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Name of Journal: *World Journal of Stem Cells***Manuscript NO:** 55000**Manuscript type:** REVIEW

Human hair follicle-derived mesenchymal stem cells: Isolation, expansion, and differentiation

Wang B *et al.* Hair follicle MSCs

Bo Wang, Xiao-Mei Liu, Zi-Nan Liu, Yuan Wang, Xing Han, Ao-Bo Lian, Ying Mu, Ming-Hua Jin, Jin-Yu Liu

Abstract

Hair follicles are easily accessible skin appendages that protect against cold and potential injuries. Hair follicles contain various pools of stem cells, such as epithelial, melanocyte, and mesenchymal stem cells (MSCs) that continuously self-renew, differentiate, regulate hair growth, and maintain skin homeostasis.

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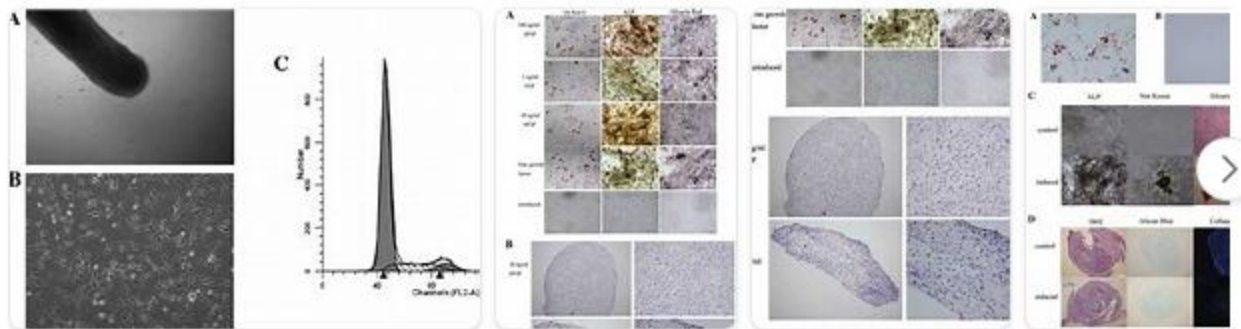
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May 20, 2018 - The protocol described below details the **isolation** and **expansion** of these **cells** for eventual clinical application. We used a dual-reporter mouse model to visualize both **isolation** and eventual **differentiation** of these **cells** in a limbal **stem cell**-deficient mouse model. ... The **hair** follicle contains **mesenchymal stem cells** in the dermal papilla ...

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To date, little is published on the characterization and therapeutic potential of **human mesenchymal stromal cells** (MSCs) derived from **hair** follicle dermal sheath (DS). We present protocols for the **isolation** and culture of **human** DS-MSCs starting with the use of a dissecting microscope to separate



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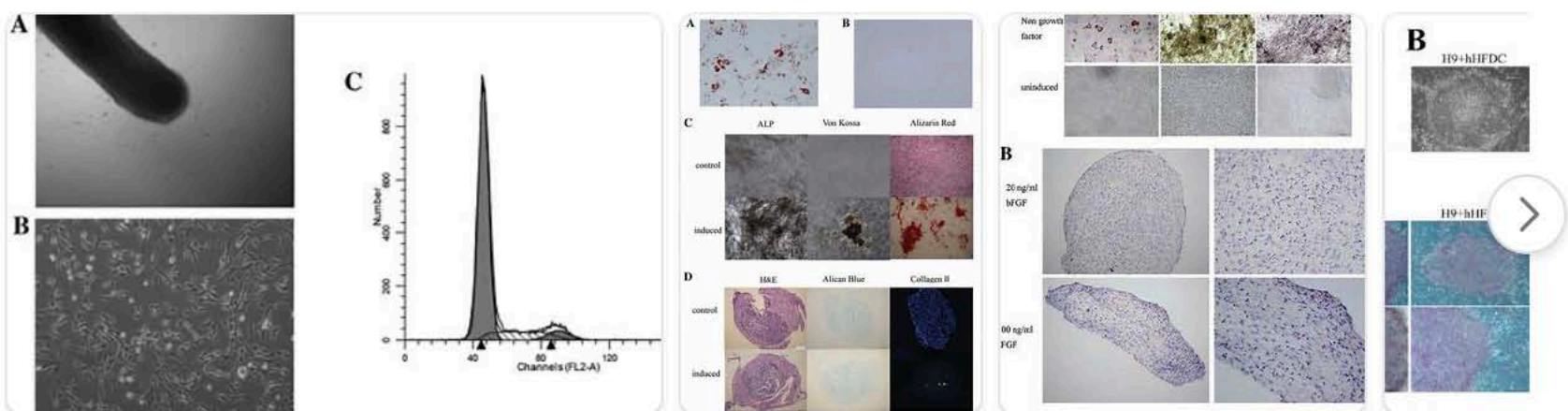
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(PDF) Hair Follicle Stem Cell Isolation and Expansion

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Stem cells are widely used for numerous clinical applications including limbal **stem cell** deficiency. **Stem cell** derived from the bulge region of the **hair** follicle have the ability to differentiate ...

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May 20, 2018 · **Hair follicle stem cells** are being studied as a valuable source of **autologous stem cells** to treat disease. The protocol described below details the **isolation and expansion** of these **cells** for **eventual clinical application**.

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Author: Mindy Call, Ewa Meyer, Winston Kao, Fri...

Publish Year: 2018

[Isolation, expansion and neural differentiation of stem ...](#)

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However, cultures containing **fibroblasts** will soon be overgrown by this **contaminating cell** type, for the doubling time of **human dermal fibroblasts** is in general 24 h, while the **hair follicle bulge stem cells** have a doubling time of an average of 3.3 days (see also "Results", **section Expansion** and cryopreservation). **Fibroblasts** will thus overgrow the other **cells** and form arrays of **cells** oriented in ...

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Author: Coen G. Gho, Timo Schomann, Simon C....

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May 31, 2019 · **Hair follicle Dermal sheath Mesenchymal stromal cells MSCs Adipogenic differentiation Osteogenic differentiation Chondrogenic differentiation Stem cells Tissue engineering** This is a preview of subscription content, log in to check access.

Author: Dongrui Ma, Seng-Teik Lee, Alvin We...

Publish Year: 2019

[NANOG Attenuates Hair Follicle-Derived Mesenchymal Stem ...](#)

<https://www.hindawi.com/journals/omcl/2019/4286213>

Stem cells derived from elderly donors or harvested by repeated subculture exhibit a marked decrease in proliferative capacity and multipotency, which not only compromises their therapeutic potential but also raises safety concerns for regenerative medicine. NANOG—a well-known core transcription factor—plays an important role in maintaining the self-renewal and pluripotency of **stem cells**.