***Oral presentation abstract*: Sodium alginate – a promising material for the encapsulation of next-generation probiotics**

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The next-generation probiotics (NGPs) have appeared in recent years with an abundance of significant therapeutic potential. However, some of these strains have been identified to be extremely oxygen-sensitive (EOS), which leads to various challenges for their production, processing, storage, and colonic delivery. Sodium alginate (SA) has appeared as a promising encapsulating material for EOS probiotics using ionotropic gelation with calcium ions. It confers excellent oxygen barrier properties as well as optimal release behavior in simulated gastrointestinal fluid (SGF). The present study comprehensively examines the effects of SA structural characteristics, molecular weight (MW), and Mannuronic/Guluronic (M/G) ratio on its functional properties as an encapsulating material for the protection and controlled release of 3 NGP strains including *Lactiplantibacillus plantarum*, *Bifidobacterium longum* subsp. *infantis* and *Faecalibacterium duncaniae* (EOS strain).

The results show that the rheological properties of SA are notably influenced by molecular weight but not by the M/G ratio. Autoclaving SA powder significantly reduces the viscosity of SA solution. However, the MW and M/G ratio do not affect the oxygen barrier properties of SA films. Although cross-linking with divalent cations slightly increases oxygen permeance, this still provides a high protection level for encapsulated microorganisms. High MW and low M/G ratio SA beads form stronger gels due to effective crosslinking of the G blocks with divalent cations. The M/G ratio affects SA bead swelling, beads with a high ratio of M blocks display higher swelling in SGF than those with a high ratio of G blocks. The MW determines solubility, beads with low MW dissolved in SGF after 4 hours. SA with low MW and high M/G ratio appears as optimal for swelling, solubility, and probiotic release. Although viability tests showed that pure SA does not protect enough probiotics in SGF, adding sodium carbonate and L-cysteine to the polymer matrix preserves *F. duncaniae* viability up to 6 logs CFU∙mL-1 after exposure to SGF.

***Keywords:*** Sodium alginate, functional properties, probiotic encapsulation, next-generation probiotics, gastrointestinal tract, colonic delivery.

Reference:

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