INSTRUCTIONS TO AUTHORS

SCOPE

Applied and Environmental Microbiology® (AEM) publishes descriptions of all aspects of applied microbial research, basic research on microbial ecology, and research of a genetic and molecular nature that focuses on microbial topics of practical value. Research must address salient microbiological principles, fundamental microbial processes, or basic questions in applied or environmental microbiology. Topics that are considered include microbiology in relation to foods, agriculture, industry, biotechnology, public health, plants, and invertebrates and basic biological properties of bacteria, fungi, algae, protozoa, and other simple eukaryotic organisms as related to microbial ecology. Manuscripts should report new and significant findings that advance the understanding of microbiology and upon which other scientists may build. To best serve its readership, the journal must accept only those papers that are most significant to the field of applied and environmental microbiology. Thus, the editors will reject manuscripts that, while scientifically sound, represent only incremental extensions of other studies, are mainly confirmatory, or do not pursue a question in sufficient depth.

AEM publishes minireviews that provide forward-reaching assessments of topics of current relevance to the diverse sections of the journal. Additional information on minireviews can be found in a subsequent part of these Instructions.

AEM welcomes microbiome studies that address the microbiology and functions of natural or experimental systems. The nature of the microbiome study will determine in which section of the journal it will be published.

The biodegradation section describes novel microbial processes for alteration, removal, or utilization of environmental or anthropogenic chemicals.

Papers in the biotechnology section describe the use and modification of organisms in order to achieve socially beneficial objectives.

The environmental microbiology section covers manuscripts that focus on research related to microorganisms in the environment. This is distinct from the microbial ecology section, which focuses on ecological relationships, such as interactions among organisms, their structure and functional role in an ecosystem, and community-level studies. Thus, the environmental microbiology section features articles that focus on specific organisms in the environment, rather than a whole community, as well as those in which the study is not focused on implied or stated underlying ecological relationships.

The enzymology and protein engineering section covers a broad range of topics relative to microbial catalysis and includes papers describing (i) the structure and function of environmentally or industrially significant proteins and how they can be modified to achieve practical catalytic objectives and (ii) the enzymology or biosynthesis of fungal, algal, and bacterial metabolites or toxins of importance to the environment or to society.

Included in the evolutionary and genomic microbiology section are papers detailing newly described evolutionary processes and evolutionary relationships among microorganisms. Topics include genomic analysis of microorganisms and metagenomic investigation of microbiomes in the environment. (Meta)genome analyses that do not provide significant new insights into the microbiology of the system(s) under study will normally not be acceptable for publication in AEM.

The food microbiology section covers manuscripts dealing with all aspects of food microbiology, including microbial food pathogens, microbial ecology of foods, predictive food microbiology, food fermentations, food spoilage, probiotics, and prebiotics. Manuscripts reporting on the effects of probiotics or prebiotics should provide new insights into the mechanism(s). Manuscripts detailing the occurrence of microbial toxins or microbial metabolites are suitable if the work includes significant information on the microbe and its toxin or metabolite production. This section also includes studies on the gastrointestinal tract microbiome as it relates to molecular toxicology, diet, and nutrition. Molecular assessments of food microbiomes should follow guidelines for the microbial ecology section.

The genetics and molecular biology section includes papers describing genetic organization, expression, mutation, and repair in organisms with environmental or practical significance.

Manuscripts for the geomicrobiology section must emphasize the role of microorganisms in geobioclimatic processes in terrestrial or aquatic ecosystems, including subsurface, aquifer, and oceanic environments. Topics include mineralization, the use of inorganic ions in energy metabolism, and growth in extreme environments. Manuscripts focused on geological processes with only marginal links to microbiology will not qualify for AEM.

Invertebrate microbiology manuscripts should address interactions between invertebrates and microorganisms, ranging from commensalism and mutualism to parasitism and pathogenicity. Manuscripts describing work dealing with the metabolites or toxins from animal, plant, or insect cells or the physiology of such cells are not suitable for AEM unless the work concerns a microbial community or individual microorganisms.

New microbial biological methods must provide novel avenues to address fundamental biological questions and will be considered for publication in AEM when accompanied by a demonstrated application. Descriptions of the application of previously described technologies, including the cloning, amplification, and expression of “foreign” genes, to a new genus or species of microbes will generally not be considered for independent publication. Manuscripts that describe the construction of engineered strains for innovative process application, development, or enhancement must present results to authenticate the utility, superiority, and uniqueness of such strains.

The microbial ecology section covers a wide range of topics on the ecology of microorganisms, including culture-independent
molecular assessments that provide new insights into (i) the structure-function relationships of microorganisms, (ii) the impact of in situ conditions on community structure, or (iii) the effect of changes in microbial community composition on ecosystem function. Phylogenetic assessments that do not provide such insights will normally not be acceptable for publication in AEM.

The physiology section addresses questions about how organisms adapt to changes in their environment, including bioenergetics, stress, starvation, metabolic challenges, and responses to nutritional variation.

The plant microbiology section covers manuscripts dealing with all aspects of plant-microorganism interactions, including symbiotic and rhizosphere bacteria as well as phytopathogenic microorganisms.

The public and environmental health microbiology section is focused primarily on environmentally transmitted microorganisms that affect human health. Environmental health microbiology is a branch of public health concerned with the environmental occurrence of disease-causing microbes and with creating health-supportive environments. Microbes of a zoonotic nature or microbes transmitted through water, soil, or environmental surfaces are of special interest.

AEM is not specialized in the systematics of prokaryotes, but taxonomic papers that describe a new prokaryotic taxon are welcome when phylogenetic or genotypic data are accompanied by a significant amount of information that goes beyond the taxonomic description of the new taxon. Such additional information might include information on the novel ecological, physiological, biotechnological, or evolutionary features of the new taxa. Description of a new taxon should include an amount of information adequate to allow the new taxon to be validated and must include genus and species descriptions, which should be placed at the end of the Discussion section. Likewise, the new taxon must be deposited in two publically available culture collections that are in separate countries. Large data sets of comparative phenotypic and genotypic features (e.g., fatty acid compositions, substrate profiles, sequence similarities) or related species that might be of value for the taxonomic evaluation of the new taxon should normally be placed in supplemental material. The section of the journal in which such a paper will be placed will depend on the nature of the new taxon and the environment from which it was isolated.

ASM publishes a number of different journals covering various aspects of the field of microbiology. Each journal has a prescribed scope which must be considered in determining the most appropriate journal for each manuscript. The following guidelines may be of assistance.

(i) AEM will consider manuscripts describing properties of enzymes and proteins that are produced by either wild-type or genetically engineered microorganisms and that are significant or have potential significance in industrial or environmental settings. Studies dealing with basic biological phenomena of enzymes or proteins or in which enzymes have been used in investigations of basic biological functions are more appropriate for the Journal of Bacteriology®.

(ii) AEM will consider papers which describe the use of antimicrobial agents as tools for elucidating aspects of applied and environmental microbiology. Other papers dealing with antimicrobial agents, including manuscripts dealing with the biosynthesis and metabolism of such agents, are more appropriate for Antimicrobial Agents and Chemotherapy®.

(iii) AEM will consider manuscripts that concern bacteriophages or other viruses in relation to the environment, public health, or industrial microbiology. Papers that primarily concern attachment and intracellular replication of viruses, virus interactions with host metabolism, virus structure, or virus genomics are more appropriate for the Journal of Virology®.

(iv) Manuscripts dealing with the immune system or with topics of basic medical interest or oral microbiology are more appropriate for Infection and Immunity®. Reports of clinical investigations and environmental biology applied to hospitals should be submitted to the Journal of Clinical Microbiology®.

(v) AEM and mSphere® accept manuscripts on population dynamics and the ecology of eukaryotic microbes. Studies of microbial communities and of microbial populations with identified economic or ecological significance, e.g., plant pathogens or symbionts, are usually more appropriate for AEM.

(vi) Manuscripts dealing with the purification and characterization of enzymes or cloning of genes that have already been extensively described for other organisms will be considered for publication only if they offer experimentally supported new insights into the biological role, properties, or applications of these enzymes. Descriptions of genes or enzymes that differ only in minor ways from the prototypes are not suitable for AEM.

Questions about these guidelines may be directed to the editor in chief of the journal being considered.

If transfer to another ASM journal is recommended by an editor, the corresponding author will be contacted.

Note that a manuscript rejected by one ASM journal on scientific grounds or on the basis of its general suitability for publication is considered rejected by all other ASM journals.

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.

Authors should comply with the ASM Journals Data Policy (https://journals.asm.org/content/open-data-policy). In a “Data availability” paragraph at the end of Materials and Methods (or at the end of the text in article types that do not have this section), include the following: a description of the data, the name(s) of the repository(ies), and digital object identifiers (DOIs) or accession numbers. The data described should include accession numbers for nucleotide and amino acid sequences, microarray data, protein structures, gene expression data, and MycoBank data.

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SUBMISSION, REVIEW, AND PUBLICATION PROCESSES

Initial Submissions

For initial submissions, AEM welcomes papers in any format (“format-neutral submission”). At this stage, authors are encouraged to upload a single PDF that incorporates the full text, tables, and figures. The reference style, the arrangement of sections of the paper, and other formatting issues are at the discretion of the author. However, to assist the reviewers, manuscript pages must have continuous line numbers and page numbers. (For revised submissions and resubmissions, formatting guidelines are described in detail below.)

Submission Process

All submissions to AEM must be made electronically via the eJournalPress (eJP) online submission and peer review system at the following URL: https://aem.msubmit.net/cgi-bin/main.plex. (E-mailed submissions will not be accepted.) First-time users must create an Author account, which may be used for submitting to all ASM journals. Instructions for creating an Author account are available at the above URL via the “help for authors” link, and step-by-step instructions for submitting a manuscript via eJP are also available through the same link on the log-in screen or on the account holder’s home page. Information on file types acceptable for electronic submission can be found under the Files heading in the help for authors screen.

Review Process

All manuscripts are considered to be confidential and are reviewed by the editors, members of the editorial board, or qualified ad hoc reviewers.

To expedite the review process, authors must recommend at least three reviewers 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. Impersonation of another individual during the review process is considered serious misconduct. Please provide, where indicated on the submission form, contact information for suggested reviewers who are not editorial board members.

To facilitate the review, copies of in-press and submitted manuscripts that are important for judgment of the present manuscript should be included as supplemental material not for publication.

When a manuscript is submitted to the journal, it is given a control number (e.g., AEM00123-20) and assigned to one of the 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 to 6 weeks after submission, of the editor’s decision to accept, reject, or require modification. When modification is requested, the corresponding author must either submit the modified version within 45 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. Additionally, 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.

Manuscripts that have been rejected with the option to resubmit, or withdrawn after being returned for modification, may be resubmitted to the same ASM journal if the major criticisms have been addressed. A manuscript rejected on scientific grounds or on the basis of its general suitability for publication by one ASM journal, with the exception of mBio® (see below), is considered rejected by all other ASM journals. A manuscript rejected solely on the basis of scope may be resubmitted to a more appropriate ASM journal.

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 response to the review(s) must be uploaded as a separate file (identified as such), and a copy of the revised manuscript tracking the changes must be included as a Marked Up Manuscript. Manu scripts resubmitted to the same journal are normally handled by the original editor. Manuscripts rejected with the option to resubmit may be resubmitted only once unless permission has been obtained from the original editor or from the editor in chief.

For manuscripts rejected from mBio and resubmitted to AEM, the author is not required to disclose the details of the previous submission. It is the author’s option whether to disclose the mBio submission in the cover letter and/or provide a response to the mBio reviews.

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. A PDF version of the accepted manuscript is posted online as soon as possible (see below). 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 eJP online 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 manuscript is scheduled for the next available issue. The editorial staff of the ASM Journals Department completes the editing of the manuscript to bring it into conformity with prescribed standards.

Accepted Manuscripts

For its primary-research journals, ASM posts online PDF versions of manuscripts that have been peer reviewed and accepted but not yet copyedited. Accepted manuscripts are accessible from the Journals website. The manuscripts are published online as soon as possible after acceptance, on a weekly basis, before the copyedited, typeset articles are published. They are posted “as is” (i.e., as submitted by the authors at the modification stage) and do not reflect ASM editorial changes. No corrections/changes to the PDF manuscripts are accepted. Accordingly, there likely will be differences between the accepted AEM manuscripts and the final, typeset articles. The manuscripts remain listed on the Accepted Manuscripts page until the final, typeset articles are posted. At that point, the manuscripts are removed from the Accepted Manuscripts page. The manuscripts are under subscription access control until 6 months after the typeset articles are posted, when free access is provided to everyone (subject to the applicable ASM license terms and conditions). Supplemental material intended, and accepted, for publication is not posted until publication of the final, typeset article.

The ASM embargo policy allows a press release to be issued as soon as the accepted manuscript is posted on the Accepted Manuscripts page. To be notified as soon as your manuscript is posted, please sign up for e-Alerts at https://aem.asm.org/alerts?destination=.

Instructions on how to cite such manuscripts may be found in “References.”

Page Proofs

Page proofs, together with a query sheet and instructions for handling proofs, will be made available to the corresponding author electronically. Queries must be answered on the query page, and any changes related to the queries, as well as any additional changes, must be indicated on the proofs. Note that the copy editor does not query at every instance where a change has been made. Queries are written only to request necessary information or clarification of an unclear passage or to draw attention to edits that may have altered the sense. It is the author’s responsibility to read the entire text, tables, and figure legends, not just items queried. Corrected proofs must be returned within two business days after notification of availability.

The proof stage is not the time to make extensive corrections, additions, or deletions. Figures as they appear in the proofs are for validation of content and placement, not quality of reproduction or color accuracy. Print output of figures in the PDF page proofs will be of lower quality than the same figures viewed on a monitor. Please avoid making changes to figures based on quality of color or reproduction in proof.

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Questions about proofs should be directed to the ASM Journals Department (e-mail, bslinker@asmusa.org; telephone, 202-942-9219).

PDF Files

The corresponding author will have limited access (10 downloads, total) to the PDF file of his/her published article. An e-mail alert will automatically be sent to him/her on the day the issue is posted. It will provide a URL, which will be required to obtain access, and instructions. An article may be viewed, printed, or stored, provided that it is for the author’s own use.

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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. AEM authors are automatically in compliance with this policy and need not take no action themselves. For the past several years, ASM has deposited in PubMed Central all publications from all ASM journals. Further, ASM policy is that all primary-research articles are made available to everyone, free, 6 months after publication through PubMed Central, HighWire, and international PubMed Central-like repositories. By having initiated these policies, ASM is in full compliance with NIH policy. For more information, see https://publicaccess.nih.gov/.

ASM also allows AEM 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 manuscript (not the typeset article) in an appropriate institutional or subject-based open repository established by a government or noncommercial entity.

Since ASM makes the final, typeset articles from its primary research journals available free of charge on the ASM Journals and PMC websites 6 months after final publication, ASM requests that when submitting the 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 6 months after publication of the typeset article by ASM and that a link to the published manuscript on the journal website be provided.

Publication Fees

Authors who choose open access will be assessed the article processing charge (APC) indicated in Table 1. Authors who do not choose open access and 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 page charges noted in Table 1 (based on the number of typeset pages, including illustrations, in the article) and to sign the ASM copyright transfer agreement.

Authors are also charged a flat fee for posting supplemental material as an adjunct to their published article (exception: no fee is charged for supplemental material associated with fee-exempt papers).

If the research was not supported by any of the means described above, a request to waive the charges may be sent to the ASM Journals Department (e-mail, bslinker@asmusa.org [after acceptance of the manuscript]). The request must include the manuscript control number assigned by ASM and indicate how the work was supported. Waivers apply only to page charges; responsibility for supplemental material fees remains with the author.

Minireviews, Commentaries, Editorials, Letters to the Editor, and corrections are not subject to page charges.

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.

APCs permit immediate public access to both the preliminary accepted version and the copyedited, typeset version published in the online journal under the Creative Commons Attribution 4.0 International license (CC BY 4.0). This option includes immediate open access provided through NIH’s PubMed Central repository.

At the time of submission, authors should complete the Author Warranty and Provisional License to Publish/CC BY 4.0, rather than the standard Copyright Transfer Agreement, if an

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article is to be published under the immediate open-access option (for example, one subject to the open-access policies of the Wellcome Trust, Research Councils UK, or the Bill and Melinda Gates Foundation funding agencies).

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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 aforementioned publications and in these Instructions. Please note that ASM uses the serial comma.

On receipt at ASM, an accepted manuscript undergoes an automated preediting, cleanup, and tagging process specific to the particular article type. To optimize this process, manuscripts must be supplied in the correct format and with the appropriate sections and headings.

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; manuscripts without line numbers may be editorially rejected by the editor, with a suggestion of resubmission after line numbers are added. 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.

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.

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.

First-time claims should be avoided. As explained in the first paragraph of the Scope section, manuscripts should report new and significant findings that advance the understanding of microbiology; therefore, first-time claims are unnecessary.

Manuscript Submission Checklist (see detailed checklist attached)

- Double-space all text, including references and figure legends.
- Number pages.
- Number lines continuously.
- Present statistical treatment of data where appropriate.
- Provide accession numbers for all newly published sequences in a dedicated paragraph, and if a sequence or sequence alignment important for evaluation of the manuscript is not yet available, provide the information as supplemental material not for publication or make the material available on a website for access by the editor and reviewers.
- Provide references for accession numbers and code (with URLs).
- Confirm that genetic and chemical nomenclature conforms to instructions.
- Include as supplemental material not for publication in-press and submitted manuscripts that are important for judgment of the present manuscript.

Supplemental Material

Supplemental material will be peer reviewed along with the manuscript and must be uploaded to the ejournalPress (eJP) peer review system at initial manuscript submission. All information required to reproduce the study (e.g., primary data sets and lists of strains and plasmids) should be placed in the manuscript, not in the supplemental material. In general, supplemental material is intended to provide access to very large data sets or other materials, such as videos, that cannot appear in the article. The decision to publish the material online with the accepted article is made by the editor. It is possible that a manuscript will be accepted but that the supplemental material will not be.

All supplemental text, tables, and figures should be combined in a single self-contained document (PDF), and no supplemental material should be included in the main manuscript. Supplemental data set and movie files may be uploaded separately. The number of supplemental material files is limited to 10. Supplemental files should be submitted in the following standard formats.

- Text, figures, tables, and legends should be included in a single PDF file. All figures and tables should be numbered independently and cited at the relevant point in the manuscript text, e.g., “Fig. S1,” “Fig. S2,” “Table S3,” etc. Do not duplicate data by presenting them in both the text of the manuscript and a supplemental figure. Each legend should appear below its corresponding figure or table. The maximum file size is 8 MB. Please review this sample file for guidance.
- Data set (Excel [.xls]) files should include a brief description of how the data are used in the paper. The maximum file size is 20 MB. Please review this sample file for guidance.
- Movies (Audio Video Interleave [.avi], QuickTime [.mov], or MPEG files) should be submitted at the desired reproduction size and length and should be accompanied by a legend. The maximum file size is 20 MB.
Unlike the manuscript, supplemental material will not be edited by the ASM Journals staff and proofs will not be made available. References related to supplemental material only should not be listed in the References section of an article; instead, include them with the supplemental material. Supplemental material will always remain associated with its article and is not subject to any modifications after publication.

Material that has been published previously (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.

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See also “Publication Fees.”

Research Articles

Research Articles should include the elements described in this section. They should not exceed approximately 6,000 words, exclusive of methods, references, figure legends, tables, and supplemental material.

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 permitted. Exercise care in composing a main title. Avoid the main title/subtitle arrangement, complete sentences, and unnecessary articles. 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” below). 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. Please review this sample title page for guidance.

Study group in byline. A study group, surveillance team, working group, consortium, or the like (e.g., the Active Bacterial Core Surveillance Team) may be listed as a coauthor in the byline if its contributing members satisfy the requirements for authorship and accountability. The names (and institutional affiliations, if desired) of the contributing members may be given as a separate paragraph in Acknowledgments.

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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.

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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 only the results of the experiments; 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. For example, except in unusual cases, double-reciprocal plots used to determine apparent $K_m$ values should not be presented as graphs; instead, the values should be stated in the text. Similarly, graphs illustrating other methods commonly used to derive kinetic or physical constants (e.g., reduced-viscosity plots and plots used to determine sedimentation velocity) need not be shown except in unusual circumstances. 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.
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8. Fitzgerald G, Shaw D. In Waters AE (ed), Clinical microbiology, in press. EFH Publishing Co, Boston, MA.* {Chapter 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 3,484,363,770. {Include the name of the patented item/ process if possible; the patent number is mandatory.}
16. Harrison F, Roberts AEL, Gabrilksa 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, Gabrilksa 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.}

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October 2020, Instructions to Authors Applied and Environmental Microbiology aem.asm.org

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- Publisher (if appropriate), and
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The following templates may be helpful.

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

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Examples follow.


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.}

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... 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/).

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- 1,200 dpi for line art

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- 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.
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(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.

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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 “10⁴ cells per ml” (not “cells per ml × 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 closely 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.

### 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 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.

### Cover Photographs and Drawings

AEM publishes photographs and drawings on the front cover. Invitations to submit an illustration for consideration as cover art are issued to authors whose manuscripts are returned for modification or whose manuscripts have been accepted for publication in AEM; material should be related to the work presented in the AEM manuscript. Unsolicited photos will also
TABLE 2 Distribution of protein and ATPase in fractions of dialyzed membranes

<table>
<thead>
<tr>
<th>Membrane</th>
<th>Fraction</th>
<th>ATPase U/mg of protein</th>
<th>Total U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Depleted membrane</td>
<td>0.036</td>
<td>2.3</td>
</tr>
<tr>
<td></td>
<td>Concentrated supernatant</td>
<td>0.134</td>
<td>4.82</td>
</tr>
<tr>
<td>E1 treated</td>
<td>Depleted membrane</td>
<td>0.034</td>
<td>1.98</td>
</tr>
<tr>
<td></td>
<td>Concentrated supernatant</td>
<td>0.11</td>
<td>4.6</td>
</tr>
</tbody>
</table>

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

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 biochemical terminology, including abbreviations and symbols, consult Biochemical Nomenclature and Related Documents (Portland Press, London, United Kingdom, 1992), available at https://www.qmul.ac.uk/iupac/sbcs/biblog/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 Microorganisms

Binary names, consisting of a generic name and a specific epithet (e.g., Escherichia coli), must be used for all microorganisms. 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 and should be italicized in the manuscript; strain designations and numbers are not. Vernacular (common) names should be in lowercase roman type (e.g., streptococcus, brucella). For Salmonella, genus, species, and subspecies names should be rendered in standard form: Salmonella enterica at first use, S. enterica thereafter; Salmonella enterica subsp. arizonae at first use, S. enterica subsp. arizonae thereafter. Names of serovars should be in roman type with the first letter capitalized: Salmonella enterica serovar Typhimurium. After the first use, the serovar may also be given without a species name: Salmonella Typhimurium, S. Typhimurium, or Salmonella serovar Typhimurium. For other information regarding serovar designations, see Antigenic Formulae of the Salmonella Serovars, 9th ed. (P. A. D. Grimont and F.-X. Weill, WHO Collaborating Centre for Reference and Research on Salmonella, Institut Pasteur, Paris, France, 2007; see http://www.scacm.org/free/Antigenic%20Formulae%20of%20the%20Salmonella%20Serovars%202007%20edition.pdf). For a summary of the current standards for Salmonella nomenclature and the Kaufmann-White criteria, see the article by Brenner et al. (J Clin Microbiol 38:2465–2467, 2000), the opinion of the Judicial Commission of the International Committee on Systematics of Prokaryotes (Int J Syst Evol Microbiol 55:519–520, 2005), and the article by Tindall et al. (Int J Syst Evol Microbiol 55:521–524, 2005).

The spelling of bacterial names should follow the Approved Lists of Bacterial Names (Amended) & Index of the Bacterial and Yeast Nomenclatural Changes (V. B. D. Skerman et al., ed., American Society for Microbiology, Washington, DC, 1989) and the validation lists and notification lists published in the International Journal of Systematic and Evolutionary Microbiology (formerly the International Journal of Systematic Bacteriology) since January 1989. In addition, two sites on the World Wide Web list current approved bacterial names: Prokaryotic Nomenclature Up-to-Date (https://www.dsmz.de/bacterial-diversity/prokaryotic-nomenclature-up-to-date.html) and the 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 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.

For guidelines regarding new names and descriptions of new genera and species, see the articles by Tindall (Int J Syst Bacteriol 49:1309–1312, 1999) and Stackebrandt et al. (Int J Syst Evol Microbiol 52:1043–1047, 2002). To validate new names and/or combinations, authors must submit three copies of their published article to the International Journal of Systematic and Evolutionary Microbiology.

It is recommended that a strain be deposited in at least two recognized culture collections in different countries when that strain is necessary for the description of a new taxon (Int J Syst Evol Microbiol 50:2239–2244, 2000).

Since the classification of fungi is not complete, it is the responsibility of the author to determine the accepted bino-
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 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 lowercased (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.

Microorganisms, viruses, and plasmids should be given designations consisting of letters and serial numbers. It is generally advisable to include a worker’s initials or a descriptive symbol of locale or laboratory, etc., in the designation. Each new strain, mutant, isolate, or derivative should be given a new (serial) designation. This designation should be distinct from those of the genotype and phenotype, and genotypic and phenotypic symbols should not be included. Plasmids are named with a lowercase “p” followed by the designation in uppercase letters and numbers. To avoid the use of the same designation as that of a widely used strain or plasmid, check the designation against a publication database such as Medline.

For submissions on the topic of probiotics, the Food and Agriculture Organization and World Health Organization (FAO/WHO) definition must be used: “live microorganisms, which when administered in adequate amounts, confer a health benefit on the host.” To avoid any misrepresentation of how this term should be applied, authors are encouraged to read the FAO/WHO Guidelines published in 2002 (https://www.who.int/foodsafety/fs_management/en/probiotic_guidelines.pdf).

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 nonstandard nomenclature may be delayed by the editor or the Journals Department so that they may be reviewed.

Bacteria. The genetic properties of bacteria are described in terms of phenotypes and genotypes. The phenotype describes the observable properties of an organism. The genotype refers to the genetic constitution of an organism, usually in reference to some standard wild type. The guidelines that follow are based on the recommendations of Demerec et al. (Genetics 54:61–76, 1966).

(i) Phenotypic designations must be used when mutant loci have not been identified or mapped. They can also be used to identify the protein product of a gene, e.g., the OmpA protein. Phenotypic designations generally consist of three-letter symbols; these are not italicized, and the first letter of the symbol is capitalized. It is preferable to use Roman or Arabic numerals (instead of letters) to identify a series of related phenotypes. Thus, a series of nucleic acid polymerase mutants might be designated Pol1, Pol2, and Pol3, etc. Wild-type characteristics can be designated with a superscript plus (Pol+), and, when necessary for clarity, negative superscripts (Pol−) can be used to designate mutant characteristics. Lowercase superscript letters may be used to further delineate phenotypes (e.g., Str+ for streptomycin resistance). Phenotypic designations should be defined.

(ii) Genotypic designations are also indicated by three-letter locus symbols. In contrast to phenotypic designations, these are lowercase italic (e.g., ara his rps). If several loci govern related functions, these are distinguished by italicized capital letters following the locus symbol (e.g., araA araB araC). Promoter, terminator, and operator sites should be indicated as described by Bachmann and Low (Microbiol Rev 44:1–56, 1980), e.g., lacZp, lacAt, and lacZo.

(iii) Wild-type alleles are indicated with a superscript plus (ara+ his+). A superscript minus is not used to indicate a mutant locus; thus, one refers to an ara mutant rather than an ara− strain.

(iv) Mutation sites are designated by placing serial isolation numbers (allele numbers) after the locus symbol (e.g., araA1 araA2). If it is not known in which of several related loci the mutation has occurred, a hyphen is used instead of the capital letter (e.g., ara-23). It is essential in papers reporting the isolation of new mutants that allele numbers be given to the mutations. For Escherichia coli, there is a registry of such numbers: the Coli Genetic Stock Center (http://cgs2.biology.yale.edu/). For the genus Salmonella, the registry is the Salmonella Genetic Stock Center (http://people.ucalgary.ca/~kesander/). For the genus Bacillus, the registry is the Bacillus Genetic Stock Center (http://www.bgsc.org/).

(v) The use of superscripts with genotypes (other than + to indicate wild-type alleles) should be avoided. Designations indicating amber mutations (Am), temperature-sensitive mutations (Ts), constitutive mutations (Con), cold-sensitive mutations (Cs), production of a hybrid protein (Hyb), and other important phenotypic properties should follow the allele number (e.g., araA230(Am) hisD21(Ts)). All other such designations of phenotype must be defined at the first occurrence. If superscripts must be used, they must be approved by the editor and defined at the first occurrence in the text.

Subscripts may be used in two situations. Subscripts may be used to distinguish between genes (having the same name) from different organisms or strains; e.g., hisE_con or hisE_con for the his gene of E. coli or strain K-12, respectively, may be used to distinguish this gene from the his gene in another species or strain. An abbreviation may also be used if it is explained. Similarly, a subscript is also used to distinguish between genetic elements that have the same name. For example, the promoters of the gln operon can be designated glnAp1 and glnAp2. This form departs slightly from that recommended by Bachmann and Low (e.g., desC1p).
(vi) Deletions are indicated by the symbol Δ placed before the deleted gene or region, e.g., ΔtrpA432, Δ(aroP-aceE)19, or Δ(hisQ-hisI)1256. Similarly, other symbols can be used (with appropriate definition). Thus, a fusion of the ara and lac operons can be shown as Φ(ara-lac)95. Likewise, Φ(arab' lacZ")96 indicates that the fusion results in a truncated arab gene fused to an intact lacZ gene. Finally, Φ(maltE-
lacZ)97(Hyb) shows that a hybrid protein is synthesized. An inversion is shown as IN(rrnD-rrnE). An insertion of an E. coli his gene into plasmid pSC101 at zero kilobases (0 kb) is shown as pSC101Ω (0kb::K-12hisB)4. An alternative designation of an insertion can be used in simple cases, e.g., galT236::Tn5. The number 236 refers to the locus of the insertion, and if the strain carries an additional gal mutation, it is listed separately. Additional examples, which utilize a slightly different format, can be found in the papers by Campbell et al. and Novick et al. cited below. It is important in reporting the construction of strains in which a mobile element was inserted and subsequently deleted that this fact be noted in the strain table. This can be done by listing the genotype of the strain used as an intermediate in a table footnote or by making a direct or parenthetical remark in the genotype, e.g., (F--), ΔMu cts, or mal::ΔMu cts::lac. In setting parenthetical remarks within the genotype or dividing the genotype into constituent elements, parentheses and brackets are used without special meaning; brackets are used outside parentheses. To indicate the presence of an episome, parentheses (or brackets) are used (λ, F--). Reference to an integrated episome is described as above for inserted elements, and an exogenote is shown as, for example, W3110/F8(gal-). For information about the symbols in current use, consult Berlyn (Microbiol Mol Biol Rev 62:814–984, 1998) for E. coli K-12, Sanderson and Roth (Microbiol Rev 52:485–532, 1988) for Salmonella serovar Typhimurium, Holloway et al. (Microbiol Rev 43:73–102, 1979) for the genus Pseudomonas, Piggot and Hoch (Microbiol Rev 49:158–179, 1985) for Bacillus subtilis, Perkins et al. (Microbiol Rev 46: 426–570, 1982) for Neisseria crassa, and Mortimer and Schild (Microbiol Rev 49:181–213, 1985) for Saccharomyces cerevisiae. For yeasts, Chlamydomonas spp., and several fungal species, symbols such as those given in the Handbook of Microbiology, 2nd ed. (A. I. Laskin and H. A. Lechevalier, ed., CRC Press, Inc., Cleveland, OH, 1988), should be used.

Conventions for naming genes. It is recommended that (entirely) new genes be given names that are mnemonics of their function, avoiding names that are already assigned and earlier or alternative gene names, irrespective of the bacterium for which such assignments have been made. Similarly, it is recommended that, whenever possible, orthologous genes present in different organisms receive the same name. When homology is not apparent or the function of a new gene has not been established, a provisional name may be given by one of the following methods. (i) The gene may be named on the basis of its map location in the style yaaA, analogous to the style used for recording transposon insertions (zef) as discussed below. A list of such names in use for E. coli has been published by Rudd (Microbiol Mol Biol Rev 62:985–1019, 1998). (ii) A provisional name may be given in the style described by Demerec et al. (e.g., wag, gene upstream of folC). Such names should be unique, and names such as orf or genX should not be used. For reference, the Coli Genetic Stock Center’s database includes an updated listing of E. coli gene names and gene products. It is accessible on the Internet (http://cgsc2.biology.yale.edu/index.php). A list can also be found in the work of Riley (Microbiol Rev 57:862–952, 1993). For the genes of other bacteria, consult the references given above.

For prokaryotes, gene names should not begin with prefixes indicating the genus and species from which the gene is derived. (However, subscripts may be used where necessary to distinguish between genes from different organisms or strains, as described in section v of “Bacteria” above.) For eukaryotes, such prefixes may be used for clarity when discussing genes with the same name from two different organisms (e.g., ScURA3 versus CaURA3); the prefixes are not considered part of the gene name proper and are not italicized.

Locus tags. Locus tags are systematic, unique identifiers that are assigned to each gene in GenBank. All genes mentioned in a manuscript should be traceable to their sequences by the reader, and locus tags may be used for this purpose in manuscripts to identify uncharacterized genes. In addition, authors should check GenBank to make sure that they are using the correct, up-to-date format for locus tags (e.g., uppercase versus lowercase letters and the presence or absence of an underscore, etc.). Locus tag formats vary between different organisms and also may be updated for a given organism, so it is important to check GenBank at the time of manuscript preparation.

“Mutant” versus “mutation.” Keep in mind the distinction between a mutation (an alteration of the primary sequence of the genetic material) and a mutant (a strain carrying one or more mutations). One may speak about the mapping of a mutation, but one cannot map a mutant. Likewise, a mutant has no genetic locus, only a phenotype.

“Homology” versus “similarity.” For use of terms that describe relationships between genes, consult the articles by Theissen (Nature 415:741, 2002) and Fitch (Trends Genet 16: 227–231, 2000). “Homology” implies a relationship between genes that have a common evolutionary origin; partial homology is not recognized. When sequence comparisons are discussed, it is more appropriate to use the term “percent sequence similarity” or “percent sequence identity,” as appropriate. When using “percent sequence similarity,” the method/algorithm used to calculate the percentage should be stated.

Strain designations. Do not use a genotype as a name (e.g., “subsequent use of leuC6 for transduction”). If a strain designation has not been chosen, select an appropriate word combination (e.g., “another strain containing the leuC6 mutation”).

“Natural” versus “artificial” transformation. Natural transformation is a process whereby the recipient cell has the inherent capacity to take up and integrate exogenous DNA into its genome. As such, natural transformation is part of the biology of the recipient cell line and should not be confused with processes through which integration of DNA is forced upon recipient cells.

Viruses. The genetic nomenclature for viruses differs from that for bacteria. In most instances, viruses have no phenotype,
since they have no metabolism outside host cells. Therefore, distinctions between phenotype and genotype cannot be made. Superscripts are used to indicate hybrid genomes. Genetic symbols may be one, two, or three letters. For example, a mutant strain of λ might be designated λ Aam1 int2 red14 c857; this strain carries mutations in genes cl, int, and red and an amber-suppressible (Am) mutation in gene λ. A strain designated λ attB434 imm41 would represent a hybrid of phage λ that carries the immunity region (imm) of phage 21 and the attachment (att) region of phage 434. Host DNA insertions into viruses should be delineated. As pgd.org/ is the authority for Drosophila melanogaster. When naming genes for Aspergillus species, the nomenclature guidelines posted at http://www.aspergillusgenome.org/Nomenclature.shtml should be followed, and the Aspergillus Genome Database (http://www.aspgd.org/) should be searched to ensure that any new name is not already in use. The Saccharomyces Genome Database (https://www.yeastgenome.org/) and the Candida Genome Database (http://www.candidagenome.org/) are authorities for Saccharomyces cerevisiae and Candida albicans genetic nomenclature, respectively.

For more information about the genetic nomenclature of eukaryotes, see the Instructions to Authors for Molecular and Cellular Biology.

Transposable elements, plasmids, and restriction enzymes. Nomenclature of transposable elements (insertion sequences, transposons, and phage Mu, etc.) should follow the recommendations of Campbell et al. (Gene 5:197–206, 1979), with the modifications given in section vi of “Bacteria” above. The Internet site where insertion sequences of eubacteria and archaea are described and new sequences can be recorded is https://www.is.biotoul.fr.

The system of designating transposon insertions at sites where there are no known loci, e.g., zef-123::Tn5, has been described by Chumley et al. (Genetics 91:639–655, 1979). The nomenclature recommendations of Novick et al. (Bacteriol Rev 40:168–189, 1976) for plasmids and plasmid-specified activities, of Low (Bacteriol Rev 36:587–607, 1972) for F’ factors, and of Roberts et al. (Nucleic Acids Res 31:1805–1812, 2003) for restriction enzymes, DNA methyltransferases, homing endonucleases, and their genes should be used when possible. The nomenclature for recombinant DNA molecules constructed in vitro follows the nomenclature for insertions in general. DNA inserted into recombinant DNA molecules should be described by using the gene symbols and conventions for the organism from which the DNA was obtained.

Tetracycline resistance determinants. The nomenclature for tetracycline resistance determinants is based on the proposal of Levy et al. (Antimicrob Agents Chemother 43:1523–1524, 1999). The style for such determinants is, e.g., Tet B; the space helps distinguish the determinant designation from that for phenotypes and proteins (TetB). The above-referenced article shows the correct format for genes, proteins, and determinants in this family.

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)**
- cDNA (complementary DNA)
- RNA (ribonucleic acid)
- tRNA (transfer RNA)
- AMP, ADP, ATP, dAMP, ddATP, and GTP, etc. (for the respective 5’ phosphates of adenosine and other nucleotides) (add 2’-, 3’- or 5’- when needed for contrast)
- ATPase and dGTPase, etc.
- (adenosine triphosphatase and deoxyguanosine triphosphatase, etc.)
- NAD (nicotinamide adenine dinucleotide)
- NAD+ (nicotinamide adenine dinucleotide, oxidized)

**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:


If biological variation within a treatment (coefficient of variation, the standard deviation divided by the mean) is small (less than 10%) and the difference among treatment means is large (greater than 3 standard deviations), it is not necessary to report statistics. If the data do not meet these criteria, however, the authors must include an appropriate statistical analysis (e.g., Student’s t test, analysis of variance, or Tukey’s test, etc.). Statistics should represent the variation among biological units (e.g., replicate incubations) and not just the variation due to method of analysis.

Phylogenetic trees based on nucleotide or amino acid sequence alignments must be supported by appropriate statistical analyses of tree stability (e.g., bootstrap analysis), and nonsupported branches (e.g., bootstrap coefficients below 50%) should be collapsed. A copy of the alignment should be available for examination by the editor or the reviewers upon request.


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

### 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 μm or μμ. Parts per million (ppm) may be used when that is the common measure for the science in that field. Units of temperature are presented as follows: 37°C or 324 K.

When fractions are used to express such units 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 applicable SI units.

Representation of data as accurate to more than two significant figures must be justified by presentation of appropriate statistical analyses.


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

### Equations

In mathematical equations, indicate the order of operations clearly by enclosing operations in parentheses, brackets, and braces, in that order: \((a + b) \times c\) or \(a + (b \times c)\), \(100 \times \left(\frac{1}{2}\right) + \left(\frac{1}{3}\right)\) or \(100 \times \left[\frac{1}{2}\left(\frac{1}{3}\right)\right]\). Italicize variables and constants (but not numerals), and use roman type for designations:

- \(E_0\)
- \(E_p\)
- \(M_L\)
- \(K_m\)
- \(K_a\)
- \(a + b = 1.2 \text{ mM, } Ca^{2+} V_{max} = \exp(1.5x + y), \text{ BOD} = 2.7x^2\).

### Isotopically Labeled Compounds

For simple molecules, isotopic labeling is indicated in the chemical formula (e.g., \(^{14}\text{C}O_2\), \(^{3}\text{H}_2\text{O}\), and \(\text{H}_2{^{32}}\text{SO}_4\)). 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., \(^{32}\text{S}-\text{ATP}\)) or to a word that is not a specific chemical name (e.g., \(^{13}\text{I}-\text{labeled protein},^{14}\text{C}-\text{amino acids, and}^{3}\text{H}-\text{ligands}\)).

For specific chemicals, the symbol for the isotope introduced is placed in 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.

- \(^{14}\text{C}\text{urea}\)
- \(^{14}\text{Cmethionine}\)
- \(^{14}\text{C}\text{lysine}\)
- \(^{32}\text{P}\text{ATP}\)
- UDP-\(^{14}\text{C}\text{glucose}\)
- \(E. \text{coli}^{32}\text{P}\text{DNA}\)
- fructose 1,6-\(^{14}\text{C}\)bisphosphate
Below is a quick checklist of formatting issues that we commonly ask authors to address. This list is not all-inclusive. Authors are encouraged to review the **Instructions to Authors** for more guidelines and details. If this is a revision/resubmission, specific issues identified by the editor, reviewers, and/or ASM staff are listed in your decision letter; be sure to review and address these issues.

<table>
<thead>
<tr>
<th>Author Checklist</th>
<th>Instructions</th>
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<tr>
<td><strong>Page Format/Length</strong></td>
<td>□ Double-space and left-justify the manuscript; use 12-point type and 1-inch margins; use portrait layout for 8.5″ × 11″ paper. Add continuous line numbers and page numbers to assist editors/reviewers. Note also that AEM no longer publishes short-form papers.</td>
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<td><strong>Title page</strong></td>
<td>□ On the title page (first page of your manuscript), include the full working title, author byline with all authors’ full names and affiliations, contact information for the corresponding author(s) (note that there may be two), and keywords.</td>
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<td><strong>First-Time Claims/Abstract/Importance</strong></td>
<td>□ First-time claims should be avoided.</td>
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<td>□ Most article types require an abstract (see the <strong>Instructions to Authors</strong> for exceptions and for specific word limits). The abstract should concisely summarize the content of the paper without presenting extensive experimental details.</td>
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<td>□ For Research Articles, include a separate Importance paragraph of ≤150 words. This is a nontechnical explanation of why the work was undertaken.</td>
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<td><strong>References</strong></td>
<td>□ 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. Include the names of all authors for each work cited (instead of “et al.”).</td>
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<td>□ Refer to the <strong>Instructions to Authors</strong> for specific formatting instructions.</td>
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<tr>
<td><strong>Tables</strong></td>
<td>□ Place all tables after the References section.</td>
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<td>□ Create tables using the Table function of Microsoft Word (preferably without using the spacing and tabbing features). Arrange the data so that columns of like material read down, not across.</td>
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<td>□ 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 (a, b, c, etc.).</td>
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<tr>
<td><strong>Figures</strong></td>
<td>□ Place all figures after the References section and after tables, if any.</td>
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<td>□ On initial submission, figures may be supplied as PDF files. For revisions, they must be supplied as individual TIFF or EPS files. PowerPoint files are NOT accepted.</td>
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<td>□ Multipanel figures must be assembled in a single file (and onto one page if at all possible).</td>
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<td>□ On initial submission, set each figure legend directly beneath the corresponding figure. For revisions, the legend(s) should be provided in the manuscript file, separate from the figure file(s).</td>
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<td>□ Supplemental text, tables, and figures should be combined and uploaded as a single PDF. (Only supplemental data sets [Excel files] and movies should be uploaded separately.) Legends and descriptions for the supplemental material should appear within the supplement file.</td>
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<td>□ AEM will post no more than 10 individual supplemental items.</td>
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<td>□ 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, insert a References section in the supplemental file and cite the references by numbers. Do not include references in the main text that are cited only in the supplemental material.</td>
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<td>□ In addition to the specific items mentioned above for revisions, please include a Response to Reviewer Comments file that addresses the editor/reviewer comments point by point, with line numbers to indicate where changes have been made. Do NOT include this file as part of the cover letter. A Response to Reviewer Comments file is also required for any submission that has previously been rejected by an ASM journal.</td>
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<td>□ Upload a separate Marked Up Manuscript file showing the changes made to the paper. Your main manuscript text file must contain only a clean copy of the revised paper.</td>
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