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Controlled release strategies for modulating immune responses to promote tissue regeneration

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**Title: Controlled release strategies for modulating immune responses to promote tissue regeneration**

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**Abstract**

Advances in the field of tissue engineering have enhanced the potential of regenerative medicine, yet the efficacy of these strategies remains incomplete, and is limited by the innate and adaptive immune responses. The immune response associated with injury or disease combined with that mounted to biomaterials, transplanted cells, proteins, and gene therapies vectors can contribute to the inability to fully restore tissue function. Blocking immune responses such as with anti-inflammatory or immunosuppressive agents are either ineffective, as the immune response contributes significantly to regeneration, or have significant side effects. This review describes targeted strategies to modulate the immune response in order to limit tissue damage following injury, promote an anti-inflammatory environment that leads to regeneration, and induce antigen (Ag)-specific tolerance that can target degenerative diseases that destroy tissues and promote engraftment of transplanted cells. Focusing on targeted immuno-modulation, we describe local delivery techniques to sites of inflammation as well as systemic approaches that preferentially target subsets of immune populations.

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