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Novel chitosan film embedded with liposome-encapsulated phage for biocontrol of *Escherichia coli* O157:H7 in beef

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Highlights:

- Preparation of liposome-encapsulated phage improved the stability of phage.
- Chitosan film prepared in this study displayed long-term antibacterial property.
- Chitosan film prepared in this study broadened the scope of phage applications.

ABSTRACT

In recent years, phages used for the reduction of pathogenic bacteria have fostered many attentions, but they are liable to lost bioactivity in food due to the presence of acidic compounds, enzymes and evaporite materials. To improve the stability of phages, a chitosan edible film containing liposome-encapsulated phage was engineered in the present study. The characteristics of liposome-encapsulated phage and the chitosan film containing liposome-encapsulated phage were investigated. The encapsulation efficiency of phages in liposome reached $57.66 \pm 0.12\%$. Besides, the desirable physical properties of chitosan film were obtained. The chitosan film embedded with liposome-encapsulated phage exhibited high antibacterial activity against *Escherichia coli* O157:H7, without the impact on the sensory properties of beef. Hence, chitosan film containing liposome-encapsulated phage could be a promising antibacterial packaging for beef preservation.

Keywords: Chitosan film; Liposome; Phages; *E. coli* O157:H7; Antibacterial activity

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