Title : Acetic Acid Bacteria (AAB) as versatile whole-cell biocatalysts for intensified bioprocesses.

Acetic acid bacteria (AAB) are aerobic, Gram-negative microorganisms able to oxidise a wide variety of sugars, alcohols, and polyols with outstanding stereo- and regio- specificity, thanks to the action of their membrane and periplasmic space located dehydrogenases[1].

Our research group kept an all-round view on the synthetic potentialities of such biocatalyst, particularly focusing on their oxidative metabolism and on the widening of the obtainable molecules through genetic engineering approaches. We observed good conversion in the oxidation of aliphatic[2], aryl-aliphatic and benzyl alcohols to their corresponding acids ranging from 60 to 100%. The transient aldehydic intermediate have been collected using a two-liquid phase extraction[3] or have been further converted into oximes[4], valuable and versatile group in organic chemistry, by simply providing hydroxylamine in the system, maximizing the variety of achievable products.

Besides, by the heterologous expression of a terminal monooxygenase[5], even alkanes can be used by AAB as starting material, allowing the conversion of limonene into perillartine, a natural sweetener.

Since AAB can be easily immobilised in alginate beads, they are particularly suitable for intensification processes in a continuous-flow mode, for example by using a packed bed reactors[6].

Moreover, several strains able to grow on various agri-food waste have been studied for the production of bacterial cellulose, which has been chemically functionalised to be efficiently used as immobilisation support[7] for esterases and glycosidases, retaining good residual activity and stability for several cycles.

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