Synopsis of Original Research Paper

Elucidation of the mechanism by which UV-expanded regulatory T cells promote skin wound healing

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Skin wound healing is a highly organized process that maintains tissue integrity and function. We found that ultraviolet-B (UVB) irradiation promotes skin wound healing. However, the mechanism by which UVB regulates the repair process is not fully understood. Regulatory T cells (Tregs) play a pivotal role in maintaining immune homeostasis. Skin exposure to UVB induces the expansion of $Foxp3^+$ regulatory T cells. UVB-expanded Tregs (UVB-skin Tregs) enhance re-epithelialization by producing proenkephalin (PENK) and Areg, promoting wound healing of the skin. In this study, we further investigated the mechanisms by which UVB-skin Tregs interact with other immune cells and inflammatory mediators to regulate wound healing. Full-thickness wounds were made on the back skin of mice irradiated with UVB before 30 minutes or 6 days and compared to wounds of non-irradiated mice. UVB irradiation before 6 days promoted wound healing in mice, whereas UVB irradiation before 30 minutes rather delayed wound healing. Flow cytometric analysis showed that UVB-skin Tregs highly accumulated in the wounds of mice irradiated with UVB before 6 days but not 30 min. UVB-skin Tregs strongly expressed activation markers such as KLRG1, indicating that they were highly activated in the wounds. UVB irradiation also induced an inflammatory response in the wounds that negatively regulates tissue repair. Pro-inflammatory cytokine expression and inflammatory macrophage accumulation in the wounds were enhanced by UVB irradiation and those were partially suppressed by UVB-skin Tregs. These results suggest that UVB irradiation has both positive and negative impacts on the tissue repair function of the skin. Controlling these responses might enhance UVB-promoted skin wound healing.