

INSTRUCTIONS TO AUTHORS

SEE AUTHOR CHECKLIST

SCOPE

mBio[®] is a broad-scope open access journal edited by active research scientists. It strives to publish the best research in microbiology and allied fields. *mBio* publishes outstanding papers in all disciplines that address microbiological problems, including, but not limited to, biochemistry and molecular biology, genetics and genomics, environmental science, evolution, immunology, infectious disease, and physiology. Topics covered include bacteria, viruses, parasites, fungi, and simple eukaryotic organisms, as well as all types of host-microbe interactions. We understand that there may be overlap in the scope statements of the ASM journals. Questions about these guidelines may be directed to the editor in chief of the journal being considered.

ETHICS RESOURCES AND POLICIES

Ethics

Please refer to ASM Journals' Ethics Resources and Policies page (<https://journals.asm.org/content/ethics-and-policies>) for the ethical standards expected of manuscript submissions, as well as for specific recommendations on the proper use of microbiological information, the use of human subjects or animals in research, publishing ethics (including authorship, plagiarism, and image manipulation), conflicts of interest, and availability of data and materials.

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Warranties and Exclusions

Articles published in this journal represent the opinions of the authors and do not necessarily represent the opinions of ASM. ASM does not warrant the fitness or suitability, for any purpose, of any methodology, kit, product, or device described or identified in an article. The use of trade names is for identification purposes only and does not constitute endorsement by ASM.

SUBMISSION, REVIEW, AND PUBLICATION PROCESSES

Initial Submissions

For initial submissions, *mBio* welcomes papers in any format (format-neutral submissions). At this stage, authors may upload

individual files or a combined PDF, so long as they convey all of the materials intended for review. The reference style, the arrangement of sections of the paper, and other formatting issues are at the discretion of the author. Detailed formatting guidelines are described below. For revisions, resubmissions, and AAM Contributions, you may be asked to conform to these guidelines and/or provide publication-ready source files.

Submission Process

All submissions to *mBio* must be made electronically via the [online submission and peer review system](#). First-time users must create an Author account.

Review Process

All manuscripts are considered to be confidential and are reviewed by members of the *mBio* Board of Editors, invited editors, or invited reviewers.

To expedite the review process, authors must recommend five (5) members of the *mBio* Board of Editors (available at <https://mbio.asm.org/content/board-editors>) who would be able to handle the review of their manuscript. Authors also must suggest at least three (3) reviewers (five are recommended) who have expertise in the field, who are not members of their institution(s), who have not recently been associated with their laboratory(ies), and who could not otherwise be considered to pose a conflict of interest regarding the submitted manuscript. Please provide their contact information where indicated on the submission form. Impersonation of another individual during the review process is considered serious misconduct.

When a manuscript is submitted to the journal, it is given a manuscript control number (e.g., mBio00123-20) and assigned to a member of the Board of Editors. (Always refer to this control number in communications with the editor and the Journals Department.) From there it is assigned to at least two independent experts for peer review. A single-blind review, where authors' identities are known to reviewers, is applied. It is the responsibility of the corresponding author to inform the coauthors of the manuscript's status throughout the submission, review, and publication processes. The reviewers operate under strict guidelines set forth in "Reviewer Guidelines" (<https://journals.asm.org/content/reviewer-guidelines>) and are expected to complete their reviews expeditiously.

The corresponding author is notified, generally within 4 weeks after submission, of the decision to accept, reject, or require modification. When modification is requested, the corresponding author must either submit the modified version within 30 days or withdraw the manuscript. A point-by-point response to all of the reviews must be uploaded as a separate Response to Reviewer Comments file. Addition-

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Instructions to Authors are updated throughout the year. The current version is available on the journal website.

ally, a Marked Up Manuscript file (without figures) highlighting all of the changes from the original manuscript submission must be uploaded as a separate file. For the benefit of editors and reviewers assessing revisions, all changes in this file should be highlighted, no matter how minor. Please note that a manuscript may not necessarily be processed editorially until a version with all changes noted has been submitted.

AAM Contributions

mBio is published in association with the American Academy of Microbiology (AAM), and AAM Fellows are entitled to submit one paper per calendar year via a special, accelerated submission path. This path requires Fellows to obtain two reviews prior to submission (from reviewers who are not recent collaborators, trainees, etc.), make any necessary modifications in response to the reviewers' comments, and communicate the entire package to *mBio*: the initial reviews, point-by-point responses to the reviewer comments, the revised paper, and e-mail verification showing that each reviewer has seen and approved the final manuscript.

AAM Contributions should be formatted as either Research Articles or Observations and are subject to the same length requirements as regular Research Articles and Observations. Reviewers for AAM Contributions are required to fill out an external review form [external review form](#). Detailed instructions for submitting an AAM Contribution can be found at <https://mbio.asm.org/content/fellows>.

Submitting via this path does not guarantee acceptance. The editor still has the option of recommending modification or rejection. However, AAM Contributions will not be subject to additional blind review. Like all other *mBio* articles, AAM Contributions are expected to represent the top 10% of work in the field.

Papers cannot be "communicated" via the AAM Contribution path; AAM Fellows can submit only papers that they have authored or coauthored.

Manuscripts that were previously rejected from the standard peer review path are not eligible for resubmission through the AAM Contribution path.

Rejected Manuscripts

Authors who believe that their manuscript has been unfairly rejected because an important aspect was misunderstood or overlooked by the reviewers may submit an appeal. The appeal will be processed by the editor in chief, who may consult with the editor and/or invited editor of the manuscript. Please note that while we are willing to entertain appeals, it is uncommon for editorial decisions to be reversed.

Manuscripts that have been rejected, or withdrawn after being returned for modification, may be resubmitted to *mBio* (once; see below) if the major criticisms have been addressed.

Manuscripts rejected by *mBio* may be resubmitted to a more appropriate ASM journal without penalty; however, a manuscript rejected by another ASM journal is considered rejected by *mBio* and will not be reviewed.

The cover letter of every resubmitted manuscript must state that the manuscript is a resubmission, and the former manuscript control number must be provided. A point-by-point re-

sponse to the review(s) must be included (as a separate Response to Reviewer Comments file), and a compare copy of the revised manuscript should be included as a Marked Up Manuscript file. Manuscripts resubmitted to the same journal are normally handled by the original editor. Rejected manuscripts may be resubmitted only once unless permission has been obtained from the original editor or from the editor in chief.

Manuscripts Reviewed by Non-ASM Journals

mBio will consider previous reviews from certain highly selective non-ASM journals. If you have addressed the review comments from the other journal and feel that your manuscript may be suitable for publication in *mBio*, please include the following items in your *mBio* submission:

- A cover letter declaring the previous submission and requesting expedited review
- A PDF file of the entire previously submitted manuscript uploaded as a Related Manuscript File
- A Response to Reviewer Comments file containing the previous decision letter(s), all previous reviews, any manuscript correspondence, and your point-by-point response to the reviews, including page and line numbers where changes have been made
- A tracked-changes file showing the revisions made, uploaded as a Marked Up Manuscript file

In many cases, manuscripts with previous reviews will receive an expedited decision. The editor still has the option to request additional review and revisions.

Notification of Acceptance

When an editor has decided that a manuscript is acceptable for publication on the basis of scientific merit, the author and the Journals Department are notified. The text files undergo an automated preediting, cleanup, and tagging process specific to the particular article type, and the illustrations are examined. If all files have been prepared according to the criteria set forth in these Instructions and those in the manuscript submission system, the acceptance procedure will be completed successfully. If there are problems that would cause extensive corrections to be made at the copyediting stage or if the files are not acceptable for production, ASM Journals staff will contact the corresponding author. Once all the material intended for publication has been determined to be adequate, the editorial staff of the ASM Journals Department completes the editing of the manuscript to bring it into conformity with prescribed standards.

mBio Publication Schedule

mBio articles are released in an article-based workflow. Articles are not held until an issue is released. The articles published over the preceding weeks are collected into a bimonthly issue and moved into the *mBio* archive.

Page Proofs

Page proofs, together with a query sheet, will be made available to the corresponding author electronically. Included in

the proofs will be the typeset pages of the article, a page showing the legends for any supplemental material (since these legends will appear in the HTML view of the published article), and an author query sheet. All author queries must be answered, and any changes related to the queries, as well as any additional changes, must be indicated in the text. Note that the copy editor does not query at every instance where a change has been made. Queries are written only to request clarification or to draw attention to edits that may have altered the sense. It is the author's responsibility to read the entire proof. The corrected, annotated PDF file must be returned within two business days to mBio@asmusa.org.

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Questions about proofs should be directed to the *mBio* staff (e-mail, mBio@asmusa.org).

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The National Institutes of Health (NIH) requests that its grantee and intramural authors provide copies of their accepted manuscripts to PubMed Central (PMC) for posting in the PMC Public Access Repository. *mBio* authors are automatically in compliance with this policy and need take no action themselves. For the past several years, ASM has deposited in PMC all publications from all ASM journals. Since *mBio* articles are open access and are made available through PMC and international PMC-like repositories immediately after publi-

cation, ASM is in full compliance with NIH policy. For more information, see <https://publicaccess.nih.gov/>.

ASM also allows *mBio* authors whose work was supported by funding agencies that have public access requirements like those of the NIH (e.g., the Wellcome Trust) to post their accepted manuscripts in publicly accessible electronic repositories maintained by those funding agencies. If a funding agency does not itself maintain such a site, then ASM allows the author to fulfill that requirement by depositing the article in an appropriate institutional or subject-based open repository established by a government or noncommercial entity.

ASM requests that when submitting an accepted manuscript to PMC or a similar public access site, the author specify that **the posting release date for the manuscript be no earlier than the date of publication on the *mBio* website**. Articles are published on the website as soon as they are processed, so delays should be minimal.

Publication Fees

Authors whose research was supported by grants, special funds (including departmental and institutional), or contracts (including governmental) or whose research was done as part of their official duties (government or corporate, etc.) are required to pay the article processing charge (APC) and supplemental material fee (if relevant) noted in [Table 1](#).

All fees are subject to change without notice. Nonmember corresponding authors may [join ASM](#) to obtain discounts on publication fees. Former members who wish to renew their membership at the same level may do so [online](#). However, to change your membership level, please contact customer service at Service@asmusa.org.

If the research was not supported by any of the means described above, a request to waive the fee may be made through the online submission form or submitted via e-mail to mBio@asmusa.org. The request must include the manuscript control number assigned by ASM and indicate how the work was supported.

Minireviews, Commentaries, Perspectives, Editorials, and Letters to the Editor are not subject to APCs.

Author Reprints

Instructions for ordering reprints can be found in the billing notification e-mail sent to all corresponding authors. Please see the [Author Center](#) for more information.

TABLE 1 Publication fees^a

Fee type	Fee (\$) for all members except supporting members	Fee (\$) for supporting members and nonmembers
Research paper APC	2,500	3,500
Short article (i.e., Observation or Opinion/Hypothesis) APC	1,360	1,990
Supplemental material (flat) fee	230	355

^aPublication fees do not apply to Minireviews, Commentaries, Perspectives, Editorials, Letters to the Editor, or corrections. For member discounts, the corresponding author must be an ASM member.

ORGANIZATION AND FORMAT

Editorial Style

The editorial style of ASM journals conforms to the *ASM Style Manual for Journals* (American Society for Microbiology, 2020, in-house document [you may find the [ASM Word List](#) helpful]) and *How To Write and Publish a Scientific Paper*, 7th ed. (Greenwood, Santa Barbara, CA, 2011), as interpreted and modified by the editors and the ASM Journals Department.

The editors and the Journals Department reserve the privilege

of editing manuscripts to conform with the stylistic conventions set forth in the aforesaid publications and in these Instructions. Please note that ASM uses the serial comma.

On receipt at ASM, an accepted manuscript undergoes an automated proofreading, cleanup, and tagging process specific to the particular article type. To optimize this process, accepted manuscripts must be supplied in the correct format and with the appropriate sections and headings. The Journals staff will contact you if anything is needed before processing for publication.

Type every portion of the manuscript double-spaced (a minimum of 6 mm between lines), including figure legends, table footnotes, and References, and number all pages in sequence, including the abstract, figure legends, and tables. Place the last two items after the References section.

Manuscript pages should have continuous line numbers. The font size should be no smaller than 12 points. It is recommended that the following sets of characters be easily distinguishable in the manuscript: the numeral zero (0) and the letter “oh” (O); the numeral one (1), the letter “el” (l), and the letter “eye” (I); and a multiplication sign (×) and the letter “ex” (x). Do not create symbols as graphics or use special fonts that are external to your word processing program; use the “insert symbol” function. Set the page size to 8.5 by 11 inches (ca. 21.6 by 28 cm). Italicize any words that should appear in italics, and indicate paragraph lead-ins in boldface type.

Authors who are unsure of proper English usage should have their manuscripts checked by someone proficient in the English language or engage a professional language editing service for help.

Manuscripts may be editorially rejected, without review, on the basis of poor English or lack of conformity to the standards set forth in these Instructions.

First-time claims should be avoided. Manuscripts should report new and significant findings that advance the understanding of microbiology; therefore, first-time claims are unnecessary.

Article Word Count

mBio article word counts are based on the article type. Research Articles should be approximately 5,000 words. Minireviews should be approximately 6,000 words maximum (with up to two figures or tables). Opinions/Hypotheses should be approximately 2,500 words maximum. Perspectives should be approximately 2,000 words maximum. Observations should be approximately 1,200 words maximum. Commentaries should be approximately 1,000 words maximum. Letters to the Editor and Replies should each be approximately 500 words maximum. Word counts do not include Materials and Methods, references, tables, or figure legends.

Authors will be asked to shorten overlong papers.

Supplemental Material

Supplemental material can be posted by *mBio* or, if authors prefer, can be submitted by the authors for posting by a third-party service such as Dryad, figshare, or a similar repository. In the latter case, the assigned accession number(s) must be included in the manuscript submitted for review.

Supplemental items intended for posting by ASM should be uploaded as separate “Supplemental Material” files. Each item in

the supplemental material should be submitted as a separate file; e.g., multiple figures and/or tables should not be zipped together or combined in a single PDF. ASM will post no more than 10 individual supplemental items. The maximum size permitted for an individual file is 3 MB (20 MB for movie and data set files).

To ensure broad access, we ask that supplemental files be submitted in the following standard formats.

- **Text:** Word, RTF, or PDF files.
- **Figures:** TIFF, EPS, PPT, PDF, JPEG, or GIF format.
- **Tables:** Word, RTF, or PDF files.
- **Data sets:** Excel (.xls), RTF, TXT, or PDF files.
- **Movies:** Audio Video Interleave (.avi), QuickTime (.mov), or MPEG files.

At the end of the manuscript text file, include a legend for each item in the supplemental material. **If it is necessary to cite references that are relevant only to these supplemental legends, use the style described for “Citations in abstracts”; do not include these references in the References section of the manuscript.** Supplemental material should be numbered with an “S” (e.g., Movie S1, Fig. S1, Fig. S2, etc.), and each item should be cited at least once in the text.

Supplemental material will be peer reviewed along with the manuscript. The main manuscript should include a distillation of the results such that the principal conclusions are fully supported without referral to the supplemental material. Supplemental material will not be edited by the ASM Journals staff, and proofs will not be made available. Supplemental material will always remain associated with the article and is not subject to any modifications after publication.

Material that has been published previously (in print or online) is not acceptable for posting as supplemental material. Instead, the appropriate reference(s) to the original publication should be made in the manuscript text.

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Research Articles

Research Articles are limited to 5,000 words (exclusive of references, tables, and figure legends) and should report a major advance in any area of microbiology or allied fields. These articles should include the elements described in this section.

Title, running title, byline, affiliation line(s), and corresponding author. Each manuscript should present the results of an independent, cohesive study; thus, numbered series titles are not allowed. Avoid the main title/subtitle arrangement, complete sentences, and unnecessary articles. Indicate the specific organisms under study in the title or abstract as appropriate. On the title page, include the title, the running title (not to exceed 54 characters and spaces), the name of each author, all

authors' affiliations at the time the work was performed, the name(s) and e-mail address(es) of the corresponding author(s), and a footnote (*) indicating the present address of any author no longer at the institution where the work was performed. Place a number sign (#) in the byline after the affiliation letter(s) of the author to whom inquiries regarding the paper should be directed (see "[Correspondent footnote](#)"). Indicate each author's affiliation with a superscript lowercase letter placed after the author's surname in the byline (separate multiple affiliation letters with commas but no space). Each affiliation should have its own line and its own superscript affiliation letter preceding it. Do not consolidate different departments at one institution into one address with a single affiliation letter, even if all affected authors belong to all of those departments. Also include on the title page the word count for the abstract and the word count for the text (excluding the references, table footnotes, and figure legends). [Please review this sample title page for guidance.](#)

Correspondent footnote. The e-mail address for the corresponding author should be included on the title page of the manuscript. This information will be published with the article to facilitate communication, and the e-mail address will be used to notify the corresponding author of the availability of proofs and, later, of the PDF file of the published article. No more than two authors may be designated corresponding authors.

Two-part abstract. Research Articles have structured abstracts consisting of two sections with their own headings: "Abstract" and "Importance." Because the structured abstract will be published separately by abstracting services, it must be complete and understandable without reference to the text. Please refer to a [sample structured abstract for guidance](#). For a discussion of how to evaluate the importance of a piece of research, see the essay by A. Casadevall and F. C. Fang, *Important Science—It's All About the SPIN*, *Infect Immun* 77:4177-4180.

The Abstract section should be no more than 250 words and should concisely summarize the basic content of the paper without presenting extensive experimental details.

The Importance section should be no more than 150 words and should provide a nontechnical explanation of the significance of the study to the field. Avoid abbreviations and references, and indicate the specific organism under study. When it is essential to include a reference, use the format shown under "References" below (see the "[Citations in abstracts](#)" section).

Introduction. The introduction should supply sufficient background information to allow the reader to understand and evaluate the results of the present study without referring to previous publications on the topic. The introduction should also provide the hypothesis that was addressed or the rationale for the present study. Use only those references required to provide the most salient background rather than an exhaustive review of the topic.

Results. In the Results section, include the rationale or design of the experiments as well as the results; reserve extensive interpretation of the results for the Discussion section. Present the results as concisely as possible in one of the following: text,

table(s), or figure(s). Avoid extensive use of graphs to present data that might be more concisely presented in the text or tables. Limit photographs (particularly photomicrographs and electron micrographs) to those that are absolutely necessary to show the experimental findings. Number figures and tables in the order in which they are cited in the text, and be sure to cite all figures and tables.

Discussion. The Discussion should provide an interpretation of the results in relation to previously published work and to the experimental system at hand and should not contain extensive repetition of the Results section or reiteration of the introduction. In short papers, the Results and Discussion sections may be combined.

Materials and Methods. The Materials and Methods section should include sufficient technical information to allow the experiments to be repeated. When centrifugation conditions are critical, give enough information to enable another investigator to repeat the procedure: make of centrifuge, model of rotor, temperature, time at maximum speed, and centrifugal force ($\times g$ rather than revolutions per minute). For commonly used materials and methods (e.g., media and protein concentration determinations), a simple reference is sufficient. If several alternative methods are commonly used, it is helpful to identify the method briefly as well as to cite the reference. For example, it is preferable to state "cells were broken by ultrasonic treatment as previously described (9)" rather than to state "cells were broken as previously described (9)." This allows the reader to assess the method without constant reference to previous publications. Describe new methods completely and give sources of unusual chemicals, equipment, or microbial strains. When large numbers of microbial strains or mutants are used in a study, include tables identifying the immediate sources (i.e., sources from whom the strains were obtained) and properties of the strains, mutants, bacteriophages, and plasmids, etc.

Enzyme purifications should be described in this section, but the results of such procedures should be described in the Results section. A method or strain, etc., used in only one of several experiments reported in the paper may be described in the Results section or very briefly (one or two sentences) in a table footnote or figure legend. It is expected that the sources from whom the strains were obtained will be identified.

As noted on ASM Journals' [Ethics Resources and Policies](#) page, a paragraph dedicated to new accession numbers for nucleotide and amino acid sequences, microarray data, protein structures, gene expression data, and MycoBank data should appear at the end of Materials and Methods with the paragraph lead-in "Data availability." Please also provide references (with URLs) for the accession numbers.

Acknowledgments. Statements regarding sources of direct financial support (e.g., grants, fellowships, and scholarships, etc.) should appear in the Acknowledgments. A funding statement indicating what role, if any, the funding agency had in your study (for example, "The funders had no role in study design, data collection and interpretation, or the decision to submit the work for publication.") may be included. Funding

agencies may have specific wording requirements, and compliance with such requirements is the responsibility of the author. In cases in which research is not funded by any specific project grant, funders need not be listed, and the following statement may be used: “This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.” Statements regarding indirect financial support (e.g., commercial affiliations, consultancies, stock or equity interests, and patent licensing arrangements) are also allowed. It is the responsibility of authors to provide a general statement disclosing financial or other relationships that are relevant to the study.

Recognition of personal assistance should be given in the Acknowledgments section, as should any statements disclaiming endorsement or approval of the views reflected in the paper or of a product mentioned therein.

In addition to acknowledging sources of financial support in the manuscript, authors should list any sources of funding in response to the Funding Sources question on the online submission form, providing relevant grant numbers where possible, and the authors associated with the specific funding sources. In the event that your submission is accepted, the funding source information provided in the submission form may be published, so please ensure that all information is entered accurately and completely. (It will be assumed that the absence of any information in the Funding Sources fields is a statement by the authors that no support was received.)

Appendixes. Appendixes that contain additional material to aid the reader are permitted. Titles, authors, and reference sections that are distinct from those of the primary article are not allowed. If it is not feasible to list the author(s) of the appendix in the byline or the Acknowledgments section of the primary article, rewrite the appendix so that it can be considered for publication as an independent article. Equations, tables, and figures should be labeled with the letter “A” preceding the numeral to distinguish them from those cited in the main body of the text.

References. In the reference list, references are numbered in the order in which they are cited in the article (citation-sequence reference system). In the text, references are cited parenthetically by number in sequential order. Data that are not published or not peer reviewed are simply cited parenthetically in the text (see section ii [below](#)).

(i) References listed in the References section. The following types of references must be listed in the References section:

- Journal articles (both print and online)
- Books (both print and online)
- Book chapters (publication title is required)
- Patents and patent applications
- Theses and dissertations
- Published conference proceedings
- Meeting abstracts, posters, and presentations
- Letters (to the editor)
- Company publications
- In-press journal articles, books, and book chapters
- Data sets
- Code

Provide the names of all the authors and/or editors for each reference; long bylines should not be abbreviated with “et al.”

All listed references must be cited in the text. Abbreviate journal names according to the PubMed Journals Database (National Library of Medicine, National Institutes of Health; available at <https://www.ncbi.nlm.nih.gov/nlmcatalog/journals>), the primary source for ASM style (do not use periods with abbreviated words). The EndNote output style for ASM Journals’ current reference style can be found at https://endnote.com/style_download/american-society-for-microbiology-asm-journals-2/; save it to your EndNote Styles folder (it should replace any earlier output styles for ASM journals [all ASM journals use the same reference style]). Note that DOIs are not needed for most references. ASM copy editors will automatically insert DOIs on all references in the CrossRef and PubMed databases during copyediting. URLs for government reports and other references not indexed in these databases should be provided if desired; URLs for citations of database accession numbers and code/software should be provided by you.

Follow the styles shown in the examples below.

1. Caserta E, Haemig HAH, Manias DA, Tomsic J, Grundy FJ, Henkin TM, Dunny GM. 2012. *In vivo* and *in vitro* analyses of regulation of the pheromone-responsive *prgQ* promoter by the PrgX pheromone receptor protein. *J Bacteriol* 194: 3386–3394.
2. Bina XR, Taylor DL, Vikram A, Ante VM, Bina JE. 2013. *Vibrio cholerae* ToxR downregulates virulence factor production in response to cyclo(Phe-Pro). *mBio* 4:e00366-13.
3. Winnick S, Lucas DO, Hartman AL, Toll D. 2005. How do you improve compliance? *Pediatrics* 115:e718–e724.
4. Falagas ME, Kasiakou SK. 2006. Use of international units when dosing colistin will help decrease confusion related to various formulations of the drug around the world. *Antimicrob Agents Chemother* 50:2274–2275. (Letter.) {“Letter” or “Letter to the editor” is allowed but not required at the end of such an entry.}
5. Cox CS, Brown BR, Smith JC. *J Gen Genet*, in press.* {Article title is optional; journal title is mandatory.}
6. Forman MS, Valsamakis A. 2011. Specimen collection, transport, and processing: virology, p 1276–1288. *In* Versalovic J, Carroll KC, Jorgensen JH, Funke G, Landry ML, Warnock DW (ed), *Manual of clinical microbiology*, 10th ed, vol 2. ASM Press, Washington, DC.
7. da Costa MS, Nobre MF, Rainey FA. 2001. Genus I. *Thermus* Brock and Freeze 1969, 295,^{AL} emend. Nobre, Trüper and da Costa 1996b, 605, p 404–414. *In* Boone DR, Castenholz RW, Garrity GM (ed), *Bergey’s manual of systematic bacteriology*, 2nd ed, vol 1. Springer, New York, NY.
8. Fitzgerald G, Shaw D. *In* Waters AE (ed), *Clinical microbiology*, in press. EFH Publishing Co, Boston, MA.* {Chapter title is optional.}
9. Green PN, Hood D, Dow CS. 1984. Taxonomic status of some methylotrophic bacteria, p 251–254. *In* Crawford RL, Hanson RS (ed), *Microbial growth on C₁ compounds*. Proceedings of the 4th International Symposium. American Society for Microbiology, Washington, DC.
10. Rotimi VO, Salako NO, Mohaddas EM, Philip LP. 2005. Abstr 45th Intersci Conf Antimicrob Agents Chemother, abstr D-1658. {Abstract title is optional.}

11. Smith D, Johnson C, Maier M, Maurer JJ. 2005. Distribution of fimbrial, phage and plasmid associated virulence genes among poultry *Salmonella enterica* serovars, abstr P-038, p 445. Abstr 105th Gen Meet Am Soc Microbiol. American Society for Microbiology, Washington, DC. {*Abstract title is optional.*}
12. García CO, Paira S, Burgos R, Molina J, Molina JF, Calvo C, Vega L, Jara LJ, García-Kutzbach A, Cuellar ML, Espinoza LR. 1996. Detection of *Salmonella* DNA in synovial membrane and synovial fluid from Latin American patients using the polymerase chain reaction. *Arthritis Rheum* 39(Suppl 9):S185. {*Meeting abstract published in journal supplement.*}
13. O'Malley DR. 1998. PhD thesis. University of California, Los Angeles, CA. {*Title is optional.*}
14. Stratagene. 2006. Yeast DNA isolation system: instruction manual. Stratagene, La Jolla, CA. {*Use the company name as the author if none is provided for a company publication.*}
15. Odell JC. April 1970. Process for batch culturing. US patent 484,363,770. {*Include the name of the patented item/process if possible; the patent number is mandatory.*}
16. Harrison F, Roberts AEL, Gabriliska R, Rumbaugh KP, Lee C, Diggle SP. 2015. A 1,000-year-old antimicrobial remedy with antistaphylococcal activity. *mBio* 6:e01129-15. {*Original article that describes how data submitted to a database were generated.*}
17. Harrison F, Roberts AEL, Gabriliska R, Rumbaugh KP, Lee C, Diggle SP. 2015. Data from "A 1,000-year-old antimicrobial remedy with antistaphylococcal activity." Dryad Digital Repository <https://doi.org/10.5061/dryad.mn17p>. {*Citation for the database where the data in the previous reference were deposited; the URL is necessary.*}
18. Wang Y, Rozen D. 2016. Colonization and transmission of the gut microbiota of the burying beetle, *Nicrophorus vespilloides*, through development. *bioRxiv* <https://doi.org/10.1101/091702>.

*A reference to an in-press ASM publication should state the control number (e.g., mBio00123-20) if it is a journal article or the name of the publication if it is a book.

In some online journal articles, posting or revision dates may serve as the year of publication; a DOI (preferred) or URL is required for articles with nontraditional page numbers or electronic article identifiers.

Magalon A, Mendel RR. 15 June 2015, posting date. Biosynthesis and insertion of the molybdenum cofactor. *EcoSal Plus* 2015 doi:10.1128/ecosalplus.ESP-0006-2013.

Note: a posting or accession date is required for any online reference that is periodically updated or changed.

Citations of accepted ASM manuscripts should look like the following example.

Wang GG, Pasillas MP, Kamps MP. 15 May 2006. Persistent transactivation by Meis1 replaces Hox function in myeloid leukemogenesis models: evidence for co-occupancy of Meis1-Pbx and Hox-Pbx complexes on

promoters of leukemia-associated genes. *Mol Cell Biol* doi:10.1128/MCB.00586-06.

Other journals may use different styles for their publish-ahead-of-print manuscripts, but citation entries must include the following information: author name(s), posting date, title, journal title, and volume and page numbers and/or DOI. The following is an example:

Zhou FX, Merianos HJ, Brunger AT, Engelman DM. 13 February 2001. Polar residues drive association of polyleucine transmembrane helices. *Proc Natl Acad Sci U S A* doi: 10.1073/pnas.041593698.

To encourage data sharing and reuse, ASM recommends reporting data sets and/or code both in a dedicated "Data availability" paragraph and in References. The components of a complete data citation include the following:

- Responsible party (senior author, collector, agency),
- Publication year,
- Complete name of a data set, including the name of the database or repository and its URL, **or** the name of the analysis software (if appropriate), including the version and project,
- Publisher (if appropriate), and
- Persistent unique identifier(s) (e.g., URL[s] or accession number[s]).

The following templates may be helpful.

Author. Year. Description of study topic. Retrieved from Database URL (accession no. ●●●●●●). {*Unpublished raw data.*}

Author. Year. Description or title of software (version). Repository URL. Retrieved day month year. {*Software or code.*}

Examples follow.

Christian SL, McDonough J, Liu C-Y, Shaikh S, Vlamakis V, Badner JA, Chakravarti A, Gershon ES. 2002. Data from "An evaluation of the assembly of an approximately 15-Mb region on human chromosome 13q32-q33 linked to bipolar disorder and schizophrenia." GenBank <https://www.ncbi.nlm.nih.gov/nuccore/AF339794> (accession no. AF339794). {*Accession number.*}

Sun Z. 2013. Reprocessed: in-depth membrane proteomic study of breast cancer tissues. ProteomeXchange <http://proteomecentral.proteomexchange.org/cgi/GetDataset?ID=RPXD000665> (accession number requested). {*Unsigned accession number.*}

Hogle S. 2015. Supplemental material for Hogle et al. 2015 *mBio*. figshare <https://doi.org/10.6084/m9.figshare.1533034.v1>. Retrieved 16 March 2017. {*Code and/or software.*}

Nesbitt HK, Moore JW. 2016. Data from "Species and population diversity in Pacific salmon fisheries underpin indigenous food security." Dryad Digital Repository <https://doi.org/10.5061/dryad.ng8pf>. {*Data set in repository.*}

(ii) References cited in the text. References that should be cited in the text include the following:

- Unpublished data
- Manuscripts submitted for publication
- Personal communications
- Websites

These references should be made parenthetically in the text as follows:

- ... similar results (R. B. Layton and C. C. Weathers, unpublished data).
- ... system was used (J. L. McInerney, A. F. Holden, and P. N. Brighton, submitted for publication).
- ... as suggested by the World Health Organization (<http://www.who.int/campaigns/immunization-week/2017/en/>).

URLs for companies that produce any of the products mentioned in your study or for products being sold may not be included in the article. However, company URLs that permit access to scientific data related to the study or to shareware used in the study are permitted.

(iii) Citations in abstracts. Because the abstract must be able to stand apart from the article, references cited in it should be clear without recourse to the References section. Use an abbreviated form of citation, omitting the article title, as follows.

- (P. S. Satheshkumar, A. S. Weisberg, and B. Moss, *J Virol* 87:10700–10709, 2013, doi:10.1128/JVI.01258-13)
- (J. H. Coggin, Jr., p. 93–114, in D. O. Fleming and D. L. Hunt, ed., *Biological Safety. Principles and Practices*, 4th ed., 2006)
- “... in a recent report by D. A. Hopwood (*mBio* 4:e00612-13, 2013, doi:10.1128/mBio.00612-13) . . .”

When necessary, this style should also be used for references cited in legends for supplemental material and in Addenda in Proof.

(iv) References related to supplemental material. For the reader’s benefit, and to avoid the potential for error during revisions, **references cited in the supplemental material must be maintained separately from the references cited in the main text.**

If references must be cited for an item in the supplemental material, include those references in the supplemental item itself and cite them by those numbers. Do not include references in the main text that are cited only in the supplemental material. If any references are cited in both the supplemental material and the main text, those references should be included separately in both places.

If references must be cited in the supplemental legends in the main text, use the format for “[Citations in abstracts](#)” rather than a numbered citation.

Observations

Observations are short descriptions (with a maximum of 1,200 words and no more than 2 figures and 25 references) of

research results of exceptional importance and unusual interest to the broad microbiology community, e.g., reports of a new type of organism, a new organelle, a new association of microbes and disease, etc.

The body of an Observation may have paragraph lead-ins. As with Research Articles, authors should include an abstract of 250 words or fewer as well as an Importance section of 150 words or fewer providing a nontechnical explanation of why the work was undertaken.

As noted on ASM Journals’ [Ethics Resources and Policies](#) page under “mBio open data policy,” a paragraph dedicated to new accession numbers for nucleotide and amino acid sequences, microarray data, protein structures, gene expression data, and MycoBank data should appear at the end of the text with the paragraph lead-in “Data availability.”

Minireviews

Minireviews are brief summaries (with a maximum of 6,000 words and up to two figures or tables) of important developments in microbiology research. They must be based on published articles, and they may address any subject within the scope of the journal.

Minireviews may be either solicited or proffered by authors responding to a recognized need. Irrespective of origin, Minireviews are subject to review and should be submitted via the online manuscript submission and peer review system. The cover letter should state whether the article was solicited and by whom.

Minireviews must have abstracts. Limit the abstract to 250 words or fewer. The body of the Minireview may have section headings and/or paragraph lead-ins.

Author bios. At the editor’s invitation, corresponding authors of minireviews may submit a short biographical sketch and photo for each author for publication with the article. Biographical information should be submitted at the modification stage.

- The text limit is 150 words for each author and should include WHO you are (your name), WHERE you received your education, WHAT positions you have held and at WHICH institutions, WHERE you are now (your current institution), WHY you have this interest, and HOW LONG you have been in this field.
- The photo should be a black-and-white head shot of passport size. Photos will be reduced to approximately 1.125 inches wide by 1.375 inches high. Photos must meet the production criteria for regular figures.
- To submit, upload the text and photos with your modified manuscript in the eJournalPress (eJP) online manuscript submission and peer review system. Include the biographical text after the References section of your manuscript, in the same file. Upload the head shots in the submission system as a “Minireview Bio Photo”; **include the author’s name or enough of it for identification in each photo’s file name.** Contact the *mBio* staff if you have questions about what to write or if you have questions about submitting your files.

Opinions/Hypotheses

Opinions/Hypotheses are short articles (with a maximum of 2,500 words and no more than 25 references) that present original and well-developed insights without complete supporting data. Although microbiology and allied fields are primarily experimental sciences, this article type places equal importance on new thought that is formulated in a manner that summarizes a problem, provides a new synthesis, and/or is suitable for subsequent experimental testing.

In this category, the journal provides a highly visible venue for the publication of ideas that have the potential to move fields and to challenge the status quo.

Authors should provide an abstract of 150 words or fewer. The body of an Opinion/Hypothesis article may have section headings and/or paragraph lead-ins.

Commentaries

Commentaries are short articles (with a maximum of 1,000 words) that discuss issues of particular significance to the field of microbial sciences. Commentaries may discuss papers of special interest published in *mBio* or other timely information or comment. Commentaries may be solicited by editors or unsolicited submissions.

Authors should provide an abstract of 150 words or fewer. The body of a Commentary may have section headings and/or paragraph lead-ins.

Perspectives

Perspectives are brief reviews (limited to 2,000 words) that offer a succinct overview of a specific topic, with an emphasis on opinion and synthesis.

Authors should provide an abstract of 150 words or fewer. The body of a Perspective article may have section headings and/or paragraph lead-ins.

Editorials

Editorials communicated by members of the *mBio* Board of Editors address issues of science, politics, or policy.

Editorials should include an abstract of 150 words or fewer.

Letters to the Editor

Letters to the Editor are intended for comments on articles published in the journal and must cite published references to support the writer's argument.

Letters may be **no more than 500 words long and must be typed double-spaced**. All Letters to the Editor must be submitted electronically. The cover letter should refer to the article in question by its title and the last name of the first author. In addition, the volume and issue and/or DOI should be indicated. Letters to the Editor do not have abstracts. The Letter must have a distinct title, which must appear on the manuscript and on the submission form. Figures and tables should be kept to a minimum.

The Letter will be sent to the editor who handled the article in question. If the editor believes that publication is

warranted, he/she will solicit a reply from the corresponding author of the article and make a recommendation to the editor in chief. Final approval for publication rests with the editor in chief.

Please note that some indexing/abstracting services do not include Letters to the Editor in their databases.

Errata

Errata provide a means of correcting errors that occurred during the writing, typing, editing, or publication (e.g., a misspelling, a dropped word or line, or mislabeling in a figure) of a published article. Submit Errata via the *mBio* online submission and peer review system at <https://mbio.msubmit.net/cgi-bin/main.plex>. In the Abstract section of the submission form (a required field), put "Not Applicable." Upload the text of your Erratum as a Microsoft Word file. Please see a recent issue for correct formatting.

Author Corrections

Author Corrections provide a means of correcting errors of omission (e.g., author names or citations) and errors of a scientific nature that do not alter the overall basic results or conclusions of a published article (e.g., an incorrect unit of measurement or order of magnitude used throughout, contamination of one of numerous cultures, or misidentification of a mutant strain, causing erroneous data for only a [noncritical] portion of the study). Note that the addition of new data is not permitted.

For corrections of a scientific nature or issues involving authorship, including contributions and use or ownership of data and/or materials, all disputing parties must agree, in writing, to publication of the Correction. For omission of an author's name, e-mails from or letters signed by the authors of the article and the author whose name was omitted must be sent to the [production staff](#). The editor who handled the article will be consulted if necessary.

Submit an Author Correction via the online manuscript submission and peer review system at <https://mbio.msubmit.net/cgi-bin/main.plex>. In the submission form, select Erratum as the manuscript type; there is no separate selection in the submission system for an Author Correction, but your Correction will be published as such if appropriate. In the Abstract section of the submission form (a required field), put "Not Applicable." Upload the text of your Author Correction as a Microsoft Word file. Please see a recent issue for correct formatting. E-mail agreement is also acceptable, which may be confirmed by production staff.

Retractions

Retractions are reserved for major errors or breaches of ethics that, for example, may call into question the source of the data or the validity of the results and conclusions of an article. If you feel that a Retraction may be necessary for an article that you have authored, you should contact the *mBio* staff at mBio@asmusa.org. The *mBio* staff will submit a Retraction on your behalf. The Retraction will be assigned to the editor in chief of the journal, and the editor who handled the paper and the chairperson of the ASM Journals Committee will be consulted. If

the Retraction is approved, all authors will be asked to sign a letter of agreement before the Retraction is processed for publication. If all parties agree to the publication and content of the Retraction, it will be sent to the Journals Department for publication.

Crossmark

mBio has implemented Crossmark. Crossmark is a multi-publisher initiative to provide a standard way for readers to locate the current version of an article. Clicking on the Crossmark logo will indicate whether an article is current or whether updates have been published. Additional information about Crossmark can be found on Crossmark's [website](#) and on ASM's Crossmark [policy page](#).

ILLUSTRATIONS AND TABLES

Permissions

The corresponding author is responsible for obtaining permission from both the original author and the original publisher (i.e., the copyright owner) to reproduce or modify figures and tables and to reproduce text (in whole or in part) from previous publications.

Permission(s) must be obtained no later than the modification stage. The original signed permission(s) must be identified as to the relevant item in the ASM manuscript (e.g., "permissions for Fig. 1 in mBio00123-20") and submitted to [mBio staff](#) on request. In addition, a statement indicating that the material is being reprinted with permission must be included in the relevant figure legend or table footnote of the manuscript. Reprinted text must be enclosed in quotation marks, and the permission statement must be included as running text or indicated parenthetically.

It is expected that the authors will provide written assurance that permission to cite unpublished data or personal communications has been granted.

For supplemental material intended for posting by ASM (see "[Supplemental Material](#)"), if the authors of the *mBio* manuscript are not also the owners of the supplemental material, the corresponding author must send to ASM signed permission from the copyright owner that allows posting of the material, as a supplement to the article, by ASM. The corresponding author is also responsible for incorporating in the supplemental material any copyright notices required by the owner.

Illustrations

Image manipulation. Digital images submitted for publication may be inspected by ASM production specialists for any manipulations or electronic enhancements that may be considered to be the result of scientific misconduct based on the guidelines provided below. Any images/data found to contain manipulations of concern will be referred to the editor in chief, and authors may then be requested to provide their primary data for comparison with the submitted image file. Investigation of the concerns may delay publication and may result in revocation of acceptance and/or additional action by ASM.

Linear adjustments to contrast, brightness, and/or color are generally acceptable, as long as the measures taken are necessary to view elements that are already present in the data and the adjustments are applied to the entire image and not just specific areas. Unacceptable adjustments to images include, but are not limited to, the removal or deletion, concealment, duplication (copying and pasting), addition, selective enhancement, or repositioning of elements within the image.

Nonlinear adjustments made to images, such as changes to gamma settings, should be fully disclosed in the figure legends at the time of submission. In addition, images created by compiling multiple files, including noncontiguous portions of the same image, should clearly convey that these multiple files are not a single image. This can be done by "tooling," or inserting thin lines, between the individual images.

File types and formats. Illustrations may be continuous-tone images, line drawings, or composites. On initial submission, figures may be uploaded as individual PDF files or combined and uploaded as a single PDF file. Place each legend in the text file, as well as on the same page with the figure to assist review. At the modification stage, production-quality digital files must be provided. The legends will be copyedited and typeset for final publication and should not be included as part of the figure itself at this stage. All graphics submitted with modified manuscripts must be bitmap, grayscale, or in the RGB (preferred) or CMYK color mode. See "[Color illustrations](#)." Halftone images (those with various densities or shades) must be grayscale, not bitmap. ***mBio* accepts only TIFF or EPS files for article figures; PowerPoint files will not be accepted.**

For general guidelines on creating acceptable EPS and TIFF files, refer to the [KGL Digital Art Support page](#).

Minimum resolution. It is extremely important that a high enough file resolution is used. All separate images that you import into a figure file must be at the correct resolution before they are placed. (For instance, placing a 72-dpi image in a 300-dpi EPS file will not result in the placed image meeting the minimum requirements for file resolution.) Note, however, that the higher the resolution, the larger the file and the longer the upload time. Publication quality will not be improved by using a resolution higher than the minimum. Minimum resolutions are as follows:

- 300 dpi for grayscale and color
- 600 dpi for combination art (lettering and images)
- 1,200 dpi for line art

Size. All graphics must be submitted at their intended publication size so that no reduction or enlargement is necessary. Resolution must be at the required level at the submitted size. Include only the significant portion of an illustration. White space must be cropped from the image, and excess space between panel labels and the image must be eliminated.

- Maximum figure width: 6.875 inches (ca. 17.4 cm)
- Maximum figure height: 9.0625 inches (23.0 cm)

Contrast. Illustrations must contain sufficient contrast to be viewed easily on a monitor or on the printed page.

Labeling and assembly. All final lettering and labeling must be incorporated into the figures. On initial submission, illustrations should be provided as PDF files, with the legends in the text file and with a legend beneath each image to assist review. At the modification stage, production-quality digital figure files (without legends) must be provided. Put the figure number well outside the boundaries of the image itself. (Numbering may need to be changed at the copyediting stage.) Each figure must be uploaded as a separate file, and any multipanel figures must be assembled into one file.

Fonts. To avoid font problems, set all type in one of the following fonts: Arial, Helvetica, Times Roman, European PI, Mathematical PI, or Symbol. Courier may be used but should be limited to nucleotide or amino acid sequences, where a non-proportional (monospace) font is required. **All fonts must be converted to paths (or outlines) in the application with which they were created.**

Color illustrations. All figures submitted in color will be processed as color. Adherence to the following guidelines will help to ensure color reproduction that is as accurate as possible.

Color illustrations should be supplied in the **RGB** color mode as either (i) RGB TIFF images with a resolution of at least 300 pixels per inch (raster files, consisting of pixels) or (ii) Illustrator-compatible EPS files with RGB color elements (vector files, consisting of lines, fonts, fills, and images). CMYK files are also accepted. Other than in color space, CMYK files must meet the same production criteria as RGB files. The RGB color space is the native color space of computer monitors and of most of the equipment and software used to capture scientific data, and it can display a wider range of colors (especially bright fluorescent hues) than the CMYK (cyan, magenta, yellow, black) color space used by print devices that put ink (or toner) on paper. For reprints, ASM's print provider will automatically create CMYK versions of color illustrations from the KGL Digital Art Support page, <https://www.kwglobal.com/digital-art-support>.

Preparing figures for those with color vision deficiency. Based on information on color vision deficiency provided by the [U.S. National Library of Medicine](#), we ask that you design your figures with the following considerations in mind.

- Determine whether color elements are absolutely necessary to convey the data.
- Can the data be displayed using symbols or different line thicknesses, shapes, patterns, or font types?
- Avoid the following color combinations whenever possible: red and green; yellow and bright green; light blue and pink; dark blue and violet.
- Magenta can be substituted for red in fluorescent stain images, which typically use a combination of red and green.
- Search the Internet for a color vision deficiency simulator to see how your image might appear to someone who experiences color vision deficiency.

If you have access to Adobe Photoshop or Adobe Illustrator, you can go to **View/Proof Setup/Color Blindness**, and your images will be transformed to show you how they will appear to someone who has color vision deficiency.

Please refer to the following website for more information: <http://jfly.iam.u-tokyo.ac.jp/color/>.

Drawings. Submit graphs, charts, complicated chemical or mathematical formulas, diagrams, and other drawings as finished products not requiring additional artwork or typesetting. All elements, including letters, numbers, and symbols, must be easily readable, and both axes of a graph must be labeled.

When creating line art, please use the following guidelines.

(i) All art must be submitted at its intended publication size. For acceptable dimensions, see “[Size](#).”

(ii) Avoid using screens (i.e., shading) in line art. It can be difficult and time-consuming to reproduce these images without moiré patterns. Various pattern backgrounds are preferable to screens as long as the patterns are not imported from another application. If you must use images containing screens,

(a) Generate the image at line screens of 85 lines per inch or less.

(b) When applying multiple shades of gray, differentiate the gray levels by at least 20%.

(c) Never use levels of gray below 5% or above 95% as they are likely to fade out or become totally black when output.

(iii) Use thick, solid lines that are no finer than 1 point in thickness.

(iv) Use type that is no smaller than 6 points at the final publication size.

(v) Avoid layering type directly over shaded or textured areas.

(vi) Avoid the use of reversed type (white lettering on a black background).

(vii) Avoid heavy letters, which tend to close up, and unusual symbols, which the printer may not be able to reproduce in the legend.

(viii) If colors are used, avoid using similar shades of the same color and avoid very light colors.

In figure ordinate and abscissa scales (as well as table column headings), avoid the ambiguous use of numbers with exponents. Usually, it is preferable to use the appropriate *Système International d'Unités* (SI) symbols (μ for 10^{-6} , m for 10^{-3} , k for 10^3 , and M for 10^6 , etc.). Thus, representation of 20,000 cpm on a figure ordinate should be made by the number 20 accompanied by the label kcpm. A complete listing of SI symbols can be found in the International Union of Pure and Applied

Chemistry (IUPAC) publication *Quantities, Units and Symbols in Physical Chemistry*, 3rd ed. (RSC Publishing, Cambridge, United Kingdom, 2007), and at <https://www.nist.gov/physical-measurement-laboratory/special-publication-811>.

When powers of 10 must be used, the journal requires that the exponent power be associated with the number shown. In representing 20,000 cells per ml, the numeral on the ordinate should be “2” and the label should be “ 10^4 cells per ml” (not “cells per ml $\times 10^{-4}$ ”). Likewise, an enzyme activity of 0.06 U/ml might be shown as 6 accompanied by the label 10^{-2} U/ml. The preferred designation is 60 mU/ml (milliunits per milliliter).

Presentation of nucleic acid sequences. Long nucleic acid sequences must be presented as figures in the following format to conserve space. Print the sequence in lines of approximately 100 to 120 nucleotides in a nonproportional (monospace) font that is easily legible when published with a line length of 6 inches (ca. 15.2 cm). If possible, lines of nucleic acid sequence should be further subdivided into blocks of 10 or 20 nucleotides by spaces within the sequence or by marks above it. Uppercase and lowercase letters may be used to designate the exon-intron structure or transcribed regions, etc., if the lowercase letters remain legible at a 6-inch (ca. 15.2-cm) line length. Number the sequence line by line; place numerals representing the first base of each line to the left of the lines. Minimize spacing between lines of sequence, leaving room only for annotation of the sequence. Annotation may include boldface, underlining, brackets, and boxes, etc. Encoded amino acid sequences may be presented, if necessary, immediately above or below the first nucleotide of each codon, by using the single-letter amino acid symbols. Comparisons of multiple nucleic acid sequences should conform as nearly as possible to the same format.

Figure Legends

On initial submission, each legend should be placed in the text file *and* be incorporated into the image file beneath the figure to assist review.

Legends should provide enough information so that the figure is understandable without frequent reference to the text. However, detailed experimental methods must be described in the Materials and Methods section, not in a figure legend. A method that is unique to one of several experiments may be reported in a legend only if the discussion is very brief (one or two sentences). Define all symbols used in the figure and define all abbreviations that are not used in the text.

The main text file should also contain a legend for each item in the supplemental material (see “[Supplemental Material](#)”).

Tables

Tables that contain artwork, chemical structures, or complex shading must be submitted as illustrations in an acceptable format at the modification stage. The preferred format for regular tables is Microsoft Word; however, WordPerfect and Acrobat PDF are also acceptable. Note that a straight Excel file is not currently an acceptable format. Excel files must be either embedded in a Word or WordPerfect document or converted to PDF before being uploaded.

Tables should be formatted as follows. Arrange the data so that columns of like material read down, not across. The headings

TABLE 2 Distribution of protein and ATPase in fractions of dialyzed membranes^a

Membrane	Fraction	ATPase	
		U/mg of protein	Total U
Control	Depleted membrane	0.036	2.3
	Concentrated supernatant	0.134	4.82
E1 treated	Depleted membrane	0.034	1.98
	Concentrated supernatant	0.11	4.6

^a Specific activities of ATPase of nondepleted membranes from control and treated bacteria were 0.21 and 0.20, respectively.

should be sufficiently clear so that the meaning of the data is understandable without reference to the text. See the “[Abbreviations](#)” section of these Instructions for those that should be used in tables. Explanatory footnotes are acceptable, but more-extensive table “legends” are not. Footnotes should not include detailed descriptions of the experiment. Tables must include enough information to warrant table format; those with fewer than six pieces of data will be incorporated into the text by the copy editor. [Table 2](#) is an example of a well-constructed table.

Featured Image

Each collected bimonthly issue of *mBio* is represented by a featured image, derived from an article in the issue. These featured images are used to represent the issues in the online archives.

Authors may receive an invitation to submit a featured image, or they may submit an unsolicited potential image (to mBio@asmusa.org), after their manuscript has been accepted.

The image should be related to the work presented in the manuscript, and it should meet the following specifications:

- TIF or EPS format.
- Resolution of at least 300 dpi.
- Square dimensions.

The image should be free of figure elements, e.g., arrows or panel labels. The image should be accompanied by a short legend. A legend of just a few sentences works best (for an example, see <https://mbio.asm.org/content/1/5.cover-expansion>).

No material submitted for consideration will be returned to the author. Authors will be notified only if their image is selected.

NOMENCLATURE

Chemical and Biochemical Nomenclature

The recognized authority for the names of chemical compounds is *Chemical Abstracts* (CAS; <https://www.cas.org/>) and its indexes. *The Merck Index Online* (<https://www.rsc.org/merck-index>) is also an excellent source.

For guidelines to the use of biochemical terminology, consult *Biochemical Nomenclature and Related Documents* (Portland Press, London, United Kingdom, 1992), available at <https://www.qmul.ac.uk/sbcs/iupac/bibliog/white.html>, and the Instructions to Authors of the *Journal of Biological Chemistry* and the *Archives of Biochemistry and Biophysics*.

For enzymes, use the recommended (trivial) name assigned by the Nomenclature Committee of the International Union of

Biochemistry (IUB) as described in *Enzyme Nomenclature* (Academic Press, Inc., New York, NY, 1992) and its supplements and at <https://www.qmul.ac.uk/sbcs/iubmb/enzyme/>. If a nonrecommended name is used, place the proper (trivial) name in parentheses at first use in the abstract and text. Use the EC number when one has been assigned. Authors of papers describing enzymological studies should review the standards of the STRENDA Commission for information required for adequate description of experimental conditions and for reporting enzyme activity data (<https://www.beilstein-institut.de/en/projects/strenda/guidelines>).

Nomenclature of Organisms

Mice. For mouse strain and genetic nomenclature, ASM encourages authors to refer to the guidelines set forth by the International Committee on Standardized Genetic Nomenclature for Mice, available on the Mouse Genome Informatics home page at <http://www.informatics.jax.org/> and in *Genetic Variants and Strains of the Laboratory Mouse*, 3rd ed. (M. F. Lyon et al., ed., Oxford University Press, Oxford, England, 1996).

Viruses. Names used for viruses should be those approved by the International Committee on Taxonomy of Viruses (ICTV) and reported on the ICTV Virus Taxonomy website (<https://talk.ictvonline.org/>). In addition, the recommendations of the ICTV regarding the use of species names should generally be followed: when the entire species is discussed as a taxonomic entity, the species name, as with other taxa, is italic and has the first letter and any proper nouns capitalized (e.g., *Tobacco mosaic virus*, *Murray Valley encephalitis virus*). When the behavior or manipulation of individual viruses is discussed, the vernacular (e.g., tobacco mosaic virus, Murray Valley encephalitis virus) should be used. If desired, synonyms may be added parenthetically when the name is first mentioned. Approved generic (or group) and family names may also be used.

Bacteria. Binary names, consisting of a generic name and a specific epithet (e.g., *Escherichia coli*), should be used for all bacteria. Names of categories at or above the genus level may be used alone, but specific and subspecific epithets may not. A specific epithet must be preceded by a generic name, written out in full the first time it is used in a paper. Thereafter, the generic name should be abbreviated to the initial capital letter (e.g., *E. coli*), provided there can be no confusion with other genera used in the paper. Names of all bacterial taxa (kingdoms, phyla, classes, orders, families, genera, species, and subspecies) are printed in italics; strain designations and numbers are not.

Two websites list current approved bacterial names: Prokaryotic Nomenclature Up-to-Date (<https://www.dsmz.de/bacterial-diversity/prokaryotic-nomenclature-up-to-date.html>) and List of Prokaryotic Names with Standing in Nomenclature (<http://www.bacterio.net/>). If there is reason to use a name that does not have standing in nomenclature, the name should be enclosed in quotation marks in the title and at its first use in the abstract and the text and an appropriate statement concerning the nomenclatural status of the name should be made in the text. “*Candidatus*” species should always be set in quotation marks.

Fungi. Since the classification of fungi is not complete, it is

the responsibility of the author to determine the accepted binomial for a given organism. Sources for these names include *The Yeasts: a Taxonomic Study*, 5th ed. (C. P. Kurtzman, J. W. Fell, and T. Boekhout, ed., Elsevier Science, Amsterdam, Netherlands, 2011), and *Ainsworth and Bisby's Dictionary of the Fungi*, 10th ed. (P. M. Kirk, P. F. Cannon, D. W. Minter, and J. A. Stalpers, ed., CABI International, Wallingford, Oxfordshire, United Kingdom, 2008); see also <http://www.speciesfungorum.org/Names/Fundic.asp>.

Genetic Nomenclature

To facilitate accurate communication, it is important that standard genetic nomenclature be used whenever possible and that deviations or proposals for new naming systems be endorsed by an appropriate authoritative body. Review and/or publication of submitted manuscripts that contain new or non-standard nomenclature may be delayed by the editor or the Journals Department so that they may be reviewed.

ABBREVIATIONS AND CONVENTIONS

Verb Tense

ASM strongly recommends that for clarity you use the past tense to narrate particular events in the past, including the procedures, observations, and data of the study that you are reporting. Use the present tense for your own general conclusions, the conclusions of previous researchers, and generally accepted facts. Thus, most of the abstract, Materials and Methods, and Results will be in the past tense, and most of the introduction and some of the Discussion will be in the present tense.

Be aware that it may be necessary to vary the tense in a single sentence. For example, it is correct to say “White (30) demonstrated that XYZ cells *grow* at pH 6.8,” “Figure 2 *shows* that ABC cells failed to grow at room temperature,” and “Air *was* removed from the chamber and the mice *died*, which *proves* that mice *require* air.” In reporting statistics and calculations, it is correct to say “The values for the ABC cells *are* statistically significant, indicating that the drug *inhibited*. . .”

For an in-depth discussion of tense in scientific writing, see *How To Write and Publish a Scientific Paper*, 7th ed.

Abbreviations

General. Abbreviations should be used as an aid to the reader, rather than as a convenience to the author, and therefore their use should be limited. Abbreviations other than those recommended by the IUPAC-IUB (*Biochemical Nomenclature and Related Documents*, 1992) should be used only when a case can be made for necessity, such as in tables and figures.

It is often possible to use pronouns or to paraphrase a long word after its first use (e.g., “the drug” or “the substrate”). Standard chemical symbols and trivial names or their symbols (folate, Ala, and Leu, etc.) may also be used.

Define each abbreviation and introduce it in parentheses the first time it is used; e.g., “cultures were grown in Eagle minimal essential medium (MEM).” Generally, eliminate abbreviations that are not used at least three times in the text (including tables and figure legends).

Not requiring introduction. In addition to abbreviations for Système International d'Unités (SI) units of measurement, other common units (e.g., bp, kb, and Da), and chemical symbols for the elements, the following should be used without definition in the title, abstract, text, figure legends, and tables.

DNA (deoxyribonucleic acid)	dinucleotide phosphate, reduced)
cDNA (complementary DNA)	
RNA (ribonucleic acid)	NADP ⁺ (nicotinamide adenine dinucleotide phosphate, oxidized)
cRNA (complementary RNA)	
RNase (ribonuclease)	
DNase (deoxyribonuclease)	poly(A) and poly(dT), etc. (polyadenylic acid and polydeoxythymidylic acid, etc.)
rRNA (ribosomal RNA)	
mRNA (messenger RNA)	oligo(dT), etc. (oligodeoxythymidylic acid, etc.)
tRNA (transfer RNA)	UV (ultraviolet)
AMP, ADP, ATP, dAMP, ddATP, and GTP, etc. (for the respective 5' phosphates of adenosine and other nucleosides) (add 2', 3', or 5' - when needed for contrast)	PFU (plaque-forming units)
ATPase and dGTPase, etc. (adenosine triphosphatase and deoxyguanosine triphosphatase, etc.)	CFU (colony-forming units)
NAD (nicotinamide adenine dinucleotide)	MIC (minimal inhibitory concentration)
NAD ⁺ (nicotinamide adenine dinucleotide, oxidized)	Tris (tris[hydroxymethyl]aminomethane)
NADH (nicotinamide adenine dinucleotide, reduced)	DEAE (diethylaminoethyl)
NADP (nicotinamide adenine dinucleotide phosphate)	EDTA (ethylenediaminetetraacetic acid)
NADPH (nicotinamide adenine dinucleotide phosphate, reduced)	EGTA (ethylene glycol-bis[β-aminoethyl ether]-N,N,N',N'-tetraacetic acid)
	HEPES (N-2-hydroxyethylpiperazine-N'-2-ethanesulfonic acid)
	PCR (polymerase chain reaction)
	AIDS (acquired immunodeficiency syndrome)

Abbreviations for cell lines (e.g., HeLa) also need not be defined. The following abbreviations should be used without definition in tables.

amt (amount)	SD (standard deviation)
approx (approximately)	SE (standard error)
avg (average)	SEM (standard error of the mean)
concn (concentration)	
diam (diameter)	sp act (specific activity)
expt (experiment)	sp gr (specific gravity)
exptl (experimental)	temp (temperature)
ht (height)	vol (volume)
mo (month)	vs (versus)
mol wt (molecular weight)	wk (week)
no. (number)	wt (weight)
prepn (preparation)	yr (year)

Reporting Numerical Data

Standard metric units are used for reporting length, weight, and volume. For these units and for molarity, use the prefixes m, μ, n, and p for 10⁻³, 10⁻⁶, 10⁻⁹, and 10⁻¹², respectively. Likewise, use the prefix k for 10³. Avoid compound prefixes such as mμ or μμ. Use μg/ml or μg/g in place of the ambiguous ppm. Units of temperature are presented as follows: 37°C or 324 K.

When fractions are used to express units such as enzymatic activities, it is preferable to use whole units, such as “g” or “min,” in the denominator instead of fractional or multiple units, such as μg or 10 min. For example, “pmol/min” is preferable to “nmol/10 min,” and “μmol/g” is preferable to “nmol/μg.” It is also preferable that an unambiguous form, such as exponential notation, be used; for example, “μmol g⁻¹ min⁻¹” is preferable to “μmol/g/min.” Always report numerical data in the appropriate SI units.

For a review of some common errors associated with statistical analyses and reports, plus guidelines on how to avoid them, see the articles by Olsen (Infect Immun 71:6689–6692, 2003; Infect Immun 82:916–920, 2014).

For a review of basic statistical considerations for virology experiments, see the article by Richardson and Overbaugh (J Virol 79:669–676, 2005).

Isotopically Labeled Compounds

For simple molecules, isotopic labeling is indicated in the chemical formula (e.g., ¹⁴CO₂, ³H₂O, and H₂³⁵SO₄). Brackets are not used when the isotopic symbol is attached to the name of a compound that in its natural state does not contain the element (e.g., ³²S-ATP) or to a word that is not a specific chemical name (e.g., ¹³¹I-labeled protein, ¹⁴C-amino acids, and ³H ligands).

For specific chemicals, the symbol for the isotope introduced is placed in square brackets directly preceding the part of the name that describes the labeled entity. Note that configuration symbols and modifiers precede the isotopic symbol. The following examples illustrate correct usage:

[¹⁴ C]urea	[γ- ³² P]ATP
L-[methyl- ¹⁴ C]methionine	UDP-[U- ¹⁴ C]glucose
[2,3- ³ H]serine	<i>E. coli</i> [³² P]DNA
[α- ¹⁴ C]lysine	fructose 1,6-[1- ³² P]bisphosphate

mBio follows the same conventions for isotopic labeling as the *Journal of Biological Chemistry*, and more-detailed information can be found in the Instructions to Authors of that journal.

Author Checklist

Below is a quick checklist that may be helpful when preparing your submission. This list is not all-inclusive. Authors are encouraged to review the Instructions to Authors for more guidelines and details. These guidelines apply to articles contributed by AAM Fellows as well as direct submissions. If this is a revision/resubmission, specific issues identified by the Editor, reviewers, or Central Office staff are listed in your decision letter. Please be sure to review and address these issues.

Selection of Editors	<ul style="list-style-type: none"> <input type="checkbox"/> Suggest at least three Editors from the Board of Editors who are experts in the field of research for your manuscript. This will allow staff to assign the manuscript appropriately and avoid delays in securing Editors. <input type="checkbox"/> In the cover letter, list Editors that you prefer not to handle your manuscript.
Initial Submissions	<ul style="list-style-type: none"> <input type="checkbox"/> For initial submissions, <i>mBio</i> welcomes papers in any format. You may upload a single PDF that incorporates the full text, tables, and figures or you may upload individual source files. The reference style, the arrangement of sections of the paper, and other formatting issues are at the discretion of the author. (For revised submissions and resubmissions, some key formatting guidelines will be listed in your decision letter.)
Page Format/Length	<ul style="list-style-type: none"> <input type="checkbox"/> While not required, you should prepare your manuscript in a way that is easily readable for Editors and reviewers (e.g., double-space and left-justify the manuscript; use 12-point type). Line numbers assist Editors and reviewers when commenting on your manuscript. <input type="checkbox"/> Most article types have word limits (which do not include Materials and Methods, References, tables, or figure legends), and some have limits on the numbers of figures and/or references. See the Instructions to Authors for detailed information. <input type="checkbox"/> On the title page (first page of your manuscript), include the full working title, author byline with all authors' full names and affiliations, and the corresponding author's contact information.
Abstract/Importance	<ul style="list-style-type: none"> <input type="checkbox"/> Most article types require an abstract (see the Instructions to Authors for exceptions). The abstract should concisely summarize the content of the paper without presenting extensive experimental details. <input type="checkbox"/> For Research Articles and Observations, include a separate Importance paragraph of ≤ 150 words. This is a nontechnical explanation of why the work was undertaken.
Acknowledgments	<ul style="list-style-type: none"> <input type="checkbox"/> The source(s) of any direct financial support (funding) received for the work being published must be indicated on the submission form; any other form(s) of assistance that you received may be noted in an Acknowledgments section. <input type="checkbox"/> Recognition of personal assistance should be given as a separate paragraph, as should any statements disclaiming endorsement or approval of the views reflected in the paper or of a product mentioned therein.
References	<ul style="list-style-type: none"> <input type="checkbox"/> The numbered citation (citation-sequence) reference method should be used. List and number references in the References section in the order in which they are cited in the text. <input type="checkbox"/> Include references for accession numbers and code (with URLs).
Tables	<ul style="list-style-type: none"> <input type="checkbox"/> At the revision stage, place all tables after the References section. <input type="checkbox"/> Refer to each table at the appropriate place in the body of the text. <input type="checkbox"/> Create tables using the Table function of Microsoft Word (preferably without using the spacing and tabbing features). <input type="checkbox"/> Create fully descriptive table captions and place them above the body of the table. Create footnotes for content that does not conveniently fit in the title or in data cells. Use superscript lowercase italic letters in alphabetical order as the footnote symbols (<i>a, b, c, etc.</i>).
Figures	<ul style="list-style-type: none"> <input type="checkbox"/> On initial submission, figures may be supplied within the text file or as PDF files. <input type="checkbox"/> For revisions, figures must be supplied as individual TIFF or EPS files. At the revision stage, place all figures after the References section and after tables, if any. The figure legend(s) should be provided in the manuscript file, separate from the figure file(s). <input type="checkbox"/> Multipanel figures must be assembled onto one page if at all possible. <input type="checkbox"/> Refer to each figure at the appropriate place in the body of the text. <input type="checkbox"/> If any figure is being adapted or reproduced from a previously published version, secure all necessary permissions from the original authors and publishers and forward these to the <i>mBio</i> Central Office (mbio@asmusa.org) at the manuscript revision stage. Include the manuscript number and title on the correspondence.
Supplemental Material	<ul style="list-style-type: none"> <input type="checkbox"/> ASM will post no more than 10 individual supplemental items. If during the review the Editor/reviewer asked you to modify supplemental material that will cause your manuscript to exceed the limits, please indicate this in the manuscript comment section or cover letter. <input type="checkbox"/> At the revision stage, each item in the supplemental material must be submitted as a separate file, i.e., multiple figures should not be zipped together or combined in a single PDF. Include a legend for each item of supplemental material at the end of the manuscript text file. This includes supplemental text files, table files, etc. <input type="checkbox"/> Each different type of supplemental material should be numbered with a separate series of "S" numbers (e.g., a set of files that includes a movie and two figures should be numbered as Movie S1 and Fig. S1 and S2). Supplemental material must be cited at least once in the text. If references are included for supplemental material, add those references in the supplemental item itself and cite them by those numbers. Do not include references in the main text that are cited only in the supplemental material.
AAM Contributions	<ul style="list-style-type: none"> <input type="checkbox"/> At least two external reviewer forms are required. Close scientific associations such as previous postdocs, graduate students, and recent collaborators are not appropriate as reviewers. <input type="checkbox"/> Provide responses to reviewer comments. <input type="checkbox"/> Provide e-mail verification from reviewers stating that he or she has seen the final manuscript and agrees that the authors have addressed the concerns.