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## EDITORIAL

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### Biotechnology and the *Journal of Agricultural and Food Chemistry*

How does/should the *Journal of Agricultural and Food Chemistry* deal with manuscripts describing results from modern food and agricultural biotechnology research?

Biotechnology encompasses the wide range of technologies that utilizes living organisms to generate, modify, or enhance products including pharmaceuticals, industrial materials, and food. Classical agricultural and food biotechnology includes the use of microorganisms, plant breeding, and animal breeding to enhance the yield and value of products. Microbial biotechnology includes the use of fermentation to make alcohol, leaven bread, produce cheese, and accelerate environmental remediation. Plant selection, cross-breeding, and hybridization have led to enormous yield enhancements, new crops, and pest-resistant crops. Animal biotechnology has led to improved domestic animals for food and work. Historically, most enhancements have been made through cross-fertilization and selection within species or in closely associated species (e.g., oranges and tangerines to produce tangelos). Traditional biotechnology also can include enzymatic modification of products and biocatalysis. Modern techniques in biotechnology continue with direct manipulation of organisms but also allow the transfer of genetic material between widely differing organisms. Genetic engineering is the specific modification of genetic material in a target organism by human intervention. It is this modification of the genetic material that underlies the modern revolution in biotechnology (1).

Since 1988, when the *Journal of Agricultural and Food Chemistry* first introduced categories for its published manuscripts, there has been one termed simply "Biotechnology". Until roughly 1995, the manuscripts published in this category were either classical biotechnology topics or immunoassay and enzyme-based detection methods. In recent years, there have been a steadily increasing number of manuscripts, which have included

molecular biology, genetic modification, and genomics. The increase in submissions follows the increased role of biotechnology in food production, processing, and analysis.

Since 1995, 248 manuscripts have been published in this category, of 4666 manuscripts published overall. This is a significant but hardly overwhelming number. Among the *Journal's* 10 subject categories, Biotechnology ranked seventh, with 5.3% of the total manuscripts published (872) in all categories for the period January 1–July 31, 2000. On closer analysis, approximately 20% of the manuscripts published as "Biotechnology" in 2000 reported on gene transfer, genomics, and DNA/RNA manipulation, whereas the majority (65%) conformed to the classical definition of biotechnology. The remainder fell in a gray area, reporting PAGE or mass spectrometric analysis of protein/enzyme systems or immunoassay and related techniques. For all of the manuscripts published in *JAFCh*, the authors are requested to select the appropriate category, with oversight by the Editorial staff. Clearly, many authors feel that their work is "Biotechnology", whereas others might judge differently.

This leads to the issue at hand: What should "Biotechnology" mean in terms of the *Journal's* categories? This issue was framed by Dr. Irvin Liener at the August 2000 annual meeting of the *Journal's* Advisory Board, sparking a lively debate. The following are titles of manuscripts published as "Biotechnology" in 2000, which illustrate the range of choices:

A. Immunological Characterization of Recombinant Soy Protein Allergen Produced by *Escherichia coli* Expression System

B. Development of a Monoclonal Antibody-Based cELISA for the Analysis of Sulfadimethoxine

C. Enantiomeric Synthesis of (*S*)-2-Methylbutanoic Acid Methyl Ester, Apple Flavor, Using Lipases in Organic Solvent

Clearly, title A is modern biotechnology. Recombinant

DNA techniques of genetic engineering, involving a "foreign" organism, *E. coli*, were employed. Manuscript B is "Biotechnology" by the classical definition as in fact are many things published in *JAFC*. Monoclonal antibody technology is similar to recombinant DNA technology: both techniques produce clones of cells that perform specific functions, but instead of merging DNA fragments, monoclonal antibody technology fuses two whole cells, creating a hybridoma, which produces the desired and useful monoclonal antibody. Manuscript C is "Biotechnology" only by the classical definition. It is, however, modern and sophisticated, relying on the three-dimensional structure of an enzyme to produce a useful chemical.

If we follow the definition of biotechnology offered by the USDA (2), that is, "a collection of scientific techniques including genetic engineering that are used to create, improve, or modify plants, animals, and microorganisms..." all of these manuscripts are properly classified as "Biotechnology" and, in fact, all of the manuscripts published in this category in recent volumes of the *Journal* are properly categorized.

But, as pointed out by Radin and Bretting (3) in their thoughtful manuscript "Defining Biotechnology: Increasingly Important and Increasingly Difficult", the modern technology of interest centers upon the new-found ability to remove DNA from cells or an organism, modify it, and reinsert it into cells where it will be functional. They argue that it is important to precisely define biotechnology in a modern context as a basis for labeling foods. The biotechnology products of concern from a labeling perspective are those that involve recombinant DNA derived in part from DNA that was extracted from sources not sexually compatible with the target organisms, modified *in vitro*, and asexually reinserted by a human-directed process (3).

What does this mean from the *Journal's* viewpoint in categorizing research manuscripts? Should we go "classical" as at present, aiming toward inclusiveness, or "modern", accepting the narrower definition at the

heart of the current debate? I would argue the former, at least for the time being, while the debate continues. It seems important that we not let "Biotechnology", which has been so useful to agriculture and food over thousands of years, be painted into a corner from which it may have difficulty surviving the current debate. The broader definition of the USDA includes both classical and modern biotechnology. For the present, the USDA definition seems to serve the research community in agricultural and food chemistry very well. On the other hand, the Editor and Associate Editors will continue to provide oversight to the selection of categories by authors, to ensure that the category selected is the most appropriate for a particular manuscript. We would discourage selection of the category "Biotechnology" for manuscripts that clearly fit more properly in other categories of the *Journal*.

What is your opinion? Comments from our readers received by e-mail at [JAFC@ucdavis.edu](mailto:JAFC@ucdavis.edu) or by fax at (530) 754-7006 will be shared with a Subcommittee of the Editorial Advisory Board and reported in a future issue of the *Journal*.

I would appreciate hearing from you.

#### LITERATURE CITED

- (1) American Chemical Society, Department of Government Relations and Science Policy. *Biotechnology*; Information Pamphlet; Washington, DC, 1995.
- (2) U.S. Department of Agriculture. *Agricultural Biotechnology; Frequently Asked Questions; USDA and Biotechnology; What Is Biotechnology?* <http://www.aphis.usda.gov/biotechnology/faqs/html>
- (3) Radin, J. W.; Bretting, P. S. Defining Biotechnology: Increasingly Important and Increasingly Difficult. In *Genetic Engineering To Improve Attributes of Crop Plants*; Rajasekaran, K., Finley, J., Jacks, T., Eds.; ACS Symposium Series; Oxford Books: New York, in press.

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Editor

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