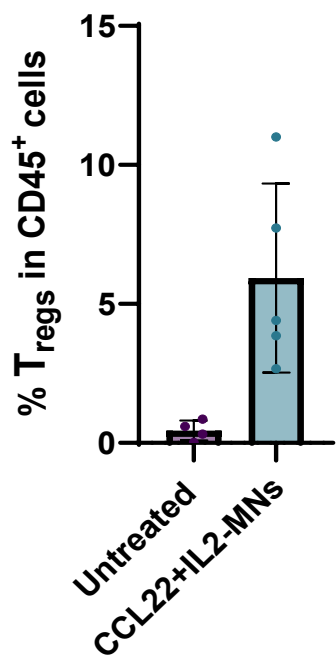
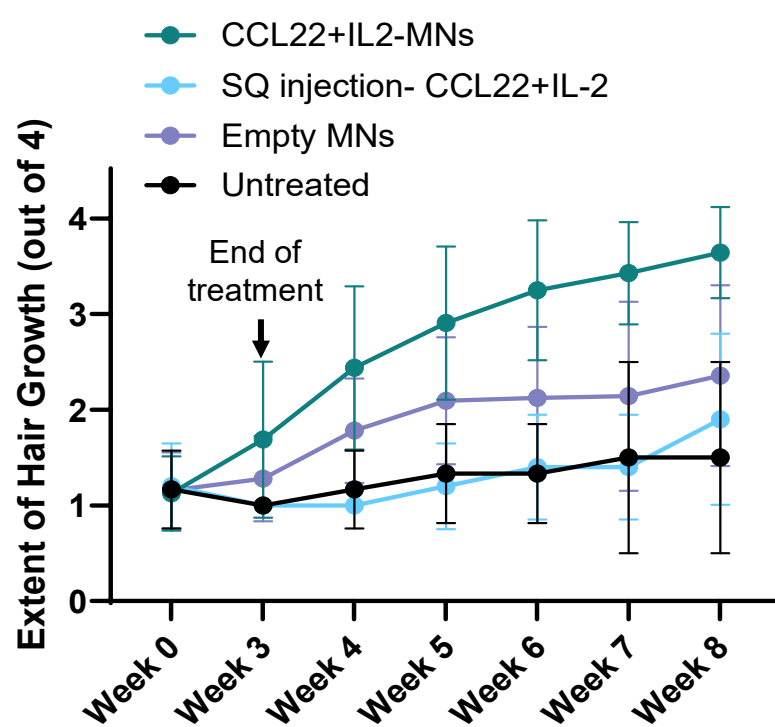
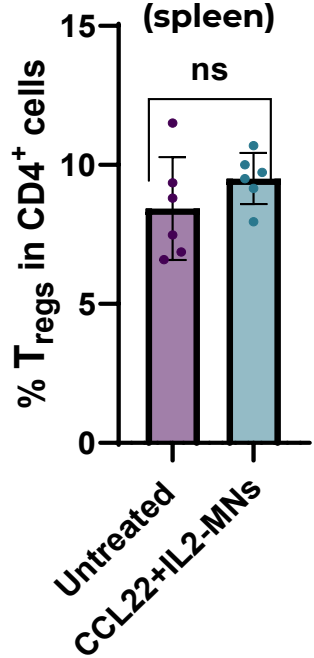


Microneedle Drug Delivery Patch to Treat Autoimmune Skin Disease

Localized T_{reg} expansion (AA skin lesion)



No systemic immunosuppression (spleen)



Clinical Need

Alopecia Areata (AA) is a T cell-mediated autoimmune skin disease that causes hair loss. The disease inflicts devastating social and psychological implications, yet patients with patchy or focal AA (>90% of all AA patients) remain without FDA-approved treatments.

Our Innovative Approach

We engineered a novel microneedle (MN) patch for local and painless delivery of immunomodulators (CCL22 and IL2) that promote the recruitment and proliferation of regulatory T cells (Tregs). Bolstering Treg numbers at the site of autoimmunity can restore immune tolerance without the systemic off-target effects (*e.g.*, immunosuppression) associated with conventional drug delivery methods. Further, restoring local immune balance holds potential to elicit long-term immune tolerance.

Results

Experiments in a murine immune-mediated AA model showed that CCL22+IL2 delivered *via* MN patch increased the frequency of Tregs in AA lesions. The absence of peripheral Treg expansion suggests that systemic immune function was maintained. This therapy led to a decrease in inflammatory markers and hair regrowth that persisted for months post-treatment cessation. In contrast, these same agents delivered by subdermal needles failed to induce hair growth.

Commercial Potential

While AA serves as a beachhead market, our MN patch delivery technology can be applied to a range of autoimmune skin diseases such as psoriasis and vitiligo. Our startup, Lybra Bio, is seeking partners in its efforts to transform treatment options for autoimmune skin diseases.

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