

Topic 2: Bioaccessibility/absorption of beneficial and harmful compounds | Poster

(22784) - MICROBOTS FOR COLONIC DELIVERY OF PHENETHYL ISOTHIOCYANATE (PEITC): USING INFOGEST TO OPTIMISE FORMULATION AND BIOACCESSIBILITY

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Abstract

Globally, gastrointestinal diseases impact 40% of the population and burden healthcare services. Inflammatory bowel disease (IBD) is a common disorder affecting over 6 million people worldwide, leading to significant morbidity and mortality[1]. Therefore, novel approaches are needed to control colonic diseases effectively with minimal side effects.

Using natural bioactive compounds such as isothiocyanates (ITCs) from cruciferous vegetables has shown promise in treating various diseases. Phenethyl isothiocyanate (PEITC), an ITC found in watercress, has potential bioactivities such as antioxidant, anti-inflammatory, and anticancer effects. Hence, PEITC shows potential as a natural therapeutic strategy for IBD due to its ability to alleviate inflammation and inhibit the growth of harmful intestinal bacteria without harming healthy gut microorganisms[2]. However, further research is necessary to establish PEITC's therapeutic potential for IBD and its impact on gut microbiota and overall intestinal health.

Encapsulation technology, crucial for enhancing PEITC's effectiveness and bioavailability in food or nutraceutical matrices, offers promising therapeutic and preventive applications in IBD treatment. Colon-targeted delivery systems are highly effective, especially those activated by gut microbiota. These systems use microbiota and enzymes like β -glycosidase to release drugs in the colon, a strategy ideal for PEITC delivery given its poor water solubility and instability [3].

This research aims to develop a microbot for targeted PEITC delivery to the inflamed colon. It will assess the interaction with gut microbiota and the effectiveness of target functionalities, including antioxidant and anti-inflammatory properties. The delivery system will feature a biodegradable polysaccharide coating, ensuring precise colon targeting. The INFOGEST protocol will simulate human gastrointestinal digestion *in vitro*, being a valuable tool for optimising the microbot's formulation and evaluating PEITC bioaccessibility. This preliminary stage will guide the enhancement of microbot design for subsequent *in vivo* testing.

Thus, developing microbots for oral administration will provide practical solutions for preventing and controlling gastrointestinal diseases, particularly IBD, with minimal impact on the patient's quality of life.

References

1 10.1016/j.tifs.2022.09.012

2 10.3390/molecules27030794

3 10.3390/pharmaceutics12010068

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