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Novel biomaterial may help combat antimicrobial resistance in fish

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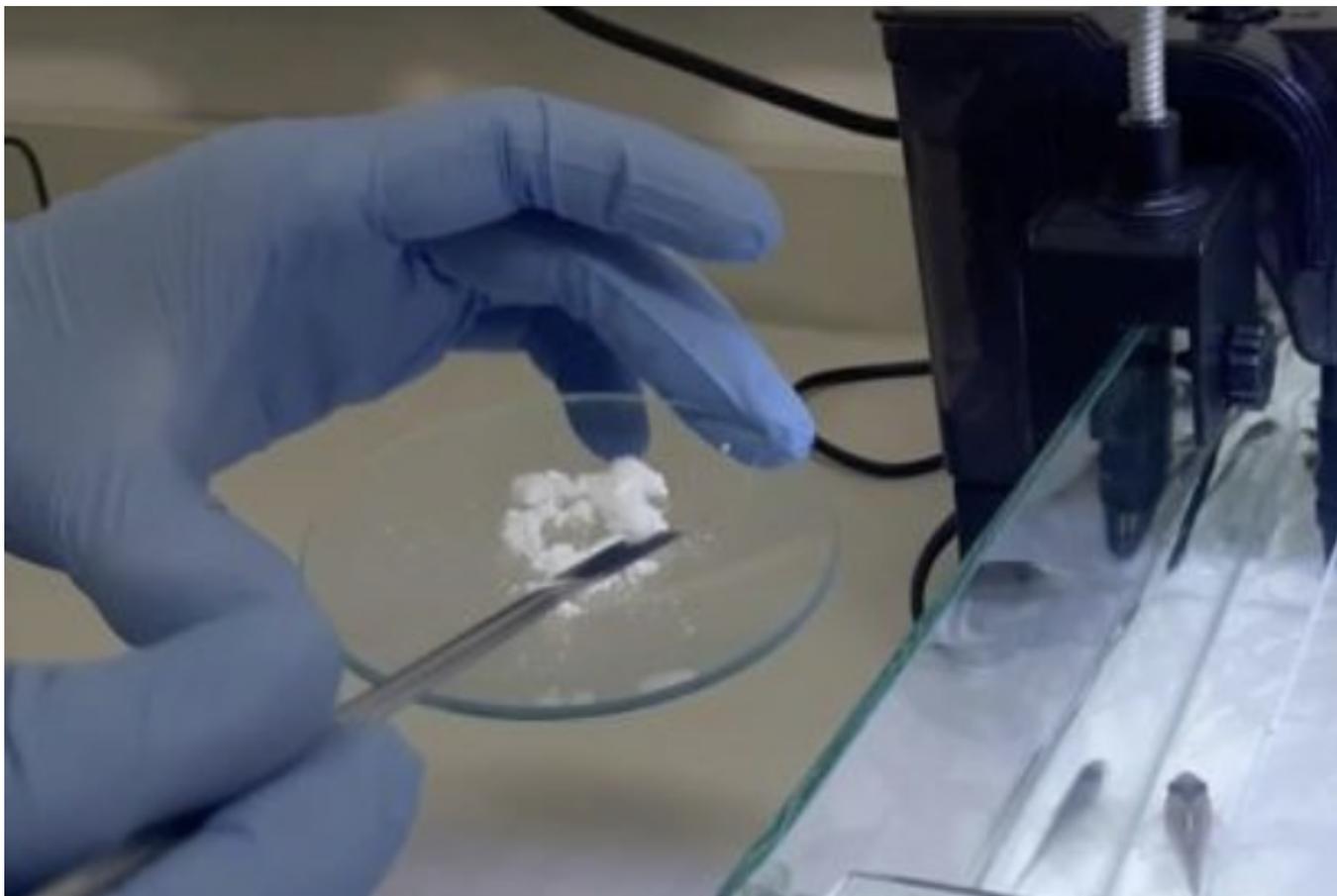
By Responsible Seafood Advocate

Bioparticle delivers medication directly to the gastrointestinal tract of fish to circumvent antimicrobial resistance

The Federal University of São Paulo (UNIFESP) in Brazil has developed a novel biomaterial that delivers medication directly to the fish gut. In addition to helping combat antimicrobial resistance, the bioparticle avoids the waste and pollution created by excessive amounts of drugs in water bodies. The strategy was tested on an ornamental fish species native to the Amazon and found to be safe, paving the way for its use to treat fish farmed for human consumption.

“Our bioparticle can pass through the digestive tract and deliver medication directly to the intestine, enhancing the efficacy of conventional drugs, which is increasingly impaired by bacterial resistance,” said Patrick D. Mathews, a co-author of the article published in ***Biomaterials Advances*** (<https://www.sciencedirect.com/science/article/abs/pii/S2772950823002480>).

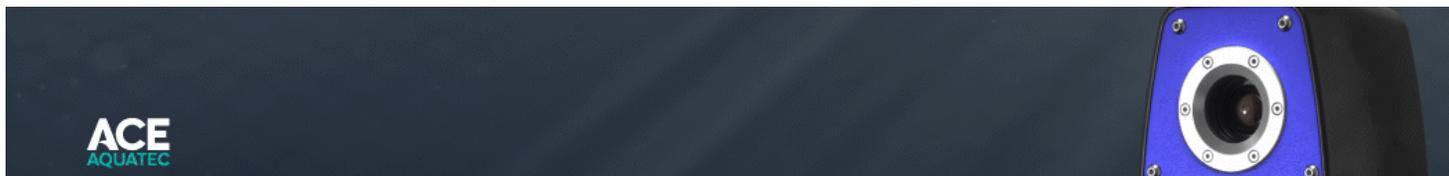
The bioparticle is based on chitosan and alginate, polysaccharides of natural origin used in industry and research. Chitosan is derived from the shells of crustaceans, and alginate is derived from seaweed. The formulation also contains arginine, an amino acid present in most protein-rich foods. The



A researcher administers the biomaterial to ornamental fish from the Amazon. The bioparticle was effective in this trial, paving the way for its use to treat fish farmed for human consumption. Photo by Omar Mertins.

antimicrobial molecule used was a peptide obtained from an arachnid found in Brazil's Southeast region.

"The material can be administered directly in the water, where it is consumed by the fish," said Matthews. "The normal delivery method entails mixing medication into feed, so you never know how much is actually consumed as opposed to just polluting the water. This has become a serious issue for large fish farming ventures such as Chile's salmon industry."



(<https://aceaquatec.com/aquaculture-products/grow/a-biomass>).

Specimens of Schwartz's catfish (*Corydoras schwartzi*), an ornamental fish species native to the Amazon and other parts of South America, were treated with the biomaterial for eight days. Analysis of their intestinal tissue showed high penetration of the biomaterial into epithelial cells and deeper layers of the organ. Various histological methods failed to detect any cytotoxic effects or other damage due to the particle. Hematological tests confirmed the absence of toxicity in blood cells.

"We used materials known to have little or no cytotoxicity," said Omar Mertins, a professor in EPM-UNIFESP's Biophysics Department and an author of the article. "Chitosan also has the advantage of adhering well to mucous membranes, as demonstrated in the study. The tests also showed that it tolerates digestive tract acidity and reaches the intestine intact."

[Read the full study here](#)

<https://www.sciencedirect.com/science/article/abs/pii/S2772950823002480>).

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