THE SCIENCE WORLD
A Monthly e Magazine
ISSN:2583-2212
Oct, 2023; 3(10), 2666-2669

Popular Article

Animal Models for Wound Regeneration

Amitha Banu S*, Sharun Khan, A M Pawde
Division of Surgery, ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh, India
*Division of Surgery, ICAR-Indian Veterinary Research Institute Izatnagar, Bareilly, Uttar Pradesh, India.
https://doi.org/10.5281/zenodo.10050061

Abstract

Animal models provide a valuable tool for controlled environment to investigate the complex mechanisms involved in wound healing and evaluate potential therapeutic interventions. Mouse and pig models, among others, offer insights into the cellular and molecular processes of wound healing and allow for the testing of novel treatments. This article briefs about the dimensions of animal models for wound regeneration.

Wound healing is a complex process that involves a series of coordinated events to restore the integrity of damaged tissues. In order to better understand this process and develop effective therapies for wound regeneration, researchers often rely on animal models. Animal models provide a valuable tool for studying wound healing mechanisms, evaluating potential treatments, and predicting their efficacy in humans. In this article, we will explore the use of animal models in wound regeneration research.

Animal models play a crucial role in wound healing research due to their physiological and genetic similarities to humans. They allow researchers to investigate the various stages of wound healing, including inflammation, tissue formation, and remodeling, in a controlled environment. By studying wound healing in animals, researchers can gain insights into the underlying cellular and molecular mechanisms involved in the process (Masson-Meyers *et al.*, 2020).

Mouse model

Mice are widely used due to their genetic similarity to humans and the availability of various genetic tools for manipulation. Researchers can create wounds on the skin of mice and

Official Website
www.thescienceworld.net
thescienceworldmagazine@gmail.com
Published: 24.10.2023

study the healing process over time. This model allows for the evaluation of different wound healing parameters, such as wound closure rate, re-epithelialization, and collagen deposition. Additionally, the use of transgenic mice with specific genetic modifications enables researchers to investigate the role of specific genes or signaling pathways in wound healing.

Rat model

The rat model for wound regeneration is a widely used and valuable tool in scientific research. Rats, due to their genetic similarity to humans and ease of handling, provide an excellent platform for studying the wound healing process. Researchers can create standardized wounds on the skin of rats and monitor the healing process, allowing for the evaluation of wound closure rate, re-epithelialization, and the deposition of extracellular matrix components. Additionally, the larger size of rats enables the application of advanced wound healing techniques and the evaluation of potential therapeutic interventions, such as growth factors or stem cells.

Guinea pig

The guinea pig model for wound regeneration is a valuable and widely utilized tool in wound healing research. Guinea pigs share many physiological similarities with humans, making them an excellent model for studying wound healing processes. Researchers can create standardized wounds on the skin of guinea pigs and observe the healing progression over time. This model allows for the evaluation of wound closure rate, re-epithelialization, and the deposition of extracellular matrix components, such as collagen. Additionally, guinea pigs have a unique ability to develop hypertrophic scars, making them particularly useful for studying scar formation and potential therapeutic interventions. The guinea pig model also enables researchers to investigate the effects of various treatments, such as growth factors or novel wound dressings, on wound healing outcomes.

Rabbit

The rabbit model for wound regeneration is a widely employed and valuable tool in wound healing research. Rabbits share several physiological similarities with humans, making them an excellent model for studying the wound healing process. Researchers can create standardized wounds on the skin of rabbits and monitor the healing progression over time. This model allows for the evaluation of wound closure rate, re-epithelialization, and the deposition of extracellular matrix components, such as collagen. Additionally, rabbits have a relatively large size, which enables the application of advanced wound healing techniques and the evaluation of potential therapeutic interventions. The rabbit model also allows researchers to investigate the effects of various treatments, such as growth factors or tissue engineering approaches, on wound healing outcomes (Banu *et al.*, 2023).

Official Website
www.thescienceworld.net
thescienceworldmagazine@gmail.com
Published: **24.10.2023**

Pig model

Pigs have a similar skin structure and wound healing process to humans, making them an excellent model for studying wound healing in larger animals. The use of pigs allows researchers to evaluate wound healing outcomes, such as scar formation and tissue regeneration, in a more clinically relevant setting. Additionally, the larger size of pigs enables the application of advanced wound healing techniques, such as tissue engineering and regenerative medicine approaches, which may not be feasible in smaller animal models.

Types of wound healing models

Excisional Wound Mode: In this model, a defined area of skin is surgically removed, creating a wound. This model allows researchers to study the different phases of wound healing, including inflammation, granulation tissue formation, and re-epithelialization.

Incisional Wound Model: In this model, a controlled incision is made in the skin, simulating a surgical wound. This model is often used to study wound closure, tensile strength, and the effects of various interventions on wound healing (Banu *et al.*, 2023).

Ischemic Wound Model: This model involves the induction of ischemia, or reduced blood flow, to the wound area. Ischemic wounds mimic the conditions seen in chronic wounds, such as diabetic ulcers. Researchers can study the impact of impaired blood flow on wound healing and test potential therapies to improve healing in ischemic conditions.

Pressure Ulcer Model: Pressure ulcers, also known as bedsores, are a common type of chronic wound. Animal models can be used to simulate pressure ulcers by applying pressure to specific areas of the skin. This model allows researchers to investigate the underlying mechanisms of pressure ulcer formation and test interventions to prevent or treat these wounds.

Diabetic Wound Model: Diabetes can impair wound healing, leading to chronic wounds. Animal models with diabetes-like conditions, such as genetically modified mice or chemically induced diabetic animals, can be used to study the effects of diabetes on wound healing and test potential therapies for diabetic wounds.

Animal models also provide a platform for testing potential wound healing therapies. Researchers can administer various treatments, such as growth factors, stem cells, or biomaterials, to the wounds of animals and assess their effects on wound healing outcomes. These studies help identify promising therapeutic strategies and optimize their delivery methods before moving on to human clinical trials. Animal models also allow for the evaluation of potential adverse effects or complications associated with the treatments, ensuring their safety and efficacy (Grambow *et al.*,2021).

Despite their advantages, animal models also have limitations. The wound healing process in

Official Website
www.thescienceworld.net
thescienceworldmagazine@gmail.com
Published: 24.10.2023

animals may differ from that in humans due to species-specific variations. Therefore, findings from animal studies should be interpreted with caution and validated in human clinical trials. Additionally, ethical considerations must be taken into account when using animal models, and efforts should be made to minimize animal suffering and use alternative methods whenever possible (Parnell and Volk, 2019)

In conclusion, animal models are invaluable tools for studying wound regeneration. However, it is important to acknowledge the limitations of animal models and ensure that findings are validated in human studies. By combining animal models with clinical research, we can advance our understanding of wound healing and develop effective strategies for promoting tissue regeneration in humans.

References

Banu, S. A., Pawde, A. M., Sharun, K., Kalaiselvan, E., Shivaramu, S., Mathesh, K., Chandra, V., Kumar, R., Maiti, S. K., Verma, M. R., Singh, K. P., & Amarpal (2023). Evaluation of bone marrow-derived mesenchymal stem cells with eggshell membrane for full-thickness wound healing in a rabbit model. Cell and tissue banking, 10.1007/s10561-023-10105-0. Advance online publication. https://doi.org/10.1007/s10561-023-10105-0

Grambow, E., Sorg, H., Sorg, C. G. G., & Strüder, D. (2021). Experimental Models to Study Skin Wound Healing with a Focus on Angiogenesis. Medical Sciences, 9(3), 55. MDPI AG. Retrieved from http://dx.doi.org/10.3390/medsci9030055

Masson-Meyers, D. S., Andrade, T. A. M., Caetano, G. F., Guimaraes, F. R., Leite, M. N., Leite, S. N., & Frade, M. A. C. (2020). Experimental models and methods for cutaneous wound healing assessment. International journal of experimental pathology, 101(1-2), 21–37. https://doi.org/10.1111/iep.12346

Parnell, L. K. S., & Volk, S. W. (2019). The Evolution of Animal Models in Wound Healing Research: 1993-2017. Advances in wound care, 8(12), 692–702. https://doi.org/10.1089/wound.2019.1098