

# The cornerstone of translational research – selection of appropriate animal models

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The appropriate use of animal models is one of the most important steps for a successful translational research project. For scientists working in basic biomaterials research and development, the problem is the uncertainty in selecting the most suitable models for a particular research question. Because of the complexity of translational research, the choice of animal model must be a thorough and clearly-defined process in order to provide relevant, reliable and translatable scientific data, ensure the most beneficial use of the animals, and to be accepted by peers. As stated by Bernard Rollin,<sup>1</sup> “*The most brilliant design, the most elegant procedures, the purest reagents, along with investigator talent, public money, and animal life are all wasted if the choice of animal is incorrect.*” To design a successful animal experiment, many questions need to be addressed:

- Is the choice of a certain animal model appropriate for the study? While many animals respond similarly to humans from physiological, pathological, and therapeutic perspectives, there are also significant species differences.
- What are the similarities and differences between humans and selected animals which are relevant to the designed experiments?
- Is the animal model necessary or even feasible for the planned project?
- Is the selected animal model reproducible?
- What is the proper number of animals that should be used in the study? For all animal studies, the number necessary to reach a certain statistical power, plus a margin for losses, should be calculated.
- Can one easily transfer information from one animal species to the next?
- Whether it may be more beneficial to split the study group into several “mini animal experiments”?<sup>2</sup>

For biomaterials research, the confidence in the correlation of results from a model to the human

disease can be achieved only if the relationship of the animal model to the human disease is well understood. Therefore, it is exceedingly important to research what is already known in the field. Our journal puts a strong emphasis on the application of appropriate animal models for biomaterials research. We are particularly interested in the development and standardisation of animal models that can be used in the biomaterials field. Leading scientists with experience of each animal model are invited to give a comprehensive review in our journal. Publication of studies involving new animal models is encouraged in our journal as well.

In this issue, we publish the first review paper in this endeavour, “*Proper animal experimental designs for preclinical research of biomaterials for intervertebral disc regeneration*” by Peng and coauthors.<sup>3</sup> This is a comprehensive review that summarises all established animal models for intervertebral disc degeneration, an important musculoskeletal disease. The authors have done a fantastic job in highlighting the appropriate animal models and important parameters that are related to models of intervertebral disc degeneration. Furthermore, existing biomaterials used in animal studies of disc regeneration are also discussed, and related well-established assays for *in vivo* disc regeneration are described. In our future issues, we will continue this effort and bring such encyclopaedic review articles to our readers, which should ultimately benefit biomaterials scientists by helping them to select and design suitable animal experiments.

In this issue, we continue to publish high calibre articles covering emerging translational research into biomaterials. Two research papers by Hong et al.<sup>4</sup> and Francis et al.<sup>5</sup> showcase the wide range of translational research into biomaterials—from the intrinsic cytotoxicity of metallic nanoparticles to transdermal gene delivery. Metavarayuth et al.<sup>6</sup> report the extremely interesting discovery that surface free energy and topography may work synergistically in regulating stem cell

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<http://doi.org/10.12336/biomatertransl.2021.02.001>

**How to cite this article:**  
Wang, Q. The cornerstone of translational research – selection of appropriate animal models. *Biomater Transl.* 2021, 2(2), 87-88.



responses, showing the significance of physical/chemical cues in modulating cell fates. Along the same lines, Dr. James T. Triffitt,<sup>7</sup> one of our Honorary Editors-in-Chief, provides a Viewpoint essay which will stimulate discussions on the potential, promise, confusion, and misconception around stem cells in orthopaedic tissue engineering. We plan to publish a themed issue to further discuss the potential applications of stem cell research in translational medicine in the near future, so, please stay tuned.

*Editor note: Qian Wang is an Editorial Board member of Biomaterials Translational.*

*The article was subject to the journal's standard procedures, with peer review handled independently of this Editorial Board Member and their research groups.*

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Received: June 22, 2021

Revised: June 24, 2021

Accepted: June 24, 2021

Available online: June 28, 2021