Title: Optimized Production Method for hPON1 Enzyme to Combat Organophosphate Poisoning

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KEYWORDS: Recombinant cloning, hPON1 protein production, Organophosphates, Inclusion bodies, Protein refolding
DOMAIN: Life Science (toxicology)

SUMMARY:

Large-scale usage of organophosphate pesticides in agriculture and horticulture, food protection, and veterinary products produces toxic by-products and contaminates the soil, affecting food and water. Human Paraoxonase 1 (hPON1) obtained from the liver cells is an important enzyme to counteract the toxic effect of organophosphate with low or no immunogenic response.

To make it commercially viable, it is generated recombinantly by cloning method, yet the recombinant production needs to improve its performance to avoid the problem of low expression and poor yield of functionally active protein. Hence an improved production process is developed to increase the production of hPON1 protein's high in active state. Different E. coli strains were optimized along with various physiochemical parameters such as media, IPTG concentration, induction point, and post-induction duration to enhance the expression of the protein.

ADVANTAGES:

1. Achieving an eight-fold increase in protein production compared to the current process.
2. Utilizing a straightforward purification method to attain protein purity levels ranging from 95% to 99%.
3. Obtaining a high yield of functionally active protein at 150-250mg per litre.

APPLICATION:

1. Act as an antidote for treatment of organophosphate poisoning.
2. Agent to decontaminate organophosphate-contaminated surfaces and objects.
3. As a biosensor for the detection of organophosphates after further research.

SCALE OF DEVELOPMENT: Enzyme production at lab scale.

TECHNOLOGY READINESS LEVEL: TRL 4

IP STATUS: Indian Patent application (202111058426)