

# Applied Animal Science Instructions for Authors: Manuscript Preparation

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## ABOUT THE JOURNAL AND ARPAS

The journal *Applied Animal Science* (AAS) is the official publication of the American Registry of Professional Animal Scientists (ARPAS). Authors need not be members of ARPAS. The peer-reviewed scientific journal publishes manuscripts on scientific discoveries and applications for the animal sciences and production systems. The primary focus is on innovations and technologies that have fairly immediate (or emerging) application in domestic animal agriculture. More fundamental (basic) articles also are welcome if the application to the animal sciences is readily obvious and can be communicated to readers. Types of articles published include original research, reviews, invited reviews, short communications, technical notes, perceptions and commentaries, letters to the editor, and articles from symposia and conferences.

The journal invites organizers of symposia and conferences to contact the editor-in-chief about submitting manuscripts resulting from presentations for publication in AAS. These manuscripts undergo the standard peer review. The meeting organizer or a designee may serve as guest editor working with the editor-in-chief to manage the review process and publication. The articles may be any of the types mentioned above and may be published as part of a regular AAS issue or as a complete set in a separate issue of AAS.

The main purpose of ARPAS is to provide certification of professional status for qualified members of the registry, to strengthen the animal sciences among the professions, and to promote the animal sciences and the profession of animal scientists. Continual education is required of all certified professionals to keep abreast of rapidly changing technology in their fields. The journal of AAS provides highly relevant information for these registry professionals. It also serves a global need as an important source to communicate and exchange refereed science and applications among animal agriculture professionals, livestock producers, and animal scientists.

### Audience

The journal is a resource for research scientists, professional consultants, advisors, practitioners, extension educators, teachers, and students of the registry as well as all other individuals engaged in the animal sciences and production systems that serve mankind, and benefit domestic animals and the environment.

### Contact Information for Journal Staff

For information about the scientific content of the journal, contact the editor-in-chief, David K. Beede ([cowtrout@gmail.com](mailto:cowtrout@gmail.com) or [beede@msu.edu](mailto:beede@msu.edu)). For assistance with the peer-review site or copyright forms, contact Shauna Miller ([shaunam@assoqh.org](mailto:shaunam@assoqh.org)), editorial assis-

tant, ARPAS Headquarters Office, 1800 S. Oak St., Suite 100, Champaign, IL 61820.

For questions about manuscript preparation, journal style and form, and proofs, contact Christine Horger, lead technical editor, at [christineh@assoqh.org](mailto:christineh@assoqh.org) or [journals@assoqh.org](mailto:journals@assoqh.org).

For assistance with page charge forms, contact Brittany Morstatter at [brittanym@assoqh.org](mailto:brittanym@assoqh.org).

For other information, contact Laura Esterman, managing editor, ARPAS Headquarters Office; phone 217-239-3352; [laurae@assoqh.org](mailto:laurae@assoqh.org) or [journals@assoqh.org](mailto:journals@assoqh.org).

## Science and Applications in AAS

Articles in these scientific areas and applications of animal science and production are published in the journal as they apply for beef cattle, dairy cattle, horses, poultry, companion animals, swine and other species that benefit mankind with meat and milk, work (e.g., draught), recreation, ecosystem services, fuel, and material byproducts (e.g., hides, feathers and feed byproducts). Authors will select one of the following topic areas when submitting a manuscript for peer review.

- Extension and Teaching
- Food Science
- Forages and Feeds
- Genetics and Breeding
- Health
- Production and Management
- Nutrition
- Physiology
- Sustainability and Integrated Systems
- Welfare and Behavior

## Types of Articles

**Original Research.** These articles report unpublished research results. The material must not have been published previously in a refereed scientific journal or submitted to another peer-reviewed journal prior to receiving a decision from AAS. Research is from experimentation with animals or plants grown for feed and forage, economic analyses, field trials, scientific literature-based meta-analyses, or a combination thereof. The research must be from adequately replicated experiment(s) with the appropriate experimental unit, and with sufficient statistical power for sound analysis and interpretation. Data gleaned from the literature are acceptable only if pooled for the purpose of analyzing, summarizing, and interpreting; exceptions must be approved by the original author and publisher. Research addressing commercial products should address hypothesis-driven questions about the biology or mode of action for practical applications. The majority of articles in AAS are original research articles.

**Reviews and Invited Reviews.** Reviews integrate information and provide well-founded recommendations from research for application in animal agriculture. Reviews

should include the author's expert evaluation of the current state of the area and propose future needs for research and application. Author-originated topical reviews are welcome. Authors interested in writing reviews are encouraged to contact the editor-in-chief or an associate editor before writing the review to verify interest in the topic and timeliness. The editor may invite reviews from experts on a variety of topics.

**Short Communications.** Short Communications report results and interpretation of relatively limited or narrowly focused research that is appropriately designed to provide well-documented and substantiated results. The articles must contain a hypothesis (if appropriate) and objective(s), sufficient detail in materials and methods for repetition of the work, results with brief discussion, references, and tables and figures as needed to display relevant findings. The research must be from adequately replicated experiment(s) with the appropriate experimental unit, and with sufficient statistical power for sound analysis and interpretation.

They may be case studies that provide unique or novel information. However, if factors are compared (e.g., from on-farm or research station studies) statistical analysis with appropriate experimental unit and replication are needed.

**Technical Notes.** These articles result from well-designed research studies related to novel (or the improvement of existing) methods or processes or to new equipment for field application or the research laboratory. The article should state a hypothesis, full description of the technical aspects in the Materials and Methods section for repetition by other researchers, and explicit controls to indicate precision, accuracy, and sensitivity of the method or equipment. Mean and dispersion statistics must be included.

**Letters to the Editor.** Letters can be submitted by anyone with interest in the journal content and animal science and production. Letters may offer comments or questions about articles previously published in the journal, technical questions requesting a scientist's response, or educational notes about new or innovative approaches in teaching, extension, or industry programs. Letters will be reviewed by the editor-in-chief. If a letter addresses published works, opinions, or positions of others, the other party will be given opportunity to respond in writing to the letter in the same or next issue of the journal.

**Perspectives and Commentaries.** These articles provide a forum for authors to address important topics in the animal sciences related to industry opportunities, issues, practices, and applications or related to research investigation and application. They typically are more forward looking and may be more speculative than Reviews and Invited Reviews and may take a narrower field of view. They may be opinionated but should remain balanced and are intended to stimulate discussion and(or) describe and support (validate) new industry and(or) experimental approaches. These articles may document industry or scientific needs or practices and may provide recommendations. Information shared should be from extensive first-hand experience and new data, results, and

information, which should be displayed with some statistical evaluation when possible. References to the refereed scientific literature are encouraged when appropriate but are not essential nor required. These articles are invited by the editor-in-chief. Individuals are encouraged to contact the editor-in-chief to suggest topics and(or) potential authors for Perspectives and Commentaries articles or to indicate a desire to submit an article of this type to the journal.

## MANUSCRIPT PREPARATION

### Writing Style

Articles must be written in American English. The text and all supporting materials must use American spelling and usage as given in *Merriam-Webster's Collegiate Dictionary*, *Webster's Third International Dictionary*, or the *New Oxford American English Dictionary*.

Today, most scientific style manuals support the active over the passive voice. Use of the active voice results in lively, clear, and concise writing. Passive voice may still be appropriate in the Materials and Methods section, for example, where the actor is unimportant and the writer wishes to focus on the action or the recipient of the action. The active voice and first-person pronouns (I, we) should be used in the RESULTS AND DISCUSSION and the APPLICATIONS sections. For example, "we observed a difference..." "we concluded that..." or "Treatment A affected dry matter intake..." rather than "There was a difference..." "It was concluded that..." or "Dry matter intake was affected by treatment A ..."

For scientific conventions, authors should follow the style and form recommended in *Scientific Style and Format: The CSE Manual for Authors, Editors, and Publishers*, published by the Council of Science Editors in cooperation with University of Chicago Press ([www.scientificstyleandformat.org/](http://www.scientificstyleandformat.org/)).

### Editing Services

Before submission (or resubmission in the case of a revised manuscript), authors who believe their manuscripts would benefit from professional editing are encouraged to use a language-editing service. Use of such service may facilitate peer review of a manuscript but does not guarantee the acceptability for publication.

### Preparing the Manuscript File

Manuscripts should be typed double-spaced (in Microsoft Word) with lines and pages numbered consecutively, using Times New Roman font at 12 points. Special characters (e.g., Greek, math, symbols) should be inserted using the symbols palette available in this font. Complex math should be entered using MathType from Design Science ([www.dessci.com](http://www.dessci.com)). Tables and figures should be placed in separate sections at the end of the manuscript (not placed within the text). Tables should be kept to a minimum and should not include irrelevant or superfluous data or results. Tables must stand alone and include

sufficient information to allow the reader to understand completely the implications of the tabular results without referring to the text. All abbreviations (including treatment abbreviations) must be identified upon first use with superscripts and defined in footnotes of each table. Failure to follow these instructions may result in immediate rejection of the manuscript.

### **Title Page**

At the top of the title page (first page) provide a running head (short title) of not more than 45 characters.

The title of articles should be in boldface; the first letter of the title and proper names are capitalized and the remainder of the title is lowercase. The title must specify the animal species, sex, and type of production system discussed if applicable and contain no abbreviations.

Names of all authors (first name or initials with a space between initials, middle name or initial, and last name) shall be in mixed case with institutional addresses or affiliations denoted with numbers and placed below the author names.

Affiliations shall provide the authors' departments and institutions, city, state or country, and postal code. Please indicate if an author is ARPAS certified by including "PAS" after their name, but do not list any other titles, positions, or degrees for authors. The title page shall include contact information of the corresponding author: name, address, phone number, and email address. Footnotes can be used to indicate current address.

Funding for the research must be indicated in the Acknowledgments section as defined below. This section also can be used to acknowledge grants or provide experiment station or journal series numbers.

### **Declaration of Conflicts of Interest**

On the title page, include a statement regarding conflicts of interest. All authors must disclose any financial and personal relationships with other people or organizations that could inappropriately influence (bias) their work. Examples of potential conflicts of interest include employment, consultancies, stock ownership, honoraria, paid expert testimony, patent applications/registrations, and grants or other funding. If the authors have no conflicts of interest, then they should state "The authors have not declared any conflicts of interest."

### **Structured Abstracts and Key Words**

All manuscripts include a structured abstract to organize content of 250 to 350 words. The abstract shall be followed by up to 5 key words or phrases very specific to the area of study not from the title to broaden discovery online.

#### **Abstracts for Research Articles**

Research articles (original research, short communications, technical notes) use the following structure and bolded in-line headings for abstracts. Please use complete sentences within each abstract heading.

**Objective:** the exact question(s) addressed by the article.

**Materials and Methods:** experimental design, animals, key methods, and procedures.

**Results and Discussion:** main outcome measures, key findings, discussion, and interpretation.

**Implications and Applications:** key conclusions, implications, and practical applications resulting from the work in this specific article.

#### **Abstracts for Review Articles**

Review articles use the following structure and bolded in-line headings for abstracts. Please use complete sentences within each abstract heading.

**Purpose:** the primary objective(s) of the review.

**Sources:** a succinct summary of data, results, and information sources.

**Synthesis:** key findings and interpretation of the science and critical assessment of the state of knowledge on the subject.

**Conclusions and Applications:** key conclusions, including potential practical applications and(or) brief description of future research needs.

#### **Headings in the Manuscript Body**

**Major Headings.** Major headings are centered, boldface, all uppercase, and consist of ABSTRACT, INTRODUCTION, MATERIALS AND METHODS, RESULTS AND DISCUSSION, APPLICATIONS, ACKNOWLEDGMENTS (optional), LITERATURE CITED, and APPENDIX (optional).

**First Subheadings.** First subheadings are placed on a separate line and begin at the left margin, the first letter of each important word is capitalized, and the headings are boldface and italic.

**Second Subheadings.** Second subheadings begin the first line of a paragraph. They are indented, boldface, italic, and followed by a period.

#### **Introduction**

The introduction (approximately 250 to 350 words) should inform the reader of the background and justification for the work to understand the significance of the information presented in the article. Previous work on the topic should be summarized, and the objective of the current research must be clearly stated. A research hypothesis should be stated if appropriate.

#### **Materials and Methods**

Materials, methods and procedures should be given in sufficient detail so that someone with comparable expertise and resources could replicate the work. The names of all sources of products, equipment, and chemicals used in the experiments must be given in parentheses. Trade names are to include models and names of the manufacturers. Animal care guidelines should be referenced.

**Care and Use of Animals.** Authors must make it clear that experiments were conducted in a manner that avoided unnecessary discomfort to the animals by use of proper management and laboratory techniques. Authors must include in the Materials and Methods a declaration that experimentation was conducted by policies and

procedures approved by the institution's or organization's animal use and care committee. Experiments must be conducted in accordance with the principles and specific guidelines presented in the *Guide for the Care and Use of Agricultural Animals in Research and Teaching*, fourth edition, 2020 (<https://www.adsa.org/Publications/Guide-for-the-Care-and-Use-of-Animals>). Methods of killing experimental animals must be described in the text. In describing surgical procedures, the type and dosage of the anesthetic agent must be specified. The AAS editor in chief may refuse to publish manuscripts that are not compatible with these guides. If rejected solely on that basis, however, the manuscript may be resubmitted for reconsideration when accompanied by a written verification that a committee on animal care in research has approved the experimental design and procedures involved.

**Human Subjects.** For research involving collection of data from humans, please include a statement in the Materials and Methods section that human subject review was approved by [Institutional Review Board] and how informed consent or assent was obtained. Or if the study was deemed exempt by (insert name of institution) Institutional Review Board. This study was deemed exempt under federal regulation 4546.101(b) CFR. Reference: [www.hhs.gov/ohrp/humansubjects/guidance/45cfr46.html](http://www.hhs.gov/ohrp/humansubjects/guidance/45cfr46.html).

**Experimental Design and Statistical Analysis.** The experimental design must be clearly stated (e.g., randomized design, 4 × 4 Latin square design, randomized block design, etc.). The appropriate experimental unit is the smallest unit (subject or group or pen of subjects) to which the treatment is administered. Replication of experimental units is expected to provide sufficient power to detect differences for variables of interest. A discussion of the statistical analysis methods with sufficient detail must be included so that others could repeat the analysis. Specify the independent and dependent factors (variables) in the analysis and the statistical model used. In model statements, uppercase letters should be used for fixed effects and lowercase letters for random effects. Nonsignificant differences (e.g.,  $P > 0.05$  and  $< 0.10$ ) may be discussed using such terms as numerical differences, trends, and so forth. Nonsignificant probability levels can be presented and discussed if properly qualified so that the reader is not misled; it is desirable to give the exact probability level if not  $P < 0.05$  or  $P < 0.01$ . The authors must provide the appropriate citation in the text for all statistical methods used.

### Results and Discussion

The article should contain a combined Results and Discussion section (not separate Results and Discussion sections) that presents the results and addresses the significant interpretation and conclusions to be drawn from the results and particularly the application to animal agriculture.

### Applications

This section is required and should remind the readers of the objective(s) and summarize the key findings, interrelated aspects, and additional information in one paragraph (maximum of 300 words). The purpose is to capture ideas about application of results; highlight variables that may interact; add emphasis to biological, economic, or societal values of the research; provide context, understanding, and implications for the application of the results; and, possibly, to advise on additional specific research that could be done. The applications section is not a recapitulation of the abstract or an author-added conclusions or summary section.

### Acknowledgments

Acknowledgments are placed in a section just before the Literature Cited section. Funding disclosures must be reported in the Acknowledgments section of every article. Please include funder name, city, and state or country; competitive and noncompetitive grant numbers; and USDA project names and numbers (when applicable). List names and affiliations of individuals who provided help during the research and their role (e.g., providing writing or laboratory assistance or proof reading the manuscript).

### Literature Cited

**Citations in Text.** In the body of the manuscript, refer to authors as follows: Smith and Jones (1992) or Smith and Jones (1990, 1992). If the sentence structure requires that the authors' names be included in parentheses, the proper format is (Smith and Jones, 1982; Jones, 1988a,b; Jones et al., 1993), with citations listed chronologically (i.e., oldest first) and then alphabetically within a year. Where there are more than 2 authors, the first author's name is followed by the abbreviation "et al." in text (but all authors should be listed in the Literature Cited section). Work that has not been accepted for publication should be listed in the text as follows: "J. E. Jones (institution, city, and state, personal communication)." The author's own unpublished work should be listed in the text as "(J. Smith, unpublished data)." Personal communications and unpublished data (including manuscripts under review) must not be included in the Literature Cited section.

**Literature Cited Section.** In the Literature Cited section, list the references by authors in alphabetical order. Journals shall be abbreviated according to the conventional ISO abbreviations used by PubMed (<http://ncbi.nlm.nih.gov/nlmcatalog/journals>). If a publication has a doi, include the doi at the end of the reference. References to SAS and other software must include name of the manufacturer in parentheses in the text and are not included in the Literature Cited list (e.g., SAS Institute Inc.).

For book references, include authors, year, chapter or section title, page range, book title, edition, book editors (if applicable), and publisher name. For conference proceedings, include authors, year, abstract title, page number or abstract number, proceedings title, and name of

proceedings publisher. For abstracts presented at ARPAS or other joint animal science annual meetings, cite as a journal article but include the journal supplement number and the page of the supplement on which the abstract appeared. Include “(Abstr.)” at the end of the citation.

For patents, provide names of inventors, year, title, name of assignee, and US or other patent number. For websites, provide authors (or organization name), year, page title, date accessed (in month, day, year format), and URL.

For theses, provide author, year, title, thesis type (PhD, MS, DVM), department name, and university name and location.

For references published in a language other than English, please translate and include the title of the article in American English in parentheses behind the original title.

### Journals

- Bunting, L. D., and M. L. Galyean. 2015. Invited paper: Customer and consumer confidence in the livestock industry—Professional ethics. *Prof. Anim. Sci.* 31:309–314. <https://doi.org/10.15232/pas.2015-01399>.
- Jenkins, T. C., E. Block, and P. H. Morris. 2011. Potassium reduces the accumulation of *trans*-10, *cis*-12 conjugated linoleic acid and *trans*-18:1 in continuous cultures of mixed ruminal microorganisms regardless of dietary fat level. *J. Dairy Sci.* 94(E-Suppl. 1):509. (Abstr.)
- Zimelman, R. B., R. J. Collier, and T. R. Bilby. 2013. Effects of utilizing rumen protected niacin on core body temperature as well as milk production and composition in lactating dairy cows during heat stress. *Anim. Feed Sci. Technol.* 180:26–33.

### Books

- AOAC International. 2012. *Official Methods of Analysis*. 19th ed. AOAC Int.
- Chipley, J. R. 2005. Sodium benzoate and benzoic acid. Pages 11–48 in *Antimicrobials in Food*. P. M. Davidson, J. N. Sofos, and A. L. Branen, ed. Taylor Francis.
- FASS. 2020. *Guide for the Care and Use of Agricultural Animals in Research and Teaching*. 4th ed. FASS Inc.
- NASEM (National Academies of Sciences, Engineering, and Medicine). 2021. *Nutrient Requirements of Dairy Cattle*. 8th rev. ed. Natl. Acad. Press. <https://doi.org/10.17226/25806>.

### Conferences

- Chase, L. E., R. J. Higgs, and M. E. Van Amburgh. 2009. Feeding low crude protein rations to dairy cows—Opportunities and challenges. Pages 220–226 in *Proc. 71st Cornell Nutr. Conf. Feed Manuf.* Cornell Univ.

### Non-English Publications

- Alencar, M. M. 2004. Utilização de cruzamentos industriais na pecuária de corte tropical (Using of crossbreeding in beef cattle in tropical systems). Pages 149–170 in *Simpósio sobre Bovinocultura de Corte 2004*. Fundação de Estudos Agrários Luiz de Queiroz.

### Other

- El Halawani, M. E., and I. Rosenboim. 2004. Method to enhance reproductive performance in poultry. Univ. Minnesota, assignee. US Pat. No. 6,766,767.
- Issa, S. 2009. Nutritional value of sorghum for poultry feed in West Africa. PhD Diss. Kansas State Univ., Manhattan.

Mahanna, B. 2015. Cows may be more resilient to brief ration changes. *Feedstuffs* 87(14). Accessed Nov. 2, 2015. <http://feedstuffs.com/story-cows-may-more-resilient-brief-ration-changes-54-126313>.

USDA, Plant and Animal Health Inspection Service. 2004. Blood and tissue collection at slaughtering and rendering establishments, final rule. 9CFR part 71. Fed. Regist. 69:10137–10151.

### Tables

Tables must be created using the table feature in Microsoft Word and inserted in the manuscript after the Literature Cited section. Each table must be on a separate page. The table title shall begin with bold “Table 1.” followed by the title of the table. Units of measure (metric units) for each variable measured must be indicated. Tables must stand alone and include sufficient information to allow the reader to understand the tabular information without referring to the text. All abbreviations (including treatment abbreviations) must be identified upon first use with superscripts and defined in footnotes of each table. For each table, define author-derived abbreviations in parentheses or in numbered footnotes. Abbreviations should conform to journal style and be consistent with those used in the text. Bold and italic typefaces should not be used in tables, but when it is necessary to do so, such use must be defined in a footnote. Footnotes to tables shall be superscript numbers; superscript letters shall be used only to indicate statistical separation of means. Consult a recent issue of AAS for examples of tables. All tables must present original material. If an author wishes to present results already published in tabular form, the author must obtain permission to reproduce the table, even when the format of the table submitted with the manuscript is different from the table already published.

### Figures

To facilitate review, figures should be placed at the end of the manuscript (separated by section breaks). Each figure should be placed on a separate page and identified by the last name of the first author and figure number. Place each figure caption on the same page as the figure.

- **Figure size.** Prepare figures at final size for publication. Figures should be prepared to fit one column (8.9 cm wide), 2 columns (14 cm wide), or full-page width (19 cm wide).
- **Font size.** Ensure that all type within the figure and axis labels is readable after reduction to final publication size. The font size should be proportional to the overall size of the figure (within a range of 8 to 12 points at final publication size).
- **Fonts.** For best readability, use Helvetica, Times New Roman, Arial, and the symbols palette within those fonts only.
- **Line weight.** For line graphs, use a minimum stroke weight of 1 point for all lines. If multiple lines are to be distinguished, use solid, long-dash, short-dash, and dotted lines. Avoid the use of gray lines, as these will not reproduce well. Lines with different symbols for the data points may also be used to distinguish curves.

• **Axis labels.** Each axis should have a descriptor and a unit. Units may be separated from the descriptor by a comma or parentheses. Axes and graduation or tick marks associated with each numeric value or descriptor on the axes should be very black, but not bold. The word descriptors (word labeling) for the axes and numeric values also should be in a very black (but not bold) font of appropriate size and include units of measure as appropriate.

• **Shading and fill patterns.** For bar charts, use different colors or fill patterns if needed (e.g., black, white, gray, diagonal stripes). Avoid the use of multiple shades of gray, as they will not be easily distinguishable. Complex patterns and 3-dimensional effects reproduce poorly. Remove all unnecessary backgrounds and gridlines from all graphs.

• **Symbols.** Identify curves and data points using the following symbols only: □, ■, ○, ●, ▲, ▼, △, ▽, ◇, ◆, +, or ×. Symbols should be defined in the figure caption or in a key on the figure (but not both).

• **File formats.** Figures can be submitted in PDF, EPS, TIFF, and JPEG formats or pasted into Microsoft Word.

• **Color figures.** Figures will appear in color in the online articles. Different shades of green should not be used.

• **Resolution.** Minimum resolution is 600 dpi for grayscale and color figures, and 1,200 dpi for line art. Submitting figures that do not meet these requirements may delay publication of your article.

• **Photomicrographs.** Photomicrographs must have their unmagnified size designated with a scale bar on the figure. Reduction for publication can make a magnification power designation (e.g., 100×) inappropriate.

• **Captions.** The caption should provide sufficient information that the figure can be understood without excessive reference to the text. All author-derived abbreviations and symbols used in the figure should be defined in the caption.

• **General tips.** Do not use three-dimensional bar charts unless essential to the presentation of the data. Use the simplest shading scheme possible to present the results clearly. Ensure that data, symbols, axis labels, lines, and key are clear and easily readable at final publication size.

**No Color Fees.** The journal publishes color figures at no charge to the author.

## Appendices

If there is more than one appendix, they should be identified as Appendix A, Appendix B, and so on. Formulas and equations in appendices should be given separate numbering: Equation A1, Equation A2, and so on; in a subsequent appendix, Equation B1 and so on. Similarly for tables and figures: Table A1; Figure A1, and so on.

## Supplementary Material

Supplementary material can be provided to support and enhance your scientific research. Supplementary files offer the author additional possibilities to publish supporting applications, high-resolution images, background

datasets, sound clips and more. Please note that such items are published online exactly as they are submitted; there is no editorial review or typesetting involved (supplementary data supplied as an Excel file or as a PowerPoint slide will appear as such online). Please submit the material together with the article and supply a concise and descriptive caption for each file. If you wish to make any changes to supplementary data during any stage of the process, please make sure to provide an updated file and do not annotate any corrections on a previous version. Please also make sure to switch off the “Track Changes” option in any Microsoft Office files as these will appear in the published supplementary file(s).

## Miscellaneous Usage Notes

### Abbreviations

Abbreviations shall not be used in the title, running head, key words, or at the beginning of sentences. The suitability of abbreviations is evaluated by the reviewers, editor in chief, associate editors, and technical editor. When standard abbreviations or conventions for abbreviations exist in the discipline, these should be followed. Terms used only twice must not be abbreviated. All author-coined abbreviations are to be defined the first time they are mentioned, with the abbreviation following in capital letters, boldface, and in parentheses. Such abbreviations shall be used consistently thereafter. The units of the manuscript (abstract, text, each table, and each figure) read independently of each other; therefore, abbreviations must be defined within each unit of the manuscript.

The abbreviations in Appendix 1 toward the end of this document may be used without definition in AAS. Plural abbreviations do not use an ending “s.” Chemical symbols and 3-letter abbreviations for amino acids do not need definition. Units of measure should be abbreviated as listed in the *CRC Handbook of Chemistry and Physics* and do not need to be defined.

### Units

Follow internationally accepted rules and conventions: use the international system of units (SI). If other units are mentioned, please give their equivalent in SI.

### Currency

Monetary values should be presented in US dollars. If other currencies are used, a conversion to US dollars should be given at first use (e.g., “1 NZ\$ = 0.73 US\$”).

### SNP Nomenclature

The increasing number of SNP association studies require a standardized SNP nomenclature for unequivocal and correct SNP identification. Additionally, information regarding the SNP investigated should be easily accessible in a publicly available database. Therefore, all relevant SNP included in a study should be listed with their unique RefSNP (rs) or submitted SNP (ss) number (if rs number is not yet available) as indicated in the public domain NCBI dbSNP database (<http://www.ncbi>.

[nlm.nih.gov/snp](http://www.ncbi.nlm.nih.gov/snp)). If the SNP investigated do not yet have an entry in the NCBI dbSNP database, the authors of the manuscript are responsible for submitting all the required information to NCBI (see <http://www.ncbi.nlm.nih.gov/projects/SNP/>) for depositing the SNP into this database and obtaining a unique ss number for the SNP. In the text of the manuscript, use of the rs or ss number of the SNP or an alternative standardized nomenclature is recommended.

### **Expression of Feed Conversion Efficiency (FCE)**

The journal uses the ratio of product produced (numerator)-to-feed consumed (denominator). For swine and poultry diets “as-fed” basis may be used; for ruminant diets 100% dietary dry matter basis is used. Authors should collect, statistically analyze, and report FCE in this manner. Examples are body weight gain-to-feed (G:F), FCM yield-to-feed (FCMY:feed), and total egg weight-to-feed (tew:feed). If there is good justification for presenting the feed-to-gain ratio, these data should be analyzed separately statistically and results presented as a separate dependent variable, in addition to the gain-to-feed ratio.

### **Measures and Mathematics**

Numbers less than 1 shall be written with a preceding zero (e.g., 0.75). All cardinal numbers are written as numerals except when they begin a sentence; when 2 numerals are adjacent in a sentence (spell out the number most easily expressed in words; e.g., two 10-kg samples); or when a number is used as a figure of speech. Measures must be in the metric system; however, US equivalents may be given in parentheses. Units of measure not preceded by numbers must be written out rather than abbreviated (e.g., lysine content was measured in milligrams per kilogram of diet). Abbreviations of measures of variation presented must be spelled out in the abstract and body of the article at first use. Units of measure for feed conversion or feed efficiency shall be provided. Use the slash only when it means “per” with numbered units of measure or “divided by” in equations. Use only one slant line in a given expression (e.g., g/d per cow). The slant line may not be used to indicate ratios, mixtures, or substitute for the words “and” or “or.” Insert spaces around all signs (except slant lines) of operation (equal, minus, plus, times, greater than, or less than) when these signs occur between 2 items, including statements of probability ( $P < 0.05$ ). Use “to” instead of a hyphen to indicate range. Items in a series should be separated by commas (e.g., a, b, or c).

## **SUBMISSION OF MANUSCRIPTS**

Authors should submit their manuscripts online (<http://mc.manuscriptcentral.com/pas>). Authors should upload manuscripts using the fewest files possible to facilitate

review. Detailed instructions for submitting electronically are provided on the submission and peer-review site. Authors who are unable to submit online should contact Shauna Miller, editorial assistant ([shaunam@assochoq.org](mailto:shaunam@assochoq.org)). In addition, authors may post abstracts of manuscripts on the web at the time of submission. Once an author receives notification of acceptance, the peer-reviewed pre-typesetting manuscript can be posted to the author’s website.

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## **APPENDIX 1: ABBREVIATIONS**

The following abbreviations may be used without definition in the journal *Applied Animal Science*. Abbreviations of all chemical elements, common combinations of chemical elements, SI units of measure used with a value, and common amino acids (3-letter and 1-letter abbreviations) should be used without definition. Abbreviations are not permitted in the title, running head, and key words. Plural abbreviations do not require "s".

AA	amino acid(s)	Circ.	Circular
ACTH	adrenocorticotropin	CoA	coenzyme A
ADF	acid detergent fiber	Coll.	College
ADFI	average daily feed intake	Conf.	Conference
ADG	average daily gain	Congr.	Congress
ADIN	acid detergent insoluble nitrogen	CP	crude protein
ADL	acid detergent lignin	CV	coefficient of variation
ADP	adenosine diphosphate	DCAD	dietary cation-anion difference
AI	artificial insemination	DE	digestible energy
AMP, ADP, ATP	adenosine mono-, di-, or triphosphate	DEAE	(dimethylamino)ethyl
ANOVA	analysis of variance	df	degree(s) of freedom
AOAC	Association of Official Analytical Chemists	DHI(A)	Dairy Herd Improvement Association
ARS	Agricultural Research Service	DIM	days in milk
avg	average (use only in tables, not in the text)	DM	dry matter
B cell	bursal-derived, bursa-equivalent derived cell	DMI	dry matter intake
BCS	body condition score	DNA	deoxyribonucleic acid
BHB	$\beta$ -hydroxybutyrate	DP	dressing percentage
BLUP	best linear unbiased prediction	EAA	essential amino acid
BSA	bovine serum albumin	EBV	estimated breeding value
Bull.	Bulletin	ECM	energy-corrected milk
BUN	blood urea nitrogen	EDTA	ethylenediaminetetraacetate
BW	body weight	EFA	essential fatty acid
C	cytosine	ETA	estimated transmitting ability
cDNA	complementary DNA	ELISA	enzyme-linked immunosorbent antibody assay
CI	confidence interval	EPD	expected progeny difference

Exp.	experiment	OM	organic matter
Ext.	Extension	<i>P</i>	statistical probability
FCM	fat-corrected milk	PAGE	polyacrylamide gel electrophoresis
FFA	free fatty acid	PBS	phosphate-buffered saline
F:G	feed-to-gain	PCR	polymerase chain reaction
FSH	follicle-stimulating hormone	ppm	parts per million
GE	gross energy	PTA	predicted transmitting ability
G:F	gain-to-feed ratio	Publ.	Publication
GLC	gas-liquid chromatography	PUFA	polyunsaturated fatty acid
GLM	general linear model	QG	quality grade
HPLC	high-performance (high-pressure) liquid chromatography	<i>r</i>	correlation coefficient
$h^2$	heritability	$R^2$	coefficient of multiple determination
Ig	immunoglobulin	RDP	rumen-degradable protein
IGF	insulin-like growth hormone	Rep.	Report
i.m.	intramuscular	RIA	radioimmunoassay
Inst.	Institute	RNA	ribonucleic acid
i.p.	intraperitoneal	RUP	rumen-undegradable protein
i.v.	intravenous	s.c.	subcutaneous
IVDMD	in vitro dry matter disappearance	SCC	somatic cell count
KPH	kidney, pelvic, heart fat	SD	standard deviation
LD <sub>50</sub>	50% lethal dose	SDS	sodium dodecyl sulfate
LM	longissimus muscle	SE	standard error
LSD	least significant difference	SEM	standard error of the mean
LSM	least-squares mean	SFA	saturated fatty acids
ME	metabolizable energy	Stn.	Station
MHC	major histocompatibility complex	Suppl.	supplement
Misc.	miscellaneous	Symp.	symposium
Mongr.	Monograph	TBA	thiobarbituric acid
MP	metabolizable protein	T cell	thymic-derived cell
mRNA	messenger ribonucleic acid	TDF	total dietary fiber
MS	mean square	TDN	total digestible nutrients
MSE	mean square error	Tech.	technical
MUFA	monounsaturated fatty acid	TLC	thin layer chromatography
MUN	milk urea nitrogen	TME	true metabolizable energy
<i>N</i>	normal	TME <sub>n</sub>	nitrogen-corrected true metabolizable energy
<i>n</i>	number of observations	TMR	total mixed ration
Natl.	national	Tris	tris(hydroxymethyl)aminomethane
NDF	neutral detergent fiber	TSAA	total sulfur amino acids
NE	net energy	U	uridine
NE <sub>g</sub>	net energy for gain	UFA	unsaturated fatty acids
NE <sub>l</sub>	net energy for lactation	Univ.	University
NE <sub>m</sub>	net energy for maintenance	USDA	United States Department of Agriculture
NEAA	nonessential amino acid	UV	ultraviolet
NPN	nonprotein nitrogen	VFA	volatile fatty acid
NS	not significant	YG	yield grade

## APPENDIX 2: SELECTED UNITS AND TERMS

The following units and terms can be used without definition in *Applied Animal Science*

atomic mass unit	amu	mega	M (prefix)
atmosphere	atm	meter	m
base pair	bp	metric tonne	t or tonne
calorie (gram)	cal	micro	μ (prefix)
celsius (with number)	°C	microcurie	μCi
centimeter	cm	microfarad	μF
centimeter, square	cm <sup>2</sup>	microgram	μg
circa	ca.	microliter	μL
centimorgan	cM	milli	m (prefix)
centipoise	cP	milliliter	mL
central processing unit	CPU	millimeters of mercury	mm Hg
colony-forming unit	cfu	millimolar (concentration)	mM (= mmol/L)
counts per minute	cpm	millimole (mass)	mmol
counts per second	cps	minute(s)	min
crossed with, times	×	molar (concentration)	M
cubic	cu	molar (mass)	mol
cubic centimeter	cc, cm <sup>3</sup>	mole (number, mass)	mol
cubic millimeter	mm <sup>3</sup>	month(s)	mo
curie	Ci	morning/afternoon	a.m./p.m.
cycles per second (hertz)	Hz	nano	n (prefix)
day(s)	d	newton	N
dalton	Da	normal (concentration)	N
deci	d (prefix)	nanogram	ng
deciliter	dL	osmolality	use mmol/kg
electron volt	eV	outside diameter	o.d.
equivalents	Eq	parts per billion	ppb (use μg/kg or equivalent)
foot-candle	use lx	parts per million	ppm (use mg/kg or equivalent)
gram	g	pascal	Pa
gravity	g	pico	p (prefix)
hectare	ha	picogram	pg
hour(s)	h	plaque-forming unit	pfu
inside diameter	i.d.	probability	P
international unit	IU	revolutions per minute	rpm
intramuscularly	i.m.	second(s)	s
intraperitoneally	i.p.	siemens	S
intravenously	i.v.	species	spp.
joule	J	subcutaneous	s.c.
kilo	k (prefix)	subspecies	ssp.
kilobase	kb	unit	U
kilobyte	KB	volt	V
kilocalorie	kcal	volume	vol
kilogram	kg	volume/volume	vol/vol (use parenthetically)
kilopascal	kPa	watt	W
liter	L	week(s)	wk
logarithm (natural)	ln	weight/volume	wt/vol (use parenthetically)
logarithm (base 10)	log <sub>10</sub>	year(s)	yr
lux	lx		

**Amino Acids**

alanine	Ala
arginine	Arg
asparagine	Asn
aspartic acid	Asp
citrulline	Cit
cysteine	Cys
glutamic acid	Glu
glutamine	Gln
glycine	Gly
histidine	His
isoleucine	Ile
leucine	Leu
lysine	Lys
methionine	Met
ornithine	Orn
phenylalanine	Phe
proline	Pro
serine	Ser
threonine	Thr
tryptophan	Trp
tyrosine	Tyr
valine	Val