

Evaluation of Scientific Rigor and Experimental Reproducibility

Scientific rigor and experimental reproducibility directly impact the welfare and number of animals used in research, testing and teaching. It is AAALAC International's view that programs should consider scientific rigor and experimental reproducibility when evaluating animal research activities. The evaluation may be based on an initial review by a grants review panel, and/or may be assigned to the Institutional Animal Care and Use Committee or Oversight Board (IACUC/OB) internal protocol review process. In either scenario, the IACUC/OB review should confirm that the protocol contains pertinent study design elements and ensure adherence to the principles of the 3Rs (replacement, reduction, and refinement). That review should include aspects such as the adequacy of the rationale for the use of animals, the purpose and design of the research-- including randomization, blinding, and controls-- the justification of species, and the proposed animal numbers (via statistical power analyses, if appropriate). Moreover, it should also include consideration of the availability of alternatives to the use of animals, less invasive procedures, and use of less sentient species, as well as the ethical use of animals under appropriate experimental conditions and housing environments. Use of an experimental planning checklist (e.g., the PREPARE Guidelines) into animal protocols for submission and approval may help assure consideration of these elements. To increase awareness of and competency when evaluating rigor and reproducibility, the IACUC/OB should confirm that the program provides education/training as well as direction/recommendations related to scientific rigor and experimental reproducibility to researchers and their staff as well as the IACUC/OB members. Appropriate reporting of experimental design methods in peer-reviewed journals is another important aspect of scientific rigor and experimental reproducibility (e.g., using the ARRIVE guidelines). Guidance on various aspects of scientific rigor and experimental reproducibility may be found at:

- ACD Working Group on Enhancing Rigor, Transparency, and Translatability in Animal Research.
https://acd.od.nih.gov/documents/presentations/06112021_RR-AR%20Report.pdf
- ARRIVE 2.0 Guidelines – a checklist for reporting in vivo experiments in enough detail to add to the scientific knowledge base; endorsed by over 1,000 journals worldwide and available in multiple languages.
<https://arriveguidelines.org/>
- Experimental Design Assistant – a free online tool to help design robust animal experiments more likely to yield reliable and reproducible results; recommended by major funders worldwide. <https://eda.nc3rs.org.uk/>
- PREPARE Guidelines – guidelines for planning research and experimental procedures on animals.
<https://norecopa.no/prepare>

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Additional Guidance Documents (*not to be confused with AAALAC International Reference Resources*):

- Leung, V., Rousseau-Blass, F., Beauchamp, G., & Pang, D. S. J. (2018). Arrive has not arrived: Support for the arrive (animal research: Reporting of in vivo experiments) guidelines does not improve the reporting quality of papers in animal welfare, analgesia or anesthesia. PLoS ONE, 13(5). <https://doi.org/10.1371/journal.pone.0197882>
- Liu, Y., Zhao, X., Mai, Y., Li, X., Wang, J., Chen, L., Mu, J., Jin, G., Gou, H., Sun, W., & Feng, Y. (2016). Adherence to ARRIVE guidelines in Chinese journal reports on neoplasms in animals. PLoS ONE, 11(5). <https://doi.org/10.1371/journal.pone.0154657>
- Macleod, M. (2019). Did a change in Nature journals' editorial policy for life sciences research improve reporting? BMJ Open Science, 3(1). <https://doi.org/10.1136/bmjos-2017-000035>
- Nunamaker, E. A., & Reynolds, P. S. (2022). 'Invisible actors'—How poor methodology reporting compromises mouse models of oncology: A cross-sectional survey. PLoS ONE, 17(10 October). <https://doi.org/10.1371/journal.pone.0274738>
- Reynolds, P. S., & Garvan, C. W. (2021). Preclinical Research Reporting in Shock: Room for Improvement. In Shock (Vol. 55, Issue 5, pp. 573–580). Lippincott Williams and Wilkins. <https://doi.org/10.1097/SHK.0000000000001544>
- Zhao, B., Jiang, Y., Zhang, T., Shang, Z., Zhang, W., Hu, K., Chen, F., Mei, F., Gao, Q., Zhao, L., Kwong, J. S. W., & Ma, B. (2020). Quality of interventional animal experiments in Chinese journals: compliance with ARRIVE guidelines. BMC Veterinary Research, 16(1). <https://doi.org/10.1186/s12917-020-02664-1>