

# 可定向輸送藥物的食品級膠囊製備方法 Preparation of Food Grade Capsules for Targeted Drug Delivery

可在胃腸道中定向輸送藥物的食品級膠囊製備方法 Preparation of food grade capsules for targeted drug delivery in GI tract

> 目前,藥物膠囊一般由合成聚合物或動物性明膠製成。這些材 料在安全性和對人類健康的影響上都存在着很大的問題。我們 充分利用了玉米醇溶蛋白和果膠獨特的物理化學特質製成一種 新型膠囊。玉米醇溶蛋白是一種主要的玉米蛋白;而果膠則 是從柑橘類水果中提取的可形成凝膠的多糖。通過特殊的設 計,膠囊中的玉米醇溶蛋白能起到隔水層的作用,可以有效避 免果膠吸水膨脹;而果膠則能避免玉米醇溶蛋白在小腸中被消 化掉。更重要的是,通過調整兩種材料的比例和膠囊的設計, 可以實現定向藥物輸送,把藥物傳送到一個選定的部位,包括 胃、小腸和結腸。

# 特色與優點

- 膠囊材料為未被充分利用、從植物提取的食品級副產物,因此 具有廉價、安全和適合素食者的特點。
- 通過改變兩種材料的比例和膠囊的設計,可以實現定向藥物輸送,把藥物傳送到一個選定的部位,包括胃、小腸和結腸。

#### 應用

- 適用於藥業和健康食品工業
- 適合所有人士,包括素食者

### 獎 項

- 第42屆瑞士日內瓦國際發明展 金獎 (2014年4月)
- 泰國國家研究評議會特別獎 (2014年4月)



以玉米醇溶蛋白和果膠製成的膠囊包裹着維他命C Zein-pectin capsules with Vitamin C encapsulated



按不同玉米醇溶蛋白和果膠比例製成的膠囊藥物釋放度之曲線 圖:實驗量度了內含維他命C的膠囊在模擬胃液和模擬小腸溶液 中的藥物釋放度。膠囊先後被放在模擬胃液中2小時和模擬小腸 溶液中6小時。

Release curves of zein-pectin capsules with different zeinpectin ratios: Vitamin C was put in the capsules, and its release in simulated gastro and intestinal solutions was measured. The capsules were placed in simulated gastro solutions for the first two hours, and then in simulated intestinal solutions for the next six hours.



以玉米醇溶蛋白和果膠製成的膠囊把藥物輸送至結腸的藥物釋放 度曲線圖:實驗量度了內含維他命C的膠囊在模擬胃液、模擬小腸 溶液和模擬大腸溶液中的藥物釋放度。膠囊先後被放在模擬胃液 中2小時、模擬小腸溶液中4小時和模擬結腸溶液中18小時。 Release curve of zein-pectin capsule for colon delivery: Vitamin C was put in the capsules and its release in simulated gastro, intestinal and colon solutions was measured. The capsules were placed in simulated gastro solutions for the first two hours, then in simulated intestinal solutions for the next four hours, and finally in simulated colon solutions for the next 18 hours.

Nowadays capsules are commonly made of synthetic polymers or animal derived gelatin, which are of great safety and health concerns. We used zein and pectin to prepare a novel capsule by taking advantages of their unique physicochemical properties. Zein is a major corn protein, while pectin is a gelforming polysaccharide obtained from most citrus fruits. In

#### **Special Features and Advantages**

- The capsule materials used are food-grade, plant-based and under-utilised byproducts. Thus, they are safe, fit for vegetarians and inexpensive
- By varying the ratio of the two capsule materials and modifying the capsule design, targeted drug delivery either to the stomach,



this specially designed capsule, zein acts as a water barrier to protect pectin from swelling while pectin protects zein from intestinal digestion. More importantly, by varying the ratio of these two materials and modifying the capsule design, targeted drug delivery either to the stomach, the small intestine or the colon can be achieved.

#### Principal Investigator

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the small intestine, or the colon can be achieved

# Applications

- Suitable for both drug and health food industries
- Basically fit for all people including vegetarians

## Awards

- Gold Medal 42nd International Exhibition of Inventions of Geneva, Switzerland (April 2014)
- Special Merit Award from National Research Council of Thailand (April 2014)