

Guidelines for authors

Writing and formatting

Title

The title should be concise, omitting terms that are implicit and, where possible, be a statement of the main result or conclusion presented in the manuscript. Abbreviations should be avoided within the title.

Witty and creative titles are welcome, but only if relevant and within measure. Consider if a title meant to be thought-provoking might be misinterpreted as offensive or alarming. In extreme cases, the editorial office may veto a title and propose an alternative. Authors should avoid:

- titles that are a mere question without giving the answer
- unambitious titles, for example starting with 'Towards,' 'A description of,' 'A characterization of' or 'Preliminary study on'
- vague titles, for example starting with 'Role of', 'Link between', or 'Effect of' that do not specify the role, link, or effect

For authors

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Abstract

As a primary goal, the abstract should make the general significance and conceptual advance of the work clearly accessible to a broad readership. The abstract should be no longer than a single paragraph and should be structured, for example, according to the **IMRAD format**. For the specific structure of the abstract, authors should follow the requirements of the article type or journal to which they're submitting. Minimize the use of abbreviations and do not cite references, figures or tables. For clinical trial articles, please include the unique identifier and the URL of the publicly accessible website on which the trial is registered.

Manuscript length

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(i.e., 3.2.2.1.2 heading title).

For Original Research articles, it is recommended to organize your manuscript in the following sections or their equivalents for your field.

Introduction Succinct, with no subheadings.

Materials and methods This section may be divided by subheadings and should contain sufficient detail so that when read in conjunction with cited references, all procedures can be repeated. For experiments reporting results on animal or human subject research, an ethics approval statement should be included in this section (for further information, see the 'Bioethics' section of our [policies and publication ethics](#).)

Results This section may be divided by subheadings. Footnotes should not be used and must be transferred to the main

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Language style

The default language style at Frontiers is American English. If you prefer your article to be formatted in British English, please specify this on the first page of your manuscript. For any questions regarding style, Frontiers recommends authors to consult the [Chicago Manual of Style](#).

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In general, seek to avoid:

- language that could be deemed insulting, profane, or derogatory.
- descriptors that identify personal attributes such as age, gender, race, ethnicity, culture, sexual orientation, disability, or health conditions, where they are not critically relevant to the discussion.
- any form of language that suggests a particular culture or group as the default or standard.

And where feasible:

- proactively ask individuals or groups how they would prefer to be referenced.
- adhere to the SAGER guidelines for reference to sex and gender in research.

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the article subject(s)

- Use the maximum amount of keywords in the first two sentences of the abstract
- Use some of the keywords in level 1 headings

Alt text

As part of our commitment to make science open for all, we are dedicated to accessibility in our publications. One way you can make your manuscript more accessible is by including alternative text (alt text) with all figures or images.

What is alt text?

Alt text is a short visual description of the contents of an image. Alt text is not the

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important?

also useful for anyone else who can't view the image - if it doesn't load quickly, for instance .

Alt text can also provide better descriptions to search engine crawlers, helping with article discoverability and indexing.

For more support, our partner [AuthorMate offers an alt-text writing service](#).

Guidelines for artificial intelligence

These guidelines cover acceptable uses of generative AI technologies such as Large Language Models (ChatGPT, Jasper) and text-to-image generators (DALL-E 2, Midjourney, Stable Diffusion) in the writing or editing of manuscripts submitted to

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produced by or edited using a generative

technology. This includes, but is not limited to, any quotes, citations or references. Figures produced by or edited using a generative AI technology must be checked to ensure they accurately reflect the data presented in the manuscript. Authors must also check that any written or visual content produced by or edited using a generative AI technology is free from plagiarism.

If the author of a submitted manuscript has used written or visual content produced by or edited using a generative AI technology, such use must be acknowledged in the acknowledgements section of the manuscript and the methods section if applicable. This explanation must list the name, version, model, and source of the generative AI technology. We encourage authors to upload all input prompts provided to a generative AI technology and outputs received from a generative AI technology

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a minimum. Non-standard abbreviations should be avoided unless they appear at

Equations should be inserted in editable format from the equation editor.

Italicize gene symbols and use the approved gene nomenclature where it is available. For human genes, please refer to the HUGO Gene Nomenclature Committee ([HGNC](#)). New symbols for human genes should be submitted to the HGNC [here](#). Common alternative gene aliases may also be reported, but should not be used alone in place of the HGNC symbol. Nomenclature committees for other species are listed [here](#). Protein products are not italicized.

We encourage the use of Standard International Units in all manuscripts.

Chemical compounds and biomolecules should be referred to using systematic nomenclature, preferably using the recommendations by the International Union of Pure and Applied Chemistry

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the code section of our [policies and publication ethics](#).

formatting references

Submissions to Frontiers must be grounded in relevant and up to date peer-reviewed, academic research, and this should be reflected in the accompanying reference lists.

Authors are welcome to use online referencing tools in preparation of their manuscript. Some useful resources include [RefMe](#), [Zotero](#), and [Mendeley](#).

- The citation of non-academic and non-peer-reviewed sources (e.g. blog posts, website content), as well as anonymous sources or commercial websites should be avoided or kept to a minimum
- Authors should avoid citing content that is not directly relevant to the scope of the article and the journal
- Reference lists should reflect the current status of knowledge in the

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date) or Vancouver (numbered). Please check our [help center](#) to find the correct

- The names of the first six authors followed by et al. and the DOI (when available) should be provided
- Given names of authors should be abbreviated to initials (e.g., Smith, J., Lewis, C.S., etc.)
- The reference list should only include articles that are published or accepted
- Unpublished data, submitted manuscripts, or personal communications should be cited within the text only, for article types that allow such inclusions
- For accepted but unpublished works use 'in press' instead of page numbers
- Data sets that have been deposited to an online repository should be included in the reference list. Include the version and unique identifier when available
- Personal communications should be documented by a letter of permission

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referencing system; to find the correct reference style and resources for the journal you are submitting to, please visit our [help center](#). Reference examples are found below, for more examples of citing other documents and general questions regarding the Harvard reference style, please refer to the [Chicago Manual of Style](#).

- References should include the full last name and first name initials of the first six authors, followed by et al. and the year of publication in brackets.
- Alphabetical order is followed for the reference list.

Reference examples

Article in a print journal Sondheimer, N., and Lindquist, S. (2000). Rnq1: an epigenetic modifier of protein function in yeast. *Mol. Cell* 5, 163-172

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gerontology database. (ACCESSION NO. 50360869)

Website World Health Organization. (2018). E. coli. <https://www.who.int/news-room/fact-sheets/detail/e-coli> [Accessed March 15, 2018].

Patent Marshall, S. P. (2000). Method and apparatus for eye tracking and monitoring pupil dilation to evaluate cognitive activity. U.S. Patent No 6,090,051. Washington, DC: U.S. Patent and Trademark Office.

Data Perdiguero P, Venturas M, Cervera MT, Gil L, Collada C. Data from: Massive sequencing of Ulms minor's transcriptome provides new molecular tools for a genus under the constant threat of Dutch elm disease. Dryad Digital Repository. (2015) <http://dx.doi.org/10.5061/dryad.ps837>

Theses and dissertations Smith, J. (2008) Post-structuralist discourse relative to phenomological pursuits in the

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reference style and resources for the

Vancouver reference style, please refer to [Citing Medicine](#).

In-text citations

- In-text citations in the Vancouver reference style should be numbered consecutively in order of appearance in the text and identified by Arabic numerals in parenthesis
- Use square brackets for physics and mathematics articles
- The abbreviation 'Ref' should not be used, e.g.: [e.g., (1)] should NOT read [e.g. Ref. (1)]
- Style for comparing a citation should follow the number format, e.g. [cf. (1)]. The same applies when using 'see', e.g. [see (46)]
- References should be numbered and listed chronologically, according to the

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University Press (1997). 345 p.

Abstract Christensen S, Oppacher F. An analysis of Koza's computational effort statistic for genetic programming. In: Foster JA, editor. Genetic Programming. EuroGP 2002: Proceedings of the 5th European Conference on Genetic Programming; 2002 Apr 3–5; Kinsdale, Ireland. Berlin: Springer (2002). p. 182–91.

Website World Health Organization. E. coli (2018). <https://www.who.int/news-room/fact-sheets/detail/e-coli> [Accessed March 15, 2018].

Patent Pagedas AC, inventor; Ancel Surgical R&D Inc., assignee. Flexible Endoscopic Grasping and Cutting Device and Positioning Tool Assembly. United States patent US 20020103498 (2002).

Data Perdiguero P, Venturas M, Cervera MT, Gil L, Collada C. Data from: Massive

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(Accessed March 15, 2018).

integrity of the references they cite, including verifying whether any article they intend to cite has been retracted. Citing retracted articles can undermine the credibility of your manuscript and should only occur where it is essential for the context of your discussion.

Guidelines for citing retracted articles:

1. **Verification:** Authors are responsible for checking the status of all cited works before submission. Lists of retracted articles can often be found in databases such as PubMed and the Retraction Watch database. Authors can check the version of the record which is expected to include a visible notice of retraction.
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ACKNOWLEDGMENTS

This is a short text to acknowledge the contributions of specific colleagues, institutions, or agencies that aided the efforts of the authors. Should the content of the manuscript have previously appeared online, such as in a thesis or preprint, this should be mentioned here, in addition to listing the source within the reference list.

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For LaTeX files, figures should be included in the provided PDF. In case of acceptance, our production office might require high-resolution files of the figures included in the manuscript in EPS, JPEG or TIF/TIFF format.

To upload more than one figure at a time, save the figures (labeled in order of appearance in the manuscript) in a zip file and upload them as 'Supplementary Material Presentation.'

Please note that figures not in accordance with the guidelines will cause substantial delay during the production process.

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layout in mind. Individual figures should not be longer than one page and with a

image appears blurry, jagged, or has a stair-stepped effect, the resolution is too low.

The text should be legible and of high quality. The smallest visible text should be no less than eight points in height when viewed at actual size.

Solid lines should not be broken up. Any lines in the graphic should be no smaller than two points wide.

Please note that saving a figure directly as an image file (JPEG, TIF) can greatly affect the resolution of your image. To avoid this, one option is to export the file as PDF, then convert into TIFF or EPS using a graphics software.

Format and color image mode

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settings: font, Arial; size, 8 pt

- Assign all chemical compounds a bold, Arabic numeral in the order in which the compounds are presented in the manuscript text.

Table requirements and style guidelines

Tables should be inserted at the end of the manuscript in an editable format. If you use a word processor, build your table in Word. If you use a LaTeX processor, build your table in LaTeX. An empty line should be left before and after the table.

Table captions must be placed immediately before the table. Captions should be preceded by the appropriate label, for example 'Table 1.' Please use only a single paragraph for the caption.

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understand all the content of an article.

These guidelines are easy to implement and are in accordance with the W3C Web Content Accessibility Guidelines ([WCAG 2.1](#)), the standard for web accessibility best practices.

Ensure sufficient contrast between text and its background People who have low visual acuity or color blindness could find it difficult to read text with low contrast background color. Try using colors that provide maximum contrast.

WC3 recommends the following contrast ratio levels:

- Level AA, contrast ratio of at least 4.5:1
- Level AAA, contrast ratio of at least 7:1

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Data that are not of primary importance to the text, or which cannot be included in the article because they are too large or the current format does not permit it (such as videos, raw data traces, and PowerPoint presentations), can be uploaded as supplementary material during the submission procedure and will be displayed along with the published article. All supplementary files are deposited to figshare for permanent storage and receive a DOI.

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Material section instead.

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- presentation (PowerPoint, PDF or Zip files)
- image (CDX, EPS, JPEG, PDF, PNG or TIF/TIFF),
- table (Word, Excel, CSV or PDF)
- audio (MP3, WAV or WMA)
- video (AVI, DIVX, FLV, MOV, MP4, MPEG, MPG or WMV).

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city zip codes or street names).

Example: Max Maximus¹ 1 Department of Excellence, International University of Science, New York, NY, United States.

Correspondence

The corresponding author(s) should be marked with an asterisk in the author list. Provide the exact contact email address of the corresponding author(s) in a separate section. Example: Max Maximus* maximus@iuscience.edu If any authors wish to include a change of address, list the present address(es) below the correspondence details using a unique superscript symbol keyed to the author(s) in the author list.

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authorship: These authors contributed equally to this work and share senior authorship

- **Equal contribution and last authorship:** These authors contributed equally to this work and share last authorship

Example: Max Maximus 1†, John Smith2† and Barbara Smith1 †These authors contributed equally to this work and share first authorship

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followed by the list of collaborators, so

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Example: John Smith and Barbara Smith on behalf of The Collaborative Working Group.

Keywords

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