

## Publications on the Microbial Safety of Avocados and Avocado Products

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## GENERAL PUBLICATIONS

- Marik, C. M., J. Zuchel, D. W. Schaffner, and L. K. Strawn. 2020. Growth and survival of *Listeria monocytogenes* on intact fruit and vegetable surfaces during postharvest handling: a systematic literature review. *J. Food Prot.* 83:108–128. Available at: <https://doi.org/10.4315/0362-028X.JFP-19-283>.
- Pomeroy, M., A. Conrad, J. B. Pettengill, M. McClure, A. A. Wellman, J. Marus, J. Huffman, and M. Wise. 2021. Evaluation of avocados as a possible source of *Listeria monocytogenes* infections, United States, 2016 to 2019. *J. Food Prot.* 84:1122–1126. Available at: <https://doi.org/10.4315/JFP-20-419>.
- Salazar, J. K., S. N. Sahu, I. M. Hildebrandt, L. Zhang, Y. Qi, G. Liggans, A. R. Datta, and M. L. Tortorello. 2017. Growth kinetics of *Listeria monocytogenes* in cut produce. *J. Food Prot.* 80:1328–1336. [avocado pulp]
- Strawn, L. K., K. R. Schneider, and M. D. Danyluk. 2011. Microbial safety of tropical fruits. *Crit. Rev. Food Sci. Nutr.* 51:132–145. Available at: <https://doi.org/10.1080/10408390903502864>.

## OUTBREAKS

- Gordillo, M. E., G. R. Reeve, J. Pappas, J. J. Mathewson, H. L. Dupont, and B. E. Murray. 1992. Molecular characterization of strains of enteroinvasive *Escherichia coli* O143, including isolates from a large outbreak in Houston, Texas. *J. Clin. Microbiol.* 30:889–893. Available at: <https://doi.org/10.1128/jcm.30.4.889-893.1992>. [guacamole as probable vehicle]
- Kendall, M. E., R. K. Mody, B. E. Mahon, M. P. Doyle, K. M. Herman, and R. V. Tauxe. 2013. Emergence of salsa and guacamole as frequent vehicles of foodborne disease outbreaks in the United States, 1973–2008. *Foodborne Pathog. Dis.* 10:316–322. <https://doi.org/10.1089/fpd.2012.1328>.
- Kimura, A. C., K. Johnson, M. S. Palumbo, J. Hopkins, J. C. Boase, R. Reporter, M. Goldoft, K. R. Stefonek, J. A. Farrar, T. J. Van Gilder, and D. J. Vugia. 2004. Multistate shigellosis outbreak and commercially prepared food. *Emerg. Infect. Dis.* 10:1147–1149. Available at: <https://dx.doi.org/10.3201/eid1006.030599>. [5-layer dip included guacamole]
- Leger, R. T., K. M. Boyer, C. P. Pattison, and J. E. Maynard. 1975. Hepatitis A: report of a common-source outbreak with recovery of a possible etiologic agent. I. Epidemiologic studies. *J. Infect. Dis.* 131:163–166. Available at: <https://doi.org/10.1093/infdis/131.2.163>. [guacamole as a probable vehicle]

## RECALLS

- U.S. Food and Drug Administration. 2008. Grande Produce, LTD.CO recalls jalapeno peppers, serrano peppers, and avocados because of possible health risk. Available at: <http://wayback.archive-it.org/7993/20170112162201/http://www.fda.gov/Safety/Recalls/ArchiveRecalls/2008/ucm12470.htm>.
- U.S. Food and Drug Administration. 2010. J. Hellman Frozen Foods, Inc. recalls Señor Mexicano™ Avocado Pulp due to possible health risk. Available at: <http://wayback.archive-it.org/7993/20170112154837/http://www.fda.gov/Safety/Recalls/ArchiveRecalls/2010/ucm218455.htm>.
- U.S. Food and Drug Administration. 2011. Fine Mexican Food Products, Inc. recalls 2.2 lb. Frozen Avocado Pulp and 3 lb. IQF Avocado Halves from Peru because of possible health risk. Available at: <http://wayback.archive-it.org/7993/20170112151656/http://www.fda.gov/Safety/Recalls/ArchiveRecalls/2013/ucm271686.htm>.
- U.S. Food and Drug Administration. 2017. Expanded voluntary recall for Casa Sanchez Foods “Real Guacamole” and to also “Spicy Guacamole” because of possible health risk. Available at: <http://wayback.archive-it.org/7993/20180126101429/https://www.fda.gov/Safety/Recalls/ucm585795.htm>.
- U.S. Food and Drug Administration. 2019. Henry Avocado recalls whole avocados because of possible health risk. Company announcement available at: <https://www.fda.gov/safety/recalls-market-withdrawals-safety-alerts/henry-avocado-recalls-whole-avocados-because-possible-health-risk>.
- U.S. Food and Drug Administration. 2019. Nature’s Touch Frozen Foods (West) Inc. voluntarily recalls Signature Select Avocado Chunks due to potential *Listeria monocytogenes* contamination. Available at: <https://www.fda.gov/safety/recalls-market-withdrawals-safety-alerts/natures-touch-frozen-foods-west-inc-voluntarily-recalls-signature-select-avocado-chunks-due>.

## SURVEYS

- Arvizu-Medrano, S. M., M. H. Iturriaga, and E. F. Escartín. 2001. Indicator and pathogenic bacteria in guacamole and their behavior in avocado pulp. *J. Food Safety* 21:233–244.
- Coetzee, C., E. du Plessis, S. Duvenage, and L. Korsten. 2017. Bacterial dynamics and the prevalence of foodborne pathogens associated with avocado fruit *Persea americana* Mill. *South African Growers' Association Yearbook* 40, pp. 36–40. Available at: <https://pdfs.semanticscholar.org/3cc6/d3df6f340b66963d041a1e27759378dd0ee2.pdf>.
- García-Frutos, R., L. Martínez-Chávez, E. Cabrera-Díaz, P. Gutiérrez-González, J. L. Montañez-Soto, J. J. Varela-Hernández, and N. E. Martínez-González. 2020. *Salmonella*, *Listeria monocytogenes*, and indicator microorganisms on Hass avocados sold at retail markets in Guadalajara, Mexico. *J. Food Prot.* 83:75–81. Available at: <https://doi.org/10.4315/0362-028X.JFP-19-273>.
- Ketema, T., T. Gaddisa, and K. Bacha. 2008. Microbiological safety of fruit juices served in cafes/restaurants, Jimma Town, Southwest Ethiopia. *Ethiop. J. Health. Sci.* 18(3):98–100. [avocado juice]

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- Rezende, A. C. B., J. Crucello, R. C. Moreira, B. S. Silva, and A. S. Sant'Ana. 2016. Incidence and growth of *Salmonella enterica* on the peel and pulp of avocado (*Persea americana*) and custard apple (*Annona squamosa*). *Int. J. Food Microbiol.* 235:10–16.
- Shiferaw, M., and M. Kibret. 2018. Microbial quality of avocado and guava fruits used for preparation of freshly squeezed juices from juice houses of Bahir Dar Town, Northwest Ethiopia. *Int. J. Sci. Res. Pub.* 8(9):100–113.
- Strydom, A., R. Vorster, P. A. Gouws, and R. C. Witthuhn. 2016. Successful management of *Listeria* spp. in an avocado processing facility. *Food Control* 62:208–215.
- U.S. Food and Drug Administration. 2018. FY 2014–2016 Microbiological sampling assignment – Summary report: whole fresh avocados. Available at: <https://www.fda.gov/food/sampling-protect-food-supply/microbiological-surveillance-sampling-fy14-16-whole-fresh-avocados>.
- U.S. Food and Drug Administration. 2019. Microbiological surveillance sampling: FY18-19 Fresh herbs (cilantro, basil & parsley) and processed avocado and guacamole assignments. Available at: <https://www.fda.gov/food/sampling-protect-food-supply/microbiological-surveillance-sampling-fy18-19-fresh-herbs-cilantro-basil-parsley-and-processed>.

## **POSTHARVEST (Whole fruit)**

- Cabrera-Diaz, E., L. Martinez-Chavez, P. Gutierrez-Gonzalez, J.A. Perez-Montano, M. O. Rodriguez-Garcia, N.E Martinez-Gonzales. 2022. Effect of temperature and time on the behavior of *Salmonella*, *Listeria monocytogenes*, and background microbiota on whole fresh avocados (*Persea americana* var Hass). *Int. J. Food Micro.* 369:109614. Available at: <https://doi.org/10.1016/j.ijfoodmicro.2022.109614>.
- Chen, Y., P. Evans, T. S. Hammack, E. W. Brown, and D. Macarisin. 2016. Internalization of *Listeria monocytogenes* in whole avocado. *J. Food. Prot.* 79:1440–1445. Available at: <https://doi.org/10.4315/0362-028X.JFP-16-075>.
- Dong, L., M. Wall, and Y. Li. 2023. Behaviors of *Salmonella enterica* serovar Typhimurium and *Listeria monocytogenes* on whole avocado during storage at 21 or 7 °C and their reduction by aqueous chlorine dioxide and peroxyacetic acid. *LWT* 173:114359. Available at: <https://doi.org/10.1016/j.lwt.2022.114359>.
- Gómez-Aldapa, C. A., M. R. Torres-Viela, M. A. Amaya-Acosta, E. Rangel-Vargas, A. Villaruel-López, and J. Castro-Rosas. 2017. Behavior of thirteen foodborne bacteria on whole Hass avocado and potential of roselle calyx extracts as alternative disinfectant agents of avocado. *J. Food Safety* 37:e12351. Available at: <https://doi.org/10.1111/jfs.12351>.
- Rezende, A. C. B., J. Crucello, R. C. Moreira, B. S. Silva, and A. S. Sant'Ana. 2016. Incidence and growth of *Salmonella enterica* on the peel and pulp of avocado (*Persea americana*) and custard apple (*Annona squamosa*). *Int. J. Food Microbiol.* 235:10–16.
- Strydom, A., R. Vorster, P. A. Gouws, and R. C. Witthuhn. 2016. Successful management of *Listeria* spp. in an avocado processing facility. *Food Control* 62:208–215.

## **POSTHARVEST (Pulp and products made from pulp)**

- Arvizu-Medrano, S. M., M. H. Iturriaga, and E. F. Escartín. 2001. Indicator and pathogenic bacteria in guacamole and their behavior in avocado pulp. *J. Food Safety* 21:233–244.
- Iturriaga, M. H., S. M. Arvizu-Medrano, and E. F. Escartín. 2002. Behavior of *Listeria monocytogenes* in avocado pulp and processed guacamole. *J. Food. Prot.* 65:1745–1749. Available at: <https://doi.org/10.4315/0362-028X-65.11.1745>.

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- Ketema, T., T. Gaddisa, K. Bacha. 2008. Microbiological safety of fruit juices served in cafes/restaurants, Jimma Town, Southwest Ethiopia. *Ethiop. J. Health. Sci.* 18(3):98–100.
- One, M.E. 2020. Effect of high-pressure processing and nisin on microbial inactivation and quality of avocado dressing. *Am. Soc. Agri. Bio. Eng.* 63(4):1099–1107.
- Rezende, A. C. B., J. Crucello, R. C. Moreira, B. S. Silva, and A. S. Sant'Ana. 2016. Incidence and growth of *Salmonella enterica* on the peel and pulp of avocado (*Persea americana*) and custard apple (*Annona squamosa*). *Int. J. Food Microbiol.* 235:10–16.
- Yigeremu, B., M. Bogale, and M. Ashenafi. 2001. Fate of *Salmonella* species and *E. coli* in fresh-prepared orange, avocado, papaya, and pineapple juices. *Ethiop. J. Health Sci.* 11(2):89–95.

## POSTHARVEST ANTIMICROBIAL TREATMENTS

- Dong, L., M. Wall, and Y. Li. 2023. Behaviors of *Salmonella enterica* serovar Typhimurium and *Listeria monocytogenes* on whole avocado during storage at 21 or 7 °C and their reduction by aqueous chlorine dioxide and peroxyacetic acid. *LWT - Food Sci. Technol.* 173:114359. Available at: <https://doi.org/10.1016/j.lwt.2022.114359>.
- One, M. E. 2020. Effect of high-pressure processing and nisin on microbial inactivation and quality of avocado dressing. *Am. Soc. Agri. Bio. Eng.* 63(4):1099–1107.
- Ramos-Villarroel, A.Y., O. Martin-Beloso, and R. Soliva-Fortuny. 2011. Bacterial inactivation and quality changes in fresh-cut avocado treated with intense light pulses. *Euro. Food Res. Technol.* 233(3):395–402.
- Ramos-Villarroel, A., N. Aron-Maftei, O. Martín-Beloso, and R. Soliva-Fortuny. 2014. Bacterial inactivation and quality changes of fresh-cut avocados as affected by intense light pulses of specific spectra. *Int. J. Food Sci. Technol.* 49(1):128–136. <https://ifst.onlinelibrary.wiley.com/doi/abs/10.1111/ijfs.12284>
- Rodríguez-García, O., V. M. González-Romero, and E. Fernández-Escartín. 2011. Reduction of *Salmonella enterica*, *Escherichia coli* O157:H7, and *Listeria monocytogenes* with electrolyzed oxidizing water on inoculated Hass avocados (*Persea americana* var. Hass). *J. Food Prot.* 74:1552–1557. Available at: <https://doi.org/10.4315/0362-028X.JFP-11-047>.