased blood supply: The use of PRP speeds up neovascularization and increases the blood supply and nutrient influx necessary for cell regeneration in damaged tissue.

Mechanisms of Action

Activated platelets can mediate cell-to-cell interactions and affect innate immune responses by different possible mechanisms.

BACTERIAL DESTRUCTION
Platelet toll-like receptor (Toll) expression enables activated platelets to bind and capture bacteria. The platelets may directly kill the bacteria by producing microbial proteins or by aggregating around the bacteria and "trapping" them for elimination.

NEUTROPHIL ACTIVATION
Platelets can interact with a wide variety of cells, including leukocytes. Activated platelets promote neutrophil tethering and activation through the expression of selectins, CD40L, and inflammatory cytokines and chemokines.

ACTIVATION OF ADAPTIVE IMMUNE RESPONSES
Activated platelets can promote the activation of monocytes and dendritic cells. This leads to increased antigen presentation to T cells and enhances adaptive immune responses.

Components of PRP

PLATELET MICROBIAL PROTEINS (PMP)
PMPs — small antimicrobial peptides — have been shown to play a key role in infection control by exerting direct microbial activity against a broad spectrum of human pathogens, including Staphylococcus aureus and Staphylococcus epidermidis. According to one 2016 study, PRP reduced:

- 2% of deep wound infections (DSWI)
- 0.6% of superficial wound infections (SWI)
- 2% of readmission rates
- 8% of costs associated with deep and superficial wound complications
- 0.8% of sternal wound infections (DSWI)

According to one 2016 study of 2,000 patients, PRP reduced:

- 2% of deep wound infections (DSWI)
- 0.6% of superficial wound infections (SWI)
- 2% of readmission rates
- 8% of costs associated with deep and superficial wound complications
- 0.8% of sternal wound infections (DSWI)

Stromal cell-derived factor 1a (SDF-1α) actively modulates migration and homing of stem cells to the repair site.

WHITE BLOOD CELLS (WBCs)

Granulocytes
- Neutrophils
- Monocytes
- Lymphocytes
- Platelets

**Platelets play a critical role in several aspects of the healing process. Activated platelets release several antimicrobial peptides that deliver properties for infection control.**

**GROWTH FACTORS**
- Platelet-derived growth factor (PDGF) enhances collagen synthesis, proliferation of bone cells, fibroblast chemotaxis and proliferative activity, and macrophage activation.
- Transforming growth factor β (TGF-β) enhances synthesis of type I collagen, promotes angiogenesis, stimulates chemotaxis of immune cells, and inhibits osteoclast formation and bone resorption.
- Vascular endothelial growth factor (VEGF) stimulates angiogenesis, migration and mitosis of endothelial cells; increases permeability of the vessels; and stimulates chemotaxis of macrophages and neutrophils.

**Platelet Microbial Proteins (PMP)**
- PMPs — small antimicrobial peptides — have been shown to play a key role in infection control by exerting direct microbial activity against a broad spectrum of human pathogens, including Staphylococcus aureus and Staphylococcus epidermidis.

**Platelets**
- Infection control. Platelets play a critical role in several aspects of the healing process. Activated platelets release several antimicrobial peptides that deliver properties for infection control.

**Granulocytes**
- Neutrophils
- Monocytes
- Lymphocytes
- Platelets

**Monocytes**
- Assist in pathogen recognition
- Eventually become macrophages, which engulf and destroy pathogens

**Lymphocytes**
- T-lymphocytes help regulate the function of other immune cells and directly attack various infected cells and tumors
- B-lymphocytes make antibodies, which are proteins that target unwanted bacteria, viruses and other foreign material

**REFERENCES**