

Cryomicroneedle delivery of melanocyte and keratinocyte for vitiligo repigmentation

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Abstract

The cryomicroneedle was developed with cell delivery in mind. Here, I present a plausible clinical use case for the repigmentation of vitiligo patients. Research has shown that autologous transplantation of melanocytes from unaffected skin regions of vitiligo patients can facilitate the repigmentation of white patches. Cryomicroneedle presents itself as the non-surgical option to deliver these cells. Additionally, we plan to deliver melanocytes co-cultured with keratinocytes, as we hypothesize that this approach may enhance overall melanin production.

To test that cryomicroneedles are a viable option for delivering melanocytes and that co-culturing with keratinocytes can boost melanin production, we have:

- i) examined the delivery of cells using cryomicroneedles onto pig skin,
- ii) tested the viability of melanocytes and keratinocytes after being fabricated into cryomicroneedles and subsequently thawed, and
- iii) assessed melanin production by melanocytes when mono-cultured or co-cultured with keratinocytes before and after freeze-thaw.

Current results show:

- i) consistent delivery of cells to the basal layer of the epidermis,
- ii) > 80% viability for melanocytes and keratinocytes after freeze-thaw,
- iii) no change in melanin production per cell in mono-cultured melanocytes before and after freeze-thaw,
- iv) five-fold increase in melanin production per cell in melanocytes co-cultured with keratinocyte comparing to monoculture, and
- v) 40% decrease in melanin production per cell in co-culture after freeze-thaw.

This project establishes the groundwork for a painless, minimally invasive device capable of delivering melanocytes in therapeutic quantities to help vitiligo patients regain pigmentation in affected skin areas. We will continue with in vivo co-culture transplant in mice using cryomicroneedle later.

Biography

Hao LI is a Ph.D. candidate under the supervision of Prof. Chenjie XU in the Department of Biomedical Engineering at City University of Hong Kong. His research focuses on realizing the use of cryomicroneedle

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