

## **Curriculum Vitae**

**Fred Breidt (fred.breidt@usda.gov)**

USDA/ARS Microbiologist, Lead Scientist

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### **Education**

Ph.D. 1987, (Microbiology) University of Kansas, Lawrence

B.S. 1981, (Genetics) The Ohio State University, Columbus

### **Academic Specialties**

Food Fermentation Microbiology, Food Safety, Microbial Ecology, Microbial Genetics/Genomics,  
Mathematical Modeling of Buffer Capacity and Microbial Growth in Fermentations

### **Employment**

2008 – Present: USDA/ARS Microbiologist (GS15), USDA Professor, Dept. of Food, Bioprocessing and Nutrition Sciences, NC State University, Raleigh, NC.

2006 – Present: Lead scientist, USDA/ARS National Program NP108 (Food Safety)

2002 – 2007: USDA/ARS Microbiologist (GS14) and USDA Associate Professor, Department of Food Science and Department of Microbiology, NC State University, Raleigh, NC

1997 – 2002: USDA/ARS Microbiologist (GS12, GS13) and USDA Assistant Professor, Dept. of Food Science, NC State University, Raleigh, NC

1993 – 1997: Senior Researcher, Dept. of Bio. Ag. Engineering, NC State University, Raleigh, NC

1990 – 1992: Research Associate (GS11), USDA/ARS, Food Science Dept., NC State University, Raleigh, NC

1987 – 1990: Post-Doctoral Fellow, NYU Medical Center at Public Health Res. Inst., NY, NY

1982 – 1986: Graduate Student Fellowship, University of Kansas, Department of Microbiology

1981 – 1982: Laboratory Technician, University of Kansas, Department of Microbiology

### **Honors and Professional Memberships**

2020 – Present: Chair, IAFP Journal of Food Protection Management Committee

2020 – Technical Achievement Award, Association for Dressings and Sauces (ADS)

2018 – Present: Member of the Editorial Board, Journal of Food Science

2017 – Present: Member of the Editorial Board, LWT- Food Science and Technology

2017 – Present: Member of the IAFP Journal of Food Protection Management Committee

2017 – Present: Member of Institute of Food Technologists (IFT)

2017 – Member, IAFP Selection Committee for Student Travel Scholarships

2014-2017 – Vice Chair and Chair, IAFP Beverage and Acid/Acidified Foods Professional Development Group

2014 – Member, Nominating Committee, International Association for Food Protection

2011 – 2112, President, Phi Tau Sigma, Food Science Honorary Society, NC State University Chapter

2010 – Present: Member of the Editorial Board, Journal of Food Protection

2006 – 2015: Member of the Society for Industrial and Applied Mathematics

2003 – 2012, 2014 – present: Member of the Editorial Board, Applied and Environmental Microbiology

2003 – Elected to Phi Tau Sigma, Food Science Honorary Society

1997 – Present: Member of the International Association for Food Protection (IAFP)

1997 – 2017: Instructor, Acidified Foods GMP School, with NC Cooperative Extension Service, Dept. of Food, Bioprocessing and Nutrition Sciences, NCSU, in cooperation with FDA and HHS.

1990 – Present: Advisory member of the Pickle Packers International, Inc. trade association (PPI) Manufacturing and Technology committee.

1986 – William Arnold Graduate Fellows Award, Univ. of Kansas

1982 – Present: Member, American Society for Microbiology (ASM)

### **Funding**

USDA is our principal source of funding. Currently, we have just renewed a USDA/ARS Food Safety National Program NP108 five-year base funding project. This fund covers base funding for research, laboratory technical support and administrative expenses for the next five years (2021 – 2026).

Additional Funding for 2021 – 2022:

Association for Dressings and Sauces: \$6,000.

USDA Innovation fund grant: \$13,000.

### **Teaching and Students**

As ARS faculty, no formal teaching responsibilities, currently supervising 1 PhD student (Co-Chair) and two NCSU undergraduate students.

### **Peer-Reviewed Publications**

- 1) Lu Z, Pérez-Díaz IM, Hayes JS, Breidt F. 2020. Bacteriophages infecting Gram-negative bacteria in a commercial cucumber fermentation. *Front Microbiol* 11:1306. doi: 10.3389/fmicb.2020.01306
- 2) Snyder A, Breidt F, Andress EL and Ingham BH, 2020. Manufacture of Traditionally Fermented Vegetable Products: Best Practice for Small Businesses and Retail Food Establishments. *Food Protect. Trends* 40(4):251–263.
- 3) Price RE, Longtin M, Conley-Payton S, Osborne JA, Johanningsmeier SD, Bitzer D, Breidt F. 2020. Modeling buffer capacity and pH in acid and acidified foods. *J Food Sci* 85(4):918-925. doi.org/10.1111/1750-3841.15091.
- 4) Longtin M, Price RE, Mishra R, Breidt F. 2020. Modeling the buffer capacity of ingredients in salad dressing products. *J Food Sci* 85(4):910-917. doi.org/10.1111/1750-3841.15018
- 5) Jones CM, Price RE, Breidt F. 2020. *Escherichia coli* O157:H7 stationary phase acid resistance and assessment of survival in a model vegetable fermentation system. *J Food Prot* 83(5):745-753. doi.org/10.4315/JFP-19-463.
- 6) McMurtrie EK, Johanningsmeier SD, Breidt F, Price RE. 2019. Effect of brine acidification on fermentation microbiota, chemistry and texture quality of cucumbers fermented in calcium or sodium chloride brines. *J Food Sci* 84(5):1129-1137. doi: 10.1111/1750-3841.14600.
- 7) Dupree DE, Price RE, Burgess BA, Andress EL, Breidt, F. 2019. Effects of sodium chloride or calcium chloride concentration on the growth and survival of *Escherichia coli* O157:H7 in model vegetable fermentations. *J Food Prot*, 82(4):570-578.
- 8) Breidt F, Andress EL, Ingham B. Recommendations for designing and conducting cold-fill challenge studies for acidified food products. 2018. *Food Prot Trends*. 38(5):322-328.
- 9) Yavuz, N, Foster AL, Sharma T, Patel K, Stoforos G, Sandeep KP, Planitkar P, Breidt, F. 2018. Hot-fill pasteurization of cucumber pickle spears: an alternative to tunnel pasteurization. *Food Prot Trends* 38(4):258-265.
- 10) Ding Z, Johanningsmeier SD, Price R, Reynolds R, Truong VD, Payton SC, Breidt, F. 2018. Evaluation of nitrate and nitrite contents in pickled fruit and vegetable products. *Food Control* 90:304-311.
- 11) Kay K, Breidt F, Fratamico PM, Baranzoni G, Kim G, Grunden A, Oh D. 2017. *Escherichia coli* O157:H7 acid sensitivity correlates with flocculation phenotype during nutrient limitation. *Frontiers Microbiol* 8:1404. doi: 10.3389/fmicb.2017.01404

- 12) Fan S, Breidt F, Price R, Perez-Diaz I. 2017. Survival and growth of probiotic lactic acid bacteria in refrigerated pickle products. *J. Food Sci*, 82(1):167-173.
- 13) Baranzoni GM, Fratamico PM, Richenberger ER, Kim GH, Breidt F, Kay K, Oh DH. 2016. Complete genome sequences of *Escherichia coli* O157:H7 strains SRCC 1675 and 28RC, which vary in acid resistance. *ASM GenomeA*. 4(4):e00743-16.
- 14) Kim, GH, Fratamico P, Breidt F, Oh DH. 2016. Survival and expression of acid resistance genes in Shiga toxin-producing *Escherichia coli* acid adapted in pineapple juice and exposed to synthetic gastric fluid. *J. Appl. Microbiol.* 12:1416-1426.
- 15) Median-Pradas E, Perez-Diaz I, Breidt F, Hayes J, Franco W, Butz N, Azcarate-Peril A. 2016. Bacterial ecology of fermented cucumber rising pH spoilage as determined by non-culture based methods. *J. Food Sci.* 81(1):M121-M129.
- 16) Kim GH, Breidt F, Fratamico P, Oh DH. 2015. Acid resistance and molecular characterization of *Escherichia coli* O157:H7 and different non-O157 Shiga toxin-producing *E. coli* serogroups. *J. Food Sci* 80(10): M2257-M2264.
- 17) Kyung K, Medina-Pradas E, Kim S, Lee Y, Kim K, Choi J, Cho J, Chung C, Barrangou R, Breidt F. 2015. Microbial ecology of watery kimchi. *J Food Sci* 80(5):M1031-M1038.
- 18) Reina LD, Pérez-Díaz IM, Breidt F, Azcarate-Peril MA, Medina E, N. Butz. 2015. Characterization of the microbial diversity in yacon spontaneous fermentation at 20 °C. *Intl J Food Microbiol* 203: 35–40.
- 19) Yang Z, Meng X, Breidt F, Dean LL, Arritt FM. 2015. Effects of acetic acid and arginine on pH elevation and growth of *Bacillus licheniformis* in an acidified cucumber juice medium. *J Food Prot* 78(4):728-737.
- 20) Lu Z, Breidt F. 2015. *Escherichia coli* O157:H7 bacteriophage (phi)241 isolated from an industrial cucumber fermentation at high acidity and salinity. *Front Microbiol* 6:1-10. doi: 10.3389/fmicb.2015.00067
- 21) Breidt F, Kay K, Osborne J, Ingham B, Arritt F. 2014. Thermal processing of acidified foods with pH 4.1 to 4.6. *Food Prot. Trends* 43:132-138.
- 22) Breidt F, Kay K, Cook J, Osborne J, Ingham B, and F. Arritt. 2013. Determination of 5-log reduction times for *Escherichia coli*, *Salmonella enterica*, or *Listeria monocytogenes* in acidified foods with pH 3.5 or 3.8. *J. Food Prot.* 76:1245-1249.
- 23) Nawalakhe R, Shi Q, Vitchuli N, Noar J, Caldwell J, Breidt F, Bourham MA, Zhang X, McCord MG. 2013. Novel atmospheric plasma enhanced chitosan nanofiber/gauze composite wound dressings. *J. Appl. Polymer Sci.* 129:916-923.
- 24) Breidt F, Medina-Pardas E, Wafa D, Perez-Diaz I, Franco W, Huang H-Y, Johanningsmeier S, Kim JH. 2013. Characterization of cucumber fermentation spoilage bacteria by enrichment culture and 16S rDNA cloning. *J. Food Sci.* 78:M470-M476
- 25) Caldwell J, Juvonen R, Brown J, Breidt F. 2013. *Pectinatus sottaceto* sp. nov. isolated from a commercial pickle spoilage tank. *J. Syst. Evol. Microbiol.* 63(10):3609-3616
- 26) Lu H, Breidt Jr. F, Perez-Diaz I. 2013. Development of an effective treatment for a 5-log reduction of *Escherichia coli* in refrigerated pickle products. *J. Food Sci.* 78: M264-M269.
- 27) Quan S, Nitchuli N, Nowak J, Jiang S, Caldwell JM, Breidt F, Bourham M, Zhang X, and M McCord. 2013. Multifunctional and Durable Nanofiber-Fabric-Layered Composite fM264or Protective Application. *J. Appl. Polymer Sci.* 128:1219-1226
- 28) Lu Z, Prez-Diaz I, Hayes J, Breidt F. 2012. Bacteriophage ecology in a commercial cucumber fermentation. *Appl. Env. Microbiol.* 78:8571-8578.
- 29) Gawish SM, Avci H, Ramadan AM, Mosleh S, Monticello R, Breidt F, and R. Kotek. 2012. Properties of antibacterial polypropylene/nanometal composite fibers. *J. Biomaterials Sci.* Vol. 23:43-61.
- 30) Lu HJ, Breidt F, Pérez-Díaz IM, Osborne JA. 2011. The antimicrobial effects of weak acids on the survival of *Escherichia coli* O157:H7 under anaerobic conditions. *J Food Prot* 6:893-898.
- 31) Vitchuli N, Shi Q, Nowak J, Kay K, Caldwell JM, Breidt F, Bourham M, McCord M, Zhang X. 2011. Multifunctional ZnO/Nylon 6 nanofiber mats by an electrospinning-electrospraying hybrid process fo ruse in protective application. *Sci. Technol. Adv. Mater.* 12:1-7.

- 32) Quan S, N Vitichuli, J Nowak, J Noar, JM Caldwell, F Breidt, M Bourham, M McCord, and X Zhang. 2011. One-Step Synthesis of Silver Nanoparticle-Filled Nylon 6 Nanofibers and their Antibacterial Properties. *J. Materials Chem.* 21:10330-10335
- 33) Shi Q, Vitichuli N, Nowak J, Caldwell JM, Breidt F, Zhang X, Bourham M, and M McCord. 2011. Durable antibacterial Ag/polyacrylonitrile (Ag/PAN) hybrid nanofibers prepared by atmospheric plasma treatment and electrospinning. *European Polymer Journal* 47:1402-1409.
- 34) Breidt F, Caldwell JM. 2011. Survival of *Escherichia coli* O157:H7 in cucumber fermentation brines. *J Food Sci* 76(3):M198-M203.
- 35) Hosein, A.M., F. Breidt, and C.E. Smith. 2011. Modeling the Effects of Sodium Chloride, Acetic Acid and Intracellular pH on Survival of *Escherichia coli* O157:H7. *Appl. Env. Microbiol.* 77:889-895.
- 36) Breidt F., Sandeep KP., Arritt F. 2010. Use of Linear Models for Thermal Processing Acidified Foods. *Food Protect. Trends* 30(5):268-272.
- 37) Lu Z., Altermann E., Breidt F., and S. Kozyavkin. 2010. Sequence Analysis of *Leuconostoc mesenteroides* Bacteriophage (phi)1-A4 Isolated from Industrial Vegetable Fermentation. *Appl. Environ. Microbiol.* 76(6):1955-1966.
- 38) Pan, Y., Breidt F., Gorski L.A. 2010. Synergistic effects of sodium chloride, Glucose, and temperature on biofilm formation by *Listeria monocytogenes* serotype 1/2a and 4b strains. *Appl. Environ. Microbiol.* 76(5):1433-1441.
- 39) Pan Y., Breidt F., and S. Kathariou. 2009. Competition of *Listeria Monocytogenes* Serotype 1/2a and 4b Strains in Mixed Culture Biofilms. *Appl Environ Microbiol* 75(18):5846-5852.
- 40) Oh, D.H, Pan, Y, Berry, E., Cooley, M., Mandrell, R. and F. Breidt, Jr. 2009. *Escherichia coli* O157:H7 Strains Isolated from Environmental Sources Differ Significantly in Acetic Acid Resistance Compared to Human Outbreak Strains. *J. Food Prot.* 72(3):503-509
- 41) Kreske, A. C., Bjornsdottir, K., Breidt, F., Hassan, H. 2008. Effects of pH, Dissolved Oxygen, and Ionic Strength on the Survival of *Escherichia coli* O157:H7 in Organic Acid Solutions. *Journal of Food Protection.* 71(12):2404-2409.
- 42) Kim, J. and Breidt, F. 2007. Development of Preservation Prediction Chart for Long Term Storage of Fermented Cucumber. *Korean Journal of Life Sciences.* 17(12):1616-1621
- 43) Pan, Y., Breidt, F. 2007. Enumeration of viable *Listeria monocytogenes* by real-time PCR with propidium monoazide and ethidium monoazide in the presence of dead cells. *Appl. Env. Microbiol.* 73(24):8028-8031.
- 44) Plengvidhya, V. Breidt, F. Jr., Lu, Z., and H.P. 2007. Investigation of the Lactic Acid Bacteria in Sauerkraut Fermentations by DNA fingerprinting Methods. *Appl. Env. Microbiol.* 73(23):7697-7720.
- 45) Breidt, F., Hayes, J.S., and R.F. McFeeters. 2007. Determination of 5-Log Reduction Times for Food Pathogens in Acidified Cucumbers during Storage at 10 and 25C., *J. Food Protect.* 70(11):2638-2641.
- 46) Perez-Diaz, I.M., Kelling, R.E., Hale, S. Breidt, F., and R.F. McFeeters. 2007. Lactobacilli and Tartrazine as Causative Agents of Red-Color Spoilage in Cucumber Pickle Products. *J. Food Sci* 72(7): M240-245.
- 47) M. Gawish, A.M. Ramadan, C.E. Cornelius, M.A. Bourham, S.R. Matthews, M.G. McCord, D.M. Wafa and F. Breidt. 2007. New Functionalities of PA6,6 Fabric Modified by Atmospheric Pressure Plasma and Grafted Glycidyl Methacrylate Derivatives. *Textile Res. J., Vol. 77, 92-104.*
- 48) Yoon, S.-S., Barrangou-Pouey, R., Breidt Jr, F., and H.P. Fleming. 2007. Detection and Characterization of a Lytic *Pedococcus* Bacteriophage from Fermenting Cucumber Brine. *J. Microbiol. Biotechnol.* 17(2):262-270.
- 49) Breidt, F., McFeeters, R.F., and I. Diaz-Muniz. 2007. Fermented Vegetables. *In Food Microbiology: Fundamentals and Frontiers*, 3<sup>rd</sup> Ed. Doyle, M.P, and L.R. Beuchat, eds. ASM Press, Washington, DC.
- 50) S. M. Gawish, S. R. Matthews, D. M. Wafa, F. Breidt, M. A. Bourham. 2007. Atmospheric Plasma-Aided Biocidal Finishes for Nonwoven Polypropylene Fabrics. I. Synthesis and Characterization. *Journal of Applied Polymer Science*, Vol. 103, 1900–1910.
- 51) D. M. Wafa, F. Breidt, S. M. Gawish, S. R. Matthews, K. V. Donohue, R. M. Roe, M. A. Bourham. 2007. *J. Appl. Polymer Science.* Atmospheric plasma-aided biocidal finishes for nonwoven polypropylene fabrics. II. Functionality of synthesized fabrics, Vol. 103, 1911–1917.

- 52) Y. Pan, F. Breidt, Jr., and S. Kathariou. 2006. Resistance of *Listeria monocytogenes* Biofilms to Sanitizing Agents in a Simulated Food Processing Environment. *Appl. Environ. Microbiol.* 72(12): 7711-7717.
- 53) Makarova, K., Slesarev, A., Wolf, Y., Sorokin, A., Mirkin, B., Koonin, E., Pavlov, A., Pavlova, N., Karamychev, V., Polouchine, N, Shakhova, V., Grigoriev, I., Lou, Y., Rohksar, D., Lucas, S., Huang, K., Goodstein, D. M., Hawkins, T., Plengvidhya, V., Welker, D., Hughes, J., Goh, Y., Benson, A., Baldwin, K., Lee, J.-H., Díaz-Muñiz, I., Dosti, B., Smeianov, V., Wechter, W., Barabote, R., Lorca, G., Altermann, E, Barrangou, R., Ganesan, B., Xie, Y., Rawsthorne, H., Tamir, D., Parker, C., Breidt, Jr., F., Broadbent, J., Hutkins, R., O'Sullivan, D., Steele, J., Unlu, G., Saier, M., Klaenhammer, T., Richardson, P., Kozyavkin, S., Weimer, B., Mills D. 2006. Comparative Genomics of the Lactic Acid Bacteria, 2006. *Proceedings of the National Academy of Sciences* 103(42):15611-15616.
- 54) Dougherty, D.P., Da Conceicao Neta, E.R., McFeeters, R.F., Lubkin, S.R., Breidt, Jr., F. 2006. Semi-Mechanistic Partial Buffer Approach to Modelling pH, the Buffer Properties, and the Distribution of Ionic Species in Complex Solutions. *J. Agric. Food Chem.* 54: 6021-6029.
- 55) Mudgal, P., Breidt, F., Lubkin, S.R., and K.P. Sandeep. 2006. Quantifying the Significance of Phage Attack on Starter Cultures: a Mechanistic Model for Population Dynamics of Phage and Their Hosts Isolated from Fermenting Sauerkraut. *Appl. Environ. Microbiol.* 72(6): 3908-3915.
- 56) Chin, H.-S., Breidt, F., Fleming, H.P., Shin, W.-C., and S.-S. Yoon. 2006. Identification of Predominant Bacterial Isolated from the Fermenting *Kimchi* Using ITS-PCR and Partial 16S rDNA Sequencing Analysis. *J. Microbiol. Biotechnol.* 16(1): 68-76.
- 57) Bjornsdottir, K., Breidt, F., and R.F. McFeeters. 2006. Protective Effects of Organic Acids on Survival of *Escherichia coli* O157:H7. *Appl. Environ. Microbiol.* 72(1): 660-664.
- 58) Mattos, E.R., Fasina, O.O., Reina, L.D., Fleming, H.P., Breidt, F., Damasceno, G.S., and E.V. Passos. 2005. Heat Transfer and Microbial Kinetics Modeling to Determine the Location of Microorganisms within Cucumber Fruit. *J. Food Sci* 50(5): E324-E330.
- 59) Lu Z., Altermann E, Breidt F, Predki P, Fleming HP, Klaenhammer TR. 2005. Sequence analysis of the *Lactobacillus plantarum* bacteriophage  $\Phi$ JL-1. *Gene* 348: 45-54.
- 60) Reina LD, Breidt Jr. F, Fleming HP, and Kathariou S. 2005. Isolation and Selection of Lactic Acid Bacteria as Biocontrol Agents for Nonacidified, Refrigerated Pickles. *J Food Sci* 70(1):M7-11.
- 61) Breidt, Jr., F., Hayes, J. S., Osborne, J. A., and McFeeters, R. F. 2005 Determination of 5-Log Pathogen Reduction Times for Heat-Processed, Acidified Foods. *J. Food Prot.*, 68 (2): 305-310.
- 62) Johanningsmeier SD, Fleming HP, Breidt Jr F. 2004. Malolactic Activity of Lactic Acid Bacteria during Sauerkraut Fermentation. *J Food Sci* 69(8):M222-227.
- 63) Breidt, Jr., F. 2004. A genomic study of *Leuconostoc mesenteroides* and the molecular ecology of sauerkraut fermentations. *J. Food Sci.* 69 (1):30-32.
- 64) Plengvidhya, V., Breidt, Jr., F., and Fleming, H. P. 2004. Use of RAPD-PCR as a method to follow the progress of starter cultures in sauerkraut fermentation. *Intern. J. Food Microbiol.* 93 (3):287-296.
- 65) Breidt, Jr., F., Hayes, J. S., and McFeeters, R. F. 2004. The independent effects of acetic acid and pH on the survival of *Escherichia coli* O157:H7 in simulated acidified pickle products. *J. Food Prot.* 67(1): 12-18.
- 66) Lu, Z., Breidt, Jr., F., Plengvidhya, V., and Fleming, H. P. 2003. Bacteriophage ecology in commercial sauerkraut fermentations. *Appl. Environ. Microbiol.* 69 (6):3192-3202.
- 67) Lu, Z. F. Breidt, Jr. , H. P. Fleming, E. Altermann and T. R. Klaenhammer. 2003. Isolation and characterization of a *Lactobacillus plantarum* bacteriophage, ( $\phi$ )JL-1, from a cucumber fermentation, *Intern. J. Food Microbiol.* 84:225-235.
- 68) Reina L, Fleming HP, and Breidt F. 2002. Bacterial Contamination of Cucumber Fruit Through Adhesion *J. Food Protection.* 65(12):1881-1887.
- 69) Barrangou, R., S.-S. Yoon, F. Breidt, H. P. Fleming, and T. R. Klaenhammer. 2002. Characterization of Six *Leuconostoc Fallax* Bacteriophages Isolated From an Industrial Sauerkraut Fermentation. *Appl. Environ. Microbiol.* 68 (11):5452-58.
- 70) Klaenhammer, T., Altermann, E.; Arigoni, F., Bolotin, A., Breidt, F., Braodbent, J., Cano, R., Chaillou, S., Deutscher, J., Gasson, M., van de Guchte, M., Guzzo, J., Hartke, A., Hawkins, T., Hols, P., Hutkins, R.,

- Kleerebezem, M., Kok, J., Kuipers, O., Lubbers, M., Maguin, E., McKay, L., Mills, D., Nauta, A., Overbeek, R., Pel, H., Pridmore, D., Saier, M., van Sinderen, D., Sorokin, A., Steele, J., O'Sullivan, D., de Vos, W., Weimer, B., Zagorec, M., and Siezen, R. 2002. Discovering lactic acid bacteria by genomics. *Antonie Van Leeuwenhoek* 82:29-58.
- 71) Yoon, S.-S., Barrangou-Pouey, R., Breidt, Jr., F., Klaenhammer, T. R., and Fleming, H. P. 2002. Isolation and characterization of bacteriophages from fermenting sauerkraut. *Appl. Environ. Microbiol.* 68 (2):973-976.
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- 73) Barrangou-Pouey, R., Yoon, S. S., Breidt, Jr., F., Fleming, H. P., and Klaenhammer, T. R. 2002. Identification and characterization of *Leuconostoc fallax* strains isolated from an industrial sauerkraut fermentation. *Appl. Environ. Microbiol.* 68:2877-2884.
- 74) Barrangou, R., Breidt, F., Schroen, D. 2002. Zonierung von intakten Bakteriophagen. *GIT Labor-Fachzeitschrift.* 4:470-471.
- 75) Unal, R., Fleming, H. P., McFeeters, R. F., Thompson, R. L., Breidt, F., Jr., and Giesbrecht, F. G. 2001. Novel quantitative assays for estimating the antimicrobial activity of fresh garlic juice. *J. Food Protection* 64 (2):189-194.
- 76) Yoon, S. S., Kim, J.-W., Breidt, F., Jr., and Fleming, H. P. 2001. Characterization of a lytic *Lactobacillus plantarum* bacteriophage and molecular cloning of a lysin gene in *Escherichia coli*. *Intern. J. Food Microbiol.* 65:63-74.
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- 82) Breidt, F. and H.P. Fleming (1997). Using Lactic Acid Bacteria to Improve the Safety of Minimally Processed Fruits and Vegetables. *Food Technol.* 51(9):44-51
- 83) Breidt, F. and H.P. Fleming. (1996). Identification of Lactic Acid Bacteria by Ribotyping. *Journal of Rapid Methods and Automation in Microbiol.* 4:219-233.
- 84) Breidt, F., K.A. Crowley, and H.P. Fleming (1995). Controlling Cabbage Fermentations with Nisin and Nisin-Resistant *Leuconostoc mesenteroides*. *Food Microbiol.* 12:109-116.
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