Preparation and Quality Control of Autologous Platelets for Therapeutic Applications

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Department of Transfusion Medicine,
BLK Super Speciality Hospital, New Delhi
Outline

• Blood Derived Biomaterials
  • Platelet Derived Biomaterials : PRP
  • Why Discussing PRP in today’s scenario ?
  • The Confusion
  • What are the methods to prepare them ?
  • Available devices in the market
  • Factors important in preparing PRP
  • Regulatory Issues
Blood Derived Biomaterials

• Unique group of blood products
  – Topically used
  – Combination of plasma and cell derived components

• Mimic thrombin-induced physiological events of coagulation leading to fibrinogen and/or platelet activation.

• Common Features
  – Physiologically compatible (Autologous Origin)
  – Devoid of risk of adverse reactions
  – Biodegradable by body enzymes

Arora S, Agnihotri N. Platelet derived Biomaterials for Therapeutic Use: Review of technical Aspects. IJHBT 2016
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Platelet Derived Biomaterials

• Unique group of platelet containing blood products
  – High concentration of platelets
  – Infiltrative or Topically used
  – Applied in Un-activated or Activated form

Platelet Derived Biomaterials: PRP

• Platelet Rich Plasma (PRP)
  – Defined as “a smaller amount of plasma that has a much higher concentration of platelets than in the peripheral blood, achieved by centrifugation of the whole blood”

• Platelet concentration and amount of growth factors
  – Depends on the technique used, but on an average, PRP has 3-5 times more platelets and thus growth factors than in the peripheral blood.

Platelet Rich Plasma (PRP)

- Anabolic Effect
- Growth Factors
- Fibrinogen
- Scaffolding Effect
- Inflammatory Mediators
- Anti-Inflammatory Effect

**Platelet Rich Plasma**
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Giants' Victor Cruz has a very important meeting with doctors next week

Written by Kevin O'Brien Posted: 10/08/2015, 04:13PM

Victor Cruz had a platelet-rich plasma injection in injured calf. He hasn't played this season. (via @JosinaAnderson)
pic.twitter.com/v9LMQskcLn

— NFL on ESPN (@ESPNNFL) October 2, 2015
IOC consensus paper on the use of platelet-rich plasma in sports medicine

Lars Engebretsen,1–3 Kathrin Steffen,1,2 Joseph Alsoussi,4 Eduardo Anitua,5 Norbert Bachl,6 Roger Devilee,7,8 Peter Everts,8,9 Bruce Hamilton,10 Johnny Huard,11 Peter Jenoure,12 Francois Kelberine,13 Elizaveta Kon,14 Nicola Maffulli,15,16 Gordon Matheson,17 Omer Mei-Dan,18 Jacques Menetrey,19,20 Marc Philippon,21 Pietro Randelli,22 Patrick Schamasch,1 Martin Schwellnus,23 Alan Vernek,24 Geoffrey Verrall25

INTRODUCTION
Acute and chronic musculoskeletal injuries in sports are common and problematic for both athletes and clinicians. A significant proportion of these injuries

PRF and its variant forms were originally used in clinical practice as an adjuvant to surgery to assist in the healing of various tissues. PRF has also been used in

state of PRF treatment among athletes, aiming to provide recommendations for clinicians, athletes and individual sports governing bodies. The purpose of this consensus paper is furthermore to review the evidence for the clinical effectiveness of PRF, its ergogenic potential and safety, and attempts to reconcile any possible disparity between its increasing popularity and the underlying science supporting its use. After an introduction into the basic science of PRF (i), the group considered the following issues regarding PRF use in clinical practice: (ii) the role of PRF in muscle injuries; (iii) the role of PRF in tendon injuries; (iv) the role of PRF in cartilage injuries and the healing of other tissues; (v) suggested techniques for the application of PRF and postinjection recommendations; (vi) potential adverse effects of PRF use; (vii) developing a randomised controlled trial (RCT) on PRF; (viii) PRF and antidoping regulations; and (ix) summary and recommendations.

Basic science of PRF

In broad terms, PRF may be defined as a volume of the plasma fraction of autologous blood having a platelet concentration above baseline and is obtained

New Treatments for Thinning Hair for Women

Skin Deep
By COURTNEY RUBIN  APRIL 15, 2015
A bloody cure for baldness? Vampire HAIR lift - which uses same technology as facial beloved by Kim Kardashian - uses your own blood to lengthen and strengthen locks

- Platelet Rich Plasma Therapy (PRP) being used on the scalp
- Can stimulate dormant hair follicles and encourage them to grow again
- Costs £1,300 and takes 90 minutes
- Kim Kardashian and Bar Refaeli had vampire facelift, which uses same technique

By BIANCA LONDON FOR MAILONLINE

PUBLISHED: 10:49 GMT, 22 September 2014 | UPDATED: 17:01 GMT, 23 September 2014
Famous fans: The vampire facial, which involves drawing the patient’s own blood, separating the layer that is filled with platelets and then injecting it back into the face, is loved by Kim Kardashian, left, and Bar Refaeli, and now it is available for your hair too.

The procedure, named Platelet Rich Plasma Therapy (PRP), is being used on the scalp as it can apparently stimulate dormant hair follicles and encourage them to start growing again.
Fig. 1 The analysis of per year publication shows the interest in PRP application for the treatment of cartilage lesions or joint degeneration with an increasing number of published studies over time.
Management of knee osteoarthritis by combined stromal vascular fraction cell therapy, platelet-rich plasma, and musculoskeletal exercises: a case series.

Gibbs N, Diamond R, Sekyere EO, Thomas WD.
PMID: 26609244 Free Article


Dhillon MS, Karna SK, Dhatt SS, Behera P, Bhatia A.
Clinical Applications

Published Interventional Clinical Studies (years 2010-2014)

A. Dentistry

<table>
<thead>
<tr>
<th>Study Type</th>
<th>Number of Patients</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prospective Trial</td>
<td>133</td>
<td>Improved quality and quantity of newly formed Bone Tissue</td>
</tr>
<tr>
<td>Comparative Study</td>
<td>25</td>
<td>Improves bone density</td>
</tr>
<tr>
<td>Clinical Investigation</td>
<td>22</td>
<td>Improves the regeneration of bone after third molar surgery</td>
</tr>
</tbody>
</table>
## Orthopedics Applications

Published Interventional Clinical Studies (years 2010-2014)

### B. Orthopedics

<table>
<thead>
<tr>
<th>Study Type</th>
<th>Number of Patients</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCT</td>
<td>40</td>
<td>Significant in preventing blood loss, post-operative pain.</td>
</tr>
<tr>
<td>Cohort Study</td>
<td>42</td>
<td>Not clearly demonstrated an accelerated recovery</td>
</tr>
<tr>
<td>Cohort Study</td>
<td>58</td>
<td>Improves healing preventing the risk of infections</td>
</tr>
<tr>
<td>Clinical Trials</td>
<td>27</td>
<td>Improves healing and pain in joint degeneration</td>
</tr>
<tr>
<td>RCT</td>
<td>40</td>
<td>Reduces pain.</td>
</tr>
<tr>
<td>Pilot Study</td>
<td>53</td>
<td>Heals muscle lesions and improves function &amp; pain.</td>
</tr>
</tbody>
</table>
| Descriptive Lab Study | 25  
NCT01200875 | PRP supports a possible ergogenic effect.                               |
| RCT Multi-Centric   | 120 
NCT00758641 | PRP induces a healing rate                                               |
| RCT Double Blind    | 54 
NCT00761423 | PRP does not improve patients in pain and activity.                     |

Orthopedics Applications

Intra-Articular Infiltrative Applications (Pre-Clinical Data)

8. Tarsal joint. A. A low-power view of control with normal articular surface and synovial projection. B. PRP treated at 2 weeks with area of synovitis and giant cell reaction. C. Residual focal synovitis at 12 weeks post PRP treatment. D. Normal appearance of articular cartilage in PRP treated subject.

Lindsay, NH eta al. The Effect of Platelet-Rich Plasma (PRP) on Normal Soft Tissues in the Rabbit
Orthopedics Applications

Intra-Articular Infiltrative Applications (Clinical Data)

PRP Is More Effective Than Placebo for Knee OA

Efficacy of PRP for Chronic Tennis Elbow


Orthopedics Applications

Intra-Articular Applications (Clinical Data Meta-Analysis)

Platelet-rich plasma for degenerative knee cartilage

**Fig 4** Temporal relationships of effect sizes of functional changes after PRP, HA, and placebo injections. We also analyzed the treatment arm only comprising RCT of PRP interventions. Abbreviation: RCT, randomized controlled trials.
# Dermatological Applications

## Published Interventional Clinical Studies (years 2010-2014)

### C. Dermatology

<table>
<thead>
<tr>
<th>Study Type</th>
<th>Number of Patients</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plot Trial</td>
<td>8</td>
<td>Improves healing</td>
</tr>
<tr>
<td>Pilot Study</td>
<td>12</td>
<td>Reduces ulcer wound size and improves quality of life.</td>
</tr>
<tr>
<td>Uncontrolled Study</td>
<td>21</td>
<td>Improves wound healing in diabetic lower extremity wounds.</td>
</tr>
<tr>
<td>RCT</td>
<td>68 NCT00931567</td>
<td>Improves healing of postoperative hand wounds.</td>
</tr>
<tr>
<td>Prospective</td>
<td>4 NCT00956020</td>
<td>Stimulates histological changes in human skin.</td>
</tr>
</tbody>
</table>
Dermatological Applications

Patterned Hair Loss (Androgenic Alopecia)

Fig. 1. Schematic view of the follicular units being implanted with platelet plasma growth factors, showing the dystrophic shading phase and the new proliferative phase with an intense vascular endoneogenesis supporting the new hair development to the anagen phase. There is an intense growth factor migration into the stem cells in the bulge area.
Patterned Hair Loss (Androgenic Alopecia)

**Figure 8:** Photos demonstrating the division of the scalp in four halves: frontal, parietal, vertex, and occipital (a). Patients with hair loss localized to the frontal and parietal areas were injected with the AA-PRP only on the frontal areas (b); the parietal area was treated with placebo based on the injection of physiological solution. Patients with hair loss in the parietal and vertex parts were injected with the AA-PRP only in the parietal part of the scalp (c); the vertex area was treated with placebo based on the injection of physiological solution.
Dermatological Applications

Patterned Hair Loss (Androgenic Alopecia)

Figure 5: PRP treatment increases the thickness of epidermis and the number of follicles of hair skin. (a) and (b): representative microphotographs of hair skin epidermis at baseline (a) and after PRP treatment (b). (c): bar graph of epidermis thickness. (d) and (e): representative microphotographs of dermal hair follicles at baseline (d) and after PRP treatment (e). (f): bar graph of the number of hair follicles/mm² at baseline and after PRP treatment; * indicates $P < 0.05$. Original magnification: (a) and (b): 200x and (d) and (e): 100x.
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The Confusion!!

Different Techniques for Platelet Preparation

International Scientific Literature

Improper Terminology used to Classify them

Lack of characterization

“Blind” Library of Knowledge

Evolution of PRP


Several researchers (1975-1979) upgraded the concept to Platelet Fibrin Gel

Role of Platelets within Fibrin Gel showed good healing properties

Last decade authors used PRP for major applications without considering the methods of preparation !!

Similar approach was known by other names as well (PDWHF) for skin ulcers on the same principles as developed by Matras et al

Another form of Platelet concentrate developed in France as PRF (2nd Gen PRP)

Generalized Classification

P-PRP
- Pure Platelet-Rich Plasma (P-PRP) – or Leukocyte- Poor Platelet-Rich Plasma – products are preparations without leukocytes and with a low density fibrin network after activation.
- Can be used both Gel or Liquid form

L-PRP
- Leukocyte-and Platelet-Rich Plasma (L-PRP) products are preparations with leukocytes and with a low-density fibrin network after activation.
- Can be used both Gel or Liquid form

P-PRF
- Pure Platelet-Rich Fibrin (P-PRF) – or Leukocyte- Poor Platelet-Rich Fibrin – are preparations without leukocytes and with a high-density fibrin network.
- Can be used only as Gel and not as Liquid form

L-PRF
- Leukocyte- and Platelet-Rich Fibrin (L-PRF) products are preparations with leukocytes and with a high-density fibrin network. Per definition, these products only exist in a strongly activated gel form.

## Classification for Sports Medicine

<table>
<thead>
<tr>
<th>Type</th>
<th>White Blood Cells</th>
<th>Activated</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Increased over Baseline</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>Increased over Baseline</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>Minimal or no WBC</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>Minimal or no WBC</td>
<td>Yes</td>
</tr>
</tbody>
</table>

- **A** Platelets > 5x Baseline
- **B** Platelets < 5x Baseline


<table>
<thead>
<tr>
<th>Type</th>
<th>Platelet Conc</th>
<th>WBC Conc</th>
</tr>
</thead>
<tbody>
<tr>
<td>LR-PRP</td>
<td>More than Baseline</td>
<td>More than Baseline</td>
</tr>
<tr>
<td>LP-PRP</td>
<td>More than Baseline</td>
<td>Less than Baseline</td>
</tr>
<tr>
<td>PPP</td>
<td>Less than Baseline</td>
<td>NA</td>
</tr>
</tbody>
</table>

PRP “PAW” Classification

“PLRA” Classification

• Reflects clinically important PRP characterization based on contemporary literature.
  – **P-** Platelet Concentration (Absolute number /µL)
  – **L-** Leukocyte Concentration (Including neutrophils)
  – **R-** Red Cell Concentration
  – **A-** Activation by Exogenous Agents

K. Mautner et al.. PM R 7 (2015) S53-S59
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Conventional Methods

Arora S et al. Indian Journal of Hematology and Blood Transfusion 2016 (Accepted)
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Available devices in the market

<table>
<thead>
<tr>
<th>Technology</th>
<th>Principle</th>
<th>Name [Product]</th>
<th>Biomaterial Prepared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floating Buoy or Shelf</td>
<td>Buffy Coat</td>
<td>Biomet GPS [PCP/L-PRP]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Harvest [L-PRP]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SmartPRep2 [L-PRP]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BMAC</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Depuy SymphonyII</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>31PCCS</td>
<td></td>
</tr>
<tr>
<td>Cell Saver Based Systems</td>
<td></td>
<td>Electa [PRP]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Haemonetics</td>
<td></td>
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<td></td>
<td></td>
<td>CATS</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>BRAT</td>
<td></td>
</tr>
<tr>
<td>Computer Aided Systems</td>
<td>Buffy Coat</td>
<td>Sorin Angel</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Arteriocyte Medical</td>
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<tr>
<td></td>
<td></td>
<td>(Magellan)</td>
<td></td>
</tr>
</tbody>
</table>

PCP- Platelet Concentrated Plasma; PRF- Platelet Rich Fibrin; Biomet GPS Harvest
<table>
<thead>
<tr>
<th>Technology</th>
<th>Principle</th>
<th>Name [Product]</th>
<th>Biomaterial Prepared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Centrifugation</td>
<td>PRP</td>
<td>AutoloGel System [PRP]</td>
<td>Platelets in plasma suspension with minimum white cells and low concentration of platelets</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Smart PReP [PReP/L-PRP]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cascade PRFM</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fibronet System [P-PRF]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Choukroun’s PRF</td>
<td></td>
</tr>
<tr>
<td>Direct Siphoning</td>
<td>PRP</td>
<td>Genesis CS [PRP]</td>
<td></td>
</tr>
<tr>
<td>Direct Aspiration</td>
<td>PRP</td>
<td>Secquire [PRP]</td>
<td></td>
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<td></td>
<td></td>
<td>Arthrex ACP</td>
<td></td>
</tr>
<tr>
<td>Platelet Separation</td>
<td></td>
<td>Vivostat [PRF]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Confusion as it is P-PRF</td>
<td></td>
</tr>
<tr>
<td>Platelet Filtration</td>
<td></td>
<td>Caption [PC]Adv Tissue Regeneration (ART)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Curasan Set</td>
<td></td>
</tr>
</tbody>
</table>

ACP-Autologous Conc Plasma; PCP- Platelet Concentrated Plasma; PRF- Platelet Rich Fibrin;
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Factors important in preparing PRP

a. Venipuncture
b. Volume of Whole Blood
c. Anticoagulant Used
d. Role of pH
e. Centrifugation
f. Platelet Count
g. Inclusion of WBC
h. Activation of PRP
Venipuncture

• Collection of whole blood for PRP preparation requires great care
  – Avoid any activation of platelets at the site
  – Should be clean without the need to manoeuvre the vein
  – Collection should be with a uniform flow

• Blood from adult donors can be obtained using a 19 to 21-gauge needle (*preferably*).

• Some studies do promote collection of blood in an AC *primed* syringe but the sterility and ratio of AC to whole blood collected is difficult to maintain.

Arora S, Agnihotri N. Indian Journal of Hematology and Blood Transfusion 2016 (Accepted)
Volume of Blood Collected

• Normal range of platelets - 150,000 to 450,000 platelets/μL

• The *volume* of whole blood harvested depends on the amount of platelets required in the final product.

• Techniques that harvest *more* blood will obviously lead to products which contain more platelets.

• The volume of the whole blood drawn at the beginning should consider the volume of the final product as well as the desired platelet yield.
Anticoagulant Used

• Anticoagulant (AC) plays an important role in
  – Preventing the coagulation cascade
  – Influences the efficacy of the final platelet product
    • Ratio of anticoagulant to whole blood,
    • Rate of collection of whole blood,
    • Mixing with the anticoagulant and
    • Time between collection of the whole blood and its separation into PRP.

• The *Aim* is to have
  – Minimum aggregation and
  – Activation of platelets during anticoagulation of the blood
Anticoagulant Used

• **Citrate:**
  – Ratio of nine parts blood to one part AC.
  – Citrate binds the calcium and hence prevents the coagulation cascade.
  – In order to calculate the amount of AC to be added there is a need to correct for the hematocrit of the whole blood used.
    
    \[
    \text{Whole blood to add to 1.0 mL anticoagulant} = \frac{5}{(1 - 0. Hct)}
    \]

• **Heparin:**
  – Heparin inhibits the generation and activity of thrombin via its complex with antithrombin III.
  – “Spontaneous” aggregation of platelets in presence of heparin is seen in some individuals.
Anticoagulant Used

- **EDTA:**
  - Act by chelation of calcium molecules in the blood.
  - Suppress platelet degranulation hence it is not a recommended AC for platelet biomaterial preparation.

- **ACD/ACD-A:**
  - ACD brings the pH of the PRP to 6.5-7.2.
  - Dextrose and other ingredients support platelet metabolism and viability.
  - Many cellular growth factors are influenced by the pH of the tissue, some protocols recommend buffering the PRP.
  - ACD is one of the most common AC used by the commercial kits for preparing PRP.

Anticoagulant Used

- CPD/CPDA-1:
  - Similar to ACD-A but less effective at maintaining platelet viability.
  - Citrate in CPD plasma is usually 20 to 22 mM
  - Used in the ratio of 1:7 with the whole blood.
  - Maintains pH and concentrations of calcium ions where platelets are less likely to become activated.
Role of pH

• As per platelet aggregation studies, platelets are pH sensitive.
  – pH < 6.4 - no aggregation
  – pH > 8.0 - spontaneous aggregation
  – pH approaches 10 - inhibition of aggregation

• The change in pH of the plasma is mediated by the diffusion of CO₂ out of the plasma. As the CO₂ diffuses out of the plasma, the pH rises.

• PRP should be kept in a tube that minimizes the surface area exposed to the atmosphere (small diameter tubes) and the tube should be kept capped (avoid CO₂ diffusion)

Centrifugation

• Centrifugation uses the physical principle by “Stoke Law”,
  – “the settling velocity of particles in a liquid environment in response to gravitational forces is approximately proportional to their diameter”

• Particles with a larger diameter settle proportionally faster.
  – Red blood cells (~ 7 microns in diameter) Platelets
  – WBCs (7 to 15 microns in diameter) (~ 2 microns)

• The magnitude of the acting centrifugal force depends on the
  – Apparent mass of the particle,
  – Angular velocity,
  – Distance from the axis of the centrifugal head or rotor.
Centrifugation

RCF = 28.38 × R × (RPM/1000)^2

RCF = relative centrifugal force (x g); R = radius in inches; RPM = revolutions per minute
Centrifugation: $RPM$

Arora S et al. Transfusion and Apheresis Science 2016 (Accepted)
Centrifugation: *Radius of Rotor (R)*

- The greater the distance from the rotor, the greater is the centrifugal force acting on the particle.
  - Amanda et al. (2014) studied two size of the commercial tubes collecting 3.5 ml and 8.5 ml

  - At the same angular velocity,
    - Centrifugal force applied on the erythrocytes decreased with the smaller mean distance from the rotor for the larger volume (8.5mL) processed.

  - Causes the decrease of the packing of erythrocyte at the bottom layer and also the recovery efficiency of platelets at the upper layer.
The higher number of platelet in the platelet product can proportionately produce a higher degree of clinical response.

In vitro studies have also shown that the dose-response curves of most growth factors are not linear.

At a higher concentration when the cell surface receptors for a specific growth factor are occupied
- Further increasing conc. of the growth factor have no additional effect or
- Might produce inhibitory effect

Platelet Counts

a. **Platelet Capture Efficiency / Platelet Yield (%) =**
   \[
   \frac{\text{Volume of Product (ml) \times Platelet Concentration in the Product (x10^9/L) \times 100}}{\text{Volume of WB Collected (ml) \times Platelet Concentration in WB (x10^9/L)}}
   \]

b. **Relative Concentration of Platelet (%) =**
   \[
   \frac{\text{Platelet Concentration in the Product (x10^9/L) \times 100}}{\text{Platelet Conc (x10^9/L) + WBC Conc (x10^9/L) + RBC Conc (x10^9/L)}}
   \]

c. **Factors increase in Platelet/WBC concentration =**
   \[
   \frac{\text{Platelet / WBC Concentration in the Product (x10^9/L)}}{\text{Platelet / WBC Concentration in WB (x10^9/L)}}
   \]

d. **Platelet Dose in the Product (x10^6) =**
   \[
   \frac{\text{Volume of Product (ml) \times Platelet Concentration in the Product (x10^9/L)}}{1000}
   \]

e. **Growth Factor Dose (x10^{12}) =**
   \[
   \frac{\text{Volume of Product (ml) \times Growth Factor in Product (10^{12}/ml)}}{}
   \]
WBC: Good or Bad?

- **Advantage**
  - VEGF from Leukocytes offer antimicrobial and promote tissue repair
  - Neutrophils offer local inflammation to localize any pathogen

- **Disadvantages**
  - Increase inflammation at the site of injection (may cause pain at the site??)

Activation of PRP

- Activators used
  - Calcium
  - Calcium with Thrombin \((\text{recombinant})\)
  - Freeze Thaw

- It is also important to understand that once activated, platelets begin secreting their growth factors immediately.

- Approximately 70% of these growth factors are secreted within the first 10 minutes after activation and within an hour almost 100% have been secreted.

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Regulatory Issues !!

• PRP is a biological product.
• In India, for preparation of both "plasma" and "platelets" blood banks need to obtain licence.
• The Drug and Cosmetics Act, 1940, is silent about the preparation, quality control, and use of PRP in regenerative medicine.
• In USA also, there is a lot of confusion with regard to regulatory issues of autologous PRP preparation device.
• In USA these devices are brought to the market via 510 (k) clearance which certifies that the safety and performance of the device is substantially equivalent to a predicate PRP device.
• In India the device is controlled but not the final PRP product.

Aim is to provide platelet biomaterial with adequate dose of platelets with or without WBC !!!

To anticipate a clinical response

How to prepare these products will depend on which type of PRP are we trying to provide

Classification !!!!

Once we are able to finalize that what will be our final product based on a classification

Clinical Evaluation of response

Quality Control of the products

Reproducibility of the product and response

“PRP Circle!! “
Are We Playing Too Much?

- Long term studies of efficiency and side effect of these PRP application is still to be evaluated!!

- Maximum available data is of 2-3 year post injection follow up that too in Orthopedics ,,,, none in Dermatology or plastic surgery.

- Theoretically repeated application of localized trauma with bolus of growth factors could lead to stimulation of excessive growth of tissue ?? (?? Skin Melanoma/ BCC)
Conclusion !!

• With growing number of articles published every year there is still huge heterogeneity between the type of PRP being used.

• Sterility of the product is of prime importance (Both bacterial contamination as well as TTI)

• There is an urgent need to standardize the classification of these products in order to evaluate their clinical response.

• Classify your product with uniform terms in order to compare and follow results.

• Efficiency is still in initial phase of scientific approval hence should be applied with caution and with the institutional approval.
Thank You!!