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Doctorado en Ciencias de Recursos Naturales

Development of a scaffold of PHB from *Paraburkholderia xenovorans* LB400 and gelatin for dermal tissue regeneration

DOCTORAL THESIS IN FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE DOCTOR OF SCIENCES IN NATURAL RESOURCES

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“Development of a scaffold of PHB from *Paraburkholderia xenovorans* LB400 and gelatin for dermal tissue regeneration”

This thesis is presented under the supervision of the Thesis advisor Dra. Francisca Acevedo Canala Echevarría of the Department of Basic Sciences, Universidad de La Frontera for its acceptance by the commission.

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Thesis summary

"The extracellular matrix of the skin provides support, regulates cellular activities, and aids in nutrient transport. Polyhydroxybutyrate (PHB), a biodegradable polymer, can be combined with gelatin for tissue engineering. Electrospinning, a technique for producing fibers, was used to create dermal scaffolds with PHB and Ge. PHB was sourced from bacteria using different carbon sources and its properties were evaluated. The study aimed to create electrospun dermal scaffolds using PHB and Ge, focusing on PHB using xylose as a carbon source. PHB samples from various carbon sources were chemically and mechanically characterized. PHB microfibers were produced through electrospinning under optimal conditions, resulting in improved mechanical properties and reduced crystallinity. Additionally, the combination of PHB microfibers and Ge nanofibers was explored through electrospinning. Different conditions affecting fiber diameter were tested. The combined scaffolds were crosslinked and their physical, mechanical, and biological properties were evaluated. These scaffolds supported fibroblast growth and showed promising results in wound healing tests on diabetic rats, especially when Ge was included. The research demonstrated the potential of electrospun scaffolds using PHB and Ge, particularly the PHB using xylose. These scaffolds exhibited improved mechanical and biological properties for potential use in tissue engineering and wound healing applications."