Author Index

The Journal of Immunology
Information for Authors

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ABOUT *THE JOURNAL OF IMMUNOLOGY*

Journal Facts:

- Publisher: *The Journal of Immunology* (*The JI*) is owned and published by The American Association of Immunologists, Inc. (AAI)
- Editor-in-Chief: Eugene M. Oltz, Ph.D., eic@aai.org
- Editorial Board: *The JI* Editorial Board is included in each issue. All editors are practicing scientists.
- Impact factor:
  Two-year: 4.856 (2016 Journal Citation Reports)
  Five-year: 5.185 (2016 Journal Citation Reports)
- Citations: *The JI* is cited more than any other immunology journal (2016 Journal Citation Reports)
- Number of research articles published/year: 790 (2017)
- Number of pages published/year: 8,904 (2017)
- Over 1.5 million page views per month (2017)
- Over 330,000 PDF downloads per month (2017)
- Publication schedule: Printed and posted online twice each month
- Issue dates: 1st and the 15th of each month
- Average time from submission to initial decision (full-length manuscripts): 28 days (2017)
- Average time from acceptance to publication ahead of print: 7.4 weeks (2017)
- Acceptance rate: 51% for full-length articles, 28% for Cutting Edge articles (2017)
- Online ISSN 1550-6606; Print ISSN 0022-1767

JOURNAL SCOPE AND CONTENT

***Full-Length Articles*:** *The JI* publishes peer-reviewed manuscripts describing novel findings in all areas of experimental immunology, including both basic and clinical studies. Articles are published in the following sections:

Allergy and Other Hypersensitivities
Antigen Recognition and Responses
Autoimmunity
Clinical and Human Immunology
Immune Regulation
Immune System Development
Immunogenetics
Immunotherapy and Vaccines
Infectious Disease and Host Response
Innate Immunity and Inflammation
Molecular and Structural Immunology
Mucosal Immunology
Systems Immunology
Transplantation
Tumor Immunology
Novel Immunological Methods

Novel Immunological Methods (see P. Fink. 2014. Introducing the *Novel Immunological Methods* section. *J. Immunol.* 192: 1339): Manuscripts submitted to the *Novel Immunological Methods* section should provide a new approach to important immunological problems. The manuscript should validate the technique, reagent, or genetically manipulated line of mice (and provide data on that) and indicate their utility for solving an immunologically interesting problem, but it is not necessary for the manuscript to solve that problem. The manuscript is evaluated on whether the technique, reagent, or line of mice is better than what is currently available and could therefore advance the field, as well as the usefulness of the technique, reagent, or line of mice to the field.

***Systems Immunology*:** Manuscripts submitted to the *Systems Immunology* section should center on analyses of novel large data sets, generated by the authors, which will serve as useful resources for future work in the field. The authors' informatics analyses should allow them to draw concrete conclusions, supported by the data, about the biology of the system(s) under study. Alternatively, manuscripts may describe a novel method of data analysis, which could be applied to publicly available data sets. The latter type of manuscript must convincingly demonstrate the utility of the new analysis method to reveal novel biological insights about the system(s) under study. However, it is not necessary for either type of manuscript to include definitive mechanistic analysis or experiments beyond those necessary for the acquisition of reproducible and meaningful data sets.

***Descriptions of New Reagents, Research Techniques, or Clinical Case Reports*:** These descriptions usually are appropriate only to the extent they provide innovative insight into unresolved problems or represent major breakthroughs.

As a point of reference, descriptions of the following would only be appropriate if they provide innovative insight into unresolved immunological problems, reveal novel structural features that are unique in an immunologically relevant manner, or represent major breakthroughs in the field:

- New reagents
- T cell or B cell epitopes
- Peptide binding motifs for previously uncharacterized MHC products
- Structures of MHC allelic products or MHC-peptide complexes not previously crystallized or homologs from previously uncharacterized species
- Three-dimensional structures of allergens or other antigens, antibody-defined epitopes, or antigen-antibody complexes
- Comparative analysis of proteins of immunological interest (intra- or inter-species comparisons)

- Research techniques
- Clinical case reports

Those wishing to report the identification of epitopes may do so at the Immune Epitope Database and Analysis Resource (http://www.immuneepitope.org/).

***Brief Reviews*:** *The JI* publishes a small number of invited reviews on a regular basis. These reviews are four to six journal pages in length, including illustrations and references. They cover a focused area on the advancing edge of immunology and provide a balanced view of current research that can be understood by researchers outside of that specialty. Authors interested in submitting a manuscript to *Brief Reviews* should submit a proposal, including an outline of the proposed review, by e-mail to the Editor-in-Chief at eic@aai.org.

***Cutting Edge Articles*:** *Cutting Edge* is the rapid publication section of *The JI*, presenting short reports describing significant advances in an area of immunology. Manuscripts submitted for consideration in this section should present scientifically sound and novel research in a clear and concise fashion and contain conclusions of unusual interest to immunologists that are justified from the data presented. Chief criteria for acceptance are scientific novelty and quality, originality, clarity, and conciseness. In addition to research articles, the *Cutting Edge* section publishes invited brief commentaries on controversial subjects of broad interest to immunologists.

***Immunology Notes and Resources*:** This is a feature where items of general interest to the immunology community may be published, such as articles on nomenclature or other significant items that may impact scientific research. These articles are published at the discretion of the Editor-in-Chief, who may seek advice from other editors or experts in the field. Submissions can be made by e-mail to the Editor-in-Chief at eic@aai.org.

***In This Issue*:** A small number of articles regarded by reviewers and editors as the top 10% in their field are highlighted in this section.

***Letters to the Editor*:** The Editor-in-Chief invites brief letters (250 words or less) of general interest, commenting on work published in *The JI* within the previous 3 months. A limited number of letters will be selected for publication. The authors of the original work will be invited to respond, and both the original letter and the authors' response will be published together. If you are interested in commenting on a published article, e-mail the Editor-in-Chief at eic@aai.org.

***Pillars of Immunology*:** In the first issue of each month, *The JI* reprints articles that have come to be regarded as classics in the field. An invited commentary accompanies each reprinted article, and a podcast is recorded of the commentary writer discussing the impact of the featured article on his or her own work and on the field in general. Podcasts can be found at http://www.jimmunol.org/ImmunoCasts. Suggestions for significant articles may be made by e-mail to the Editor-in-Chief at eic@aai.org. See the Pillars of Immunology page at http://www.jimmunol.org/pillarsofimmunology. *Pillars of Immunology commentaries represent the perspectives of their authors and are not meant to serve as definitive historical documents.* Suggestions for significant articles may be made by e-mail to the Editor-in-Chief at eic@aai.org.

***Translating Immunology*:** These invited articles highlight immunological discoveries that have led to a treatment, drug, or diagnostic device. See the Translating Immunology page at http://www.jimmunol.org/translatingimmunology.

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Several funding bodies, including the National Institutes of Health (NIH), Howard Hughes Medical Institute (HHMI), Wellcome Trust, and Medical Research Council (MRC-UK), mandate that authors deposit published articles into PMC or Europe PMC. While these mandates apply to authors, not publishers, the new AAI service will help authors comply with these mandates. On behalf of authors who are funded by NIH, HHMI, Wellcome Trust, and MRC-UK, AAI will deposit all manuscripts to NIHMS or Europe PMC, as applicable, that begin submission to *The JI* after 10 AM (EDT) March 29, 2011 and are ultimately accepted for publication; the author must select this option on the online submission form in order for AAI to do so. AAI will deposit the version of the manuscript that has undergone peer review and has been accepted for publication, before copy-editing and formatting.

Most funders mandate that articles be made available to the public in PMC at either 6 or 12 months after publication; manuscripts deposited by AAI will comply with these embargo periods. Authors will receive at least two e-mail notifications from PMC about their manuscripts. Authors must respond to both e-mails, in order for the process to be completed.

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MANUSCRIPT PREPARATION

See also *Scientific Publishing Dos and Don'ts for Authors and Reviewers* (http://aai.org/About/Publications/Additional/Docs/AAI_Dos_Donts.pdf).

***General Guidelines*:** A 12-point serif font, preferably Times New Roman, is required for all text, except within figures. Do not use compressed type format. Double-space the entire manuscript; number each line and each page. Each of the following components should begin on a separate page:

1. The **Title Page** must include the full title; a running title (not to exceed 60 characters); each author's full name as it should be published (first name, middle initial, last name); and the affiliations of all

authors and their institutions, departments, or organizations (use the following symbols in this order: *, †, ‡, §, ¶, ‖, #, **, ††, ‡‡, §§, ¶¶, ‖‖, ##). List the phone number, fax number, and e-mail address of the corresponding author on the title page. (See *Submit Online* for information about the corresponding author designation during submission and peer review.)

2. The **Abstract** must be 250 words or less for full-length manuscripts. Reference citations should not be included in the *Abstract*. The species of animals or species of origin of cells used in the manuscript must be clearly stated in the *Abstract.* Please ensure that the final few sentences (50 words or less) of the *Abstract* provide a succinct summary of the main point of the manuscript.

3. The **Introduction**, **Materials and Methods**, **Results,** and **Discussion** sections should begin on separate pages in that order. Do not combine the *Results* and *Discussion* sections for full-length manuscripts.

4. In either the **Materials and Methods** or in the figure legends, authors should include:

- The gating strategies used for flow cytometry experiments.
- Minimal Information About T cell Assays (MIATA), as appropriate.
- The original source for purchased or shared animals used to generate a colony, including the commercial vendor nomenclature that specifies the strain, if relevant.
- The number and gender of animals analyzed per experiment.
- The source of experimental and control animals, including whether they are littermates and/or cohoused.

5. **Acknowledgments** appear immediately after the *Discussion* and before *References*.

6. **Grant support** must NOT be included in the *Acknowledgments,* but should be cited as a footnote to the title. All funding sources must be disclosed and will be published as a footnote to the title; anonymous or pseudonymous funders are not permitted.

7. **References** must be numbered as they appear in the text and should refer to primary literature rather than review articles wherever possible. All authors must be listed for each reference. If citations are included in tables or in figure legends, they must be numbered according to the position of citation of the table or figure in the text. Only published articles and manuscripts in press may be included in the *References*. In press manuscripts, i.e., manuscripts not yet published, must be submitted as online attachments in PDF format at the time of manuscript submission. NOTE: Do NOT submit as attachment articles that are already published, e.g., manuscripts published ahead of print. Such manuscripts must be incorporated into the *References* and cited with their DOI numbers and year of publication. Citations of "manuscripts in preparation," "unpublished observations," "manuscripts posted on preprint servers," and "personal communications" must appear parenthetically in the text. Manuscripts "submitted for publication" (i.e., not yet accepted) must also be mentioned parenthetically in the text. Written approval by the persons cited in personal communications must accompany the manuscript unless they are also authors of the manuscript submitted to *The JI*.

Format for references:

Periodicals: Wells, A. D., M. C. Walsh, D. Sankaran, and L. A. Turka. 2000. T cell effector function and anergy avoidance are quantitatively linked to cell division. *J. Immunol.* 165: 2432–2443.

Books: McIntyre, T. M., and W. Strober. 1999. Gut-associated lymphoid tissue: regulation of IgA B-cell development. In *Mucosal Immunology*, 2nd Ed. P. L. Ogra, J. Mestecky, E. Lamm, W. Strober, J. Bienenstock, and J. R. McGhee, eds. Academic Press, San Diego, CA, p. 319–356.

Manuscripts published ahead of print: Fraser, D. A., A. K. Laust, E. L. Nelson, and A. J. Tenner. 2009. C1q differentially modulates phagocytosis and cytokine responses during ingestion of apoptotic cells by human monocytes, macrophages, and dendritic cells. *J. Immunol.* doi:10.4049/jimmunol.0902232.

8. **Chemical Structures:** Manuscripts describing new chemical compounds whose use is integral to the manuscript's conclusions must provide, either in the manuscript or through a publicly accessible web source, the chemical structure, synthesis and characterization of the compounds (including their purity) in enough experimental detail to allow other researchers to reproduce the synthesis and characterization.

9. **Footnotes** should be used to designate the source of support, new or special abbreviations used, correspondence address, current address, etc. *Footnotes* should be numbered consecutively and will appear on the title page, but for submission are grouped together and placed on a separate page between the *References* and the *Figure Legends*.

10. **Abbreviations** that may be used without definition are provided in the Standard Abbreviations list. Spell out nonstandard abbreviations used less than three times. Nonstandard abbreviations used three or more times must be defined in a footnote. Abbreviations and their definitions must be consistent throughout the text.

11. **Tables** must be numbered with Roman numerals in order of appearance in the text. All tables must have a title. Table legends are prepared as footnotes to the table and are included with the table. Tables must be in DOC file format. Each table should be submitted as a separate file.

12. **Figure legends** must be numbered with Arabic numerals in order of appearance in the text and should include a short title after the figure number. Where possible, symbols and patterns used to distinguish data should be defined in a key placed within the graphic rather than in the figure legend. All figure legends must specify the number of times each experiment was independently performed, as well as the number of animals or replicates in each experimental group. For flow cytometry experiments, authors should specify the gating strategies in the *Materials and Methods* or in the figure legend.

13. **Figures:** At initial submission, please submit low-resolution files of the smallest possible size that will convey the needed information. Smaller files can be downloaded more quickly by reviewers and will hasten the review process. Alternatively, a single PDF of text plus figures may be submitted at initial submission.

At submission of a revised manuscript, high-resolution figures that meet the following specifications must be submitted. For more information, see the GUIDELINES page on *The JI* Web site (http://www.jimmunol.org/sites/default/files/additional-assets/PDFs/TheJI_DigitalArtGuidelines.pdf) and TIPS page on the online manuscript submission home page (http://ji.msubmit.net).

- *Color*: Color figures must be in the RGB color space.
- *File Sizes*: Figures should not exceed 10 MB (average size is about 2 MB).
- *Image Sizes*: Figures should be submitted in final print publication size (printed 1:1). Figures may be published in print in one of three formats: 1-column wide (20 picas/3.3″/8.5 cm), 1.5-column wide (30 picas/5″/12.7 cm), or 2-column wide (41.5 picas/6.9″/18.5 cm). The single-column format is preferred. Unless the file size is too large, multi-panel figures should be submitted as a single file. Do not draw boxes around figures or figure parts.
- *Text and Lines*: Text within figures must be 6–8 points in size, except for single letter markers, which may be 12

points. Helvetica or Arial should be used for all figure text (except for the use of symbols). Line widths must be greater than one point thick or they will not be visible on the PDF version of the article.

- *Numbering*: Figures must be numbered to enable reviewers to know the figure number for each figure.
- *File Format*: Figures should be in **TIFF** (better for halftone art, e.g., blots and photographs), **EPS** (better for line art or monochrome art, i.e., anything that involves sharply delineated lines), or PDF format. PowerPoint files are not suitable quality, as their resolution is too low for print. Please see http://www.jimmunol.org/sites/default/files/additional-assets/PDFs/PPTtoTIFF_2017.pdf for detailed instructions on converting PowerPoint files to TIFF files.

14. **Digital Images:** All images submitted to *The JI* must accurately represent the original data. Original data (digital files, autoradiographs, films, etc.) for all experiments should be fully annotated, secured, and retrievable. The original image file (raw data file) should be kept in an unprocessed and noncompressed file format. For figures that are compiled into multi-figure panels, the individual image files should be kept. For additional information, see: http://jcb.rupress.org/content/166/1/11, http://jcb.rupress.org/content/172/1/9, and *Digital Images Dos and Don'ts* (http://www.jimmunol.org/sites/default/files/additional-assets/PDFs/DigitalImageDoDont.pdf).

Although manipulation of images should be kept to an absolute minimum, there are some circumstances when manipulations are necessary. If, however, the quality of an image is too poor to clearly convey the conclusion, the experiment should be repeated.

Figures in manuscripts considered for acceptance will be screened for evidence of inappropriate manipulation. Manuscript acceptance is contingent upon a satisfactory outcome of the screening process. Please adhere to the following guidelines in preparing figures for manuscripts:

- *Collecting Images*: If multiple images are compared to one another, collect each image in the same manner. Any postcollection processing should be applied in a uniform manner to all images. If differences in collection/postcollection are necessary, these need to be described in the legend or the *Materials and Methods* section.
- *Brightness and Contrast*: Adjustments in brightness and contrast should be avoided if possible. If the brightness or contrast of an image needs minor adjustment, the adjustments must not obscure or eliminate any information and must be applied to the entire image. Significant adjustments should not be made. Do not use excessive contrast that removes background. Always note any adjustment in the legend or in the *Materials and Methods* section.
- *Cloning Tools*: Images should not be "airbrushed" (with Clone Stamp Tool/Clone Brush) to remove "blemishes." Do not use cloning tools to insert something into an image from elsewhere.
- *Gels/Blots*: All gels should contain a positive and a negative control, and a set of molecular weight markers. For Western blots, control panels (actin, GAPDH, etc.) should come from a stripped and reprobed membrane of the experimental blot shown. If this is not possible, the control blots should be derived from the same samples, and this should be indicated in the figure legend.
- *Cropping*: Conservative cropping of gels and blots to improve clarity and conciseness may be permitted if the following points are observed:
  - important bands must be retained
  - at least several band widths should be retained above and below the cropped band
  - cropping must be noted in the legend
  - band(s) of interest must be clearly labeled
  - molecular weight marker positions should be shown in all gels/blots
- *Splicing*: Occasionally, images are spliced to rearrange the order of samples for the sake of presentation, such as those in a Western blot. If splicing of data from a single experiment is necessary, draw contrasting (black or white) vertical lines to indicate where the images were joined and state the manipulation in the legend. It would be preferable to rerun the gel so the order is correct. Images from different experiments should not be spliced to form a new single image.

***Cover Art*:** Cover art is selected from images in accepted manuscripts and changes with each issue of *The JI*. Authors are encouraged to submit color figures with their manuscripts for possible use as cover illustrations. If an image is selected as cover art, the file must have a resolution of at least 300 dpi at a size of $8.5'' \times 11''$.

***Estimating Manuscript Length*:** One printed page in *The JI* contains approximately 8,000 characters, including spaces. Thus, an eight-page, full-length article would contain approximately 64,000 characters. Each line in a table occupies about 60 characters for a single-column table (120 characters for a double-column table). Figures occupy about 180 characters per centimeter height for single-column figures (360 characters for double-column figures). Determine the total character count for the text of your manuscript, and add the character-equivalents for the tables and figures. This will provide a reasonable estimate for the printed length of an article.

***Web Links in Submitted Manuscripts*:** Links to Web sites are permitted only if the information contained on the Web site is not essential to the understanding and assessment of the manuscript or to the ability to repeat the experiments described in the manuscript. Web links will not be checked after submission for correctness or functionality; it is the responsibility of the author to ensure that the Web link is correct.

***Human and Animal Use*:** All studies involving human subjects must be conducted in accordance with the guidelines of the World Medical Association's Declaration of Helsinki (most recent revision). All animal studies must be performed in compliance with the U.S. Department of Health and Human Services Guide for the Care and Use of Laboratory Animals (or otherwise equivalent guidelines). A statement that human and/or animal studies have been reviewed and approved by an appropriate institutional review committee must be included in the *Materials and Methods* section of the manuscript.

DEPOSITING IN PUBLIC DATABASES

***High-resolution structural data*:** Any manuscript submitted to *The JI* that contains new high-resolution structural data requires an accession number from the Protein Data Bank (PDB) (http://www.rcsb.org/pdb) and assurance that unrestricted release will occur at or before the time of publication. The accession number should be accompanied by the Web site address of the databank.

For studies containing x-ray protein structures, authors must also submit the PDB Summary Validation Report (http://www.wwpdb.org/validation/validation-reports) (provided after annotation by the wwPDB [http://www.wwpdb.org/]) for review at the time of submission.

***Nucleotide sequences*:** Sequences of nucleotides or amino acids longer than 50 bases/residues should not be presented in the text or in table form, but rather should be submitted as a publication quality figure. Original nucleotide sequences, determined nucleotide

sequences encoding reported amino acid sequences, and files of nucleotide sequences derived from high throughput/deep sequencing (RNA-seq, ChIP-seq, MeDIP-seq, etc.) described in the manuscript must be submitted to the appropriate public database (e.g., GenBank [http://www.ncbi.nlm.nih.gov/Genbank/] or the European Nucleotide Archive [http://www.ebi.ac.uk/ena]) at the time of manuscript submission. Trace and short read sequencing data should be deposited at the NCBI Trace Archives (http://www.ncbi.nlm.nih.gov/Traces/home/), NCBI SRA (http://www.ncbi.nlm.nih.gov/sra) or ENA's Sequence Read Archive (http://www.ebi.ac.uk/ena/submit/read-submission). An accession number and sequence availability are required at the time of publication. The accession number should be accompanied by the Web site address of the databank.

***Microarray data*:** *The JI* will not publish descriptive manuscripts that report microarray data, unless such information can be considered of unusual immunological significance and/or include functional experiments that provide novel insight into mechanism. As with other scientific approaches, current experimental, quantitation, verification, and statistical analyses are expected. Microarray experiments should be Minimum Information About a Microarray Experiment (MIAME) compliant (for guidelines, see http://fged.org/projects/miame/). Whereas limited online space may be available for supplemental tables associated with the manuscript, complete microarray data must be deposited in the appropriate public database (e.g., GEO [http://www.ncbi.nlm.nih.gov/geo/] or ArrayExpress [http://www.ebi.ac.uk/arrayexpress/]), and must be accessible without restriction from the date of publication. An entry name or accession number must be included in the manuscript before publication. The accession number should be accompanied by the Web site address of the databank.

STYLE GUIDE

General style conventions: In general, *The JI* follows *Scientific Style and Format: The CSE Manual for Authors, Editors, and Publishers, 7th Edition*, published by the Council of Science Editors, Inc., in instances where style issues are not directly addressed.

***Abbreviations for references*:** PubMed (http://www.ncbi.nlm.nih.gov/journals) is the primary source for journal name abbreviations.

***Nomenclature*:** The most current links for nomenclature guidelines are posted online.

Allergen nomenclature: The systematic allergen nomenclature of the World Health Organization/International Union of Immunological Societies (WHO/IUIS) Allergen Nomenclature Sub-Committee should be used for manuscripts that include the description or use of allergenic proteins. For manuscripts describing new allergen(s), the systematic name of the allergen must be approved by the WHO/IUIS Allergen Nomenclature Sub-Committee prior to manuscript publication. To avoid the risk of delay of publication, authors are encouraged to apply for a new allergen name using the posted submission form at the WHO/IUIS Allergen Nomenclature Web site (http://www.allergen.org/) before manuscript submission. The systematic nomenclature consists of the first three letters of the taxonomic genus of the allergen source, followed by a space; the first letter of the species epithet, followed by a space; and an Arabic numeral usually indicate the chronological order in which the allergen was described. For example, the first allergen to be purified from the house dust mite *Dermatophagoides pteronyssinus* is named "Der p 1". Further examples of the systematic allergen nomenclature for over 500 allergens can be found at the WHO/IUIS Allergen Nomenclature Web site. The submissions to the Allergen Nomenclature Sub-Committee will be kept confidential until publication if requested by the authors.

CD nomenclature: For the purpose of consistency, *The JI* will follow CD nomenclature. For murine molecules, *The JI* will follow the nomenclature previously published (*J. Immunol.* 160: 3861–3868, 1998). For human molecules, standard CD nomenclature will be followed as updated (*J. Immunol.* 168: 2083–2086, 2002). See also http://www.hcdm.org/.

Chemical names: Follow the *IUPAC-IUB Commission on Biochemical Nomenclature-Chemical Abstracts* (http://www.chem.qmul.ac.uk/iupac/bibliog/white.html) or the *Chemical Abstracts Guide to Naming and Indexing of Chemical Substances* for proper spelling and style of chemical names.

Chemokine/chemokine receptor nomenclature: The systematic name for chemokines and chemokine receptors should be used. The original name may be given in parentheses if desired. See *Cytokine* 21: 48–49, 2003.

Enzyme nomenclature: Enzyme Nomenclature (http://www.chem.qmul.ac.uk/iubmb/enzyme/) is *The JI* source for style and spelling of enzyme names.

Gene nomenclature for humans: The HUGO guidelines (http://www.genenames.org/) for gene symbols and nomenclature should be used for naming human genes; nomenclature of genome sequence variants should use the Human Genome Variation Society (HGVS) (http://www.hgvs.org/) nomenclature, summarized at http://varnomen.hgvs.org/. If commonly found in the literature, alternative nomenclature may be used in addition to HGVS nomenclature. Authors should submit all variants included in a manuscript to the relevant database (e.g., dbVar [http://www.ncbi.nlm.nih.gov/dbvar/content/submission/]) for public release if the manuscript is published; the accession number and database URL should be included in the manuscript.

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HLA nomenclature: HLA nomenclature is updated periodically by the World Health Organization Nomenclature Committee for Factors of the HLA System. Annual comprehensive revisions are published in *Human Immunology*. See also EMBL-EBI (http://www.ebi.ac.uk/ipd/imgt/hla/).

SUPPLEMENTAL DATA

- Supporting data that are not essential to understanding the material presented in the manuscript may be submitted with the original manuscript for peer review; however, the print version of the article must stand on its own without the supplemental material.
- Supplemental material is primarily intended for short videos, large tables, large sequence alignments, or large data sets. Additional supplemental figures and tables that support the interpretation and conclusions drawn in the manuscript may, however, also be submitted for review with the manuscript.
- Supplemental material must be submitted as separate files from the rest of the manuscript during the online submission; select "Supplemental Data" as the "File Type" when uploading the files.
- Apart from videos, all files must be either PDF or Excel file format; multiple PDF files should be combined into a single PDF file.

- For Cutting Edge manuscripts, no more than four supplemental figures and/or tables may be submitted. One of the allowable Cutting Edge supplemental items can be a description, no more than one page in length, of computational or bioinformatics methods. Methods that are normally found in the body of the manuscript may not be included in this Cutting Edge supplemental item.
- For full-length manuscripts, no more than four supplemental figures and/or tables may be submitted. An exception to this limit can be made for manuscripts submitted to the Systems Immunology category.
- Each supplemental figure should comprise no more than a single 8.5″ × 11″ PDF page and be large enough to be legible when that page is opened.
- Legends or short explanations must accompany all supplemental figures and videos; no other supplementary text is permitted in full-length manuscripts. Legends should be placed below the corresponding figure in the PDF. Legends for videos should be submitted as a single PDF. Table legends must be prepared as footnotes to the table; all tables must have a title.

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Å, angstrom
aa, amino acid (only with numbers)
Ab, antibody
ABTS, 2,2′-azinobis(3-ethylbenzthiazoline-6-sulfonic acid)
ADP, adenosine 5′-diphosphate
Ag, antigen
AIDS, acquired immunodeficiency syndrome
AMP, adenosine 5′-monophosphate
ANOVA, analysis of variance
AP-1, activator protein 1
APC, Ag-presenting cell
ATP, adenosine triphosphate
BALB/c, a mouse strain
BALT, bronchus-associated lymphoid tissue
BAPTA-AM, 1,2-bis(2-aminophenoxy)ethane-*N*,*N*,*N*′,*N*′-tetraacetic acid acetoxymethyl ester
BCR, B cell receptor
bp, base pair (only with numbers)
BrdU, 5-bromo-2′-deoxyuridine
BSA, bovine serum albumin
C, complement
C region, constant region of Ig

cAMP, cyclic AMP
C terminus, carboxyl terminus
C-terminal, carboxyl-terminal
CCL, CC chemokine ligand
CCR, CC chemokine receptor
CD40L, CD40 ligand
cDNA, complementary DNA
CDP, cytidine 5′-diphosphate
CDR, complementarity determining region
C/EBP, CCAAT/enhancer-binding protein
CFA, complete Freund's adjuvant
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CFU, colony-forming unit
cGMP, guanosine 3′,5′-cyclic monophosphate
CHAPS, 3-[(3-cholamidopropyl)dimethylammonio]-1-propanesulfonate
Ci, curie
CIITA, class II transactivator
CLIP, class II-associated invariant-chain peptide
cM, centiMorgan(s)
CMP, cytidine 5′-monophosphate
CMV, cytomegalovirus
CNS, central nervous system
CoA, coenzyme A
Con A, concanavalin A
CpG, cytosine guanine dinucleotide
cpm, counts per minute
CREB, cAMP response binding protein
cRNA, complementary RNA
CSF, colony-stimulating factor
CTL, cytotoxic T lymphocyte
CTLA, cytolytic T lymphocyte-associated Ag
CTP, cytidine 5′-triphosphate
CXCL, CXC chemokine ligand
CXCR, CXC chemokine receptor
d, day(s) (only with numbers); deoxy; distilled (as in dH2O)
D region, diversity region of Ig or T cell receptor for Ag
Da, dalton (only with numbers)
DAPI, 4′,6′-diamidino-2-phenylindole
DEAE, diethylaminoethyl
df, degrees of freedom
DMEM, Dulbecco's modified Eagle's medium
DMSO, dimethylsulfoxide
DNA, deoxyribonucleic acid
DNase, deoxyribonuclease
DNP, dinitrophenyl
dpm, disintegrations per minute
ds, double-stranded (as dsDNA)
DTT, dithiothreitol
E, erythrocyte
EBV, Epstein-Barr virus
EC_{50}, 50% effective concentration
ECL, enhanced chemiluminescence
ED_{50}, 50% effective dose
EDTA, ethylenediaminetetraacetic acid
EGTA, ethylene glycol-bis(β-aminoethyl ester)-*N*,*N*,*N*′,*N*′-tetraacetic acid
ELISA, enzyme-linked immunosorbent assay
ELISPOT, enzyme-linked immunospot
EMSA, electrophoretic mobility shift assay
ERK, extracellular signal-regulated kinase
E:T ratio, effector to target ratio
Fab, Ag-binding fragment
F(ab′)2, two Fab units linked by disulfide bridges between fragments of the heavy chain
F-actin, filamentous actin
FACS, fluorescence-activated cell sorting
FAM, 6-carboxyfluorescein
FBS, fetal bovine serum
FcR, Fc receptors (e.g., FcγRI)
FCS, fetal calf serum
FITC, fluorescein isothiocyanate
FLICE, Fas-associated death domain-like IL-1β-converting enzyme
FLIP, FLICE inhibitory protein
FLT3, *fms*-related tyrosine kinase 3
fMLF, formyl-methionyl-leucyl-phenylalanine
fura 2-AM, fura 2-acetoxymethyl ester
g, gram (only with numbers)
GALT, gut-associated lymphoid tissue
GAPDH or G3PDH, glyceraldehyde-3-phosphate dehydrogenase
G-CSF, granulocyte CSF
GDP, guanosine 5′-diphosphate
GFP, green fluorescent protein
GM-CSF, granulocyte-macrophage CSF
GMP, guanosine 5′-monophosphate
gp, glycoprotein (e.g., gp100)
GPI, glycosylphosphatidylinositol
GST, glutathione *S*-transferase
GTP, guanosine 5′-triphosphate
h, hour (only with numbers)
H chain, heavy chain
H&E, hematoxylin and eosin
HBSS, Hanks' balanced salt solution
HEPES, *N*-2-hydroxyethylpiperazine-*N*′-2-ethanesulfonic acid
HIV, human immunodeficiency virus
HLA, human histocompatibility leukocyte Ag
HPLC, high performance liquid chromatography
HRP, horseradish peroxidase
HSV, herpes simplex virus
HUVEC, human umbilical vein endothelial cell
IC_{50}, 50% inhibition/inhibitory concentration
ICAM, intercellular adhesion molecule
ICOS, inducible costimulator
Id, idiotype; idiotypic determinant
ID_{50}, 50% infective dose or 50% inhibiting dose
IDO, indoleamine 2,3-dioxygenase
IFA, incomplete Freund's adjuvant
IFN, interferon (e.g., IFN-γ)
Ig, immunoglobulin
IgH, Ig heavy chain
IκB or I-κB, inhibitory NF-κB
IL, interleukin (e.g., IL-2)
i.m., intramuscular
IMDM, Iscove's modified Dulbecco's medium
IMEM, Iscove's minimal essential medium
i.p., intraperitoneal
ITAM, immunoreceptor tyrosine-based activation motif
ITIM, immunoreceptor tyrosine-based inhibitory motif
IU, international unit
i.v., intravenous
J region, joining region of Ig or T cell receptor for Ag
JAK or Jak, Janus kinase
JNK, c-Jun N-terminal kinase
kb, kilobase (only with numbers)

kbp, kilobase pair (only with numbers)
K_a, association constant
K_d, distribution coefficient; dissociation constant
K_D, affinity constant
kDa, kilodalton (only with numbers)
L chain, light chain
LD_{50}, 50% lethal dose
LFA, leukocyte (lymphocyte) function-associated Ag
LIF, leukemia inhibitory factor
LPS, lipopolysaccharide
LU, lytic unit
2-ME, 2-mercaptoethanol
mAb, monoclonal Ab
2-ME, 2-mercaptoethanol
MACS, magnetic-activated cell sorting
MALDI, matrix-assisted laser desorption ionization
MALDI-TOF, matrix-assisted laser desorption ionization-time of flight
MALT, mucosa-associated lymphoid tissue
MAPK, mitogen-activated protein kinase
MCP, monocyte chemoattractant protein
M-CSF, macrophage CSF
2-ME, 2-mercaptoethanol
MEK, mitogen-activated protein kinase kinase
MEM, minimum essential medium
MES, 2-(*N*-morpholino)ethanesulfonic acid
mg, milligram (only with numbers)
MHC, major histocompatibility complex
min, minute (only with numbers)
MIP, macrophage-inflammatory protein
ml, milliliter (only with numbers)
MLC, mixed lymphocyte culture
MLR, mixed leukocyte reaction
mo, month(s) (only with numbers)
MOPS, 4-morpholinepropanesulfonic acid
M_r, relative molecular mass
mRNA, messenger RNA
MTT, 3-(4,5-dimethylthiazol-2-yl)-2,5-dimethyltetrazolium bromide
μg, microgram (only with numbers)
μl, microliter (only with numbers)
m.w., molecular weight
MyD88, myeloid differentiating factor 88
n, number in study or group
NAD, nicotinamide adenine dinucleotide
NADH, reduced NAD
$NaDodSO_4$, sodium dodecyl sulfate
NADP, NAD phosphate
NADPH, reduced NAD phosphate
NBT, nitroblue tetrazolium
ND, not determined
NDP, nucleoside 5′-diphosphate
NF, nuclear factor
NFAT or NF-AT, nuclear factor of activated T cells
NF-κB, nuclear factor κB
Ni-NTA, nickel-nitrilotriacetic acid
NK cell, natural killer cell
NMP, nucleoside 5′-monophosphate
NO, nitric oxide
NOD, nonobese diabetic
NS, not significant
nt, nucleotide (only with numbers)
N-terminal, NH2-terminal or amino-terminal
N terminus, NH2 terminus or amino terminus
NTP, nucleoside 5′-triphosphate
OCT, octamer-binding factor
OD, optical density
OVA, ovalbumin
p, probability
PAGE, polyacrylamide gel electrophoresis
PBL, peripheral blood lymphocyte
PBMC, peripheral blood mononuclear cell
PBS, phosphate-buffered saline
PCR, polymerase chain reaction
PE, phycoerythrin
PECAM-1, platelet endothelial cell adhesion molecule-1
PerCP, peridinin chlorophyll protein
PFU, plaque-forming unit
PG, prostaglandin
PHA, phytohemagglutinin
PI3K, phosphatidylinositol 3-kinase
PIPES, piperazine-*N*,*N*′-bis(2-ethane sulfonic acid)
PMA, phorbol myristate acetate
PMSF, phenylmethylsulfonyl fluoride
PWM, pokeweed mitogen
r, recombinant (e.g., rIFN-γ)
R, receptor (e.g., IL-2R)
RACE, rapid amplification of cDNA end
RAG, recombination-activating gene
RANTES, regulated upon activation, normal T cell expressed and secreted
RBC, red blood cell
RFLP, restriction fragment length polymorphism
RIA, radioimmunoassay
RNA, ribonucleic acid
RNase, ribonuclease
rpm, revolutions per minute
RPMI, (usually RPMI 1640)
rRNA, ribosomal RNA
RT-PCR, reverse transcriptase polymerase chain reaction
s, second (use only with numbers)
s.c., subcutaneous
SCID, severe combined immunodeficiency
SD, standard deviation
SDS, sodium dodecyl sulfate
SDS-PAGE, sodium dodecyl sulfate-polyacrylamide gel electrophoresis
SE, standard error
SEM, standard error of the mean
SHIP, src homology 2-containing inositol 5′-phosphatase
SIV, simian immunodeficiency virus
sp. act., specific activity
ss, single-stranded (e.g., ssDNA)
SSC, standard saline citrate
STAT, signal transducer and activator of transcription
SV40, simian virus 40
$t_{1/2}$, half-life, half-time
TAMRA, 5-(and 6)-carboxytetramethylrhodamine
TAP, transporter associated with Ag processing
Tat, terminal deoxynucleotidyltransferase
TBS, Tris-buffered saline
TBST, TBS with Tween 20
TCA, trichloroacetic acid
TCR, T cell receptor for Ag
TDP, thymidine 5′-diphosphate
TdT, terminal deoxynucleotidyltransferase
TGF, transforming growth factor
Th cell, T helper cell

TLC, thin layer chromatography
TLR, Toll-like receptor
TMP, thymidine 5′-monophosphate
TNF, tumor necrosis factor
TNP, trinitrophenyl
TRAIL, TNF-related apoptosis-inducing ligand
Tris, tris(hydroxymethyl)aminomethane
tRNA, transfer RNA
TTP, thymidine 5′-triphosphate
TUNEL, Tdt-mediated dUTP nick end labeling
U, unit (only with numbers)
UDP, uridine 5′-diphosphate
UMP, uridine 5′-monophosphate
UTP, uridine 5′-triphosphate
UV, ultraviolet
v/v, volume to volume ratio (%)
v/w, volume to weight ratio (%)
V region, variable region of Ig
VCAM, vascular cell adhesion molecule
V(D)J or VDJ, variable diversity joining
VLA, very late activation Ag
W, watt (only with numbers)
WBC, white blood cell
WEHI medium
wk, week (only with numbers)
xid, X-linked immunodeficiency
Zap70, ζ-associated protein 70 (or ζ-chain-associated protein 70)

Keywords

Animals
Human
Rodent
Other Animals

Cells
B Cells
Dendritic Cells
Endothelial Cells
Eosinophils
Mast Cells/Basophils
Monocytes/Macrophages
Natural Killer Cells
Neutrophils
Stem Cells
Stromal Cells
T Cells
T Cells, Cytotoxic
Th1/Th2 Cells

Diseases
Autoimmunity
Diabetes
EAE/MS
Endotoxin Shock
Graft Versus Host Disease
Immunodeficiency Diseases
Rheumatoid Arthritis
Systemic Lupus Erythematosus

Infections
AIDS
Bacterial
Fungal
Parasitic-Helminth
Parasitic-Protozoan
Viral

Molecules
Acute-Phase Reactants
Adhesion Molecules
Antibodies
Antigens/Peptides/Epitopes
Autoantibodies
Cell Surface Molecules
Chemokines
Complement
Cytokine Receptors
Cytokines
Fc Receptors
Lipid Mediators
Lipopolysaccharide
MHC
Nitric Oxide
Protein Kinases/Phosphatases
Superantigens
T Cell Receptors
Transcription Factors

Processes
Allergy
Antigen Presentation/Processing
Apoptosis
Cell Activation
Cell Differentiation
Cell Proliferation
Cell Trafficking
Chemotaxis
Comparative Immunology/Evolution
Costimulation
Cytotoxicity
Gene Rearrangement
Gene Regulation
Hematopoiesis
Inflammation
Memory
Neuroimmunology
Phagocytosis
Repertoire Development
Reproductive Immunology
Signal Transduction
Tolerance/Suppression/Anergy
Transplantation
Tumor Immunity
Vaccination

Techniques/Approaches
Gene Therapy
Molecular Biology
Transgenic/Knockout Mice

Tissues
Lung
Mucosa
Skin
Spleen and Lymph Nodes
Thymus