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Strain, type of food-conditioning film and their interaction significantly affect cell density and biofilm formation by *Listeria monocytogenes*.

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Abstract

Specific strains of *Listeria monocytogenes* are known to persist in different food processing plants for years and cause contamination, but there is a lack of knowledge on the mechanisms of their persistence. The purpose of the study was to investigate the effects of type of strain of *L. monocytogenes* and type of food conditioning film (CF) on cell density and biofilm formation on glass slides. Seven strains of *L. monocytogenes* were used in the study, including two strains lacking the *comK* prophage (a Lineage III strain & an Epidemic Clone I (ECI) strain) and five strains containing the *comK* prophage (three ECII strains, an ECIII strain & an ECV strain). Five RTE foods were used to make CFs, including soft cheese, hot dog, ham, cooked turkey and chicken. Briefly, each food was blended with water and the resulting food slurry was dried to form CF on slides with removable chambers. Broth cultures of different strains were loaded on these CFs. After incubation and staining, slides were examined using fluorescence microscopy. Type of strain and CF and the interaction between the two significantly affected cell density on slides ($P < 0.001$). Strains lacking the *comK* prophage showed lower cell densities than those containing the prophage (except one ECII strain) on all four meat and poultry CFs ($P < 0.05$). The ECV strain produced the highest cell densities and mature biofilms on all CFs except cheese. Among all the CFs, chicken produced the highest average cell density across all the strains ($P < 0.05$), followed by ham, turkey, hot dog and cheese. CFs were visible when cell densities were low or moderate; no CFs were left when heavy biofilms were formed by some strains. The results indicate that the *comK* prophage may contain genes essential for attachment and/or growth of *L. monocytogenes* on meat and poultry CFs. Biofilms formed by the strains containing this prophage may protect cells and help specific strains persist in meat and poultry processing plants for long periods.