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Department of
Food Science & Nutrition



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Dr. Theodore P. Labuza is a Morse Alumni Distinguished Teaching Professor of Food Science in the Department of [Food Science and](#)

Nutrition at the University of Minnesota. In 1999 he was elected into the Academy of Distinguished Teachers at the U of M. He served as Associate Dean of the Graduate School (1993 to 1996) with responsibility for management of 175 graduate programs.

Dr. Labuza received a B.S. (1962) and Ph.D. (1965) in Food Science at MIT (Cambridge Mass.). Dr. Labuza taught Food Engineering at MIT until July of 1971, when he went to the University of Minnesota. He is an author of over 260 scientific refereed research articles, 17 textbooks, 76 book chapters, 7 patents and >100 other semi-technical articles. He has also given over 500 invited technical lectures since 1971 as well over 400 more general lectures on food science and technology. The research papers published in the last 6 years include:

226 Schamberger, G. and Labuza T.P. 2006 Use of Front-Face Fluorescence for Assessing Thermal Processing of Milk J. Food Science 72 (2):C69-74227

227 Leinen, K. and T.P. Labuza 2006 Crystallization Inhibition of Amorphous lactose using raffinose. Journal of Zhejiang University SCIENCE B Applied Physics and Engineering Sciences 7(2) 79-83

228. Sa Xu, T.P. Labuza and F. Diez-Gonzales 2006 Thermal Inactivation of *Bacillus anthracis* Spores in Milk. Jr. Applied Environmental Microbiology 72(6) 4479-4483

229. Belcourt, L and Labuza, T.P. 2007 Effect of Raffinose on Sucrose Recrystallization and Textural Changes in Soft Cookies J. Food Science 72(1):C65-C71

230 Francisco Diez-Gonzalez,* Daniel Belina, Theodore P. Labuza and Amit Pal. 2007 Modeling the Growth of *Listeria monocytogenes* Based on the Time-to-Detect in Culture Media and Frankfurters 2007 Intl. J. Food Microbiology 113:277-283

231 Uzzan, M. and Labuza T.P. 2007 Thermal processing and Storage Stability of Nutraceuticals in Milk Beverage Dietary Supplement J Food Science 72(3):E109-117232

232. Labuza, T.P., Zhou Peng, Davis, L. 2007 Whey to Go: Application of whey proteins in nutrition bars J. World of Food Ingredients 7:(Nov).108-112

233 Zhou, P and Labuza T.P. 2007 Effect of moisture content on the glass transition and protein aggregation of solid-state whey proteins and their hydrolysates Jr. Food Biophysics 3: 108-116

234 Sa Xu, Theodore P. Labuza, and Francisco Diez-Gonzalez Inactivation Kinetics of Avirulent *Bacillus anthracis* Spores in Milk with a Combination of Heat and Hydrogen Peroxide. J. Food Protection 71:333-338; 2008

235. Pal, A, Labuza, T.P. and Diez-Gonzalez. F. Comparison of Primary Predictive Models to Study the Growth of *Listeria monocytogenes* at Low-Temperatures in Liquid Cultures and Selection of Fastest Growing Ribotypes in Meat and Turkey Product Slurries J. Food Microbiology 25:460-470 2008

236. Zhou, P., Liu, X. and Labuza, T.P. Moisture induced aggregation of whey proteins in a protein/buffer model system. Jr Agric. Food Chemistry 56:2048-2054 2008

237. Peng Zhou, Xiaoming Liu and T. P. Labuza Effects of moisture-induced whey protein aggregation on protein conformation, the state of water molecules, and the microstructure and

texture of high-protein-containing matrix. J. Agri. Food Chem 2008 56:4534-4540 2008

238. Sa Xu, Theodore P. Labuza, and Francisco Diez-Gonzalez. Inactivation of *Bacillus anthracis* Spores by a Combination of Biocides and Heating at High-Temperature Short-Time (HTST) Pasteurization Temperatures J Appl. Environ Micro. 74:3336-3341; 2008

239. Pal, A, Labuza, T.P. and Diez-Gonzalez. F. 2008 Evaluating the growth of *Listeria monocytogenes* in refrigerated ready-to-eat frankfurters – Influence of strain temperature, packaging, lactate and diacetate, and background microflora. J. Food Protection 71:1806-1816

240. Pal, A, Labuza, T.P. and Diez-Gonzalez. F. 2008 Shelf Life Evaluation for Ready- to-Eat Sliced Uncured Turkey Breast and Cured Ham under Probable Storage Conditions based on *Listeria monocytogenes* and psychrotrops. International Jr. FoodMicrobiology 126:49-56

241 XiaomingLiu , Zhou, Peng, Amy Tran and T. P. Labuza. 2009 Effects of polyols on stability. of Whey Proteins in Intermediate Moisture Model Systems J. Agr. Food Chem 57(6): 2339-2345 <http://DOI10.1021/jf802789y>

242. M. Uzzan J. Nekerbecki and T.P. Labuza; Effect of Water Activity and Dissolution on the Stability of Creatine During Storage 2009 Drug Development and Industrial Pharmacy (IF=1.5), 35(8): 1003–1008

243. Pal, A, Labuza, T.P. and Diez-Gonzalez. 2009 Time-to-detect Modeling of *L. monocytogenes* Growth on Frankfurters with Initial Inoculum Below Standard Detection Limit J. Food Protection(IF 1.76) 72(2):1878-1884

244. Tian-cheng Li, Peng Zhou, Ted Labuza. 2009 Effects of sucrose crystallization and moisture migration on the structural changes of a coated intermediate moisture food Frontiers of Chemical Engineering in China 3(4): 346-350

245. Peng Zhou & TP Lbuza Moisture-introduced aggregation of whey proteins, 2009 International Journal of Science & Marketing for Nutraceutical Actives* RawMaterials& Finished Products 8(4)29-33

246. OrianaLeishman, T.P.Labuza and F. Gonzalez-Diez 2010 Hydrophobic Properties and Extraction of *Bacillus anthracis* Spores from Liquid Foods J. Food Microbiology 27:661-666 electroniconline prepublication at <http://dx.doi.org/10.1016/j.fm.2010.03.001>

247. Oriana N. Leishman, Miranda J. Johnson, Theodore P. Labuza, and Francisco Diez Gonzalez 2010 Survival of *Bacillus anthracis* Spores in Fruit Juices and Wine, J. Food Protection 73(9):1694-1697)

248. R.F. Bott, T.P. Labuza and W.P. Oliveira 2010 Stability testing of spray and spouted bed dried extracts of *Passifloraalata*. Drying Research & Technology 28:1255-1265 (IF =1.05)

249. Zhu, D and Labuza T.P. 2010 Effect of cysteine on the protein bar hardening in WPI/buffer model systems and the elucidation of the underlying mechanism. J.Agric. Food Chem. 58: 7970–7979 <http://DOI:10.1021/jf100743z>

250. Michael A. Mortenson, Theodore P. Labuza, and Gary A. Reineccius; 2010 Moisture sorption isotherms for un-modified and OSA-substituted dextrin and gum acacia used as carrier materials for spray dried encapsulation of flavoring materials. (Journal of Food Properties (IF = 1.02) Vol 13 (5):992-1001 <http://DOI: 10.1080/10942910902930643>

251. John D. Floros, Rosetta Newsome, William Fisher Gustavo V. Barbosa- Canovas, Hongda Chen, C. Patrick Dunne, J. Bruce German, Richard L. Hall, Dennis R. Heldman, Mukund V. Karwe, Stephen J. Knabel, Theodore PLabuza, Daryl B. Lund, Martina Newell-

McGloughlin, James L. Robinson, Joseph G. Sebranek, Robert L. Shewfelt, William F. Tracy, Connie M. Weaver, and Gregory R. Ziegler. 2010 .Feeding the World Today and Tomorrow: The importance of Food Science and Technology; Comprehensive Reviews in Food Science and Food Safety Vol 9 (9): 572-599 <http://onlinelibrary.wiley.com/doi/10.1111/j.1541-4337.2010.00127.x/pdf>

252. Stephen E. Lumor, Francisco Diez-Gonzalez and Theodore P. Labuza Detection of Warfare Agents in Liquid Foods Using the Brine Shrimp Lethality Assay J. Food Science 76:T16-T19 DOI 10.1111/j.1750-3841.2010.01966.x.

253. Stephen E. Lumor, Aaron Hutt, Ian Ronnigen, Francisco Diez-Gonzalez and Theodore P. Labuza 2010 Validation of Immunodetection (ELISA) of Ricin Using a Biological Activity Assay. 76:T16-T19 dx.doi.org/10.1021/ac103353

254. Lili He, Christy Haynes, Francisco Diez-Gonzalez and Theodore P. Labuza. Rapid Detection of a Protein Toxin Surrogate in Milk using IMS-SERS Jr. Raman Spectroscopy 42: i(IF 3.15) DOI 10.1002/jrs.2880

255. Lili He, Tom Rodda, Christy Haynes, Timothy Deschaines, Todd Strother Francisco Diez-Gonzalez and Theodore P. Labuza 2011 Detection of a Foreign Protein in Milk Using Surface-Enhanced Raman Spectroscopy Coupled with Antibody-Modified Silver Dendrites Analytical Chemistry 83:1510-1513 (IF 5.6) DOI dx.doi.org/10.0121/ac1032353

256. Lili He, Christy Haynes, Brownyn Deen, Tom Rodda, Ian Ronnigan, Tim Blasius, Theodore P. Labuza; 2011. Rapid Detection of Ricin in Milk using Immunomagnetic Separation Combined with Surface-Enhanced Raman Spectroscopy; J. Food Science 76: XXX In press

257. Stephen E. Lumor, Bronwyn Deen, Ian Ronningen, Neal Fredrickson, Kenneth Smith, Francisco Diez-Gonzalez, and Theodore P. Labuza. Effect of Lactose on the Biological Activity of Ricin. (J. Food Science in press)

258. Yu YF, Zhou P, Liu XM, Labuza TP. Glycation of major whey proteins in intermediate moisture food systems containing fructose. (Submitted to *Journal of Agricultural and Food Chemistry*)

259. Guo MF, Zhou P, Liu DS, Liu XM, Labuza TP. Effect of Maillard reaction-induced modification and aggregation of whey proteins on the hardening of a nutritional protein bar model system. (Submitted to *Journal of Agricultural and Food Chemistry*)

260. Liu DS, Zhou P, Liu XM, Labuza TP. Moisture-induced aggregation of alpha-lactalbumin: Effects of temperature, cations and pH. (Submitted to *Journal of Agricultural and Food Chemistry*)

Copies of these papers are available by email request
tplabuza@umn.edu

These are the book chapters published since 2004:

68. Labuza, T.P., Belina, D., and Diez-Conteras, F. 2004. Food Safety Management in the Cold Chain via expiration dating. in " Cold Chain management" B. Pederson and B Kunz (editors) U Bonn, Germany. <http://www.iaph.uni-bonn.de/coldchain/>

69. Labuza, T.P, K. Roe, C. Payne, F. Panda, T.J. Labuza, P. S. Labuza and L. Krusch. 2004. Storage stability of dry food systems: influence of state changes during drying and storage in Drying 2004 M. Silva and S. Rocha (editors).pp. 48-68 Ourograf Grafica Campinas, Brazil (ISBN # 85-904573-1-1) <http://www.feq.unicamp.br/~ids2004/>

70. Sherwin, C. and T.P. Labuza 2006 Beyond water activity and glass transition: a broad perspective on the manner by which moisture can influence reaction rates in foods Chapter 20 in *Water Properties of Food, Pharmaceutical and Biological Materials*. M. Pilar et al editors Univ. Taylor and Francis NY (ISBN 0-8493-2993-0)
71. Labuza, T. P. and B. Altunakar 2007. Chapter 5: Water Activity Prediction and Moisture Sorption Isotherms pp 109-154 in "Water Activity in Foods: Fundamentals and Applications" G. Barbosa-Canovas, A. Fontanna, S. Schmidt and T. Labuza editors IFT Blackwell Press Ames Iowa
72. Labuza, T. P. and B. Altunakar 2007. Chapter 9: Diffusion and Sorption Kinetics of water pp 215-238 in "Water Activity in Foods: Fundamentals and Applications" G. Barbosa-Canovas, A. Fontanna, S. Schmidt and T. Labuza editors IFT Blackwell Press Ames
73. Rahman, M. and Labuza, T.P. 2007. Water Activity and Food Preservation Chapter 11. In Handbook of Food Preservation 2nd Edition. 2008. Marcel Dekker, New York
74. Labuza T.P., Labuza, T.J., Labuza, P.S. and Labuza, K.M. 2009 Soft Condensed Matter: A perspective on the physics of food states & stability in *Water Management in Foods Today*: TanaboonSajaanantakul Editor Wiley_Blackwell Press, NY
75. R.F. Bott, C.R.F. Souza, T.P. Labuza, W.P. Oliveira. 2010 Estabilidadede extratos secos de *passifloraalata*obtidos por *spray drying* leite de jorro. Proceedings of the 24th Brazilian Congress of System Particulates 2010
76. Peng Zhou and Ted Labuza, 2011, Chapter XX pp XX to XX; Differential Scanning Calorimetry in Chemical Deterioration and Physical Instability of Dairy Food and Beverages . Encyclopedia of Dairy Sciences, Editors: J.Fuquay, P. McSweeney and P. Fox.Elsevier Press, Oxford, UK.

Since 2000 Ted has co-authored four books:

Bell, L.N., and Labuza, T.P. 2000. Practical Aspects of Moisture Sorption Isotherm Measurement and Use. 2nd Edition AACC Egan Press, Egan, MN

Schmidl, M. and Labuza, T.P. 2000 Essentials of Functional Foods Aspen Press. Gaithersburg, MD

T.P. Labuza and Lynn Szybist 2001 Open dating of Foods. Food and Nutrition Press Trumbul CN

G. Barbosa-Canovas, A. Fontanna, S. Schmidt and T. Labuza editors 2007 *Water Activity in Foods: Fundamentals and Applications* IFT Blackwell Press Ames

Dr. Labuza also holds eight patents. The last one was for a new innovative approach to a time-temperature integrator tag that he worked on while on sabbatical at 3M. It is:

US Patent Office # 5667303. Arens, R.P., Birkholz, R.D., Johnson, D.L., Labuza, T.P. Larson, C., D. Yaruso, D. 9/16/97 Time- Temperature Integrating Indicator Device (Assigned to 3M Co.)

Ted is a member of the American Chemical Society (ACS), Institute of Food Technologists (IFT), Institute for Food Science and Technology (UK),

Association of Food & Drug Officials (AFDO), American Institute Chemical Engineers (AIChE), Society for Food Distribution Research, American Association Cereal Chemists (AACC), American Society for Nutritional Sciences, U.S. Military R&D Associates, and Sigma Xi.

Ted's main professional society responsibilities have been with the Institute of Food Technologists where he has served in many roles since he joined in 1959 as a student. He was an IFT regional communicator from 1975 to 1981, an IFT Scientific Lecturer, Chair of the IFT Expert Panel on Food Safety and Nutrition (1981 to 1986), on the IFT Finance Subcommittee (1988-1990), member of the Office of Scientific Public Affairs (OSPA) Committee (1986-1990), chair of the IFT Foundation (1988-90), past Chair of the IFT Information Systems Comm. and of the IFT Food Law Division. He was President of IFT during 1988-89. Currently he serves on the IFT Nominations and Elections Committee. He was elected a IFT Fellow (1979). Ted received the IFT Samuel Cate Prescott Research Award (1972), the IFT Cruess Excellence in Teaching Award (1979) and the IFT Babcock Hart Nutrition Award (1988) and in 1998, IFT's highest award for food science and technology worldwide, the Nicholas Appert Award. In 2006 he received the IFT Reister Davis Award in Food Packaging Achievement along with Dr. Marcus Karel. In 1992 Dr. Labuza was elected to the Perth Amboy (NJ) High School Hall of Fame. Dr. Labuza also served as a member of the Department of Defense High Heat Environment Food Quality Task Force during Operation Desert Storm.

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Right: Ted presenting at the opening ceremony of IFT's 50th Anniversary Annual meeting 1989

Dr. Labuza was editor of the Journal of Food Processing and Preservation. from 1976-84, and has been on the Board of Editors of Nutrition Research Newsletter (1982-90), Cereal Foods World (1987-89), Journal of Packaging Technology (1986-91), Journal of Food Additives and Contaminants (1980-1990), Journal of Nutrition and Cancer (1975-1995) and the Journal of Food Science (1984 -86). He is currently on the Board of Editors of Trends in Food Science and Technology, Italian Journal of Food Science, Polish Journal of Food Science, J. Ciencia y Tecnologia Alimentaria, J. Innovative Food Science & Technologies and the International Journal of Food Properties. He serves as reviewer for another 40 + journals including Food Technology, J. Agr. and Food Chem., Biotechnology Progress, International J. of Food Science and Technology, LebensmittelWissenschaft and Technology, J. Texture Studies and the Jr. of the Am. Assoc.ofPharmaceuticalScience.Ted also has been

involved in the planning and management of three major international symposia on food science issues that meet every two to three years. These include ISOPOW (Int. Symposium on the Properties of Water) which he has been involved with since 1965 and ran a program on research and teaching paradigms at the last meeting in Israel in 2001, The Maillard Symposium of which he is a founding member and MODEL-IT. He also is one of few scientists to be quoted in Newsweek, Time magazine, The Wall Street Journal and Scientific American.



Dr. Labuza teaches courses in food physical chemistry, reaction kinetics, food safety and risk assessment, food processing and food law. <http://www.foodtechsource.com/emag/003/trend.htm> His research is related to the properties of water and influence of temperature on the processing, packaging and storage stability of foods, drugs and biologics, especially as related to texture and glass transition phenomena, the physical chemistry and kinetics involved in processing and shelf life testing of foods as a function of water activity, oxygen level and temperature such as fresh roasted ground coffee, and evaluation of time temperature integrators. Recent work has also focused on biosecurity in the food distribution chain with the objectives of(1)

modeling food distribution chains for vulnerability; (2) developing rapid (<20 min) assays for bio-threat agents in complex matrices like milk; and (3) Since he started as a faculty member in 1965, Ted has graduated over 78 M.S. students and 32 Ph.D. students. . In addition he has mentored 32 undergraduates on research projects. Seventeen of his former students teach at universities worldwide and he has had 42 visiting professors and post-docs working in his lab.



At the University level he served on the Academic Committee on Intercollegiate Athletics (91-93 as Chair), chaired the Advisory Comm. for the Distinguished Faculty Mentors Program, and served on the UM Student Services Committee (1997-99, and the Graduate School Ethics Advocates Committee (1998-2000). He also was elected several times to the all university Faculty Senate having served last in 1999-2000. He was on the College of Agriculture, Food and Environment Sciences (COAFES) Faculty Consultative Committee in 1992-94 and again in both 2000-2002 and 2004-06, served on and was Chair of the CAFES Promotion and Tenure Committee and the Deans Planning Committee and now serves on the COAFES Priorities Education Sub-Committee 2001. He reviews research grants for both USDA and FDA, for many state programs, the Institute of Medicine Food and Agriculture Board and the U.S. Army Natick Laboratories Research Program. and is a reviewer for faculty leaves in the US Fulbright Scholars Program.



In 1995, Dr. Labuza received the Dairy and Food Industries/American Association of Agricultural Engineers Food Engineer's Award and the Gamma Sigma Delta, National Agricultural Honorary Society Award of Merit. In 1998 he received the Marcel Loncin Research Prize (\$50,000) from IFT. He is listed in fourteen Who's Who including Who's Who in America, Who's Who in the World, Who's Who in Business and Finance, Who's Who in Frontiers of Science and Technology, Who's Who in Technology, Who's Who in American Teachers, International Who's Who of Professionals, Who's Who in American Men and Women of Science, and Who's Who in Science and Engineering. In 2001 he was included in the listing of the 2000 Outstanding Scholars of the 21st century. In 1999 Ted was elected a Fellow of the International Union of Food Science and Technology (IUFOST) and in 2000 a Fellow of the UK Institute of Food Science and Technology.

For his teaching and advising Ted was given the Univ. of Minnesota H.T. Morse Alumni Distinguished Teaching Award in 1988) and in 1998 he was elected into the Univ. of Minnesota "Academy of Distinguished Teachers" . Ted was awarded the University of Minnesota McFarland Teaching Award for the College of Human Ecology in 2001.



Impact of my research

In 2002 Ted was selected to be in the group of the most highly cited scientists in the area of Agriculture and Food Science based on citations to refereed research publications in the last 20 years. This area joins the group of the most highly cited physicists, chemists, engineers and biochemists, genetics, microbiologists and neuro-scientists. Of the people who are food scientists selected for the Agricultural Sciences are two former students in the Food Science Graduate Program at Minnesota who took Dr. Labuza's courses, (1) Prof. Alan Foegeding at North Carolina State Univ. and Prof. Todd R. Klaenhammer, also at NC State in the area of microbiology. The web site for the ISI Citation is located at :

<http://isihighlycited.com/>

The criteria for selection to this group is at

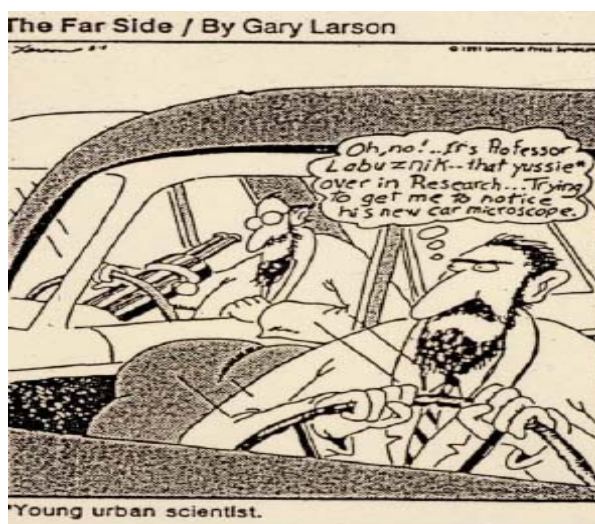
http://isihighlycited.com/isi_copy/Comm_news08.htm

In addition, 5 of Labuza's refereed research papers have achieved > 244 times and the Shelf Life book, 188 times. Of the > 37 MM published refereed papers since 1950, < 0.5% have been cited \geq 200 times. One of his papers, a critique of lipid oxidation kinetics, has been cited 471 times

The Harzing Publish or Perish web site analysis of impact (Hirsch h-index) is done by checking all fields (12/5/11) which includes books, chapters, non-refereed papers and articles for citations to the individuals research papers. Ted had a total of 10863 citations since 1965 giving an average of 121.6 citations per reference or 231 citations per year, i.e. > 2 citations every 3 days. As noted the h index (Hirsch) also includes book, chapters and other professional papers so it lists 554 published articles (note only 260 are refereed research papers) which averages out to 13.7 citations per each article. For the

Journal of Food Science since 1965, the paper in 1981 with Manny Katz on crispness ranks as the 19th most cited paper in JFS with 5.9 cites per year for 179 cites.

Labuza's Hirsch h-Index was 53 as of December 2011 based on an all field index while it is 38 if only biological fields are examined.. This index attempts to measure both the scientific productivity and the apparent scientific impact of a scientist. The index is based on the set of the scientist's most cited papers and the number of citations that those papers have received in other people's publications but indexed in a way based on the impact factor of the journal and the age of the paper, eg newly published papers would have little chance to be cited, see <http://adminapps.isiknowledge.com/JCR/JCR>.



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[FScN 4346 Dietary Supplements :Regulations, Biochemistry and Processing](#)

[FScN 4111 Food Chemistry - Revised in 2004 for Food Science and Nutrition majors](#)

[FScN 4312 Food Analysis \(section on moisture & aw measurement, thermal analysis and XRD\)](#)

[FScN 8318: Current issues \(food biosecurity, obesity, trans fatty acids, qualified health claims, DSHEA, regulation of contaminants, acrylamide, 2-ACBs, Teflon, food allergens, irradiation, additives, GMOs\)](#)

[FScN 8334 Reaction Kinetics and Shelf Life](#)

[FScN 4342 Properties of Water in Foods](#)

[Ethics Teaching FScN 8318 Folder](#)

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Current research in our lab

Group meeting Schedule

Labuza Research Group meetings Room 223 ABLMS

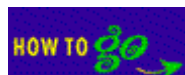
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[Link to water activity \(\$a_w\$ \) and glass transition \(\$T_g\$ \) resource page](#)

Link to water activity & T_g course
[FScN 4342 Properties of Water in foods](#)

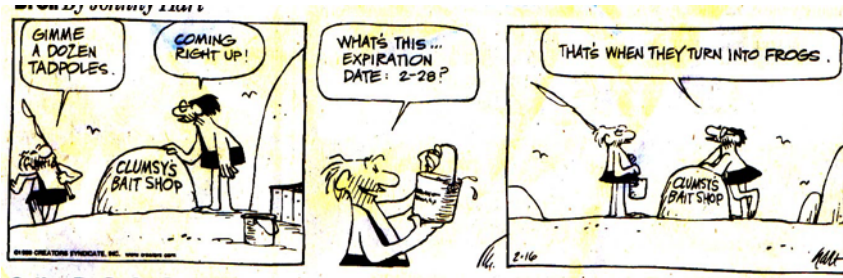


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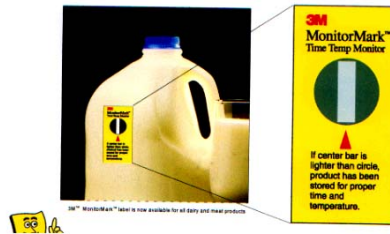


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