Mini Review
Volume 14:02, 2024

Journal of Bioengineering & Biomedical Science

ISSN:2155-9538

Open Access

Studying Human Hair Follicles through Animal Models and Other Methods

Ellis Sono*

Department of Biochemistry, Yong Loo Lin School of Medicine, National University of Singapore, Singapore 117596, Singapore

Abstract

Understanding human hair follicle biology is crucial for developing treatments for hair disorders and promoting hair regrowth. This study explores various approaches, including animal models and other methods, for studying human hair follicles. Animal models such as mice, rats and pigs have been extensively utilized due to their genetic tractability, physiological similarities and feasibility for experimental manipulation. These models offer insights into hair follicle development, cycling and regeneration, as well as the pathogenesis of hair disorders. Additionally, in vitro models using human hair follicle organ culture, 3D skin equivalents and tissue engineering techniques provide valuable tools for investigating hair follicle biology and evaluating therapeutic interventions. Furthermore, advances in imaging modalities, molecular profiling and omics technologies have enabled comprehensive characterization of human hair follicles at the cellular and molecular levels. Integration of these approaches facilitates a deeper understanding of hair follicle biology and the development of novel therapies for hair-related conditions.

Keywords: Human hair follicles • Animal models • Therapeutic interventions

Introduction

The study of human hair follicles is crucial for understanding hair growth and associated disorders, such as alopecia. While direct experimentation on human subjects is limited, researchers utilize various methods, including animal models and in vitro models, to investigate the mechanisms underlying hair follicle development, cycling and regeneration. Animal models, such as mice and rats, provide valuable insights into hair follicle biology due to their similarities to humans in terms of hair follicle structure and cycling. Additionally, advances in tissue engineering and organoid culture techniques enable the generation of human hair follicle-like structures in vitro, facilitating controlled experimentation and drug screening. By combining insights from animal models, *in vitro* models and clinical studies, researchers aim to unravel the complex mechanisms regulating human hair follicle biology and develop novel therapies for hair-related disorders [1].

Literature Review

Animal models, including mice, rats and pigs, have been widely employed to investigate various aspects of hair follicle biology, including development, cycling and regeneration. These models allow for genetic manipulation, lineage tracing and functional studies to elucidate the molecular mechanisms underlying hair follicle morphogenesis and homeostasis. Additionally *in vitro* models such as human hair follicle organ culture, 3D skin equivalents and microfluidic devices enable controlled manipulation of hair follicle cells and their microenvironment. These models provide valuable tools for studying hair follicle development, differentiation and response to environmental cues or therapeutic agents. Furthermore, advances in imaging techniques, molecular profiling and omics technologies have facilitated comprehensive characterization of human hair follicles at the cellular and molecular levels, shedding light on their dynamic behavior and regulatory networks [2].

***Address for Correspondence:** Ellis Sono, Department of Biochemistry, Yong Loo Lin School of Medicine, National University of Singapore, Singapore 117596, Singapore, E-mail: sonoellis85@yahoo.com*

Received: 02 April, 2024, Manuscript No. jbbs-24-134169; **Editor Assigned:** 04 April, 2024, PreQC No. P-134169; **Reviewed:** 16 April, 2024, QC No. Q-134169; **Revised:** 22 April, 2024, Manuscript No. R-134169; **Published:** 29 April, 2024, DOI: 10.37421/2155-9538.2024.14.415

Discussion

Studying human hair follicles poses unique challenges due to ethical considerations and limitations in direct experimentation on human subjects. However, researchers employ various methods, including animal models *in vitro* models, to investigate the biology and physiology of hair follicles. In this discussion, we delve into the advantages, limitations and implications of these approaches for understanding human hair follicle dynamics and developing therapeutic interventions for hair-related disorders. Animal models, particularly mice and rats, serve as invaluable tools for studying hair follicle biology due to their genetic similarity to humans and conserved hair follicle structure and cycling patterns. These models allow researchers to manipulate specific genes, pathways and environmental factors to elucidate their roles in hair follicle development, cycling and regeneration [3]. Additionally, animal models enable longitudinal studies and *in vivo* imaging to monitor hair follicle growth and response to experimental interventions over time. Despite their utility, animal models have inherent limitations that must be considered. While mice and rats share similarities with humans in hair follicle biology, there are also notable differences in hair type, density and growth cycle duration. Furthermore, extrapolating findings from animal studies to humans may be challenging due to species-specific differences in physiology, metabolism and drug responses. Additionally, ethical considerations regarding animal welfare and the relevance of animal models to human hair disorders must be carefully evaluated. In addition to animal models, researchers utilize *in vitro* models and other experimental approaches to study human hair follicles. Tissue engineering techniques enable the generation of human hair follicle-like structures in culture, providing a controlled environment for investigating follicle development, morphogenesis and response to stimuli. Furthermore, *ex vivo* human hair follicle organ culture systems preserve native follicle architecture and allow for drug screening and toxicity testing [4]. By integrating insights from animal models, *in vitro* models and clinical studies, researchers gain a comprehensive understanding of human hair follicle biology and pathology. Comparative studies across species help identify conserved regulatory mechanisms and potential therapeutic targets for hair-related disorders. Moreover, advances in imaging technologies, genomics and computational modeling facilitate the analysis and interpretation of complex hair follicle dynamics. The knowledge gained from studying human hair follicles through animal models and other methods has significant implications for the development of therapeutic interventions for hair disorders

[5]. Targeted manipulation of key signaling pathways, stem cell populations and micro environmental factors holds promise for promoting hair growth, preventing hair loss and improving treatment outcomes for conditions such as alopecia areata and androgenetic alopecia. Continued research efforts are needed to overcome the limitations of current experimental approaches and advance our understanding of human hair follicle biology. Integration of emerging technologies, such as single-cell sequencing and organ-on-a-chip models, may provide new insights into follicle development, regeneration and disease pathogenesis. Additionally, interdisciplinary collaborations between basic scientists, clinicians and industry partners are essential for translating research findings into clinically relevant therapies for patients with hair-related disorders [6].

Conclusion

In conclusion, studying human hair follicles through animal models and experimental methods provides valuable insights into their biology and physiology. Despite challenges in direct human experimentation, researchers have made significant progress in understanding follicle development, cycling and regeneration. Animal models like mice and rats are crucial tools due to their genetic similarity to humans and comparable follicle structures and cycling patterns. They allow manipulation of genes and environmental factors to uncover their roles in follicle dynamics. Additionally, *in vitro* models and experimental approaches offer controlled environments for studying human hair follicles and assessing potential treatments. Integration of insights from animal models, *in vitro* studies and clinical research yields a comprehensive understanding of human hair follicle biology and pathology. Comparative studies across species help identify key regulatory mechanisms and therapeutic targets for hair disorders. Advanced imaging, genomics and computational techniques aid in analyzing complex follicle dynamics. This knowledge has significant implications for developing therapies for hair disorders, including promoting hair growth and preventing hair loss. Targeted manipulation of signaling pathways, stem cells and microenvironments holds promise for improving treatment outcomes.

Acknowledgement

None.

Conflict of Interest

None.

References

1. Tan, Chew Teng, Chin Yan Lim and Kenneth Lay. "Modelling human hair follicles-lessons from animal models and beyond." *Biol* 13 (2024): 312.
2. Schneider, Marlon R., Ruth Schmidt-Ullrich and Ralf Paus. "The hair follicle as a dynamic miniorgan." *Curr Biol* 19 (2009): R132-R142.
3. Paus, Ralf and George Cotsarelis. "The biology of hair follicles." *N Engl J Med* 341 (1999): 491-497.
4. Nishimura, Emi K., Siobhán A. Jordan, Hideo Oshima and Hisahiro Yoshida, et al. "Dominant role of the niche in melanocyte stem-cell fate determination." *Nature* 416 (2002): 854-860.
5. Tobin, Desmond J. "The cell biology of human hair follicle pigmentation." *Pigment Cell Melanoma Res* 24 (2011): 75-88.
6. Chang, Chiung-Ying, H. Amalia Pasolli, Eugenia G. Giannopoulou and Géraldine Guasch, et al. "NFIB is a governor of epithelial-melanocyte stem cell behaviour in a shared niche." *Nature* 495 (2013): 98-102.

How to cite this article: Sono, Ellis. "Studying Human Hair Follicles through Animal Models and Other Methods." *J Bioengineer & Biomedical Sci* 14 (2024): 415.