# The ARRIVE guidelines

**Animal Research: Reporting In Vivo Experiments**

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### ITEM | RECOMMENDATION
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Housing and husbandry | 9 Provide details of:
- a. Housing (type of facility e.g. specific pathogen free [SPF]; type of cage or housing; bedding material; number of cage companions; tank shape and material etc. for fish).
- b. Husbandry conditions (e.g. breeding programme, light/dark cycle, temperature, quality of water etc for fish, type of food, access to food and water, environmental enrichment).
- c. Welfare-related assessments and interventions that were carried out prior to, during, or after the experiment.

Sample size | 10 a. Specify the total number of animals used in each experiment, and the number of animals in each experimental group.
- b. Explain how the number of animals was arrived at. Provide details of any sample size calculation used.
- c. Indicate the number of independent replications of each experiment, if relevant.

Allocating animals to experimental groups | 11 a. Give full details of how animals were allocated to experimental groups, including randomisation or matching if done.
- b. Describe the order in which the animals in the different experimental groups were treated and assessed.

Experimental outcomes | 12 Clearly define the primary and secondary experimental outcomes assessed (e.g. cell death, molecular markers, behavioural changes).

Statistical methods | 13 a. Provide details of the statistical methods used for each analysis.
- b. Specify the unit of analysis for each dataset (e.g. single animal, group of animals, single neuron).
- c. Describe any methods used to assess whether the data met the assumptions of the statistical approach.

**RESULTS**

Baseline data | 14 For each experimental group, report relevant characteristics and health status of animals (e.g. weight, microbiological status, and drug or test naïve) prior to treatment or testing. (This information can often be tabulated).

Numbers analysed | 15 a. Report the number of animals in each group included in each analysis. Report absolute numbers (e.g. 10/20, not 50%).
- b. If any animals or data were not included in the analysis, explain why.

Outcomes and estimation | 16 Report the results for each analysis carried out, with a measure of precision (e.g. standard error or confidence interval).

Adverse events | 17 a. Give details of all important adverse events in each experimental group.
- b. Describe any modifications to the experimental protocols made to reduce adverse events.

**DISCUSSION**

Interpretation/scientific implications | 18 a. Interpret the results, taking into account the study objectives and hypotheses, current theory and other relevant studies in the literature.
- b. Comment on the study limitations including any potential sources of bias, any limitations of the animal model, and the imprecision associated with the results.
- c. Describe any implications of your experimental methods or findings for the replacement, refinement or reduction (the 3Rs) of the use of animals in research.

Generalisability/translation | 19 Comment on whether, and how, the findings of this study are likely to translate to other species or systems, including any relevance to human biology.

Funding | 20 List all funding sources (including grant number) and the role of the funder(s) in the study.
The guidelines are intended to:

- Improve reporting of research using animals.
- Guide authors as to the essential information to include in a manuscript, and not be absolutely prescriptive.
- Be flexible to accommodate reporting a wide range of research areas and experimental protocols.
- Promote reproducible, transparent, accurate, comprehensive, concise, logically ordered, well written manuscripts.
- Improve the communication of the research findings to the broader scientific community.

The guidelines are NOT intended to:

- Promote uniformity, stifle creativity, or encourage authors to adhere rigidly to all items in the checklist. Some of the items may not apply to all studies, and some items can be presented as tables/figure legends or flow diagrams (e.g. the numbers of animals treated, assessed and analysed).
- Be a guide for study design and conduct. However, some items on the checklist, such as randomisation, blinding and using comparator groups, may be useful when planning experiments as their use will reduce the risk of bias and increase the robustness of the research.

What kind of research areas do the guidelines apply to?

- The guidelines will be most appropriate for comparative studies, where two or more groups of experimental animals are being compared; often one or more of the groups may be considered as a control. They apply also to studies comparing different drug doses, or, for example, where a single animal is used as its own control (within-subject experiment).
- Most of the recommendations also apply to studies that do not have a control group.
- The guidelines are suitable for any area of bioscience research where laboratory animals are used.

Who are the guidelines aimed at?

- Novice and experienced authors
- Journal editors
- Peer reviewers
- Funding bodies

How might these guidelines be used?

The guidelines provide a checklist for those preparing or reviewing a manuscript intended for publication.

References


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†Please note: that the working group members who contributed to these guidelines were advising in their personal capacity and their input does not necessarily represent the policy of the organisations with which they are associated.

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