

Poly-β-hydroxybutyrate (PHB) supplementation influences the lipid levels and fatty acid composition of axenic *Artemia*

Ludevese-Pascual Gladys¹, Edgar Amar², Peter Bossier¹⁺, and Peter de Schryver^{1**}

¹ Laboratory of Aquaculture & *Artemia* Reference Centre, Faculty of Bioscience Engineering – Department of Animal Production, Ghent University, Rozier 44, B-9000 Gent, Belgium
E-mail: Gladys.Ludevese@UGent.be

² Southeast Asian Fisheries Development Centre/Aquaculture Department (SEAFDEC/AQD), Brgy. Buyuan, Tigbauan, Iloilo 5021, Philippines

⁺ Senior author

The actual mechanisms on the protective capacity of the bacterial storage compound poly-β-hydroxybutyrate (PHB) against adverse environmental conditions and pathogens are not yet fully understood. According to Defoirdt *et al.* (2009), polyhydroxyalkanoates (PHAs) are polymers of β-hydroxy short-chain fatty acids (SCFAs) and hence, if the polymers could be degraded in the gut, they could have similar beneficial effects as have been described for other SCFAs. There is, however, no evidence that the short-chain fatty acid hydroxybutyrate, the end product of PHB degradation, could influence the total lipid (TL) and fatty acid (FA) composition in crustaceans. To study this, we supplemented axenic *Artemia* Instar II for 24h with PHB in different forms (100mg L⁻¹): crystalline and amorphous. Treatment with no addition of PHB was also kept as the control. Co-supplementation with *Comamonas testosteroni* (10⁶ cells mL⁻¹), a known bacterial PHB degrader, was also investigated to show its influence on the potential outcome.

Results from the non-parametric Kruskal-Wallis H statistics showed that crystalline but not amorphous PHB significantly improved the TL content of *Artemia*. However, the extra addition of *C. testosteroni* increased the effect of amorphous PHB on the TL content to the level of the crystalline PHB, suggesting that the contribution of degraders cannot be underestimated. The addition of *C. testosteroni* alone did not influence the TL content of the *Artemia*. Results from the 3x2 factorial design on the different fatty acid groups showed that the total saturated FA content and the ratio of the n3–n6 FA were significantly influenced by the combined effects of PHB and *C. testosteroni* whereas total monoenoic FA's, essential n–3 and n–6 FA's and n–3 highly unsaturated FA's (HUFA) were influenced by either PHB or *C. testosteroni*. PHB supplementation in both crystalline and amorphous forms increased the latter although it seemed that crystalline PHB affected these groups more than the amorphous PHB. In all fatty acid groups examined, changes were significantly more pronounced with the addition of the PHB degrader. Our findings indicated that PHB could affect lipid and fatty acid composition of the axenic *Artemia* culture and this outcome is more pronounced with the addition of a PHB degrader.

References

Defoirdt T., N. Boon, P. Sorgeloos, W. Verstraete, and P. Bossier. 2009. Short-chain fatty acids and poly-β-hydroxyalkanoates: (New) Biocontrol agents for a sustainable animal production. *Biotechnology Advances* 27:680–685.