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Novel carbohydrate-active enzymes for improved detergent sustainability

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PURPOSE OF THE ABSTRACT

There is an increasing interest in using enzymes in detergents, attributable to the necessity to discover more sustainable methods for cleaning and breaking down soils. Enzymes are naturally occurring biocatalysts which catalyse reactions with a high rate and efficiency and are better than non-biodegradable surfactants which the industry is striving to phase out. This is largely attributable to the ability of enzymes to catalyze reactions with a higher rate, precise specificity, and greater efficiency [1,3]. Eco-friendly washing conditions are of significant importance to the detergent industry, with many households decreasing temperature used during laundry cycles, this often leads to inefficient stain removal, enzyme technology can aid in overcoming this issue and removing remaining soils whilst encouraging the reduction in washing temperatures and cycle length without compromising cleaning [4]. Enzymes utilized in detergent formulations also bypass the necessity for the use of harsh chemicals and surfactants which are released into the environment and pollute ecosystems [1,2]. Current detergents are formulated with carbohydrate active enzymes (CAZymes) designed to improve cleaning by targeting a variety of distinct polysaccharide-based soil components, current enzymes used for this application include amylase, mannanase, licheninase and cellulase. Recent analysis of residual polysaccharide soils remaining on fabrics following washing cycles suggests potential for other enzyme classes to be used to improve cleaning and bring additional performance benefits by targeting these polysaccharides. This could help pave the route for washing in more environmentally friendly colder and quicker washing conditions and improve the sustainability of detergents by replacing harsh petrochemicals. The aim of the project is to identify and produce novel CAZyme candidates designed to target remaining residual polysaccharides on fabrics, through metagenome mining and by studying the secreted enzymes of microorganisms known to degrade the target polysaccharides, including Bacteroides strains. Work involves collaboration with partners at Newcastle University to study interactions between the enzymes and polysaccharides using molecular probe enabled technology, and visits to Procter & Gamble's Newcastle Innovation Centre to evaluate the performance of enzymes produced in various tests aimed to evaluate consumer benefits.

FIGURES

FIGURE 1

FIGURE 2

KEYWORDS

Carbohydrate-active enzymes | Sustainability

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