

FOOD TECHNOLOGY

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*Advancing Food
Science and Technology
for Fifty Years*



1947 - 1997

ALSO INSIDE...

The Chemistry of Flavor Interactions

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Ingredients for Fat Replacement



FOOD TECHNOLOGY: *Advancing Food Science and Technology for Fifty Years*

How IFT's flagship publication has chronicled—and will continue to chronicle and help advance—food science and technology

NEIL H. MERMELSTEIN, SENIOR ASSOCIATE EDITOR, AND FRANCES R. KATZ, EDITOR

FOOD TECHNOLOGY IS 50 YEARS OLD. It has covered all aspects of food science and technology—from bread baking in ancient Egypt to feeding humans in space. It has chronicled advances in food science and technology that lead to tomorrow's food products and systems. It has provided guidance in the education of food scientists and technologists and recommendations for improving the health and nutrition of people around the world.

How It Began

Prior to 1946, the Institute of Food Technologists published occasional newsletters and proceedings of the papers presented at its annual IFT Food Conferences from 1940 through 1945. In 1946, the Council decided to publish a monthly Institute journal and include the proceedings of the 1946 Food Conference.

The first issue of *Food Technology* was published in January 1947, with C. Olin Ball as editor-in-chief. In January 1949, *Food Technology* became a monthly publication.

In 1966, IFT's publishing activities were consolidated in the IFT headquarters office with a full-time editorial staff. The major changes in the magazine are detailed in the timeline accompanying this article.

The following are discussions of major events covered in the pages of *Food Technology* during past five decades.

1947-49

In the first three years of publication, military developments were of interest. World War II had ended in 1945, and the American food industry took the information about feeding a world at war and applied it to feeding a much larger world at peace. An editorial in 1947 noted that "The war showed us some of the wonders wrought by food technologists. They enabled our G.I.'s to eat a healthy, balanced diet in the Arctic, in the Temperate Zones and in the Tropics." While G.I.'s weren't totally enamored of C-rations, the Quartermaster Corps had put together a food system that supported the troops, and the science of food preservation was on a roll.

Demand for food in all forms was unleashed, as a country that once used red and blue tokens for the right to buy food found that companies were now ready and willing to supply food in increasing quantity and improving quality. The history of food had changed.

One of the first editorials in *Food Technology* addressed the need for food technology curricula—a subject that reached a peak in 1966 with IFT's development of minimum standards for undergraduate curricula in food science and technology.

1950-59

Dehydration advanced from simple drum drying to vacuum drying to spray drying to

freeze drying. Dried potatoes and other vegetables received attention. Freezing covered all aspects, from freezing to dehydrofreezing to immersion freezing. Frozen concentrated orange juice was a very important initiative during the '50s. It retained vitamin C and tasted much better than canned juice. More than 23 papers appeared in *Food Technology* on frozen orange juice, as the postwar appearance of refrigerators with freezer compartments—although generally small—made frozen concentrated orange juice a popular consumer item.

The industry developed processes to safely can all types of foods. Thermal death time curves were produced, and processors looked for better methods of determining with precision how much time was enough. A paper describing determination of thermal death times for *Clostridium botulinum* under high-temperature/short-time processing of foods was published in 1950. HTST processing provided fruits and vegetables with more natural color and texture than earlier methods.

Regulatory matters also figured heavily in the '50s, with enactment of the Food Additives Amendment to the Federal Food, Drug, and Cosmetic Act in 1958. There was discussion of microbial standards for foods and standards of identity.

Military feeding continued to be of interest, with more than 20 papers discussing various aspects of feeding the military, on

January 1947

The first issue of *Food Technology* is published, with C. Olin Ball as Editor-in-Chief. The magazine is published quarterly until 1949, then monthly. It includes basic and applied research papers, as well as editorials and news of the food industry and IFT. Ball continues as editor through June 1950.



January 1949

Food Technology becomes a larger, monthly publication, carrying advertising for the first time.



July 1950

Zoltan I. Kertesz becomes Editor-in-Chief and continues in that position through July 1952.



land and sea, in the air, and in atomic submarines. Space feeding came of interest late in the decade. A number of popular consumer products were derived from space feeding research.

Sensory evaluation covered both methods for conducting sensory tests and actual applications to a wide variety of foods and beverages, including wines. Technology carried the producing industry past the tasting sessions among managers and staff that had been the deciding factors for new products, replacing "the boss liked it" with statistics from objective tasters.

By the end of the decade, a series of in-depth studies on the nutritive value of foods and on the time-temperature tolerance of frozen foods had been published. Also by the end of the decade, the influence of fats in the diet, particularly cholesterol and its relationship to myocardial infarction, had been a subject of discussion.

There were the beginnings of modified-atmosphere packaging, microwave processing, and cryogenic freezing.

Work was done on rancidity testing. The thiobarbituric acid test developed in the late '50s resulted in two of the most-cited papers ever published in *Food Technology* (see list on p. 11).

1960-69

The Flavor and Extract Manufacturers' Association looked at the 1958 Food Additives Amendment, which allowed determination by experts that substances were generally recognized as safe, and decided to establish an expert panel to make GRAS determinations regarding flavoring substances. FEMA's flavor additives survey, its decision-tree approach, and the resulting list of flavoring substances considered GRAS were published in October 1960. Updates to the FEMA GRAS lists continue to be published in *Food Technology* today.

Articles throughout the '60s discussed the growing world population and world food problems in developing countries, including hunger and malnutrition. The tenor of the '60s, including the appearance of the Peace Corps and the altruism of that era, produced much work on nutritious food products such as Incaparina. The Cold War

also led to much work on food security, and a series of articles on Civil Defense and fallout shelters appeared in the magazine.

Flexible packaging, including the retort pouch initially developed for military use, was discussed. Work early in the decade focused on problems of measuring internal pressure, preventing expansion of the pouches, measuring the seal integrity, and maintaining the integrity of the film.

The need for abstracting and retrieval of food science information led to the establishment of the International Food Information Service and publication of *Food Science and Technology Abstracts* in 1962.

Gas chromatography was suddenly in vogue for everything. In contrast to paper chromatography methods, which were difficult to use and somewhat deficient in accuracy, GC looked pretty good. The method was used in flavor evaluation and in headspace analysis. Analytical methods and instruments developed and/or studied included nuclear magnetic resonance, infrared spectroscopy, atomic absorption spectroscopy, reflectance spectroscopy, refractometry, tenderness, and water activity.

The July and September 1964 issues provided special coverage in honor of IFT's 25th anniversary. Articles looked at accomplishments of IFT and progress in education and research & development in food processing.

IFT's minimum standards for undergraduate curricula in food science and technology were published in the December 1966 issue. They were revised in 1977 and again in 1992.

The importance of animal diets and their effect on the characteristics of the foods from those animals was discussed in 1960. Work on differences in eggs from hens fed corn oil, beef tallow, and a stock ration foreshadowed today's work that produces eggs with high levels of omega-3 fatty acids.

1970-79

Protein concentrates, such as whey, meat, wheat, and soy, and unconventional sources of proteins such as yeast and fungi (single-cell protein), were also studied. Protein was considered the limiting nutrient whose lack could keep the world in hunger.

In June 1972, *Food Technology* published the first Scientific Status Summary ("Botulism") prepared by IFT's new Expert Panel on Food Safety & Nutrition.

Flavor continued in importance. *Food Technology* published articles on identification of significant components of flavors and flavor precursors. Chromatography equipment with better resolution allowed advances in measuring and differentiating flavor components.

The White House Conference on Food, Nutrition, and Health held in December 1969 led to much coverage during the '70s of the nutritive value of foods, malnutrition and undernutrition, as well as discussions of consumer education, nutrition education vs fortification, etc. Food composition data were also developed, as well as methods for analyzing foods for various nutrients.

Protein quality evaluation, nutrient retention, nutritional quality of foods, and the relationship between diet and health were widely discussed. Dietary fiber became an important subject later in the decade, as did the terms nutrient density and index of nutritional quality, which related the nutrient content of an ingredient or food to the calorie count.

The last few years of the decade saw controversy over nitrites and their use in cured meats. Nitrites had been suspect since the last half of the '60s. The mechanism of nitrosamine formation was investigated, and in 1978 the U.S. Dept. of Agriculture acted to regulate the amount of nitrite used in bacon. Nitrosamine levels began to drop, according to an article in the May 1980 issue in which USDA reported on the work that was being done to reduce or eliminate nitrites.

Xanthan gum, the first of the fermentation gum products, was approved by the Food and Drug Administration in March 1969, and articles on it appeared in several issues in the '70s.

1980-89

Food Technology published the working report of the Food Safety Council in the March 1980 issue, recommending use of risk-benefit analysis. Objectives were set for the formation of forward-thinking food

August 1952

Martin S. Peterson becomes Editor-in-Chief and continues in that position through December 1960.



June 1953

New logo and cover design.



August 1957

New logo and cover design.



January 1961

George F. Stewart becomes Executive Editor. *Food Technology* adopts a new format, publishing feature articles, news, and applied research papers. Basic research papers are shifted to *Journal of Food Science*. Stewart continues as Executive Editor through July 1966.



50 Years of Food Technology (continued)

safety regulations and criteria by which to judge their efficacy.

The March 1980 publication of a symposium on extending the shelf life of fresh foods by combining controlled atmospheres and refrigeration ushered in an ongoing consideration of the "fresh," pre-cut products that resulted in today's growing market. Extending shelf life of meats, fish, and poultry was also targeted.

Work on emerging pathogens, including enteropathogenic *Escherichia coli*, *Vibrio parahaemolyticus*, *Yersinia enterocolitica*, *Clostridium perfringens*, and *Vibrio cholerae* continued throughout the decade. A symposium published in April 1980 discussed the mechanism of action of some of these pathogens.

Energy economics was discussed in the May 1982 issue. One article discussed the savings that could be made by partially concentrating foods before freezing; another compared the cost of various sources of energy in citrus warehousing. Cogeneration became a buzzword.

Updated articles on space feeding appeared in September 1982, discussing requirements for the space shuttle.

Biotechnology, an activity that had been accelerated primarily by the commercial banker, showed signs of becoming a real force for change in the food system. Articles in October 1986 discussed techniques and control of biogenetic processes, and talked briefly about commercial opportunities in plant biotechnology. The tomato was a topic of great interest. Additional articles discussed genetic modification of enzymes and their use in producing cyclodextrin, cheese, and other foods and additives.

As industry was being pushed to bring more new products to the market, faster and with better targeting, industry-university interaction increased. The September 1982 issue described such cooperative efforts to bring new products to market.

Food scientists were becoming concerned about the reduction in basic research and the lack of coordination between food and agriculture. IFT convened a workshop on research needs, and *Food Technology* published a special report, "America's Food Research: An Agenda for Action," in June

1985. The report identified critical needs and noted that federal funding for these projects had dipped in recent years.

Growing understanding about fat's role in the diet led to increased interest in fats. In the December 1986 issue, a symposium on foods, nutrients, and hypertension considered the effects of sodium, calcium, and magnesium on blood pressure. Keeping those nutrients in processed foods was addressed.

High-performance liquid chromatography was used throughout the decade. As the years passed, articles began to appear on ion chromatography, gas chromatography-mass spectrometry, ATP bioluminescence, and ion-exclusion chromatography.

Aspartame was the subject of a number of papers, and acesulfame K and a variety of other sweeteners, nutritive and nonnutritive, including xylitol, were also discussed.

The September 1989 issue celebrated the 50th anniversary of IFT. It featured articles on IFT's history and the past and future of all aspects of food science and technology.

1990-96

Passage of the Nutrition Labeling and Education Act of 1990 permitted specified health label claims for foods, and provided a way to request that new claims be approved. NLEA revolutionized the food label, listing components in a way that brought attention to components that would have not been noticeable on the old label. FDA and USDA issued final regulations on nutrition labeling in November 1990. These regulations became one of the most discussed topics in *Food Technology*.

Sensory evaluation continued to be important. As new products multiplied like rabbits and often failed, information about how good a product was and how well it would be accepted became intensely important. Four of the most cited articles in *Food Technology* were on sensory evaluation.

Fats continued to be a major topic of discussion: articles covered medium-chain triglycerides, fat free, low fat, new fat substitutes, clearance of olestra for salty snacks, development of protein and carbohydrate combinations for fat replacement, and use of water activity to predict shelf life

of low- or no-fat products. These weren't all that new, of course—work on fat metabolism had been well in place during the early '80s. But by the late '80s and early '90s, it was standing-room-only on the low-fat food shelves.

As it became possible to measure molecular weight ranges of carbohydrates more easily, the relationship between the various carbohydrate products and their function could be more easily understood. Use of carbohydrates as flavor protectors, as cryoprotectants, as ingredients in baked foods, and as components of extruded products was written about in March 1991. Small carbohydrates, particularly sucrose, continued to fascinate food scientists and the public. A symposium in January 1993 was dedicated to uses of sucrose and its properties in foods and health.

Food Technology published the second special workshop report, "America's Food Research Needs: Into the 21st Century," in March 1993, discussing the needs for research in food safety, diet and nutrition, biotechnology, engineering, processing, and packaging, and for developing better information about the molecular basis of food functionality.

Foods with health benefits were debated during the '90s, particularly after passage of the Dietary Supplement Health and Education Act, which changed the relationship between food additives, GRAS ingredients, and supplements.

A variety of new processes were advanced during the early '90s—pulsed light, ohmic heating, ultra-high-temperature pasteurization, particulate aseptic packaging, and hydrostatic processing. A May 1994 article continued to show the safety and benefits of irradiation, as well as changes in consumer attitudes toward the process.

Downsizing continued to plague major players in the industrial sector of the food system, and mergers among companies and the economic consequences of debt load changed the employment picture. International harmonization of regulations was discussed on a regular basis.

A major feature of the mid-'90s has been the change from inspecting production to avoid shipping off-quality foods, to use of

May 1966

Walter M. Urbain becomes Scientific Editor and continues in that position through June 1970.



July 1966

Karl O. Herz becomes Director of Publications and Editor of *Food Technology* and continues in that position through March 1970.

June 1969

New logo and cover design.



April 1970

John B. Klis becomes Director of Publications and Editor of *Food Technology* and continues in that position through March 1996.



the Hazard Analysis Critical Control Point approach for producing only good quality. FDA issued its mandatory HACCP rules for seafood production in December 1995, and USDA issued its pathogen reduction/HACCP rules for meat and poultry products in July 1996.

The Future

Food Technology has covered major advances in food science and technology and served as a source of information and a forum for discussion of important issues and trends. It remains the voice of food science for the food system. In the years ahead,

Food Technology, with a new look, will provide more information on developments, trends, and cutting-edge research that will further advance food science and technology and help food scientists and related personnel in their careers.

Food Technology's Most-Cited Papers

The most-cited—and therefore most influential—papers that have been published in *Food Technology* were identified by citation analysis provided by the Institute for Scientific Information, Philadelphia, Pa. The Institute's Science Citation Index scans 4,000 peer-reviewed, internationally influential journals in the sciences and each year indexes 1 million papers containing 14 million citations (references). Counting the number of times a particular paper was cited by other papers provides a ranking of the most significant or influential papers in a particular journal or field. The table below lists the 13 papers published in *Food Technology* that were cited the most in all the journals indexed up to 1992; data were not readily available for 1992–96 but are unlikely to change the listing.

Rank	Title	Author	Vol. (Issue): Page (Year)	No. of citations
1	2-Thiobarbituric Acid Method for the Measurement of Rancidity in Fishery Products. II. The Quantitative Determination of Malonaldehyde	Russell O. Sinnhuber and T.C. Yu	12: 9-12 (1958)	214
2	Comminuted Meat Emulsions—The Capacity of Meats for Emulsifying Fat	C.E. Swift, C. Lockett, and A.J. Fryar	15: 468-473 (1961)	208
3	Hedonic Scale Method of Measuring Food Preference	David R. Peryam and Francis J. Pilgrim	11(9, insert): 9-14 (1957)	182
4	Sensory Evaluation by Quantitative Descriptive Analysis	Herbert Stone, Joel Sidel, Shirley Oliver, Annette Woolsey, and Richard C. Singleton	28(11): 24, 26, 28-29, 32, 34 (1974)	172
5	Studies on a Radio-Resistant Micrococcus. I. Isolation, Morphology, Cultural Characteristics, and Resistance to Gamma Radiation	A.W. Anderson, H.C. Nordan, R.F. Cain, Gordon Parrish, and Dennis Duggan	10: 575-578 (1956)	170
6	Protection of Cooked Meats with Phosphates	Margaret J. Tims and Betty M. Watts	12: 240-243 (1958)	130
7	Texture Profile Analysis	Malcolm C. Bourne	32(7): 62-66, 72 (1978)	121
8	Training and Testing of Judges for Sensory Analysis of Meat Quality	H.R. Cross, Ron Moen, and Marilyn S. Stanfield	32(7): 48 (1978)	118
9	Changes in the Water-Holding Capacity and Cationic Shifts During the Heating and Freezing and Thawing of Meat as Revealed by a Simple Centrifugal Method for Measuring Shrinkage	Eugen Wierbicki, L.E. Kunkle, and F.E. Deatherage	11: 69-73 (1957)	115
10	2-Thiobarbituric Acid Method for the Measurement of Rancidity in Fishery Products	T.C. Yu and Russell O. Sinnhuber	11: 104 (1957)	107
11	Emulsion Formation in Finely Comminuted Sausage	Leo J. Hansen	14: 565-569 (1960)	107
12	Sorption Phenomena in Foods	T.P. Labuza	22: 263-265, 268, 270, 272 (1968)	104
13	Post Mortem Changes in Stored Meats. I. Microorganisms Associated with Development of Slime on Eviscerated Cut-up Poultry	John C. Ayres, W.S. W.S. Oglivy, and G.F. Stewart	4: 199-205 (1950)	102

July 1970

Ernest J. Briskey becomes Scientific Editor and continues in that position through December 1970.

January 1971

Applied research papers are transferred from *Food Technology* to *Journal of Food Science*, with Bernard J. Liska as *JFS* Scientific Editor. Abstracts of all the research papers in *JFS* are published in *Food Technology*.

January 1977

New logo and cover design and introduction of *Overview*, outstanding symposia in food science and technology.



June 1985

New logo and cover design



September 1996

Frances R. Katz becomes Director of Publications and Editor of *Food Technology*.

