

*Clinical Chemistry*, issued monthly, is published under the direction of an Editorial Board of the American Association for Clinical Chemistry, Inc. The Editors give equal consideration to original manuscripts in English from any country, whether or not the author is a member of the Association.

Excellent scientific work deserves excellent presentation—but frequently suffers a lack of it. The aim of these instructions is to expedite publication by making it easier for the potential author to present his work in a form that will minimize editorial revision and delay.

*Copies are available on request.*

## Scope

*Clinical Chemistry* welcomes contributions on the application of chemistry to the understanding of the human organism in health and disease. Articles submitted for publication should contain original information, experimental or theoretical, that advances the science of clinical chemistry. This includes (e.g.) basic materials or principles, analytical techniques, instrumentation, data processing, statistical analyses of data, clinical investigations in which chemistry has played a major role, and experimental (laboratory animal) investigations of chemically oriented problems of human disease.

Other appropriate contributions include reviews, case reports, case conferences, scientific notes, and letters to the editor, all of which must be prepared in the form described below. Prospective contributors should consult recent issues of *Clinical Chemistry* to determine the appropriate category for their contribution, as well as for examples of acceptable style.

## Submission of Manuscripts

Manuscripts and other editorial correspondence should be addressed to J. Stanton King, Ph.D., Executive Editor, *Clinical Chemistry*, Box 5218, Winston-Salem, NC 27103.

Manuscripts (with a covering letter) are considered for publication with the understanding that, if accepted, copyright is transferred to the publisher, and no paper presenting the same information—other than an abstract or preliminary report—has been or will be published elsewhere. *Clinical Chemistry* is copyrighted by the Association. Permission to reproduce copyrighted material for scholarly use can be arranged through the Executive Editor.

An original typescript and one copy of the manuscript (and of any later revision) are to be submitted, *double-spaced* (preferably triple-spaced) *throughout* (especially abstract, references, tables, figure legends, and footnotes), on one side of paper 22 × 28 cm (no larger), with 4-cm margins. Each copy must include all figures and tables. A separate sheet should be used for the title page, with authors' names and affiliations, and for the abstract. References, tables, figure legends, and footnotes should be grouped on separate sheets, in that order. Every page, beginning with the title page, should be numbered. All sheets should carry the name of the first author in the upper right corner. If the current address of any author differs from that where the work was done, it will be included as a footnote; if reprints are to be requested from someone other than the first author, or from an address other than that where the work was done, say so in a footnote.

## Review of Manuscripts

Manuscripts will be evaluated by two anonymous persons, either members of the Editorial Board or qualified invited reviewers. Manuscripts are considered privileged information by the reviewers, who are expected to disqualify themselves before reviewing papers in cases where there may be a possible conflict of interest.

When reviewers clearly disagree on the merits of a manuscript, a referee will generally be asked to examine it. A résumé of the reviewers' critiques will be sent to the author when he is notified of the disposition of the manuscript (usually not later than six weeks from receipt) by the Executive Editor, who makes the final decision. If the manuscript is rejected, the author may appeal in writing, giving his reasons why the manuscript should be reconsidered.

The principal desiderata for an acceptable paper are:

- subject matter that is original and significantly advances the state of knowledge of clinical chemistry
- conclusions that are justified from the design of the experiments and the data presented
- information that is sufficiently detailed to permit repetition of the work by a competent clinical chemist
- clear, concise, and grammatical writing.

## Manuscript Preparation

The principal guides for the author should be the *ACS Handbook for Authors* (1), and the *Council of Biology Editors Style Manual* (2), with the former taking precedence where there is disagreement. Only critical preparation of the manuscript can enable the author to avoid obscure wording, neologisms, "laboratory slang," and unfamiliar (and undefined) terminology (3).

There is no rigid prescription for organization of papers acceptable for publication in *Clinical Chemistry*, but manuscripts should be arranged generally into the following sections: title, abstract, introduction, materials and methods, results, discussion, and references.

*Letters to the Editor* should be arranged as they will appear when printed.

### Title

The title should be specific, informative, and concise. Symbols, formulas, or arbitrary abbreviations should not be included in the title, except chemical symbols to indicate the structure of isotopically labeled compounds.

### Abstract

An abstract, intelligible by itself, should be included in all contributions to *Clinical Chemistry* except Letters to the Editor and case conferences. The abstract, not to exceed 150 words, summarizes the plan, procedures, results, and conclusions of the investigation. Remember that the abstract will be the most widely read portion of the paper and will be used by the various abstracting services.

The Executive Editor will select "Additional Keyphrases" not found in the title.

## Introduction

This should indicate the importance of the work, its relation to previous work, and (if it is a method) reasons why it is preferable to older methods.

## Materials and Methods

The material to be presented dictates the way in which this section is written. Whatever the arrangement, the following topics are usually present:

**Apparatus.** All apparatus should be identified, including manufacturer's name and address (city, zip code), and model number if different versions exist. Further details are necessary only when the equipment is not standard. If standard apparatus has been modified or new apparatus built, lists of components and their sources should be provided, along with directions from which the equipment can be duplicated.

**Reagents.** All reagents used may be listed; only special or unusual ones need be described in detail, and their source mentioned. If purity or stability of reagents is critical, particulars about the source, degree of purity, and preservation should be included. Only novel details of preparation or purification of reagents need be described.

The pH and composition of buffers should be unambiguous; a standard reference can often be cited. The temperature at which critical pH measurements are made should be stated. Make clear whether the concentrations in a reaction mixture represent final concentrations or the original concentrations of the solutions mixed.

**Procedures.** Where procedures are intended as instructions for other workers, use of the imperative mood is both clearer and more succinct. Published procedures should be cited but not described, except where a brief résumé of the principle of a method or modifications of it is appropriate.

Adequate details of critical steps (e.g., collection and storage of samples), standardization, calibration, and calculation of results are necessary to permit the work to be repeated by a competent clinical chemist. Mention any potential hazards in the procedure.

## Results

These should be presented in concise and simple language, with use of tables or graphs for clarification if necessary.

## Discussion

This section should discuss significance of results and lead to a valid conclusion. Results and conclusions should be compared and contrasted with those of comparison methods or previous studies. Interpret the results here but do not recapitulate them. Such matters as time- and cost-savings, special problems, interferences, effect of order of reagent addition, and color stability are appropriate to this section. Sometimes clarity is improved if discussion is intermingled with results in a single section, but if this is done the author should clearly distinguish speculation and fact.

## Acknowledgments

Acknowledgments of financial support, gifts, technical help, or other assistance (especially that rendered by a company in evaluation of a product) are made in a brief paragraph preceding the references. A statement regarding possible conflicts of interest follows these instructions and is available on request.

## References

References to the literature should be listed by number in

the order of their appearance in the text. The appropriate positions in the text should be indicated by underlined Arabic numerals in parentheses. Reference examples:

### Journals

1. Klein, B., and Lucas, L. B., Application of Fe(II)-5-pyridyl benzodiazepin-2-ones to the manual or automated determination of serum uric acid. *Clin. Chem.* **19**, 67-75 (1973).

*Books and monographs (except serial volumes, which are treated as journals)*

2. Henry, R. J., *Clinical Chemistry: Principles and Technics*, Hoeber, New York, NY, 1964, pp 364-370.

3. Schmidt, E., Schmidt, F. W., Horn, H. D., and Gerlach, U., The importance of measurement of enzyme activities in medicine. In *Methods of Enzymatic Analysis*, 1, Section C, H. U. Bergmeyer, Ed., Academic Press, New York, NY, 1963, pp 651-655.

It is the author's responsibility to verify the accuracy and adequacy of reference information. This is where most errors appear—and persist, because the editorial office does not routinely check references. Only essential references should be cited; cite review articles when appropriate.

Avoid listing references to unpublished work, manuscripts in preparation, verbal reports given at meetings, and personal communications. This type of information should be mentioned parenthetically in the text. References to papers in press may be included among the references; it may be advisable to enclose copies of such papers, to assist in the evaluation of the manuscript. Citations of published abstracts must appear as text footnotes, but should be avoided whenever possible.

## Abbreviations

This journal discourages the unnecessary use of new abbreviations, such as acronyms. A few such abbreviations may aid readability; a profusion of them does not. If more than two are used, all nonstandard abbreviations must be defined in a single footnote in the text at the point where the first is used. Abbreviations, if previously defined, may be used in figures, tables, and equations. Letter combinations that form words or that are already in current use as conventional abbreviations must be avoided. Abbreviations listed in the recommended references (1, 2) may be used, and internationally agreed-upon biochemical symbols and abbreviations, considered standard, have been collected from the literature in the IUB document *Biochemical Nomenclature and Related Documents* (1978).

The Association has officially accepted (4) the recommendations of the Commission on Clinical Chemistry of the IUPAC and the IFCC on a standard international (SI) system of units. The following examples include abbreviations appearing most commonly in the journal; others can be found elsewhere (5). Examples of abbreviations that are no longer acceptable are also given. Consistently use the proper units in text, figures, and tables. Notice that periods do not follow the abbreviations.

### Prefixes for decimal factors:

10 <sup>3</sup>	kilo-	k	10 <sup>-6</sup>	micro-	μ
10 <sup>-1</sup>	deci-	d	10 <sup>-9</sup>	nano-	n
10 <sup>-2</sup>	centi-	c	10 <sup>-12</sup>	pico-	p
10 <sup>-3</sup>	milli-	m	10 <sup>-15</sup>	femto-	f

**Length:** m, cm, mm, μm, nm (not acceptable: in., ft., yd., Å mμ).

**Area:** m<sup>2</sup>, cm<sup>2</sup>, mm<sup>2</sup>, μm<sup>2</sup> (not acceptable: sq. in., in.<sup>2</sup>, u<sup>2</sup>).

**Volume:** L, mL, μL, nL, pL (not acceptable: pint, gallon, cc, ccm, λ, μμl).

**Mass:** kg, g, mg, μg, ng, pg (not acceptable: oz., lb., Kg, gr, gm, gms, mgm, mgms, mgs).

**Mass concentration:** kg/L, g/L, mg/L, μg/L (not acceptable: %, g/ml, ppm, mg %).

**Substance concentration:** mol/L, mmol/L, μmol/L, nmol/L (not acceptable: M, N, mEq/l).

**Temperature:** °C (not acceptable: °, C).

**Time:** s, min, h.

**Density:** kg/L.

**Relative density:** This term replaces "specific gravity."

**Absorbance:** A.

**Radioactivity:** Ci, mCi, μCi.

**International (IUB) units of enzymic activity:** U (amount), U/L (concentration).

**Coefficient of variation (relative standard deviation):** CV.

EDTA, ethylenediaminetetraacetate.

Tris, tris(hydroxymethyl)methylamine.

RIA, radioimmunoassay.

Use official USPS two-letter abbreviations for state names.

## Illustrations

Use figures only when they have real utility. Mathematical formulas or a statement of numerical values may often substitute for a figure.

All line drawings and halftones (and such material as computer printouts) should be submitted as camera-ready copy (glossy prints). Illustrations should not be mounted or attached in any way to sheets of paper. Photographs or prints must not be larger than 22 × 28 cm or smaller than 5 × 8 cm. If it is necessary to submit original figures, rather than the preferred glossy prints, they should be drawn with India ink on white drawing paper, blue tracing paper, or coordinate paper ruled in blue only. Gridlines that are to show in the final engraving should be inked in black. Letters, numerals, data points, and other marks should be made neatly and of such size that the smallest will be readable when the figure is reduced to one- or two-column size. Avoid wasted space in illustrations; several curves may often be shown clearly on the same graph, for example. The word "top," the figure number, and the author's name should be lightly written in pencil on the back of each illustration. Do not paperclip illustrations together. Each illustration must have a caption that makes it intelligible by itself. Number in Arabic numerals.

A reasonable financial allowance is made to each paper for illustrations and tabular composition. If this allowance is exceeded or if illustrations in color are required, special arrangements must be made with the Executive Editor.

## Tables

Each table should be on a separate page and numbered consecutively with Arabic numerals in order of mention in the text. Each table should have a descriptive heading that makes it intelligible without reference to the text; footnotes to the table should appear on the same sheet as the table. Each column should have a heading with clearly defined units. *Lengthy tabulations are expensive to set; unless essential, they should be avoided and replaced by statistical statements.* Figures and tables should not be used to illustrate the same data; use whichever is clearer, or omit entirely if the information can be stated concisely in the text.

## Text Footnotes

Footnotes are used sparingly, for auxiliary or explanatory material that cannot be incorporated into the text without seriously disrupting the train of thought. The position of a footnote in the text is indicated by a *superscript* Arabic numeral. Footnotes should be typed on a separate sheet of paper, with the appropriate number and page number for each. On the first page of each published article, the following information will be printed routinely as footnotes: laboratory affiliation(s) of the author(s) and the dates on which the manuscript was received and accepted for publication. Footnotes to tables are independent of other footnotes, and should be indicated by superscript lower-case italic letters in alphabetical order, reading across the table.

## Description of Analytical Methods and Results

Manuscripts dealing with the development and evaluation of performance of methods and instruments should discuss chemical sensitivity and specificity, detection limits, precision, accuracy, recovery, interference, comparison with other analytical methods, and normal range, and when appropriate should include clinical references. The paper should document the analytical advantages of the new or modified method over existing methods. Analytical methods should be identified as *equilibrium* or *kinetic* methods; use of the term "end-point" is discouraged, because current usage is not consistent with formal definitions of the term.

**Standard curves and linearity:** Data for these studies should be subjected to linear-regression analysis (if a linear response is obtained) and should include the slope, intercept, standard error of estimate (standard deviation about the regression line), and the standard deviations of the slope and intercept. Standard deviations of repeated points may be included. In preparing radioimmunoassay standard curves, authors may use any objective, statistically valid method, but should specify the method used (see, e.g., 6).

**Precision:** Studies must include estimates of "within-run" and "between-run" precision. Each should be determined at low, normal, and above-normal concentrations, with use of specimens that are in an appropriate biological fluid matrix. For the between-run precision evaluation, at least four observations should be accumulated for each of five separate groups of samples. The mean, standard deviation, and coefficient of variation should be reported.

**Accuracy:** (a) *Analytical recovery studies* involve analyses after known amounts of analyte are added to the biological fluid on which the determination will be performed. Samples from patients with grossly abnormal and pathological conditions should be included, as well as samples from healthy individuals. Percentage recovery should be calculated as (amount found of added/amount added) × 100.

(b) *Interference studies* should be performed to assess the effects of other substances on the analyte to be determined. Substances tested at extremely high concentrations should include common serum components, such as lipids, hemoglobin, bilirubin, and other endogenous substances that may interfere. Exogenous materials such as commonly used or commonly co-administered drugs that might interfere with the determination should also be tested for interferences.

(c) *Comparison-of-methods studies* should compare results by the new or proposed method with those by a reference-quality method or other generally accepted analytical method for which the performance is documented. It is desirable to test 100 to 200 different samples from patients who have been selected to include a wide variety of pathological conditions

and a concentration range that includes values (normal and abnormal) likely to be encountered in routine application.

These comparison data should be subjected to appropriate statistical analysis. Information is available on the application and interpretation of statistics in method-comparison studies (7-10). Authors should choose parametric or non-parametric statistics as appropriate (7) and should specify the statistical methods used. Values for  $t$  (Student's  $t$ -test),  $F$  ( $F$ -test), and  $r$  (correlation coefficient) are often difficult to interpret (8), as are their non-parametric counterparts. The decision on acceptability requires that observed errors be judged in the context of medical limits for allowable analytical error (9). Regression analysis is often most useful for estimating the differences or errors between two analytical methods, because the errors can be calculated at any medically important concentration within the range studied; furthermore, the slope and intercept may give some indication of the type of systematic error, which may aid in reducing the analytical errors (8). Because the reliability of the estimates of slope and intercept can be affected by nonlinearity in the data set, outliers, a narrow range of data, and variability of the comparison method, samples preferably should cover the complete range of concentrations that might be encountered, and standard deviations of slope and intercept should be given.

**Reference interval (normal range):** Depending on the conclusions of the accuracy studies, modification of the existing normal range may be indicated. Description of the normal-range study should include details about sampling; selection of the subjects, including their number, age, and sex distribution; the statistical method for summarizing the results (10); and other factors that would influence the values obtained.

**Chromatograms.** Chromatograms from gas-liquid and "high-performance" liquid chromatography should usually be presented so readers can see the efficiency of the separation, calculate the number of theoretical plates, and observe the resolution from interfering substances in the matrix. The exact source of columns and packing materials, and their handling, must be described. The solvent sources and solvent compositions must be accurately given, and the history of experience with each column must be described. Migration should be expressed in terms of  $R_f$  (or retention times for columns). Temperature conditions should be stated. Solvents or carriers and their order of use should be described in detail. Similar information should be included for electrophoresis.

**Enzyme activities.** The effects of certain factors are cus-

tomarily described in methods for determination of catalytic activity: temperature, pH, substrate concentration, enzyme concentration, order of reaction, inhibitors, activators, buffers, chelators, and the like. Representative calculations deriving the results must usually be shown, because pure enzymes are seldom obtainable for standardization of the method. Enzymes must be identified by their Enzyme Commission number (11) when first mentioned.

## References

1. *Handbook for Authors*, American Chemical Society Publications, Washington, DC 20036, 1978.
2. Council of Biology Editors, *CBE Style Manual*, 4th ed., American Institute of Biological Sciences, Arlington, VA 22209, 1978.
3. *American National Standard for the Preparation of Scientific Papers for Written or Oral Presentation (Z39.16-1972)*. American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018, 1972.
4. *Clin. Chem.* 15, 427-428 (1969).
5. (a) *The SI for the Health Professions*. World Health Organization, Geneva, 1977. (b) *Units, Symbols, and Abbreviations; a Guide for Biological and Medical Editors and Authors*, 3rd ed., D. N. Baron, Ed., Royal Society of Medicine, Chandos House, 2 Queen Anne St., London W1M 0BR, U. K., 1977. (c) *The International System of Units (SI)*. C. H. Page and P. Vigoureaux, Eds., National Bureau of Standards Special Publication 330 (periodically revised; for sale by the Supt. of Documents, U. S. Govt. Printing Office, Washington, DC. 20402; order by SD Catalog No. C 13.10:330).
6. Rodbard, D., Data processing for radioimmunoassays: An overview. In *Clinical Immunochemistry: Chemical and Cellular Bases and Applications in Disease*, S. Natelson, A. J. Pesce, and A. A. Dietz, Eds., Am. Assoc. for Clin. Chem., Washington, DC 20006, 1978, pp 477-494.
7. Wu, G. T., Twomey, S. L., and Thiers, R. E., Statistical evaluation of method-comparison data. *Clin. Chem.* 21, 315-320 (1975).
8. (a) Westgard, J. O., and Hunt, M. R., Use and interpretation of common statistical tests in method-comparison studies. *Clin. Chem.* 19, 49-57 (1973). (b) Davis, R. B., Thompson, J. E., and Pardue, H. L., Characteristics of statistical parameters used to interpret least-squares results. *Clin. Chem.* 24, 611-620 (1978).
9. Westgard, J. O., Carey, R. N., and Wold, S., Criteria for judging precision and accuracy in method development and evaluation. *Clin. Chem.* 20, 825-833 (1974).
10. Read, A. H., Henry, R. J., and Mason, W. B., Influence of statistical method used on the resulting estimate of normal range. *Clin. Chem.* 17, 275-284 (1971).
11. *Enzyme Nomenclature, Recommendations (1978) of the International Union of Biochemistry*, Academic Press, New York, NY, 1979.

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## Statement of Interest

Much clinical chemical research involves assessment of new equipment, reagents, or kits. Costs of such evaluation are often directly or indirectly underwritten by the manufacturer. When an author of a paper concerned with the evaluation of a product is employed by the manufacturer, readers will see this connection in the "from" line. Other authors who receive consulting or other fees from a manufacturer may do their work (and themselves) a disservice by failing to disclose an interest that conceivably could alter their objectivity. If a business address is not used by an employee of a commercial organization, readers may question the work, even though it

may have great scientific merit.

We hope that authors will declare (in the "acknowledgments") their interest in publications that involve evaluations of commercial products, interests such as personal financial gain and (or) a manufacturer's donation or loan of equipment, reagents, and the like.

No paper will be rejected by *Clinical Chemistry* solely because no such statement has been made. Nonetheless, we believe that a full disclosure will be of value to our readers and prevent misunderstandings.