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SELECTIVE BIOCATALYTIC HYDRATION OF FATTY ACIDS FROM WASTE COOKING OILS FOR HYDROXY FATTY ACIDS AND POLYESTER SYNTHESIS

Antonino Biundo[a]; Gennaro Agrimi[a,b]*; Isabella Pisano[a,b]*

[a]*Department of Biosciences, Biotechnology and Biopharmaceutics, University of Bari, Via E. Orabona 4, 70125, Bari, Italy*

[b]*CIRCC, Interuniversity Consortium Chemical Reactivity and Catalysis, Via C. Ulpiani 27, 70126, Bari, Italy*

Corresponding author: gennaro.agrimi@uniba.it (Prof.**), isabella.pisano@uniba.it (**Researcher**)*

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Choose your Topic: **1. Industrial Biochemistry, integrated biotechnological processes from renewable resources to added value products**);

The development of biorefinery approaches is of great relevance for the sustainable production of valuable compounds.[1] In accordance with circular economy principles, waste cooking oils (WCOs) are renewable resources and biorefineries feedstocks contributing to a reduced impact on the environment.[2] Commonly, this waste is wrongly disposed of into municipal sewage systems creating problems for the environment and increasing treatment costs in wastewater treatment plants. In this study, regenerated WCOs intended for the production of biofuels[3] were transformed through a chemo-enzymatic approach to produce hydroxy fatty acids, which were further used in polycondensation reaction for polyester production. *Escherichia coli* whole cell biocatalyst expressing the recombinant *Elizabethkingia meningoseptica* Oleate hydratase (Em_OhyA)[4] was used for the biocatalytic hydration of crude WCOs-derived unsaturated free fatty acids for the production of hydroxy fatty acids. Further hydrogenation reaction and methylation of the crude mixture allowed the production of (*R*)-10-hydroxystearic acid methyl ester that was further purified through column chromatography with the production of a high purity (> 90 %) product. Different intermediates were analyzed by GC-MS, HPLC and NMR to identify the specificity of the biocatalytic reaction and the stability of the compounds during further chemical transformation. The purified (*R*)-10-hydroxystearic acid methyl ester was polymerized through a polycondensation reaction for the production of the corresponding polyester which was analyzed by SEC and DSC to characterize both molecular weight and physical properties. This work highlights the potential of

enzymes for the selective transformation of waste products and for the production of bio-based polyesters through a biorefinery approach.

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