

**Effects of dietary microencapsulated sodium butyrate on growth, intestinal mucosal morphology, immune response and adhesive bacteria in juvenile common carp (*Cyprinus carpio*) pre-fed with or without oxidised oil**

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**Abstract:** The aim of the present study was to investigate the effects of different dietary sustained-release microencapsulated sodium butyrate (MSB) products (0 (non-supplement), 1.5 and 3.0 h) for a control or oxidised soyabean oil (SBO) diet on fish production, intestinal mucosal condition, immunity and intestinal bacteria in juvenile common carp (*Cyprinus carpio*). Dietary MSB increased weight gain and reduced the feed conversion ratio within the control and oxidised SBO groups. Gut mucosa was damaged in the oxidised SBO group fed without MSB, in contrast to a normal appearance found in fish fed the MSB1.5 and MSB 3.0 diets in the oxidised SBO group. Microvillus density increased in fish fed the MSB1.5 and MSB 3.0 diets in the oxidised SBO group ( $P<0.001$ ); however, microvillus density was affected by the different pre-fed diets in the midgut ( $P<0.001$ ) and by the different sustained-release times of MSB in the distal gut (DG) ( $P=0.003$ ). The interaction between the pre-fed diets and the sustained-release times of dietary MSB was significant for the relative gene expression levels of gut heat shock protein-70 (*HSP70*), pro-inflammatory cytokines (*IL-1 $\beta$*  and *TNF- $\alpha$* ) and anti-inflammatory cytokines (transforming growth factor- $\beta$ ) within each gut segment, except for *HSP70* in the DG and *IL-1 $\beta$*  in the foregut. Modulation of adherent bacterial communities within each gut segment investigated was not obvious when the common carp were fed the diets with MSB, as similarity coefficients of 0.79 were observed. These results indicated that MSB can be used as a dietary supplement to repair or prevent intestinal damage in carp fed oxidised SBO.

**Key words:** *Cyprinus carpio*, Microencapsulated sodium butyrate, Oxidised soyabean oil, Intestine