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研究興趣

• 分子探針技術於雙性藥物釋放載體之研究

本研究在透過分子探針技術研究雙藥物功能性載體其藥物釋放機制，本團隊成功發展出一功能性雙性藥物釋放載體；兩親性羧甲基-己酰基殼聚醣(Carboxymethyl - Hexanoyl Chitosan, CHC)大分子的兩親性修飾允許CHC大分子在中性水溶液中自組裝成納米顆粒並同時包封藥物，這可以提供高藥物包封率而不改變藥物活性。然而，從科學角度來看，其在水溶液中的停留時間方面與納米結構穩定性或變化相關的自組裝行為尚未得到很好的表徵。在本研究中，選擇疏水性藥物作為模型分子探針。該模型用於評估包封效率和納米結構變化，同時藥物被包封並從CHC納米顆粒釋放。實驗結果給出了納米結構轉換的更清晰的圖像。螺旋CHC內部的這種包埋和分子排列為所得的藥物攜帶納米顆粒提供了更多空間，而膠體和納米結構穩定性保持完整併且基本上是藥物遞送目的的優勢，研究成果已發表於Carbohydrate Polymers國際期刊。

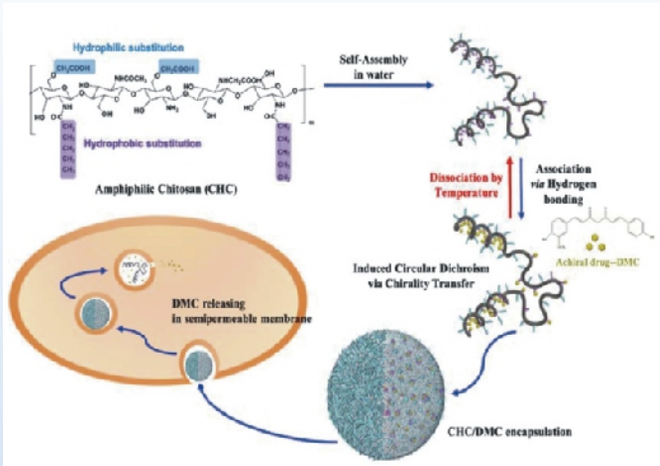

Figure 1. 雙性藥物釋放載體之藥物包覆與釋放機制
Wei-Ting Huang, Min-Chih Chang, Che-Yi Chu, Chia-Ching Chang, Ming-Chia Li*, Dean-Mo Liu*, *Carbohydrate Polymers* **215**, 2019, pp. 246-252 (2019).

• 透過奈米壓印技術成功開發可應用於神經再生之細胞骨架

與黃兆祺副教授於過去研究發現具有生物相容性之微米溝槽可幫助中樞以及周邊神經細胞貼附。此微米溝槽也可以專一性的引導神經軸突生長 。另外，我們也發現此微米溝槽可以有效地加速週邊神經再生，未來有機會以此材料製造可促進神經再生的神經導管，研究成果已發表於 *Macromolecular Bioscience,* 6 (9), pp 1800335 (2018)。

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Research Interests

• Self-assembled amphiphilic chitosan: A time-dependent nanostructural evolution and associated drug encapsulation/elution mechanism

In this study, the CHC/DMC assembled model was used to evaluate entrapping efficiency, CHC-DMC interaction, and nanostructural variation while the drug being encapsulated and released from the CHC nanoparticles. Experimental outcomes showed a fractal transition between nanoparticulate and short fiber-like network evolution of the CHC as time elapsed, with the presence or absence of the DMC probe. This entrapment of DMC is relatively efficient upon CHC assembly and the associated DMC arrangement inside the helical CHC macromolecule gave largely increasing space over the resulting CHC/DMC assembly. Its excellent colloidal and nanostructural stability over a reasonably long period of time in testing environment suggests that this CHC/DMC assembly not only provides a crucial advantage for drug delivery application but also considers as a nanostructural model for better understanding of the mechanism upon drug encapsulation and elution which can be applicable to alternative amphiphilic polysaccharide-based macromolecules (Figure 1).

• Nanoimprinted Anisotropic Topography Preferentially Guides Axons and Enhances Nerve Regeneration

Surface topography has a profound effect on the development of the nervous system, such as neuronal differentiation and morphogenesis. While the interaction of neurons and the surface topography of their local environment is well characterized, the neurontopography interaction during the regeneration process remains largely unknown. It is found that neurons from both the central and peripheral nervous system can survive and grow on this grooved surface. Additionally, it is observed that axons but not dendrites specifically align with these grooves. Furthermore, it is demonstrated that neurons on the grooved surface are capable of regeneration after an on-site injury. More importantly, these injured neurons have an accelerated and enhanced regeneration. Together, the data demonstrate that this anisotropic topography guides axon growth and improves axon regeneration. This opens up the possibility to study the effect of surface topography on regenerating axons and has the potential to be developed into a medical device for treating peripheral nerve injuries, which has been published in Macromolecular Bioscience, 6 (9), pp 1800335 (2018).

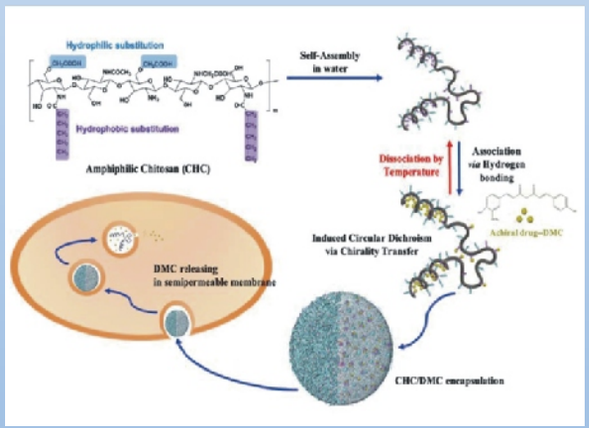

Figure 1. Drug releasing mechanism for better understanding of the mechanism upon drug encapsulation and elution. Wei-Ting Huang, Min-Chih Chang, Che-Yi Chu, Chia-Ching Chang, **Ming-Chia Li***, **Dean-Mo Liu***, *Carbohydrate Polymers* **215,** 2019, pp. 246-252 (2019).