

## AACP Platelet Gel FSC 2007

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## How is platelet gel made ?

1. A small amount of blood is drawn from the patient.
2. This blood is placed into a special centrifuge that separates the platelets and white blood cells from the rest of the blood. This combination of platelets and white blood cells is referred to as platelet concentrate.
3. When the surgical site is ready, the platelet concentrate is turned into a gel and applied to the wound.

## How is the platelet concentrate activated?

Platelet gel is made up of large amounts of concentrated platelets.

When the platelets are exposed to a naturally occurring clotting factor called thrombin, they become activated, change their shape and are forced to release a myriad of proteins that are called growth factors.

## Autologous Platelet Gel

- Through the use of new technology, it is now possible to harvest the body's own healing cells, concentrate the cells, and apply these cells to the wound site to enhance the recovery period.

## Human Platelets

- It has been found that the human platelets carry multiple growth factors that are responsible for wound healing, the production of new blood vessels and the stimulation of bone growth.

## What is what ?

- PRP (Platelet-rich-plasma)
- PPP (Platelet-poor-plasma)
- Platelet concentrate
- Platelet gel

## PRP

- The components of whole blood remaining after the removal of red blood cells.
- Buffy coat (white cells + platelets)
- All of the plasma

## PPP

- Plasma without the buffy coat
- PPP contains abundant fibrinogen
- PPP contains abundant clotting factors

## Platelet Concentrate

- Buffy coat (white blood cells + platelets)
- Small amount of plasma
- May/may not have a small portion of RBC

## Platelet Gel

The result of the combination of:

- Platelet concentrate
- Activator (Thrombin/Calcium Chloride)

## Platelet Concentrate or PRP?

- Platelet concentrate should approximate a minimum of 400% (4X) of the peripheral platelet count.
- Anything less than this concentration is platelet-rich-plasma (diluted with platelet-poor-plasma).

## Concentration of Fibrinogen in Platelet Gel

- Native levels of fibrinogen are preferable to higher levels found in commercially prepared fibrin sealants.
- The deposition of collagen is dependent on the breakdown of fibrin.
- The wound healing process is delayed in the presence of high levels of fibrinogen.

## Platelet Biology

- Platelets are living but terminal cytoplasmic portions of marrow megakaryocytes.
- They have no nucleus for replication and will die off in five to nine days.
- In addition to contributing to the hemostatic process, platelets actively extrude the growth factors involved with initiating wound healing.

## Platelet Biology

- These growth factors, also called cytokines, are proteins of about 25,000 Daltons MW.
- Growth factors are stored in the alpha granules of platelets.
- In response to platelet aggregation or platelet to connective tissue contact, the cell membrane of the platelet is activated to release these growth factors.

## Platelet Derived Growth Factor

- PDGF is the evolutionary sentinel growth factor that initiates nearly all wound healing.
- PDGF's main functions are to stimulate cell replication (mitogenesis) of healing capable stem cells.
- PDGF stimulates angiogenesis and the cell replication of endothelial cells.
- There are about 1200 molecules of PDGF per each individual platelet.

## How does platelet gel work ?

- Platelet gel works by sealing off all of the small blood vessels that are cut during surgery.
- A cascade of growth factors are released that are responsible for the body's healing process.
- Nerve endings are "coated", contributing to less discomfort.  
In essence, platelet gel is a catalyst for wound healing.

## How can platelet gel help in surgery ?

- Platelet gel has been shown to decrease the bruising and swelling that naturally occurs with various surgical procedures.
- It can cut the down time that patients experience, in half, and will allow them to return to their daily lives and activities much sooner.

## Bactericidal Properties

- Platelet gel is bactericidal to *Bacteroides fragilis*, *Enterobacter faecium*, *Escherichia coli*, and *Staphylococcus aureus*.
- It does not appear to have an effect on *Klebsiella pneumoniae* or *Pseudomonas aeruginosa*.

## Host Defense

- Platelet microbicidal proteins PMP's
- Released in the presence of microorganisms or agonists associated with infection
- Synergistically interact with leukocytes and conventional antimicrobial agents against infection

## Observations of Host Defense

- Earliest cells at site of microbial colonization
- Surface receptors and granules similar to white cells
- Adhere to and internalize microbial pathogens
- Kill bacterial, fungal, and protozoal pathogens in vitro

## More Observations

- Capable of initiating and amplifying complement fixation in presence of microorganisms
- Release platelet microbicidal peptides PMP's in vitro with microorganisms or agonists associated with infection
- Generate oxygen metabolites
- Interact synergistically with leukocytes to exert enhanced antimicrobial functions in vitro

## More Observations

- Thrombocytopenia increases susceptibility to and severity of certain infections
- PMP-susceptible pathogens are less capable of proliferation or hematogenous dissemination in vivo than are organisms that are more resistant to PMP's
- Source of observations: Yeaman MR. The Role of Platelets in Antimicrobial Host Defense. *Clinical Infectious Diseases* 1997;25:951-70.

## Applications

- Platelet gel can be used on a wide variety of procedures. It has shown great success in wound healing (decubitis, venostasis, and diabetic foot ulcers).
- Cosmetic surgery (face, neck, brow, and breast lifts, laser resurfacing).
- Anywhere tissue or bone is injured, cut, or burned.

## Is platelet gel safe ?

- There have been no reported complications with use of platelet gel.
- It is made from the patient's own blood and eliminates the risks that may be associated with a blood product derived from other sources.

## Obstacles

- **Reimbursement**
  - A multitude of codes being used
  - Most codes are not appropriate
  - Widely varying reimbursement amounts
  - Codes relating to "platelet pheresis" may not be appropriate for platelet gel
  - Codes relating to "tissue grafts" may not be appropriate for platelet gel

## Current Research

- Existing papers only address patient outcomes
- Anecdotal stories are numerous but fail to prove real scientific evidence about functional mechanism of platelet gel on surgical wounds
- Need clear scientific laboratory analysis before it becomes a wide spread globally accepted methodology.

## Generic Business Model

- ↓ **Identify and target physicians in a given specialty**
  - Know who the early adopters are
- ↓ **Talk with them about the therapy and share with them the services you will provide and how they will benefit their practice**
- ↓ **Share available literature as it relates to their specialty**
  - Focus on improved outcomes and reduce overall costs

## Generic Business Model

- ↓ **Create an economic model**
  - Understand the cost threshold
  - Construct pricing that relates to cost savings for therapy (e.g., less bleeding, less blood product utilization, less inflammation, shorter length of stay, reduction or replacement of supplies used, autologous therapy)
  - Closure of sternal wounds
- ↓ **Develop Physician Champion**
- ↓ **Peer to peer counseling**

## Common Misconceptions:

- Replacement for Sutures
- Arterial and Venous Bleeds
- Replaces Tissue Grafts

## Set Realistic Customer Expectations

- Acts as an Autologous Sealant
- Assists in Tissue Adhesion
- Stops Capillary "OOZING"
- Extends Tissue Grafts
- Improves Surgical Healing Times
- Increases Opportunity for Tissue Regeneration in Older and Sicker Patients