Title: Functionalizated magnetic nanoparticles for biodetection, imaging and separation of *Mytilus galloprovincialis* larvae using NIT-zipper® technology.

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Novel nanomaterials are envisaged to have a major impact on a number of relevant areas. It is anticipated that within the next few years the application of nanomaterials and nanotechnology-based manufacturing will have a crucial role in biomedical, pharmaceutical, cosmetic, veterinary, environmental and agro-food technologies.

In this work, several sizes of high-quality monodisperse Fe_3O_4 Nanoparticles (NPs) were synthesized and functionalizated (or bioconjugated)using NIT-zipper® disruptive technology, following the manufacturer's instructions (Nanoimmunotech), with monoclonal antibodies (mAbs) directed against mussel (Mytilus galloprovincialis) larvae, such as M22.8 and M36.5 (Pérez et al., 2009), and with different labels (fluorescent dyes), that may allow an easier and more specific identification.

Functionalizated Nps were incubated with mussel larvae and magnetic separation was perform. The larvae collected in the magnet were analyzed by fluorescent and optical microscopy (pictures: A; 20X mussel larvae with Texas Red dye, B; magnetic nanoparticles aggregates inside mussel larvae, and C; 20X mussel larvae with FITC dye) and flow citometry.

The obtained results clearly indicate that our successful nanosystem recognise the mussel larvae in field plankton samples from different geographical regions, but not the larvae of any other bivalve species. Thus, it could be used for routine monitoring and purification of mussel larvae in plankton samples from different sources, offering an innovative solution to agro-food markets that could give rise to new processes and solve current problems, like the lack of suitable methods for an unequivocal recognition and a rapid sorting of the bivalve larvae species in plankton samples, in these industries.