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Histopathological Effects of *Pseudomonas aeruginosa* Exotoxin A on Diabetic Skin Wounds in Rats

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ABSTRACT

Diabetes definitely affects the wound healing process by interfering with tissue remodeling and prolonging the inflammatory phase. This study aims to evaluate the histopathological effects of Exotoxin A (ETA), one of the main virulence factors of *Pseudomonas aeruginosa* bacteria, on the healing of skin wounds in diabetic rats. Techniques: Full-thickness skin wounds were created in rats with diabetes induced by alloxan. Rats were divided into three groups: a control group treated with phosphate-buffered saline (PBS) and two groups receiving Exotoxin A (ETA) at doses of 10 µg and 50 µg. Tissue samples were collected on days 4, 8, 12, and 16, and histological changes were evaluated using hematoxylin and eosin (H&E) staining. The diabetes control wounds showed prolonged inflammatory exudation, aberrant collagen organization, and a significant delay in epidermal reconstitution. Conversely, wounds treated with ETA showed poor regeneration and early cellular damage. Both doses (10 µg and 50 µg) demonstrated significant improvement in the later stages compared to the control, including thicker epidermis, more pronounced granulation tissue development, better collagen fiber organization, and nearly complete wound closure on days 12 and 16.Overall, Exotoxin A causes early damage to diabetic wounds but later promotes better tissue reconstruction. These results suggest that ETA may have a regulatory role in the healing of chronic wounds, necessitating further investigation to identify the precise mechanisms and evaluate the efficacy of therapy.

1. Introduction

Diabetic wounds represent one of the most serious complications of diabetes mellitus and are frequently associated with delayed healing [1] and increased susceptibility to bacterial infections, particularly those caused by *P. aeruginosa* [2] .
The Gram-negative opportunistic pathogen *Pseudomonas aeruginosa* can cause hospital-acquired infections as well as infections in the community, with potentially fatal or cosmetic consequences [3]. Skin and soft tissue infections, ulcerative keratitis, diabetic foot and wound infections [4], burn wound

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