Biostabilization of Diagnostic Macromolecules for Food Safety Monitoring

Proposed by Professor Carl Batt, Department of Food Science

Organophosphorus hydrolase (OPH) is a critical enzyme to treat post-exposure of toxic chemical agents such as insecticides and herbicides, thus plays an important role in food safety monitoring process. While given its bio-characteristics, the stabilization of OPH is especially challenging during its storage and also as it is used later in the field with various conditions. Applications of several different biomaterials to form matrices for immobilization and stabilization of biologics like OPH have been reported in recent decades. Among those materials, polyhydroxyalkanoate (PHA) is one of the most promising ones that is suitable for this purpose, with its hydrophobic nature and ideal biocompatibility. This polymer is naturally synthesized in most bacteria under the regulation of PHA synthase (PHAC), where PHAC has shown a satisfying catalysis activity to grow PHA chains which are condensed afterwards into granules with an average diameters of 3 μ m and molecular weights up to 1.3 x10^7Da according to previous studies.

The objective of this project is to construct a fusion protein of OPH-PHAC through genetic engineering. By fusing OPH and PHAC together, OPH could then be attached to the surface of the highly hydrophobic PHA granules. This method would not only provide an excellent stable environment of targeted protein OPH, but also realize a complete auto-assembly of biofunctional matrices. With a similar principle, novel stabilization platforms for other biologics could also be developed in a promisingly short time.

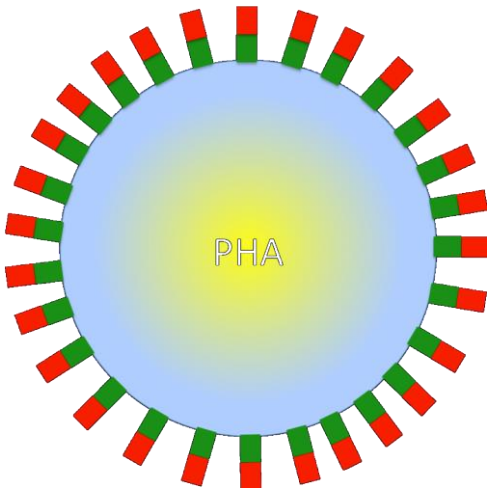

Fig 1. Schematic of PHA granule synthesized from OPH(red box)-PHAC(green box) protein

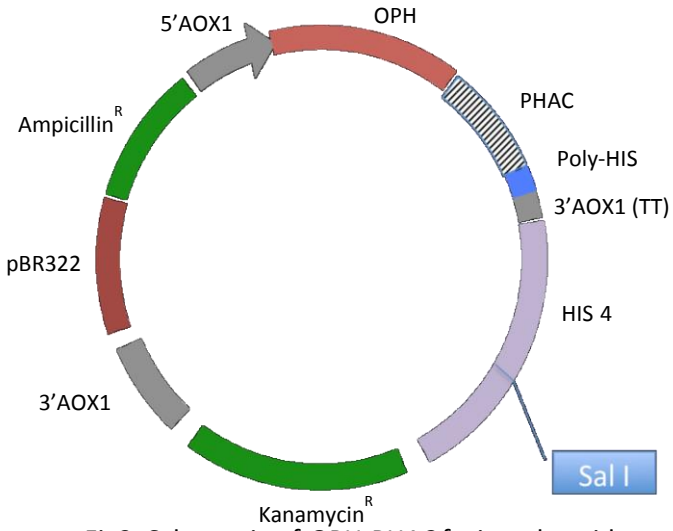

Fig2. Schematic of *OPH-PHAC* fusion plasmid

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