

STAR Methods Guide for Authors

Cell Press has replaced the Experimental Procedures and Supplemental Experimental Procedures sections with **STAR Methods (Structured, Transparent, Accessible Reporting)** in our life sciences journals.

The STAR Methods section is structured with six headings (in all caps below) and a Key Resources Table that summarizes the critical materials and resources used in the manuscript. There is no character limit.

The STAR Methods section is typeset and included with the main text online and in the online PDF. It is, however, not copyedited. The print-only PDF will summarize the STAR Methods section in an outline that is automatically generated from the section's headings and first-level subheadings. Authors do not need to submit the outline; it will be created by our Production team and included with the page proofs for review.

The STAR Methods format is required for acceptance. It is not required for initial submission, but it is encouraged. For examples of the format, see any research articles published in *Cell* as of [the August 25, 2017 issue](#).

The STAR Methods Guide includes three main components:

- I. **General Instructions** designed to assist authors as they prepare the STAR Methods text and Key Resources Table.
- II. A **Final File Checklist** that aims to clarify how an article's content should be organized when final files are uploaded to Editorial Manager.
- III. The **STAR Methods Reference Sheet**, a checklist of key points that editors will check during the review of a manuscript.

I. General Instructions: STAR Methods Text

The STAR Methods section should be included in the same Word document as the main text. The section should be introduced after the figure legends.

Please report your methods with sufficient detail so readers do not need to refer to other papers to understand how procedures were performed. Citations of previous publications are allowed but should not be used as a substitute for providing the details of a procedure.

Articles no longer include a Supplemental References list. References cited in the STAR Methods section and in supplemental files must be included in the main References list. (Please note that *Current Biology* is an exception to this and still includes a Supplemental References list; see [Supplemental Information Guidelines](#).) References are not included in the manuscript character count limits.

The STAR Methods text is organized into six standard headings. To specify the types of experiments and analyses used, authors are encouraged to further organize the text by adding up to two levels of subheadings under each heading. Please note:

- (1) The six standard headings and the first level of author-added subheadings are used to populate the outline of the STAR Methods section that appears before the References in the article.
- (2) Author-added subheadings should be clear and concise and are limited to 45 characters.
- (3) Subheadings should not be numbered.
- (4) Please format each level of subheading with a typeface that is different from the body text and the other subheadings.

LEAD CONTACT AND MATERIALS AVAILABILITY

Authors must be willing to distribute all materials, datasets, and protocols used in the manuscript. The Lead Contact, as designated in the author list, holds responsibility for responding to requests and providing information regarding reagents and resource sharing. Authors are required to designate a Lead Contact in this section, who will be responsible for communication with the journal before and after publication and is the arbiter of disputes, including concerns related to reagents or resource sharing. Additional information on the responsibilities of Lead Contact is available on each journal's Information for Authors page. If it is uncertain that the Lead Contact will be able to manage this long-term responsibility, please contact your handling editor to discuss.

In addition, this section must include a "Materials Availability Statement" describing the availability of newly generated materials associated with the paper, including any conditions for access. In cases where there are restrictions for distribution of materials, we require written explanation of the restriction (i.e., MTA). For ease of distribution, we encourage the use of repositories for ease of distribution (e.g., Addgene, Jackson Labs, American Type Culture Collection, etc.). Newly generated items should be also listed in the KEY RESOURCES TABLE, where the source should be stated as "this manuscript".

Examples of the types of appropriate Statements are below. A combination of these Statements may be appropriate. Please note that the first Statement indicating the Lead Contact is mandatory.

- Further information and requests for resources and reagents should be directed to and will be fulfilled by the Lead Contact, Jane Doe (janedoe@qwerty.com). (*required*)
- Plasmids generated in this study have been deposited to [Addgene, name and catalog number or unique identifier].
- Mouse lines generated in this study have been deposited to [the Knockout Mouse Project (KOMP), name and catalog number or unique identifier].
- This study did not generate new unique reagents.
- There are restrictions to the availability of [reagent] due to [reason why restrictions exist].

EXPERIMENTAL MODEL AND SUBJECT DETAILS

**Please omit this section if your study does not use experimental models (e.g., computational studies). This section should also include information related to cell lines/strains used for in vitro experiments.*

Please list here under separate headings all of the experimental models (animals, human subjects, plants, microbe strains, cell lines, primary cell cultures) used in the study. For each model, provide information related to their species, maintenance, and care. In cases where this is appropriate, the influence (or association) of sex, gender, or both on the results of the study must be reported.

For in vivo animal studies, reporting of the sex and age/developmental stage of the subjects is required. If there are technical or scientific reasons why sex/gender and age/developmental stage cannot be reported, a statement must be provided to disclose this and the reasons why. We also ask authors to provide details recommended by [ARRIVE guidelines](#). This includes providing the available and detailed information related to the species, strain and backcrossing status, developmental stage, weight, genotype, health/immune status, drug or test naive, previous procedures, housing, and husbandry. Please note here if the animals were kept under specific conditions (e.g., single/group housed, specific food, temperature, or cage conditions). Also, please describe here how animals were allocated to experimental groups (e.g., littermates of the same sex were randomly assigned to experimental groups). Studies that use live vertebrates must perform their work in accordance with relevant institutional and national guidelines and regulations, and it is required that authors identify here the committee approving the experiments and confirming that all experiments conform to the relevant regulatory standards.

For human studies, the age/developmental stage, sex, and gender identity (if known) of the subjects must be provided. If there are technical or scientific reasons why the sex and/or gender of the subjects cannot be reported, a statement must be provided to disclose this and the reasons why. Please also provide information related to the subjects (e.g., sample size, etc.) or indicate where in the manuscript such information can be found. Studies that work with human subjects are required to provide a statement here identifying the committee approving the studies and confirming that informed consent was obtained from all subjects.

For cell lines, primary cultures, microbe strains, and plants, please describe culture/growth conditions, including temperature. Sex of cells must also be reported. If this is not possible, a statement must be provided to disclose this and the reasons why. Please note here available information about cell authentication. As you may be aware, the practice of cell authentication is becoming more common, and while we understand that this is not yet a standard practice, please indicate whether your cell lines have been authenticated. If so, please describe how.

For all experimental models, we highly recommend including models' RRIDs in their description, as well as using the RRID as the identifier in the Key Resources Table. For more details on how to obtain or generate an RRID for existing or newly generated resources, please visit [visit the RII](#) or [search for RRIDs](#).

For studies that use organisms as source for materials used in experiments (e.g., crystallography, biochemistry, in vitro studies), please provide details on the source organism (e.g., strain, growth/ husbandry conditions, sex, age, etc.).

METHOD DETAILS

Please provide precise details of all the procedures in the paper (behavioral task, generation of reagents, biological assays, modeling, etc.) such that it is clear how, when, where, and why procedures were performed. We encourage authors to provide information related to the experimental design as suggested by [NIH](#) and [ARRIVE](#) guidelines (e.g., information about replicates, randomization, blinding, sample size estimation, and the criteria for inclusion and exclusion of any data or subjects).

Computational models and chemical synthesis details may also be presented in this section. However, if it is difficult to present the details of the computational models and/or chemical synthesis without the use of extensive tables or figures, please contact your handling editor for guidance on how to proceed.

All datasets, program code, and methods used in your manuscript must be appropriately cited in the text and listed in the References section, either in the form of the publications in which they were first reported or in the form of independent persistent identifiers such as the Digital Object Identifier (DOI). When a dataset, program code, or method has a persistent identifier independent from the original study in which it is first reported, we encourage you to cite both that identifier and the original study. For details on how References should be presented, please see the References section under "How to Prepare and Submit Research Articles" on our Information for Authors page.

QUANTIFICATION AND STATISTICAL ANALYSIS

Please describe here all of the statistical analysis and software used. We ask authors to indicate in this section where all of the statistical details of experiments can be found (e.g., in the figure legends, figures, Results, etc.), including the statistical tests used, exact value of *n*, what *n* represents (e.g., number of animals, number of cells, etc.), definition of center, and dispersion and precision measures (e.g., mean, median, SD, SEM, confidence intervals). Also please summarize in this section how significance was defined, the statistical methods used to determine strategies for randomization and/or stratification, sample size estimation, and inclusion and exclusion of any data or subjects, as well as any methods used to determine whether the data met assumptions of the statistical approach.

DATA AND CODE AVAILABILITY

Datasets should be made freely available to readers following publication, ideally through appropriate public repositories. For particular types of data (i.e., DNA and protein-sequenced structures of biological macromolecules, microarray data, etc.), submission of the full dataset to a community-endorsed public repository is mandatory (see the journal's Information for Authors for further details).

Any previously unreported custom computer code or algorithm used to generate results that are central to the main conclusions of a paper must also be archived in a publicly accessible repository. Data and code should be deposited in a form that will allow maximum reuse.

In this section, authors must include a "Data and Code Availability Statement" even if there is no dataset/code associated with the paper. This section should include a statement describing the availability of datasets/code associated with the paper, including any conditions for access of datasets not publicly available. This section should also include any accession numbers, DOIs or unique identifiers, or web links to deposited datasets and code. If URLs or links are provided in supplemental files, please report the supplemental file name (i.e., Table S1 if the information is reported in a supplemental table or Data S1 if the data is provided as part of the Supplemental Information PDF or compiled in a standalone ZIP file [which must be < 150 MB]). For raw data at repositories that are Force11 compliant (i.e., Mendeley Data), please provide the DOI.

Examples of the types of appropriate "Data and Code Availability Statements" are below. Statements with multiple types of datasets may use a combination of statements.

- The [datasets/code] generated during this study are available at [name of repository] [accession code/web link].
- The published article includes all [datasets/code] generated or analyzed during this study.
- The [datasets/code] supporting the current study have not been deposited in a public repository because [reason why data are not public] but are available from the corresponding author on request.
- This study did not generate/analyze [datasets/code].
- There are restrictions to the availability of [dataset/code] due to [reason why restrictions exist].
- Original/source data for [figures/datatype] in the paper is available [i.e., Mendeley Data DOI].

ADDITIONAL RESOURCES

**Please omit this section if your study has not generated or contributed to a new website/forum or if it is not part of a clinical trial.*

Please provide links to websites that provide further information relevant to the study (e.g., protocol download, trouble-shooting forum, etc.). Clinical trial registry numbers and links should also be placed here. Please briefly describe the resource and its relevance for the paper. Please report this information as:

"Description: URL"

KEY RESOURCES TABLE

The Key Resources Table serves to highlight materials and resources (including genetically modified organisms and strains, cell lines, reagents, software, experimental models, and original source data for computational studies) essential to reproduce results presented in the manuscript. The items in the table must also be reported alongside the description of their use in the Method Details section. Literature cited within the Key Resources Table must be included in the References list. We highly recommend using RRIDs (see <https://scicrunch.org/resources>) as the identifier for antibodies and model organisms in the Key Resources Table.

Please **do not add custom headings or subheadings** to the Key Resources Table.

To create the Table, please use the provided [Table Template](#) or the [KRT webform](#).

II. STAR Methods Final Files Checklist

When submitting your article, please provide materials in the formats shown below.

- **Main document file:** *Word or LaTeX document, including (in this order):*
 - Standard article sections (as applicable)
(Title page, Summary, Introduction, Results, Discussion, Author Contributions, Acknowledgments)
 - Main figure titles and legends
 - Main tables and corresponding titles and legends (if applicable)
 - STAR Methods text
 - Supplemental item titles (including “Related to” info; mandatory) and legends (optional) for items that are *not* included in the main supplemental PDF (if applicable) (e.g., Excel tables, supplemental movies, etc.)
 - References (*see below for *Current Biology* exception)
(all references, including those cited only in the KRT, STAR Methods text, and supplemental files, are included in one References list)
- **Key Resources Table:** *separate Word document created from [Table Template](#)*
- **Main figures:** *individual TIFF or PDF files*
(TIFF is preferred format, see [Figure Guidelines](#) for additional specs)
- **Supplemental figures with corresponding titles and legends and supplemental tables with corresponding titles and legends (non-Excel):** *combined in one PDF file*
 - See [Supplemental Information Guidelines](#) for additional details
 - Titles should include “Related to” info; legends are mandatory for supplemental figures but optional for supplemental tables
- **Supplemental tables not included in main supplemental PDF:** *Excel or CSV*
 - Descriptive table titles (mandatory) and legends (optional) should be included *in the main document file after the STAR Methods text*
 - Titles should include “Related to” info
- **Supplemental movie and/or data files**
 - See [Supplemental Information Guidelines](#) for preferred file formats
 - Descriptive titles (including “Related to” info; mandatory) and legends (optional) should be included *in the main document file (after the STAR Methods text)*

**Current Biology*: If applicable, a Supplemental References list should be included in the combined PDF that includes the supplemental figures and tables. This Supplemental References list includes papers cited within the Supplemental Information, even if they have already been listed in the main References list. Additional information is available in the [Supplemental Information Guidelines](#). Please note that the Key Resources Table and the STAR Methods text are not part of the Supplemental Information.

III. STAR Methods Reference Sheet

This list highlights key points that should be followed to ensure timely acceptance of the manuscript.

GENERAL FORMAT REQUIREMENTS

1. Are there no more than two levels of customized subheadings to help organize the information reported in the STAR Methods text?
2. Are the subheadings shorter than 45 characters and free of numbering or parenthetical text?
3. Is sufficient information provided about the methods and analyses so that readers understand how experiments and analyses were conducted and/or modified if based on previously published work?
4. Are the references cited in the STAR Methods text and Key Resources table provided in the main References list?

LEAD CONTACT AND MATERIALS AVAILABILITY

1. Are the Lead Contact details provided?
2. Is the Lead Contact the only author listed? (No other authors should be noted in this section.)
3. Is a "Materials Availability Statement" included?
4. Are any restrictions for use of the materials disclosed?
5. Is the section's text provided in paragraph form (rather than a simple list of contact info)?

EXPERIMENTAL MODEL AND SUBJECT DETAILS

1. Are all experimental models (human, animal, plant, cell line, microbes) listed in this section under separate headings?
2. For **human studies**:
 - a. Is there a statement identifying the committee approving the studies and confirming that informed consent was obtained from subjects?
 - b. Is the sex, gender, and information about age provided here for all study participants, or is it indicated where they can be found? If not, is there a statement of why this data is unavailable?
 - c. Are the sample size and how subjects/samples were allocated to experimental groups specified?
3. For study that works with **live vertebrates**:
 - a. Is the committee approving the experiments identified?
 - b. Is there confirmation that all experiments conform to the relevant regulatory standards?
4. For **animal studies**, is the sex, genotype, age/developmental stage, health status, involvement in previous procedures, and other parameters following [ARRIVE guidelines](#) specified? If not, is there a statement of why this data is unavailable?
5. For studies that include both male and female subjects or tissue from both sexes, please provide an analysis of the influence (or association) of sex, gender, or both on the results of the study, or indicate in the Experimental Model and Subject Details section why such analyses were not performed. If these analyses were not performed but may be pertinent for the generalization of the results to both sexes, consider covering this topic in the Discussion section. Include negative results as well as results that show differences.
6. For **animal and plant studies**, are housing and husbandry conditions specified?
7. For **in vitro studies**, including expression systems for source material, are culture conditions/maintenance specified?

8. For **cell lines and primary cultures**, is the sex reported? If not, is there a statement of why this data is unavailable?
9. Is any available information on **cell line authentication** provided?

METHOD DETAILS

1. Are there method-specific descriptive subheadings provided (must be less than 45 characters, no parenthetical text, and not numbered)?
2. Is there detailed information on the methods such that it is clear how and why procedures or analysis were conducted?
3. Are the methods provided in full, instead of referring to other papers for details?
4. For experiments in which temperature may impact results (e.g., electrophysiology, behavior of subjects or materials, binding assays), is the temperature provided?
5. Are the references cited provided in the References list?
6. Is there information related to **experimental design**?
 - a. Replication
 - b. Strategy for randomization and/or stratification
 - c. Whether the study was done blinded
 - d. Inclusion and exclusion criteria of any data or subjects
 - e. Sample size estimation and statistical method of computation

QUANTIFICATION AND STATISTICAL ANALYSIS

1. Is there an explanation of the statistical analysis used to quantify data?
2. Is there a statement of where the statistical parameters (i.e., exact value of n, what n represents, SEM, SD, etc.) are reported in the paper?
3. Is there a statement of whether any methods were used to determine whether the data met assumptions of the statistical approach?

DATA AND CODE AVAILABILITY

1. Is a “Data and Code Availability Statement” provided, even if there are no new datasets/code generated in the paper?
2. Are datasets **newly** generated in this study described, and are the links (e.g., Mendeley data, repository of raw data) provided here and in the KRT?
3. For data required to be deposited in community-endorsed repositories (i.e., sequences, structures of biological macromolecules, microarray data), is an **accession number** provided here and in the KRT? (See journal’s Information for Authors page for additional examples of repositories.)

ADDITIONAL RESOURCES

1. If there are websites or resources (i.e., protocol site, forum) that have been created or further expanded by this study to provide further information or support relevant to the paper, is this information and links reported?
2. If relevant, are the **clinical registry numbers** and links associated with study provided?

KEY RESOURCES TABLE (KRT)

1. Is the KRT provided as a separate file?
2. Have custom headings or subheadings been added to the KRT? (This is prohibited.)
3. Are all of the items in the KRT also mentioned in the Method Details or main text of the manuscript?

4. Are all of the papers that are cited in the KRT included in the References list?
5. Are the source and identifier provided for all resources, if available? (If identifier is not available, "N/A" should appear in the column.)
6. Are the unique identifiers provided for all items listed and clearly labeled (e.g., prepended with Cat#, Lot, Clone, RRID, GEO)? Please see the [Table Template](#) for examples.
7. Are all deposited data used and generated in the study included in the KRT and provided with links to access the data?
8. Are all of the software and algorithms used in the study included in the KRT and provided with links for downloading?
9. When more than 10 oligonucleotides are used, are they provided in a supplemental table and cited in the KRT?
10. Is there only one item per row?
11. Are the descriptions for the items intuitive and informative?