The generation of tri-block copolymers capable of detecting and detoxifying organophosphates

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Abstract

The use of organophosphates (OP) as chemical warfare agents presents a notable threat. The development of materials capable of detecting and detoxifying these agents is an essential step in countering these threats. A number of enzyme variants, which are capable of degrading OP compounds, have been developed. However, the lack of simple means for detecting and quantitating these enzymes poses a challenge. Biophysics can be used to determine the function of enzymes and to develop new materials capable of detoxifying these compounds. A number of enzymes exist which are capable of degrading a wide range of OP compounds; however, to maximize the effectiveness of these enzymes for biocatalytic sensing and decontamination they need to be immobilized. Utilizing the biophysical properties of three different proteins we propose the formation of a novel tri-block copolymer capable of detecting and detoxifying OPs. The tri-block is in A.B.C or B.A.C configuration where the A block is an elastin-like peptide capable of undergoing a reverse phase transition, the B block is COMP a small protein capable of housing small molecules and the C block is phosphotriesterase (PTE) an enzyme found in soil bacterium which has been shown to have high catalytic towards a broad range of OPs.

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Future Direction

- Generate C/E/PTE & E/C/PTE constructs
- Express and purify fusion proteins
- Develop assay for PTE hydrogel formation
- Assess the functionality of PTE hydrogels