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ORGANIZATION AND FORMAT

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 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).

Authors who are unsure of proper English usage 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. On the title page, include the title, running title (not to exceed 54 characters and spaces), name of each author, address(es) of the institution(s) at which the work was performed, each author’s affiliation, and a footnote indicating the present address of any author no longer at the institution where the work was performed. Place an asterisk after the name of the author to whom inquiries regarding the paper should be directed (see “Correspondent footnote” below).

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 as described in these Instructions. The names (and institutional affiliations if desired) of the contributing members only may be given in a footnote keyed to the study group name in the byline or a separate paragraph in Acknowledgments.

If the contributing members of the group associated with the work do not fulfill the criteria of substantial contribution to and responsibility for the paper, the group may not be listed in the author byline. Instead, it and the names of its contributing members may be listed in the Acknowledgments section.

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Abstract. Limit the abstract to 250 words or fewer and concisely summarize the basic content of the paper without presenting extensive experimental details. Avoid abbreviations and references, and do not include diagrams. When it is essential to include a reference, use the same format as shown for the References section but omit the article title. Because the abstract will be published separately by abstracting services, it must be complete and understandable without reference to the text.

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 and the rationale for the present study. Use only those references required to provide the most

Full-Length Papers

Full-length papers should include the elements described in this section.

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**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 (× 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.

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.

**Results.** The Results section should include 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 Km 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.

**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.

**Acknowledgments.** The source of any financial support received for the work being published must be indicated in the Acknowledgments section. (It will be assumed that the absence of such an acknowledgment is a statement by the authors that no support was received.) The usual format is as follows: “This work was supported by Public Health Service grant CA-01234 from the National Cancer Institute.” 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.

**Appendixes.** Appendixes, which contain additional material to aid the reader, are permitted. Titles, authors, and References 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, either full-length or Note style. 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.** (i) References listed in the References section. The References section must include all journal articles (both print and online), books and book chapters (both print and online), patents, theses and dissertations, published conference proceedings, meeting abstracts from published abstract books or journal supplements, letters (to the editor), and company publications, as well as in-press journal articles, book chapters, and books (publication title must be given). Arrange the citations in alphabetical order (letter by letter, ignoring spaces and punctuation) by first-author surname and number consecutively. Provide the names of all the authors for each reference. All listed references must be cited parenthetically by number in the text. Since title and byline information that is downloaded from PubMed does not always show accents, italics, or special characters, authors should refer to the PDF files or hard-copy versions of the articles and incorporate the necessary corrections in the submitted manuscript. Abbreviate journal names according to the List of Journals Indexed for Medline (National Library of Medicine, National Institutes of Health, 2009; available at ftp://nlmpubs.nlm.nih.gov/online/journals/ljiweb.pdf), the primary source for ASM style.

Follow the styles shown in the examples below for print references.

1. Arendsen, A. F., M. Q. Solimar, and S. W. Ragsdale. 1999. Nitrate-dependent regulation of acetate biosynthesis and nitrate respiration by *Clostridium thermoceticum*. J. Bacteriol. 181:1489–1495.
2. Cox, C. S., B. R. Brown, and J. C. Smith. J. Gen.
Genet., in press.* {Article title is optional; journal title is mandatory.}
3. **da Costa, M. S., M. F. Nobre, and F. A. Rainey.** 2001. Genus I. Thermus Brock and Freeze 1969, 295, Al emend. Nobre, Trüper and da Costa 1996b, 605, p. 404–414. In D. R. Boone, R. W. Castenholz, and G. M. Garrity (ed.), Bergey’s manual of systematic bacteriology, 2nd ed., vol. 1. Springer, New York, NY.
4. **Elder, B. L., and S. E. Sharp.** 2003. Cumitech 39, Competency assessment in the clinical laboratory. Coordinating ed., S. E. Sharp. ASM Press, Washington, DC.
5. **Falagas, M. E., and S. K. Kasiakou.** 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.)
6. **Fitzgerald, G., and D. Shaw.** In A. E. Waters (ed.), Clinical microbiology, in press. EFH Publishing Co., Boston, MA.* {Chapter title is optional.}
7. **Forman, M. S., and A. Valsamakis.** 2003. Specimen collection, transport, and processing: virology, p. 1227–1241. In P. R. Murray, E. J. Baron, M. A. Pfaller, J. H. Jorgensen, and R. H. Yolken (ed.), Manual of clinical microbiology, 8th ed. ASM Press, Washington, DC.
8. **Garcia, C. O., S. Paira, R. Burgos, J. Molina, J. F. Molina, and C. Calvo.** 1996. Detection of salmonella DNA in synovial membrane and synovial fluid from Latin American patients. Arthritis Rheum. 39(Suppl.):S185. {Meeting abstract published in journal supplement.}
9. **Green, P. N., D. Hood, and C. S. Dow.** 1984. Taxonomic status of some methylotrophic bacteria, p. 251–254. In R. L. Crawford and R. S. Hanson (ed.), Microbial growth on C_{1} compounds. Proceedings of the 4th International Symposium. American Society for Microbiology, Washington, DC.
10. **Odhell, J. C.** April 1970. Process for batch culturing. U.S. patent 484,363,770. {Include the name of the patented item/process if possible; the patent number is mandatory.}
11. **O’Malley, D. R.** 1998. Ph.D. thesis. University of California, Los Angeles. {Title is optional.}
12. **Rotimi, V. O., N. O. Salako, E. M. Mohaddas, and L. P. Philip.** 2005. Abstr. 45th Intersci. Conf. Antimicrob. Agents Chemother., abstr. D-1658. {Abstract title is optional.}
13. **Smith, D., C. Johnson, M. Maier, and J. J. Maurer.** 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.}
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.}

“A reference to an in-press ASM publication should state the control number (e.g., EC00577-09) if it is a journal article or the name of the publication if it is a book.

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1. **Charlier, D., and N. Glansdorff.** September 2004, posting date. Chapter 3.6.1.10, Biosynthesis of arginine and polyamines. In R. Curtiss III et al. (ed.), EcoSal—Escherichia coli and Salmonella: cellular and molecular biology. ASM Press, Washington, DC. http://www.ecosal.org/ecosal/index.jsp. (Note that each chapter has its own posting date.)
2. **Dionne, M. S., and D. S. Schneider.** 2002. Screening the fruitlet immune system. Genome Biol. 3:REVIEWS1010. http://genomebiology.com/2002/3/4/reviews/1010.
3. **Smith, F. X., H. J. Merianos, A. T. Brunker, and D. M. Engelman.** 2001. Polar residues drive association of polyleucine transmembrane helices. Proc. Natl. Acad. Sci. USA 98:2250–2255. doi:10.1073/pnas.041593698.
4. **Winnick, S., D. O. Lucas, A. L. Hartman, and D. Toll.** 2005. How do you improve compliance? Pediatrics 115:e718–e724.

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

(ii) References cited in the text. References to unpublished data, manuscripts submitted for publication, unpublished conference presentations (e.g., a report or poster that has not appeared in published conference proceedings), personal communications, patent applications and patents pending, computer software, databases, and websites (home pages) 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 described previously (M. G. Gordon and F. L. Rattner, presented at the Fourth Symposium on Food Microbiology, Overton, IL, 13 to 15 June 1989). {For unpublished abstracts and posters, etc.}

... this new process (V. R. Smoll, 20 June 1999, Australian Patent Office). {For non-U.S. patent applications, give the date of publication of the application.}
available in the GenBank database (http://www.ncbi.nlm.nih.gov/Genbank/index.html).

... using ABC software (version 2.2; Department of Microbiology, State University [http://www.stu.micro]).

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.

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Wang, G. G., M. P. Pasillas, and M. P. Kamps. 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, F. X., H. J. Merianos, A. T. Brunger, and D. M. Engelman. 13 February 2001, posting date. Polar residues drive association of polyleucine transmembrane helices. Proc. Natl. Acad. Sci. USA doi:10.1073/pnas.041593698.

Notes

The Note format is intended for the presentation of brief observations that do not warrant full-length papers. Submit Notes in the same way as full-length papers. They receive the same review, they are not published more rapidly than full-length papers, and they are not considered preliminary communications.

Each Note must have an abstract of no more than 50 words. Do not use section headings in the body of the Note; combine methods, results, and discussion in a single section. Paragraph lead-ins are permissible. The text should be kept to a minimum and if possible should not exceed 1,000 words; the number of figures and tables should also be kept to a minimum. Materials and methods should be described in the text, not in the figure legends or table footnotes. Present acknowledgments as in full-length papers, but do not use a heading. The References section is identical to that of full-length papers.

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Minireviews are brief (limit of six printed pages exclusive of references) biographical profiles, historical perspectives, or summaries of developments in fast-moving areas. They must be based on published articles; they may address any subject within the scope of the journal.

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Guest Commentaries are communications written in response to invitations issued by the editors and concern relevant topics in eukaryotic microbiology that are not necessarily covered by Minireviews. They should raise issues of interest to the scholarly community, initiate or focus discussion, and propose needed position or consensus statements by leadership groups in research and education. Reviews of the literature, methodologies and other how-to-papers, and responses targeted at a specific published paper are not appropriate. Guest Commentaries are subject to review.

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ILLUSTRATIONS AND TABLES

To acknowledge a shift in readership and subscriptions from the print journals to the online publications, starting in 2009, the online version will be considered the journal of record for all ASM journals. This change means that RGB (red, green, blue) color space will now be the preferred format for authors’ color files. The switch to RGB color will enable the online journals to reproduce scientific data with more accuracy and detail than is possible in a printed version. 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 additional information on RGB versus CMYK color, refer to the Cadmus digital art site, http://art.cadmus.com/da/guidelines_rgb.jsp.

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File types and formats. Illustrations may be continuous-tone images, line drawings, or composites. Color graphics may be submitted, but the cost of printing in color must be borne by the author. Suggestions about how to reduce costs and ensure accurate color reproduction are given below.

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(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 fill patterns are not imported from another application. If you must use images containing screens,

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(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.). 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 (RSC Publishing, Cambridge, United Kingdom, 2007); an abbreviated list is available at http://www.old.iupac.org/reports/1993/homann/index.html.

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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.

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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 shading must be submitted as illustrations in an acceptable format at the modification stage. The preferred format for regular tables is MS 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. If your modified manuscript contains PDF tables, select “for reviewing purposes only” at the beginning of the file upload process.

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 (below) of these Instructions for those that should be used in tables. Explanatory footnotes are acceptable, but more-extensive table “legends” are not. Footnotes should

| TABLE 1. Effect of glucose on levels of catabolic enzymes and morphology in M. rouxii |
|-------------------|-----------------|-----------------|-----------------|-----------------|
| Cell type        | Enzyme activity            |                  |                  |                  |
|                  | Pyruvate kinase\(^a\) | Phosphofructokinase\(^b\) | Glutamate dehydrogenase\(^c\) | Pyruvate decarboxylase\(^c\) |
|                  | 1 min | 5 min |                  |                  |                  |
| Mycelium         |        |       |                  |                  |                  |
| −Glucose         | 1,056 | 2     | 1.7              | 4.3              | 0.05             |
| +Glucose         | 2,930 | 10    | 8.04             | 0.53             | 1.3              |
| Yeast            |        |       |                  |                  |                  |
| −Glucose         | 1,145 | 4     | 23.2             | 4.1              | 0.04             |
| +Glucose         | 4,380 | 30    | 63.6             | 0.03             | 1.7              |

\(^a\) Nanomoles of pyruvate formed per milligram of protein in time shown (3, 9).
\(^b\) Millimoles of fructose 1,6-diphosphate produced per minute per milligram of protein (7).
\(^c\) Micromoles of NADH oxidized per minute per milligram of protein (10).
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 1 (below) is an example of a well-constructed table.

Cover Photographs and Drawings

EC publishes photographs and drawings on the front cover. Invitations are issued to authors whose manuscripts are returned for modification or whose manuscripts have been accepted for publication in EC; material should be related to the work presented in the EC manuscript. Unsolicited photos will also be considered. No material submitted for consideration will be returned to the author. Authors will be notified only if their cover art is selected. Copyright for the chosen material must be transferred to ASM. A short description of the cover material will be included. Technical specifications for submission are available from the cover editor, C. C. Wang (e-mail: ccwang@cgl.ucsf.edu).

NOMENCLATURE

Chemical and Biochemical Nomenclature

The recognized authority for the names of chemical compounds is Chemical Abstracts (CAS; http://www.cas.org/) and its indexes. The Merck Index, 14th ed. (Merck & Co., Inc., Whitehouse Station, NJ, 2006), 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 http://www.chem.qmul.ac.uk/iupac/biblog/white.html, and the instructions to authors of the Journal of Biological Chemistry and the Archives of Biochemistry and Biophysics (first issues of each year).

Do not express molecular weight in daltons; molecular weight is a unitless ratio. Molecular mass is expressed in daltons.

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 at http://www.chem.qmul.ac.uk/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, and express enzyme activity either in katals (preferred) or in the older system of micromoles per minute.

Nomenclature of 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 Database 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).

Nomenclature of Microorganisms

Binary names, consisting of a generic name and a specific epithet (e.g., Saccharomyces cerevisiae), 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., S. cerevisiae), provided there can be no confusion with other genera used in the paper. Names of all taxa (kingdoms, phyla, classes, orders, families, genera, species, and subspecies) are printed in italics and should be italicized (or underlined) in the manuscript; strain designations and numbers are not.

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., ASM Press, 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: Bacterial Nomenclature Up-to-Date (http://www.dsmz.de/microorganisms/main.php?contentleft_id=14) and List of Prokaryotic Names with Standing in Nomenclature (http://www.bacterio.cict.fr/).

Since the classification of fungi is far from 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, 4th ed. (C. P. Kurtzman and J. W. Fell, ed., Elsevier Science Publishers B.V., Amsterdam, The Netherlands, 1998) and Ainsworth and Bisby’s Dictionary of the Fungi, 9th ed. (P. M. Kirk, P. F. Cannon, J. C. David, and J. A. Stalpers, ed., CABI Publishing, Wallingford, Oxfordshire, United Kingdom, 2001); see also http://www.speciesfungorum.org/Names/Fundic.asp.

Names used for viruses should be those approved by the International Committee on Taxonomy of Viruses (ICTV) and published in Virus Taxonomy: Eighth Report of the International Committee on Taxonomy of Viruses (C. M. Fauquet et al., ed., Elsevier Academic Press, San Diego, CA, 2005). 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, like 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.

Microbial strains, viruses, and plasmids should be given individual 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.

**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 by the Genetics and Genomics Committee of the ASM Publications Board.

**Before submission of manuscripts, authors may direct questions on genetic nomenclature to the committee’s chairman: Maria Costanzo (e-mail: maria@ genome.stanford.edu). Such a consultation should be mentioned in the manuscript submission letter.**

**Eukaryotes.** The nomenclature used for the genetics of lower eukaryotic microorganisms has not been as well formalized as that for bacteria and bacteriophages. Generally, authors should conform to current practices in identifying mutants and their genotypes. For organisms not mentioned below, it is advisable to consult the *Handbook of Microbiology*, 2nd ed. (A. I. Laskin and H. A. Lechevalier, ed., CRC Press, Boca Raton, FL, 1988) or the *Handbook of Genetics*, vol. 1, *Bacteria, Bacteriophages, and Fungi* (R. C. King, ed., Plenum Publishing Corp., New York, NY, 1974).

Gene names may begin with prefixes to indicate the genus and species from which the gene is derived only when needed 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.

The genetic nomenclature of *Dictyostelium* is summarized in the *Trends in Genetics* “Genetic Nomenclature Guide” (p. S.5–S.6; Elsevier Science Ltd., Cambridge, United Kingdom, 1998; out of print). The most recent modifications can be found at http://dictybase.org /GeneNames.html.

For *Saccharomyces cerevisiae*, a gene name should always be indicated in italics and, for the wild-type locus (or dominant alleles), capital letters (e.g., URA3). Loss-of-function (hypomorphic) or altered-function (neomorphic) alleles of the same locus should always be indicated in italics and lowercase letters (e.g., ura3Δ). The product of a gene (i.e., a protein) should be indicated in roman type with an initial capital letter (e.g., Ura3). There is generally no need to add the suffix “p” to the symbol for a protein; however, in rare instances where it may be deemed necessary to indicate unambiguously that the symbol refers to a protein, the “p” suffix may be added (e.g., Ura3p). For the most recent information on *S. cerevisiae* gene names, consult the *Saccharomyces Genome Database* (SGD) at http://www.yeastgenome.org/. Details on the format of *S. cerevisiae* locus and allele designations are provided in the SGD and are also described by Cherry (Trends Genet. March: 11–12, 1995) (available for download as a PDF file at SGD, http://www.yeastgenome.org/sgdpub/Saccharomyces _cerevisiae.pdf). Authors should use standard *S. cerevisiae* gene names, as listed in the SGD, in their submitted manuscripts and register new gene names with the SGD no later than the modification stage.

The most recent information for *Neurospora crassa* can be found in *The Neurospora Compendium: Chromosomal Loci* (D. R. Perkins et al., Academic Press, San Diego, CA, 2001), and that for *Aspergillus* spp. can be found at http://www.fgsc.net/nomenclature.htm. The 1998 *Trends in Genetics* “Genetic Nomenclature Guide” (Elsevier Science Ltd., Cambridge, United Kingdom; out of print) contains nomenclature guidelines for several eukaryotic microbes: *Schizosaccharomyces pombe* (p. S.7–S.9), *Chlamydomonas reinhardtii* (p. S.18–S.19), *Neurospora crassa* (p. S.14–S.15), and *Aspergillus nidulans* (p. S.12–S.13). In addition, for *S. pombe*, the websites http://www.sanger.ac.uk/Projects/S _pombe/SP_Name_FAQ.shtml and http://www.rcf.usc.edu /~forsburg/plasmids.html#nomenclature may be helpful, and for *C. reinhardtii*, use http://www.chlamy.org/chlamydb .html.

For *Trypanosoma* and *Leishmania*, consult the article by Clayton et al. (Mol. Biochem. Parasitol. 97:221–224, 1998).

For the most recent information on *Candida albicans*, consult the *Candida Genome Database* (CGD) at http://www.candidagenome.org. Details on the format of *C. albicans* gene nomenclature are described at http://www .candidagenome.org/Nomenclature.shtml. Authors should use standard *C. albicans* gene names, as listed in the CGD, in their submitted manuscripts and should register new gene names with the CGD no later than the modification stage.

**Prokaryotes.** The genetic properties of prokaryotes 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. Use the recommendations of Demerec et al. (Genetics 54:61–76, 1966) as a guide to the use of these terms. If your manuscript contains genetic nomenclature, please refer to the Instructions to Authors in the January issue of the *Journal of Bacteriology*. Viruses. In most cases, viruses have no phenotype, since they have no metabolism outside host cells. Therefore, distinctions between phenotype and genotype are not made. Superscripts are used to indicate hybrid genomes.
Genetic symbols may be one, two, or three letters. For example, a mutant strain of lambda may be designated cI857 int2 red114 Aam11; this strain carries mutations in genes cI, int, and red and an amber-suppressible (am) mutation in gene A. Host DNA insertions into viruses should be delineated by square brackets, and the genetic symbols and designations for such inserted DNA should conform to those used for the host genome.

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 organism 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, the GenBank locus tag may be used to designate the gene; it should not be 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. However, since locus tags are not genetic names, they should appear in roman type rather than in italics. 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 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.

“Homology” versus “similarity.” For use of terms that describe relationships between genes, consult the articles by Theissen (Nature 418:741, 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.

“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.

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 referred to in the Instructions to Authors in the Journal of Bacteriology.

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). Use 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. 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.

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 p. 191–193 in How To Write and Publish a Scientific Paper, 6th ed.

Abbreviations

General. Abbreviations should be used as an aid to the reader, rather than as a convenience for 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 (isolate, Ala, and Leu, etc.) may also be used.

It is strongly recommended that all abbreviations except those listed below be introduced in the first paragraph in Materials and Methods. Alternatively, 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 Systeme 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); cRNA (complementary RNA); RNase (ribonuclease); DNase (deoxyribonuclease); rRNA (ribosomal RNA); mRNA (messenger RNA); tRNA (transfer RNA); AMP, ADP, ATP, dAMP, ddATP, and GTP, etc. (for the respective 5’ phosphates of adenosine and other nucleosides); NAD (nicotinamide adenine dinucleotide); NADP (nicotinamide adenine dinucleotide phosphate); NADH (nicotinamide adenine dinucleotide, reduced); NADPH (nicotinamide adenine dinucleotide phosphate, oxidized); poly(A) and poly(dT), etc. (adenosine triphosphatase and deoxyguanosine triphosphatase, etc.); NAD (nicotinamide adenine dinucleotide); NAD+ (nicotinamide adenine dinucleotide, oxidized); NADH (nicotinamide adenine dinucleotide, reduced); NADP (nicotinamide adenine dinucleotide phosphate); NADPH (nicotinamide adenine dinucleotide phosphate, reduced); NADP+ (nicotinamide adenine dinucleotide phosphate, oxidized); poly(A) and poly(dT), etc. (polyadenylic acid and polydeoxythymidylic acid, etc.); oligo(dT), etc. (oligodeoxythymidylic acid, etc.); UV (ultraviolet); PFU (plaque-forming units); CFU (colony-forming units); MIC (minimal inhibitory concentration); DEAE (diethylaminoethyl); EDTA (ethylenediaminetetraacetic acid); HEPES (N-2-hydroxyethylpiperazine-N’-2-ethanesulfonic acid); PCR (polymerase chain reaction); and 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)
- approx (approximately)
- avg (average)
- concn (concentration)
- diam (diameter)
- extpt (experiment)
- exp (experimental)
- ht (height)
- mo (month)
- mol wt (molecular weight)
- no. (number)
- prepn (preparation)
- SD (standard deviation)
- SE (standard error)
- SEM (standard error of the mean)
- sp act (specific activity)
- sp gr (specific gravity)
- temp (temperature)
- tr (trace)
- vol (volume)
- vs (versus)
- wk (week)
- wt (weight)
- 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 10^3. Avoid compound prefixes such as µm or µg. 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 article by Olsen (Infect. Immun. 71:6689–6692, 2003).

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 which is not a specific chemical name (e.g., 131I-branched 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:

- [14C]urea
- [1-13C]methionine
- [2,3-3H]serine
- [α-14C]lysine
- [γ-32P]ATP
- UDP-[U-14C]glucose
- E. coli [13P]DNA
- fructose 1,6-[1-32P]
- [γ-32P]ATP

EC 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 (first issue of each year).