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Platelet derived Rich Fibrin Matrix (PRFM)

The concept and description of PRP (platelet rich plasma) originated in the field of haematology. Haematologists created the term PRP in the 1970s in order to describe plasma with a platelet count above that of peripheral blood. PRP was initially used as a transfusion product to treat patients with thrombocytopenia (Alves R, 2018). By the 1980s the use of PRF (platelet rich fibrin) had started to gain increasing attention and use in maxillofacial surgeries.

Since then, PRP based therapy has been well established in clinical trials and published scientific journals. The field of aesthetics and orthopedics has been using PRP extensively for the purpose of rejuvenation and accelerated healing of injuries.

PRF (fig 1), (platelet rich fibrin) by its definition, results from *platelet activation* which stimulates the crosslinking of fibrin into a mesh (coagulation process), and the secretion of functional growth factors. These platelet derived growth factors are trapped within the fibrin 3D scaffold. Hence this scaffold can be regarded as a slow release capsule of active growth factors.

Platelets that are produced in a PRP purification process can be activated by three major pathways: Addition of Ca2+, addition of collagen and other extracellular matrix proteins or by *thrombin* which is the natural enzyme involved in the coagulation process (J, 1995). Naturally, when injury occurs all these factors are presented and contribute to the overall activation process.
Different intervening activators induce different growth factor release modalities (Cavallo C, 2016).

Thrombin is the first enzyme that acts in the conversion of fibrinogen to non-crosslinked (single chain) fibrin. Then other enzymes that are presented in the serum finalize the cross linking of the fibrin to form a solid 3D mesh (PA, 2006). (see Figure 1)
This lays the scientific basis for further PRP derived product development.

An example is *Platelet derived Rich Fibrin Matrix* (PRFM). Thrombin is active in the absence of an anticoagulant. MyCells® PRF,
tubes do not contain anticoagulant. The liquid that surrounds the PRF clot end-product, therefore contains a significant amount of active thrombin. This liquid is referred to as **TRS** or **Thrombin Rich Serum.**

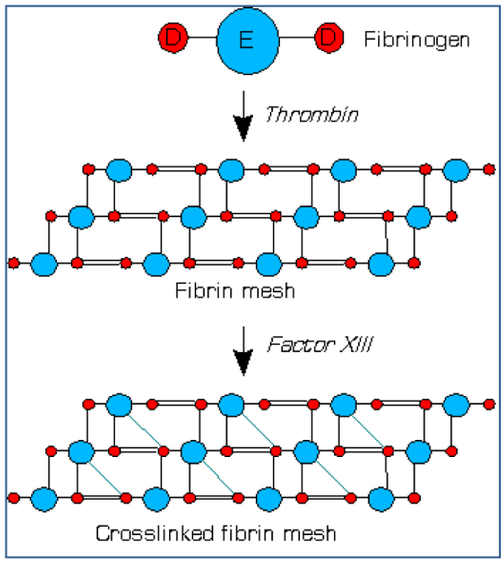

Figure 1PRF formation by thrombin

By combining MyCells®PRP and TRS one can exploit the time window before a matrix is formed and inject the activated PRP into the desired tissue. The product is referred as *PRF gelating matrix*. The injected product ensures the fixation of growth factor release into targeted areas avoiding dispersion of valuable material into undesired areas.

Of note, once activated, platelets are no longer available for further activation and lose their potency. Platelet content in TRS is minimal as most of the platelets were recruited and employed during the coagulation-activation process. (see Table 1).

	Platelets number (K/ul)	RBC (K/ul)	Granulocytes (%)	monocytes	volume (ml)
Whole Blood	302	8.3 k/ul)	52.2	5.2	11
PPP (A)	17	0	0	0	4.4
PRP (A)	860	0.05	4	7.1	1.4
PPP (B)	54	0	2.6	11.8	5.5
PRP (B)	1145	0.08	5.9	8.5	2
TRS (A)	25	0.01	4.7	5.9	3.4
TRS (B)	20	0.02	3.3	7	3.8

Table 1: Example of MyCells®, TRS performance; cell numbers after centrifugation and separation obtained by 1500g ,10min (comparison of parameters in one donor). Different procedure steps elucidate different volumes of serum/plasma that are measured by their cells content.

Using MyCells® PRP, the PRF gelating matrix maintains the exceptional quality of MyCells® PRP due to its gel separation technology. Catabolic erythrocytes and granulocytes (mainly neutrophils) are eliminated, while anabolic monocytes and lymphocytes from the white blood cell population are enriched. Moreover, this combination of PRP and TRS enables the flexibility to determine the concentration which will produce different gel viscosities and a specific growth factor release modality.

The product can be either used as gelating agent in aesthetics/orthopedics dentistry or in its membrane form, as a primary dressing in wound healing/dentistry.

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