



## 新型血小板濃厚液水膠的製備與混合裝置

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### 市場及需求：

臨床上前十字韌帶斷裂常利用重建手術將病人自體的髌骨肌腱或後腿肌腱取代受傷之組織，然而手術後的組織因常處於低氧及低養分的環境中，影響了術後修復的時間及癒合效果，也因此常常搭配其他輔助治療：例如血小板濃厚液 (PRP)。由於 PRP 是高流動性的，若是能夠透過水膠交聯系統將高流動性物質包覆在內，可以延長其停留在體內的時間。而單一系統的混合設計更是能夠提供臨床使用的便利性，使其可以在手術過程中簡便的製備並直接將水膠置於病人體內。

### 技術摘要(含成果)：

本技術包含了透過添加螯合劑調控褐藻膠的交聯過程，將欲注射的高流動性物質包覆在內，延長該物質放入體內後的停留時間，增加其輔助治療的用途。並透過單一混合系統的設計，解決臨床上製備水膠的複雜性，提供給使用者方便的準備過程。

### 優勢：

目前有許多材料可以作為水膠載體包覆藥物、蛋白質、生長因子等高流動性物質，進而達到緩慢釋放或是控制釋放等效果。而其中褐藻膠更是許多人常使用的材料之一，不僅因為是美國食品藥品監督管理局 (FDA) 所核可的物質，更是因為其製備過程非常方便且簡單。本技術透添加螯合劑將交聯過程做調控，使其能夠緩慢成膠並且將血小板濃厚液 (PRP) 均勻混合在基質中，並且達到緩慢釋放的效果。另外透過所設計的混合裝置，可以簡單的操作製備並在單一系統中混合，使其在臨床上有良好的應用價值。

### 競爭產品：

目前臨床上使用的 PRP 注射治療，都是使用市面上現有的 PRP kit，將病人的血經多次離心後注射入病患體內。也因為其高流動性，無法長久停留在體內，因此需要經過一段時間後再次進行注射治療。而多次注射的效果不一定比較有效，也無法確保每一次的注射 PRP 最後是否停留在患部，使得病患必須再次承受抽血、注射這些步驟。

### 專利現況：

本團隊對於生醫材料的研發具有豐富的經驗，目前正致力於申請中華民國專利。此外計畫主持人近年來更積極從事解決臨床上的問題，並透過產學合作期

許利用生醫材料提升臨床診療的效果

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## Novel Platelet-Rich-Plasma Hydrogel Preparation and Mixing Device

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### Experience:

<http://ntu-biomedical-polymer.weebly.com/>

### Market Needs:

Clinically, the anterior cruciate ligament (ACL) rupture often uses reconstruction surgery to replace the patient's own iliac tendon or hind leg tendon. However, the post-operative tissue is often in a low-oxygen and low-nutrient environment, which affects the postoperative repair time and healing effect, so it is often combined with other adjuvant treatments, such as Platelet-Rich-Plasma (PRP). PRP is highly fluid, if it can be encapsulated in hydrogel by cross-linking system, the retention time in patients' body can be extended. And the single mixing system can not only provide clinical convenience, but also can be easily prepared during the surgery and directly put hydrogel into the patient's body.

### Our Technology:

The technology includes regulating the cross-linking process of alginate by adding a chelating agent. The highly fluid substance to be injected is encapsulated in hydrogel to prolong its residence time after being put into the body and increase its effect for adjuvant therapy. And through the design of a single mixing system, the complexity of preparing hydrogel in clinic is solved, and a convenient preparation process is provided to the user.

### Strength:

At present, there are many materials that can be used as hydrogel carriers to encapsulate drugs, proteins, growth factors and other highly fluid substances, and then achieve slow release or controlled release effects. Among them, alginate is one of the materials commonly used by many people, not only because it is approved by the U.S. Food and Drug Administration (FDA), but also because of its convenient and simple preparation process. In the present technology, a chelating agent is added to control the cross-linking process so that it can slowly form a gel and uniformly mix PRP in the matrix to achieve the effect of slow release. In addition, through the designed mixing device, it can be prepared by simple operation and mixed in a single system, so that it has a good clinical application value.

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**Competing Products:**

At present, the PRP injection treatment clinically uses the existing PRP kit in the market and injects into patient's body after several centrifugations. Because of its high fluidity, it cannot stay in the body for a long time, so it needs to be injected again after a period of time. The effect of multiple injections are not necessarily effective, and it cannot ensure whether each injection of PRP ends up in the affected area, so that patients must undergo the steps of blood drawing and injection again

**Intellectual Properties:**

This team has rich experience in the research and development of biomedical materials, and it's currently working on applying for a patent of the Republic of China. In addition, the principal investigator has been more actively participating in solving clinical problems in recent years, and hopes to use biomedical materials to improve the effectiveness of clinical diagnosis and treatment through industry-academia cooperation.

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