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Phenol Biodegradation by *Corynebacterium glutamicum* Encapsulated in Electrospun Fibers

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ABSTRACT

In Northern Israel, olive mills discharge liquid waste causing contamination of subterranean aquifers with phenol, rendering them albeit temporarily, unfit for both drinking and irrigation. The impact of groundwater pollution due to phenol spillage can be extensive. We developed a model system for the biodegradation of phenol-contaminated wastewater by the bacterium *Corynebacterium glutamicum*. Experiments consisting of suspended cultures demonstrated the native ability of this organism to utilize phenol for its metabolic pathways enabling degradation, at levels of nearly 100 ppm within 24 hours. With the use of bioinformatic data, a complete degradation pathway was constructed. Quantitative Real Time PCR analysis of the first two enzymes in this pathway revealed very distinct expression patterns and two different regulation mechanisms were postulated. Additionally, an electrospinning core-shell system was used to assemble electrospun microtubes containing bacteria on porous metallic carriers. We used these carriers as a new immobilization technique and demonstrated their significant phenol degrading capacity in a batch bioreactor configuration. This system demonstrates the feasibility of constructing a water treatment system for the management of phenol-contaminated water.

KEYWORDS

Phenol Biodegradation; Encapsulated Bacteria; Electrospinning; Microtubes; Phenol 2-Monooxygenase; Catechol 1,2-Dioxygenase; Olive Mill Waste Treatment; Olive Mill Waste; OMW

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