INSTRUCTIONS FOR AUTHORS

Important points to note:
- p. 452—manuscript processing fee
  - page charges
- p. 453—style for References section
- p. 454—new style for illustrations

Cancer Research is the official journal of the American Association for Cancer Research, Inc., and is devoted to the publication of significant, original research in all the subfields of cancer research, including: biochemistry and physiology; chemical and physical carcinogenesis and mutagenesis; clinical investigations; endocrinology; epidemiology and biostatistics; immunology; molecular and cell biology; preclinical pharmacology and experimental therapeutics; radiobiology, and virology. Clinical investigations and epidemiological studies are published in a separate section from papers in the basic sciences.

Only those papers that report results of novel and timely studies and that meet high standards of scientific quality will be accepted. Papers are subjected to stringent review and are published within about three months of acceptance.

CATEGORIES OF PUBLICATION

The following types of manuscripts are considered for publication:

1. Papers containing results of original experimental, clinical, or statistical studies that are sufficiently well documented to be acceptable to the critical reader.
2. Concise reviews on subjects of importance to cancer researchers. Authors of unsolicited reviews should submit an outline of the proposed article for approval by the Editorial Board. If submission of the complete article is encouraged, the review will be given particularly stringent editorial evaluation before acceptance.
3. Perspectives in Cancer Research, which are invited articles analyzing either very active or undeveloped areas of research and presenting fresh insights and personal viewpoints on where research in that area may or should be heading.
4. Letters to the Editor which deal with issues of importance to cancer researchers. If experimental data are included, these should be kept to the minimum required for adequate understanding. Also included under this category is correspondence about manuscripts published in the Journal and, if accepted, replies by their authors are invited for simultaneous publication. Correspondence which concerns articles not published in Cancer Research will not be considered.
5. Brief reports of meetings, symposia, and conferences related to cancer research. These should include a statement of the purpose(s) of the meeting, a summary of the findings presented, and recommendations for future research. The names and affiliations of key speakers may also be included, if space is available.
6. Proceedings of symposia, published as external supplements to the Journal (Cancer Research Supplements), the full expenses of which are assumed by the sponsoring agency. These proceedings are published at the discretion of the Editor and do not undergo the usual review process.
7. Brief announcements of scientific meetings of interest to readers, of courses in cancer-related biomedical science, and of the availability of fellowships and scholarships. These should be submitted at least 3 months prior to the expected month of issue.
8. Brief announcements of recent deaths among distinguished contributors to the field of cancer research.

EDITORIAL POLICY

When a manuscript is received for consideration, the Editors assume that no similar paper, other than an abstract or preliminary report, has been or will be submitted for publication elsewhere. Further, it is understood that all authors listed on a manuscript have agreed to its submission. Submission of a manuscript implies acceptance of the strict policy of the Journal that under no circumstances will the identities of the Associate Editors and reviewers be revealed.

Typically, the scientific review of a manuscript is handled by an Associate Editor who selects two investigators in the field as referees. The reviewers' critiques and the Associate Editor's recommended decision are then approved by the Editor. Editorial decisions are forwarded from the Editorial Office to authors. Every effort is made to render editorial decisions promptly, consistent with thoroughness of review. Authors should note that the average review time is 10 weeks from receipt of the original manuscript. If there is a marked discrepancy in the opinions of the reviewers, this may necessitate sending the paper to an additional reviewer. In this case, more time may be needed to finalize the review process.

The Editorial Office cannot accept collect telephone calls from authors.

Since editorial staff time to answer telephone calls from authors is limited, inquiries regarding the status of manuscripts should, if possible, be submitted in writing and should be made only on those manuscripts that exceed the average review time.

SUBMISSION AND PUBLICATION FEES

A manuscript processing fee of $75 is assessed for each manuscript to cover the cost of editorial review. Payment of this processing fee may accompany the manuscript. An invoice will be mailed with the acknowledgment of receipt of the manuscript at the Editorial Office if payment has not already been made. As a courtesy to authors editorial review will not be delayed for receipt of payment. Authors are requested to fulfill their own institutional obligations with respect to purchase orders and call numbers so that payment of the manuscript handling charge can be expedited.

If an author resubmits a manuscript that our Editors previously found unacceptable for publication, it is journal policy to consider it a new submission, assign it a new manuscript number, and charge the author another $75 handling fee to cover the cost of review. The manuscript will not be reviewed until the author agrees in writing to this policy.

A page charge of $40 per printed page will be levied on all manuscripts accepted for publication. It is understood at the time of submission that the author(s) agrees to pay this charge in the event of publication. Under exceptional circumstances, when no other source of grant or other support exists, the author(s) may apply to the Editor at the time of submission for a waiver of the page charges. All such applications must be countersigned by an appropriate institutional official stating that no funds are available for the payment of page charges.

PROCEDURES FOR SUBMISSION

Contributions should be addressed to Dr. Peter N. Magee, Editor, Cancer Research Editorial Office, Fels Research Institute, Temple University School of Medicine, Philadelphia, Pa. 19140. They should be submitted by an author, preferably the senior author, who should request in the covering letter that the paper be considered for publication in Cancer Research. The exact address to which all related correspondence should be sent and a telephone number at which the author can be reached should also be given. Contributors should indicate in the covering letter if their papers would be appropriate for the Clinical and Epidemiologic Investigations section; however, the final decision as to placement within the Journal will be made at the discretion of the Editors.

If the manuscript contains any quoted information conveyed by either personal communication or release of unpublished experimental data, the covering letter should state specifically that authorization to use this material has been given.

Original submissions must include:
1. The author's covering letter in duplicate containing the above information;
2. Four copies of the manuscript;
3. At least two sets of original illustrations (if only two sets of
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original illustrations are submitted, we require that the author
also include two sets of photocopies.

Revised manuscripts must include:
(1) A covering letter in duplicate, clearly indicating what alterations
have been made in response to the reviewers' criticisms. Satis-
factory reasons should be given for noncompliance with any of
the recommendations for revision.
(2) Four copies of the revised version of the manuscript, plus a red-
marked copy of the manuscript indicating the changes made.
(3) A single self-addressed postcard containing the manuscript
number to acknowledge receipt of the revision.

Note: If a new author has been added or an author has been deleted
since the original submission, it is the responsibility of the corresponding
author to ensure that the authors involved are aware of and agree to the
changes in authorship. Cancer Research accepts no responsibility for
such changes.

Revised manuscripts may undergo another review by an Associate
Editor and/or referees, particularly if the original submission required
extensive changes.

FORMAT AND STYLE

Papers should conform strictly to Journal style. A recent issue of
Cancer Research will provide authors with assistance in the proper
arrangement of papers. Manuscripts are to be written in clear, grammat-
ical English. Papers that are not in good idiomatic English will be returned
to the author without review. Laboratory slang as well as terminology
and abbreviations not consistent with internationally accepted guidelines
should be avoided.

For general and technical assistance in writing scientific papers, au-
tors should refer to the following publications: Stedman's Medical
the Council of Biology Editors, Inc., Bethesda, Md.); and Handbook for
Authors of Papers in American Chemical Society Publications (Third

Data must be presented concisely. Large masses of data of peripheral
significance to the main thesis of the investigation will not be published
in Cancer Research but may be deposited with the National Auxiliary
Publications Service, c/o Microfiche Publications, P.O. Box 3513, Grand
Central Station, New York, N. Y. 10017. The manuscript should contain
a footnote that indicates how this ancillary material can be obtained.
Such data should be submitted for review along with the manuscript.

The manuscript should be typed on 21.6- x 28-cm (8½- x 11-inch)
paper with double spacing throughout, allowing for ample margins.
Manuscripts with typing on both sides of the page will be returned to the
authors. Consecutive numbering of all pages is requested, with the title
page as page 1. The typescript should be arranged in the following order:
(a) title, (b) author(s) and complete name(s) and location(s) of
institution(s) or laboratory(ies), (c) running title, (d) footnotes, (e) text,
(f) tables, (g) legends for all illustrations, (h) illustrations, and (i) other
material. Numbered and lettered sections in the text should be avoided.
The appropriate location for each table and illustration should be indi-
cated by marginal notes. Simple chemical formulas or mathematical
equations should be presented in a form that allows their reproduction
in single horizontal lines of type; more complicated mathematical formulas
or chemical structures difficult to set in type should be provided in the
form of India ink drawings or glossy photographs for camera-ready
reproduction.

Title. Titles should be brief but informative, and limited if possible to
about 100 characters. It is important for literature retrieval to include in
the title the key words necessary to identify the nature of the subject
matter, including, if applicable, the species on which the work is done.
Use of expressions such as "Studies on..." or "Observations of..." should be avoided, since they are not informative. Chemical formulas or
abbreviations should not be used. Titles in the form of declarative or
interrogative sentences are not acceptable. Also, do not use Roman or
Arabic numerals to designate that the paper is one in a series (see
section below on Footnotes).

Authors and Their Affiliations. Authors are urged to include their full
names, complete with first and middle names or initials. Confusion often
arises in the literature when authors are identified by surname and initials
only. Authors' academic degrees should not be included. The full names
of institutions and subsidiary laboratories should be given, together with
a useful address (including postal number). If several authors and institu-
tions are listed on a paper, the paper should be indicated with which
department and institution each author is affiliated.

Running Title. A brief running title should be provided, not to exceed
50 characters. Running titles in the form of declarative or interrogative
sentences are not acceptable.

Footnotes. Lengthy footnotes are discouraged since the same infor-
mation is most instances better presented in more effective captions.

Footnotes to the title page and text are to be designated consecutively
with superscript Arabic numerals. A footnote to the title should contain
information on financial support, including the source(s) and number(s)
of the grant(s). If the paper is one of a series, a footnote to this effect
may be included. Authors should also include a footnote designating to
whom reprint requests should be addressed. An all-inclusive abbreviation
footnote should contain a definition for every nonstandard abbreviation
used in the paper.

For footnotes to tables, see section on Tables below.

Abstract. The abstract, to appear at the beginning of the paper, should
be concise, yet indicative of the content of the paper. As abstracts are
often copied directly by the secondary services, they should recapitulate
in abbreviated form the purpose of the study and the experimental
technique, results, and interpretations of the data. Data such as the
number of test subjects and controls, strains of animals or viruses, drug
dosages and routes of administration, tumor yields and latent periods,
length of observation period, and magnitude of activity should be in-
cluded. Vague, general statements such as "The significance of the
results is discussed," or "Some physical properties were studied," are
uninformative and not acceptable. All important terms relevant to the
content of the paper should be incorporated into the abstract to assist
indexers in the derivation of key words. Abbreviations should be kept to
an absolute minimum; however, if they are needed, they must be properly
identified so as to make the abstract independent of the text. Authors
may wish to keep in mind that "Medicine," a computerized monthly
bibliography prepared by the National Library of Medicine, includes only
those abstracts that contain fewer than 200 words; with very few
exceptions, longer abstracts are not accessible through that service.

Introduction. It is not necessary to include all of the background
literature in this section. Brief reference to the most pertinent papers
generally suffices to acquaint the reader with the findings of others in
the field and with the problem or question which the author's particular
investigation addresses.

Materials and Methods. Explanation of the experimental methods
should be brief but adequate for repetition by qualified investigators.
Procedures that have been published previously should not be described
in detail but merely cited in appropriate references. Only new and
significant modifications of previously published procedures need com-
munication in the text. The sources of special chemicals or preparations
used should be given along with their locations (city and state (country, if
foreign)].

This Journal endorses the principles embodied in the Declaration of
Helsinki and expects that all investigations involving humans will have
been performed in accordance with these principles. For animal experi-
mentation reported in this Journal, it is expected that the Guiding
Principles in the Care and Use of Animals approved by the American
Physiological Society will have been observed.

Results. This section should include a concise textual description of
the data presented in tables and illustrations. Excessive elaboration of
data already given in tables and illustrations should be avoided. The
Results and Discussion sections may be combined if, by so doing, space
is saved or the logical sequence of the material is improved.

Discussion. In this section, the data should be interpreted concisely
without repeating material already presented in the Results section.
Speculation is permissible, but it must be well founded.

References. Number references in the order of their first mention
in the text; cite only the number assigned to the reference. [Please
note that this is a change from previous instructions. See the
References section in alphabetical order.] References should be typed
in double-spaced form to ensure accurate copy editing. The bibliography
should be limited to only those citations essential to the author's pres-
entation. When comprehensive review articles are available, they are
preferred to many separate references.

Before submission of the paper authors should verify the accuracy of
all references and should check that all references have been cited in the text. Examples of the two most common types of Journal references are:


Journal articles and serial compendia: The complete title, journal, volume number, inclusive pages, and year of publication should be given. Serial compendia, such as Advances in Cancer Research and the Annual Review of Biochemistry, which appear annually in numbered sequence, should be cited as journals rather than books, thus omitting the names of publishers and editors. Biological Abstracts should be consulted for abbreviations of journals and serials.

Books and chapter citations. Citation of a specific chapter or article in a book should carry the author(s) of the chapter, its title, editor(s) of the book, book title, edition, volume, inclusive pages of the chapter, location and name of the publisher, and year of publication. For references to complete books, give all of the above information that is pertinent.

Papers in press and unpublished material. Papers in press may be listed among the references with the journal name and tentative year of publication. Information submitted for publication should be cited in a footnote, not in the References section. This rule also applies to unpublished data or personal communications. The names of all authors should be given, along with manuscript titles if possible.

Addenda. Data acquired after acceptance of the paper, by the authors themselves or by others, cannot be added to the text. An addendum may be added in proof upon approval by the Editor. Addenda should be kept extremely brief. The full expense of printing an addendum will be charged to the author.

Tables. Tables should be constructed so that when typeset, they will fit within a single Journal column (8.9 cm or 3½ inches). Tabular material should not duplicate data already presented in the charts. Unnecessary columns of data that can easily be derived from the rest of the results in the table should not be included. Large groups of individual values should be avoided; instead, these should be averaged and an appropriate designation of the dispersion such as standard deviation or standard error included.

Authors are obligated to indicate the significance of their observations by appropriate statistical analysis.

Every table must have a descriptive title and an explanatory paragraph that clearly gives the experimental details for understanding by the reader without reference to the text. Each column must carry an appropriate heading and, if numerical measurements are given, these units should be added to the column heading. Tables should be numbered with Arabic numerals and table footnotes should be indicated with superscript italic letters (A, B, etc.).

All units of measurement and concentration should be clearly designated. Exponential terminology is discouraged (the term mu is preferable to \(10^{-6}\)). If exponents are absolutely unavoidable in column headings, the quantity expressed should be preceded, not followed, by the power of 10 by which its value has been multiplied, i.e., \(10^{-3}\) × concentration (M). This will permit correction as to whether the quantity should be multiplied or divided to obtain the correct value.

Illustrations. Both line-cut (graphs and drawings) and half-tone (photographs, photomicrographs, electrophoretic patterns, etc.) illustrations should be designated figures. [Please note that this is a change from our previous style of referring to line cuts as charts and half-tone as figures.]

Figures should be used when salient points need illustration for better comprehension by the reader. Half-tone that are particularly expensive to reproduce and only those absolutely essential to the clarity of the presentation should be included. Straight-line functions such as relationships between concentration and absorbance, or Lineweaver-Burk plots when these are linear, should be described in a few lines in the text.

Each figure must be labeled in pencil with the first author's name and the figure number on an adhesive label on the reverse side. For half-tone, the top of the figure should also be noted.

Legends are required for all figures. They should briefly describe the data shown; details in the text should not be repeated. Staining should be included for half-tone, where applicable. Each legend should adequately identify all symbols, abbreviations, mathematical expressions, abscissas, ordinates, units, and reference points used on the figure.

Line-cut illustrations, including flow diagrams and complex biochemical structures, should be prepared with professional instruments (not simply typewritten). They may be on Bristol board, tracing paper or cloth, or coordinate paper printed in light blue. They should not be mounted on heavy cardboard. Clear, glossy prints are acceptable in lieu of original drawings, provided that all parts of the illustration are in focus. X-ray films or Polaroid photographs are not acceptable. If original drawings are submitted, they should not be larger than 21.6 x 28 cm (8½ x 11 inches).

Except for especially complicated drawings showing large amounts of data, all line-cut illustrations are published at one-column width (8.9 cm or 3½ inches) or less. It is recommended that they be submitted in one-column size. If larger ones are submitted, it is the responsibility of the author to see that the abscissas, ordinates, lines, and especially the symbols are sufficiently large to permit reduction. When the graphs are reduced to the size of a single column, the letters and numbers must be at least 1.5 mm high and the smallest part of the illustration must be discernible or the drawing will be returned to the author for correction.

On original artwork, this can be accomplished by having the minimum height for lower-case letters 5 mm; numerals and upper-case letters 6 mm; and symbols within the drawings 5 mm. The thickness of ruled lines on the original should also vital for reproduction. The guidelines and recommendations for lines are as follows: #1 Leroy for graph grids, bonds, and arrows; #2 Leroy for graph borders or reference lines; and #5 Leroy for graph curves or emphasis lines.

The symbols can be defined directly in the body of the line-cut illustration or in the legend. Only those common symbols for which the printer has type (\(\times\) or \(\cdot\)) should be used.

Graphs should be ruled off close to the area occupied by the curve, and abscissas and ordinates should be clearly marked with appropriate units. Explanations of the coordinates should not extend beyond the respective lines. Do not box-in graphs with top and right-hand frame lines unless these are essential for reference. Titles printed outside the confines of this waste space; all of this information should be included in the legend. Also, to conserve space those curves that may appropriately appear together should be included in a single graph.

The use of exponents for labeling coordinates in graphs is considered ambiguous and should, if possible, be avoided. If exponents must be used, the quantity expressed should be preceded by the power of 10 by which its value has been multiplied, i.e., \(10^{6}\) x concentration (M). The following are correct: \(10^{-6}\) x concentration (M). The following are correct: \(10^{-6}\), \(10^{-5}\), \(10^{-4}\), \(10^{-3}\), \(10^{-2}\), \(10^{-1}\). C. If no exponents are used, the legend should designate how the quantity is to be calculated (whether multiplied or divided) to give the correct value.

Half-tone illustrations should be submitted unmounted and trimmed to exclude all but essential material. The set of half-tone illustrations intended for the printer's use must be made from original negatives; i.e., they must be first generation glossy prints. Photographs made from other prints are not acceptable for reproduction. Karotypes should be presented in the form of cardboard plates onto which chromosome sections from an original photomicrograph are pasted.

All half-tone will be published at either 1-, 1½-, or 2-column width and placed as close as possible to their first citation in the text. Half-tone must be prepared within these dimensions if they are to be reproduced without reduction; otherwise, they will be reduced to conform to these widths.

Figure numbers should not be included on the face of the illustration. However, half-tone that must appear together for comparison should be grouped under one figure number with each section lettered "a," "b," "c," "d," etc. in the lower right-hand corner on the face of the illustration. Composite figures may be mounted on a plate, with the sections butted together and tooling (thin white lines) placed between the parts of the figure. For optimal reproduction, the contrast among photographs on a plate should be consistent. The overall dimensions of photographs on a plate should not exceed 22.4 cm (7½ x 9 inches). The minimum dimensions to which the plate can be reduced must be indicated on the back of each original with the first author's name and the figure number on an adhesive label on the reverse side. For half-tone, the top of the figure should also be noted.

Symbols, arrows, or letters used in photomicrographs should contrast with the background. Wax-based lettering such as PRES-TYPE and
INSTRUCTIONS FOR AUTHORS

LETRASET is discouraged because of its tendency to crumble and adhere to vinyl overlays. Tissue overlays on half tones are a necessary protection. The important areas of the photographs that must be reproduced with greatest fidelity should be indicated on overlays.

Internal scale markers should always be included on the photographs themselves as opposed to listing magnification in the legend since it may be necessary to reduce the figures. Magnifications given in the legend will reflect size before reduction.

Color photographs are discouraged and will be published only if the Editors deem them indispensable. The complete expense of reproducing such photographs will be charged to the author. The author is also responsible for submitting prints that are of sufficient quality to permit accurate reproduction, and for approving the final color proof. If mounted, color photographs must be on a flexible backing. Cancer Research assumes no responsibility for the quality of the photograph as it appears in the Journal. Current estimates for color reproduction can be obtained from the Editorial Office.

ABBREVIATIONS

Abbreviations are in general a hindrance to readers in fields other than that of the author(s), to abstractors, and to scientists in foreign countries. Authors should limit their use to an absolute minimum. Single words should not be abbreviated, e.g., daunomycin, folate, vincristine. Abbreviations are not to be used in titles, but running titles may carry abbreviations for purposes of brevity. Abstracts may contain abbreviations for terms mentioned many times in that section but their identification is mandatory.

Authors should follow the recommendations of the IUPAC-IUB Commission on Biochemical Nomenclature (see section below on Terminology). All nonstandard abbreviations should be identified in an inclusive abbreviation footnote to the first such abbreviation after the Abstract. Abbreviations that form recognizable words, such as EAT and MOPS, are discouraged.

Standard Abbreviations. Authors may use, without definition, the abbreviations in the following lists.

NAD*, NADH nicotinamide adenine dinucleotide and its reduced form
NADP*, NADPH nicotinamide adenine dinucleotide phosphate and its reduced form
(DPN*, TPN*, and their reduced forms are not acceptable.)

CoA, acyl-CoA coenzyme A and its acyl derivatives (e.g., acetyl)
AMP, GMP, IMP, UMP, CMP, TMP the 5'-phosphates of ribosyladenine, -guanine, -inosine, -uracil, -cytosine, and -thymine
ADP, etc. the 5'(pyro)-diphosphates of adenosine, etc.
ATP, etc. the 5'(pyro)-triphosphates of adenosine, etc.
dAMP, dGMP, dIMP the 5'-phosphates of 2'-deoxyribosyladenine, etc.
RNA, DNA ribonucleic acid, deoxyribonucleic acid
RNase, DNase ribonuclease, deoxyribonuclease
mRNA messenger RNA
nRNA nuclear RNA
rRNA ribosomal RNA
tRNA transfer RNA (tRNA is not recommended for RNA preparations that accept amino acids.)
P, PP orthophosphate, pyrophosphate
Tris tris(hydroxymethyl)methylamine
EDTA ethylenediaminetetraacetate
POPOP 1,4-bis(2-(5-phenyloxazolyl))benzene
PPO 2,5-diphenyloxazole
DEAE, TEAE diethylaminoethyl, triethylaminoethyl

UV, IR ultraviolet, infrared
RBC, WBC red blood cell(s), white blood cell(s)

Units of Concentration
molar (moles/liter) m (not used for moles)
millimolar (millimoles/liter) mm (preferred to 10⁻³ m)
micromolar (micromoles/ liter) µm (preferred to 10⁻⁶ m)
nanomolar nm (not µm)
picomolar pm (not µµm)
The expression mg % should be avoided; weight concentrations should be given as g per ml, g per 100 ml, g per liter, etc.

Units of Length, Area, Volume, Mass, Time
The abbreviations below are correct for both singular and plural forms of each term.

meter m
centimeter cm
square centimeter cm²
millimeter mm
micrometer (not micron) µm (not µ)
nanometer (not millimicron) nm (not µm)
picometer (not micromicron) pm (not µµm)

Angstrom (0.1 nm) Å
liter not abbreviated
milliliter ml (use instead of cc or cm³)
microliter µl (not λ)
gram g
milligram mg
microgram µg (not γ)
kilogram kg
hour h
minute min
second s

Physical and Chemical Units

retardation factor Rᵣ
acceleration of gravity g
sedimentation coefficient s
sedimentation coefficient in water at 20° S₀,₂₀

degree Celsius (Centigrade) °C
degree Fahrenheit °F
Kelvin K
diffusion coefficient D
equilibrium constant K
inhibition constant Ki
Michaels constant Km
maximum velocity Vₘₐₓ

Others

mole mol
Curie Ci
equivalent eq
counts per minute cpm
disintegrations per minute dpm
revolutions per minute rpm
volt V
Svedberg unit S
absorbance A (not O.D.)
probability P
roentgen R
standard deviation SD
standard error of the mean SE
logarithm (Briggsian) log
logarithm (natural) \in S \\
entropy \in M,

In chemical compounds

ortho \in o \\
meta \in m \\
para \in p \\
secondary \in sec \\
tertiary \in tert

Routes of administration

intramuscular \in i.m. \\
intraperitoneal \in i.p. \\
intravenous \in i.v. \\
oral \in p.o. \\
subcutaneous \in s.c.

TERMINOLOGY

Approved terms and abbreviations for chemical substances have been collected in Biochemical Nomenclature and Related Documents, International Union of Biochemistry, Third Edition, 1978. This volume is available from: The Biochemical Society, 7 Warwick Court, London WC1R 5DP, United Kingdom. Included are all recommendations issued by the IUPAC-IUB Commission on Biochemical Nomenclature in the following areas: general abbreviations and symbols; abbreviations and symbols for chemical names of special interest in biological chemistry; stereochemistry; natural products and related compounds; isotopically labeled and modified compounds; biochemical equilibrium data; α-amino acids; symbols for amino-acid derivatives and peptides; synthetic modifications of natural peptides; synthetic polypeptides or polymerized amino acids; amino-acid sequences; conjugation of polypeptide chains; peptide hormones; human immunoglobulins, multiple forms of enzymes; nucleic acids, polynucleotides, and their constituents; lipids; steroids, quinones with isoprenoid side chains; carotenoids; tocopherols and related compounds; carbohydrates; cyclitols; phosphorus-containing compounds of importance in biochemistry; folate acids and related compounds; vitamins B-6 and related compounds; corrinoids.

Isotopically Labeled Compounds. A radioactive nuclide is indicated by its mass number as a superscript to the left of the symbol (\(^{32}\)P); when written out, it should correspond to the spoken word (phosphorus-32).

In an isotopically labeled compound, the isotopic prefix should be placed in square brackets and immediately precede the name (word) to which it refers, as in \([^{12}C]\)thymidine, \([^{14}C]\)leucine, \([^{13}C]\)methionine, \([^{3}H]\)-3-hydroxykynurenine. When more than one position in a substance is labeled by means of the same isotope and the positions are not indicated, the number of labeled atoms is added as a subscript to the right of the element, as in \([^{14}C]\)glycine. The symbol \(U\) indicates uniform labeling and \(G\), general labeling, e.g., \([U-^{14}C]\)glucose (where the \(^{14}C\) is uniformly distributed among all six positions) and \([G-^{14}C]\)glucose (where the \(^{14}C\) is distributed among all six positions, but not necessarily uniformly).

The isotopic prefix precedes that part of the name to which it refers, as in sodium \([^{14}C]\)formate, iodio\([^{14}C]\)acetate, 1-aminoo\([^{14}C]\)methylene-cyclohexylamine, \(\alpha\)-naphtho\([^{14}C]\)ic acid, 2-acetamido-\(7\)-\(^{131}\)iodofluorone, fructose 1,6-\(^{32}\)P]phosphate, 17β-\(^{3}H\)estradiol. Terms such as \(\text{\dagger}^{15}\)H-labeled albumin should not be contracted to \(\text{\dagger}^{15}\)albunin (since native albumin does not contain iodine), and \(\text{\dagger}^{14}C\)-labeled amino acids should similarly not be written as \(\text{\dagger}^{14}C\)amino acids (since there is no carbon in the amino group).

When isotopes of more than one element are introduced, their symbols should be arranged in alphabetical order, e.g., \(3,^{14}C; 2,^{3}D; 15\)N]serine. Deuterium and tritium may be designated as \(\text{\dagger}H\) and \(\text{\dagger}T\) or as D and T, respectively.

When not sufficiently distinguished by the foregoing means, the positions of isotopic labeling are indicated by Arabic numerals, Greek letters, or prefixes in italics, as appropriate; these are to be placed within square brackets to appear before the symbol of the element concerned and are attached to it by a hyphen. Examples of this style are \([1-^{14}C]\)alanine, \([2-^{14}C]\)leucine or \([\text{\dagger}^{14}C]\)leucine, \([\text{\dagger}^{14}C-\text{carboxy-}^{14}C]\)leucine, \([3,^{14}C]\)alanine hydrate, \([3-^{14}C,^{35}S]\)methionine, \([\text{\dagger}^{14}C-\text{methyl-}^{14}C]\)methionine. The symbol indicating configuration always precedes the bracketed isotope, and a hyphen is used to separate it from the brackets, e.g., \(\text{\dagger}^{14}C-\text{glucose}; \text{\dagger}^{1-^{14}C}\)leucine.

The same rules apply when the labeled compound is designated by a standard abbreviation or symbol other than the atomic symbol, e.g., \([\text{\dagger}^{3}P]\)ATP, \([\text{\dagger}^{3}P]\)CMP, or \([\text{\dagger}^{125}I]\)labeled, \(\text{\dagger}^{3}H\)-ligands, \(\text{\dagger}^{14}C\)-steroids.

Enzymes. Authors should use the Recommended Name given in Enzyme Nomenclature 1984: Recommendations of the Nomenclature Committee of the International Union of Biochemistry on the Nomenclature and Classification of Enzymes (Academic Press, Inc., Orlando, FL, 1984). In some cases the Systematic Name or the reaction catalyzed should also be included. It is strongly recommended that the Enzyme Commission number be stated at first mention.


Histones. Histone nomenclature should conform to the following system proposed at a Ciba conference held on April 4–5, 1974, in London: the six histone fractions are to be labeled H1, H1*, H2A, H2B, H3, and H4, rather than F1, F1*, F2a2, F2b, F3, and F2a1, respectively.

Interferon Assays. When reporting the calibration of interferon assays, authors should state the name, identifying number, and assigned potency of the international standard used to calibrate their assay, along with the observed geometric mean titer of the standard, the standard deviation of that value, the number of titrations performed to obtain that value, and the technical details of the assay.


Drugs. Generic names of drugs are preferred; a proprietary name may be used only after the first mention of the generic name and should be avoided in titles unless both names can easily be listed. If a foreign proprietary name is used, the name of the comparable U. S. product should be given. When there is no generic name for a drug, authors should give the chemical name or formula or a description of the active ingredients.

Authors should refer to the formally adopted generic names listed in USAN and the USP Dictionary of Drug Names (1986). In addition, the Council on Drugs reports in The Journal (New Names) drug names adopted by the USAN (United States Adopted Names) Council. These monographs include both the generic and proprietary names for the newest drugs, usually prior to their publication elsewhere.

Tumors. Tumors used in experimental investigations should be clearly described and identified in acceptable terminology. If these tumors are well known and have been identified in previous publications, extended descriptions and photomicrographs are unnecessary.

General. The composition of all solutions and buffers should be
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Decimals are preferred to fractions; the form 0.01, not .01, is required in text, tables, and charts.

Ionic charge should be designated by a superscript immediately following the chemical symbol, e.g., Mg$^{++}$, S$^-$. Advice on biochemical nomenclature is readily available from Dr. Waldo E. Cohn, Director, Office of Biochemical Nomenclature, Biology Division, Oak Ridge National Laboratory, Box Y, Oak Ridge, Tennessee 37380; (615) 574-0808.

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