

PORK SAFETY

Title: Surface Material, Temperature, and Soil Effects on Pathogen Growth in Condensate - **NPB# 02-048**

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Abstract: In the meat processing environment, bacterial contamination of food contact and non-contact surfaces can lead to post-process contamination of product through direct or indirect transfer of organisms from these surfaces. Moisture is a requirement for survival. One source of moisture common in food factories is condensation, formed when moist air contacts cool surfaces. Condensate can carry nutrients within bacterial growth niches and can act as a carrier of pathogenic and spoilage organisms from these niches on to product. We evaluated four surfaces [stainless steel, acetal resin, fiberglass reinforced plastic wall paneling (FRP), and mortar] under a variety of conditions to determine the effects that combinations of surface type, soil, and temperature have on the survival of three pathogens (*Listeria monocytogenes*, *Salmonella*, and *Yersinia enterocolitica*), in the presence of condensate. Half of the surface coupons to be tested were soiled by dipping into sterile porcine serum and then allowed to dry. Coupons were exposed to cell suspensions made up of five-strain cocktails of each organism (inoculation with each organism was performed separately on separate coupons) of ca. 10^7 CFU/mL of Butterfield's phosphate buffer (BPB) and incubated for 2 hours at 25°C to allow the cells to attach. Coupons were rinsed to remove unattached cells and then placed into sterile Petri dishes containing moistened filter paper disks to generate a 100 % relative humidity environment upon sealing of the dish. Coupons were then placed into either a 4°C or 10°C incubator and sampled at either six time intervals over a 15 day period (for stainless steel, acetal resin, and FRP) or ten intervals over 120 h (for mortar). Cells were removed from the surfaces of stainless steel, acetal resin, and FRP by vigorous shaking in 100 mL BPB with 3 g glass beads and from mortar by sonication in 100 mL BPB for 30 s. Cell populations, reported as CFU/coupon, were determined by plating onto Tryptic Soy Agar with 0.6 % Yeast Extract.

Mortar had the most lethality of any of the four surfaces studied with *Listeria* and *Salmonella* surviving better than *Yersinia*. Stainless steel did not support the survival of *Listeria* as well as acetal resin or FRP when compared across all soil and temperature conditions.

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However, for *Salmonella* and *Yersinia*, acetal resin was less supportive than stainless steel, with FRP sustaining the highest populations (least reduction). Temperature had little effect on survival of all three organisms across all surfaces, except for *Yersinia* on FRP at 10°C, which displayed growth as opposed to death at 4°C. Pork serum had a protective effect on the survival of *L. monocytogenes* on all four surfaces tested, with populations sustained at significantly ($P \leq 0.05$) higher numbers over time than unsoiled coupons. The presence of serum did not have an effect on the survival of *Salmonella* or *Yersinia* on stainless steel, acetal resin, or FRP, yet showed a significant protective effect on mortar. These results illustrate the importance of effective and timely cleaning and sanitization of both product contact and non-contact surfaces in order to prevent prolonged survival or growth of pathogens and possible contamination of post-process product.