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Development of pH-Sensitive Biopolymer Film for Diabetic Wound Monitoring and Healing

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Chronic wounds, especially in diabetic patients, are a major healthcare concern. These wounds go unnoticed if not detected in early infection stages and may even lead to severe complications like amputations. Detection of infection in early stages is a key factor to avoid unnecessary complications. This work proposes the development of a biodegradable pH-sensitive biopolymer film by using chitosan and gelatin and blending red beetroot extract as a natural pH indicator for visual detection of infection in the wounds. Chitosan has natural antibacterial activity and hence plays a major role in the healing of the wound. Gelatin enhances the flexibility and stability of the film. Glycerol acts as a plasticizer, and optional cross-linking agents can be added to prevent dye leaching. The film remains reddish pink in normal acidic wound conditions; the color changes to purple or brown in alkaline pH or infected wound conditions, visually signaling infection. It is a simple, cost-effective, and eco-friendly approach to wound healing and real-time infection monitoring, especially in diabetic wounds. The proposed work uses natural biomaterial and a natural pH indicator, which are safe for the skin, biodegradable, and provide both diagnostic and therapeutic functionality.

Keywords: Biodegradable, Diabetic wounds, Natural pH indicator, pH-sensitive, Red beetroot extract

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