De la Raiz al Remedio: Engineering Fiber-Gauze Infused With Traditional Mexican Plants

Regalado, Estefany (School: Harvest Preparatory Academy)

Medication is one of the most significant inventions in human history, often serving as a lifesaving intervention. However, access to medicine remains a major challenge due to high costs, especially in developing countries where even lower-cost alternatives may be unaffordable or less effective. As a result, there is a growing need for accessible and affordable healthcare solutions. This research aims to address this gap by engineering a cost-effective and practical alternative to conventional gauze and antibiotics using traditional Mexican medicinal plants. Plant extracts were prepared using ethanol extraction and purified through centrifugation and evaporation. Maguey fibers were processed into gauze and infused with varying concentrations (20%, 40%, and 60%) of the extracts. The engineered gauze was evaluated through absorbency, antibacterial, and diffusion-release tests. Results showed that the fiber-gauze absorbed over 375%–400% of its original weight, indicating strong liquid retention. Antibacterial assays demonstrated a clear dose-dependent response, with higher concentrations producing larger zones of inhibition. Yerba de Manso exhibited a more consistent and stronger antibacterial effect compared to Cempasúchil. Diffusion analysis using ImageJ and Higuchi modeling confirmed that the release of plant compounds followed a diffusion-controlled mechanism, suggesting sustained delivery. Overall, the findings indicate that plant-infused fiber-gauze is an effective, low-cost alternative for wound treatment, particularly in underserved communities. This study highlights the potential of integrating traditional medicine with biomedical engineering to improve healthcare accessibility.

Awards Won: