Wound healing and skin repair

Researchers at Hudson Institute are taking an innovative approach to wound healing and treatment of skin damage.

Building on our expertise in reproductive health, our scientists are applying the womb's unique ability to rapidly rebuild itself to the challenge of difficult-to-repair chronic wounds and scarring.

Summary

Our team has identified novel 'repair factors' from menstrual plasma that could be applied as a treatment to repair skin wounds or other skin damage.

Experts in endometrial repair and remodelling, our researchers have discovered that the unique, rapid repair properties of the endometrium can be harnessed to facilitate repair of other tissues. The endometrium is unique as it is the only adult tissue able to repeatedly repair itself without scarring, and it does this very rapidly by releasing specific proteins and other bioactive molecules to facilitate the repair.

Skin healing is a slow process, taking approximately two weeks in 'normal' wounds while chronic and difficult-to-repair wounds may take years for restoration of tissue integrity or they may never repair fully. By contrast, tissue repair in the endometrium takes 3-5 days.

The unique combination of repair factors identified by our researchers will enable translation of the 'rapid-repair' endometrial environment to the 'slower-repair' skin environment.

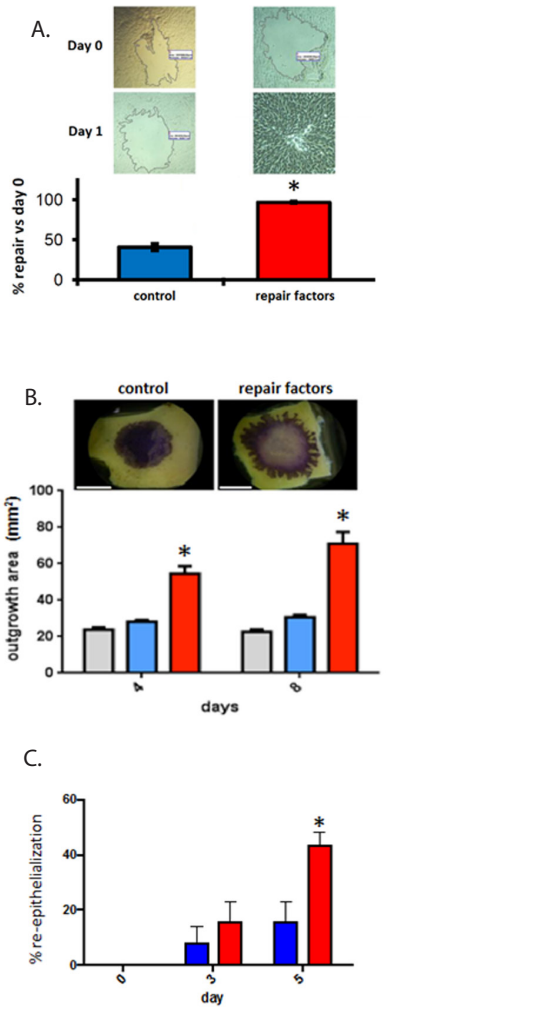
Applications

Our team's findings have broad potential therapeutic and cosmetic applications in all aspects of skin wound repair, regeneration and/or rejuvenation. These applications include treatment of wounds or lacerations arising from trauma (e.g. an injury or surgery) and chronic wounds which are difficult to heal and typically persist for a prolonged period of time.

The incidence of difficult-to-repair wounds is rising dramatically with the increasing age, obesity and diabetes rates among world populations, making wound healing a major global health issue. With relatively few options currently available for treatment of slow or non-healing wounds, novel approaches are required.

Critically, our team have shown that their treatment stimulates cell movement/migration only – a key improvement over existing treatments, which mediate cell division and thus carry a risk of malignancy.

Key data



In example wound healing assays (A, wounded keratinocyte [HaCaT] cell monolayer model), our novel repair factors enhanced the degree of repair (■) versus control (■), with complete repair of wounded monolayers in 24 hours (n=9). An *ex vivo* human skin model, utilizing skin discarded from young healthy adults during cosmetic procedures (B), also showed our novel repair factors enhanced the outgrowth/migration of skin cells (■) versus control (■). Using the gold-standard porcine skin repair model in which the upper layers of skin are removed using a dermatome (C), our treatment (■) promoted skin repair versus control (■).

Development pathway

We have completed proof-of-concept studies using these novel repair factors, demonstrating that menstrual plasma is able to mediate skin wound repair in human *in vitro* and *ex vivo* models and in the industry gold standard porcine *in vivo* model (see key data). Specific factors from menstrual plasma that mediate skin repair have also been identified and tested, with the team working to develop a complex of factors as a defined treatment product.

We are currently seeking a venture or commercial partner to develop this treatment method further.

Market

In Australia, >400,000 people are affected by chronic wounds. The cost of chronic wounds to the Australian health system is an estimated AUD2.85 billion annually, representing 2% of the total national healthcare expenditure.

In the USA, chronic wounds affect approximately 6.5 million people and wound management accounts for an estimated 3% of all healthcare expenditure.

Publication

Evans, *et al*. (2018) 'Menstrual fluid factors facilitate tissue repair: identification and functional action in endometrial and skin repair' *FASEB J*, https://doi.org/10.1096/fj.201800086R

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Team

This program is led by Dr Jemma Evans PhD, a Fielding Foundation Fellow and emerging leader in the field of uterine biology.

Dr Evans works within Hudson Institute's Endometrial Remodelling research group alongside group head, Professor Lois Salamonsen PhD, FRANZCOG(Hon), FAA, an internationally-recognized leader in human uterine biology, fertility & infertility.

Hudson Institute of Medical Research

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Our worldwide scientific and medical collaborations provide a foundation for transformative healthcare programs across the globe, with our researchers leading developments in cell therapies, women's health, microbiome research, diagnostics, and cancer.

Partnership opportunities include:

- Therapeutics, including oncology and gene therapy
- Reproductive, women's and children's health
- Regenerative medicine
- Inflammation and immunology
- Diagnostics and biomarkers