

# PILOT STUDY FOR OCCUPATIONAL EXPOSURE TO POTENTIAL MICROBIAL CONTAMINATION IN DAIRY FACILITY, CATTLE FEEDLOT, AND RANGELAND

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## I. OBJECTIVES

Workers handling livestock in beef and dairy facilities may be exposed to environmental contamination, posing potential microbial risk to workers due to pathogenic contamination through surface contact and aerosol routes. Some pathogenic bacteria such as *Salmonella* and *Yersinia* are associated with beef and dairy production and can threaten the health of farm workers. The objective was to assess the microbial contamination level of farm workers in 3 different production systems as a result of occupational exposure.

## II. MATERIALS AND METHODS

This study was conducted at 3 facilities within a 2-mo period: the University of California Davis Dairy Farm, the Beef Cattle Feedlot, and the Sierra Foothill Research & Extension Center rangeland. Four sample matrices were collected at each facility: pen floor feces, animal hide swab, floor surface swabs, and employees' outerwear swabs (hats, clothes, pants, and boots). At each facility, 1 sponge was used to swab floor surfaces of 2 randomly selected pens, and 1 sponge was used to swab the outerwear of 1 employee at the end of their shift. Two sponges were utilized to swab hides from 8 animals from 2 randomly selected pens. Twenty feces pellets (20 g per pellet) were collected from the floor of 2 pens. All samples were serially diluted and plated on 3M Petrifilm EB Plates and Aerobic Plate Count (APC) Petrifilms. After incubation, viable bacterial colonies for all swab samples were reported as log CFU/mL. Pen floor fecal bacterial counts were expressed as log CFU/g. Sample collections were repeated 4 times for each production system. Data were analyzed using one-way analysis of variance via R version 3.6. Linear models were built with alpha level 0.05.

## III. RESULTS

The EB counts from employee outerwear samples ranged from 4.32 log CFU/mL to 5.67 log CFU/mL for all facilities (Table 1). All other sample matrices ranged from 3.67 log CFU/mL to 6.76 log CFU/g (Table 1). Within each facility, employee outerwear EB counts were not different ( $P > 0.05$ ) from floor, hides, and feces. The APC counts for employees' swabs across 3 locations ranged from 6.89 log CFU/mL to 7.72 log CFU/mL. The APC counts of all other sample matrices ranged from 5.87 log CFU/mL to 8.48 log CFU/g. No differences ( $P > 0.05$ ) among the 4 sampling matrices were detected from feedlot samples. At the dairy facility, employees' swabs had lower ( $P < 0.05$ ) APC counts than floor surface samples. At rangeland, APC counts from employees were higher ( $P < 0.05$ ) than from hides. Among the 3 facilities, APC counts from employee swab samples were not significantly different ( $P > 0.05$ ) from each other. Similarly, the same pattern was identified for EB counts. As a pilot study, this investigation may potentially have reduced statistical power due to the relatively small sample size.

Table 1.

Least squares means (LSmeans; standard error) of the counts for Enterobacteriaceae from different samples after 24-hour incubation at 37°C.

<b>Location</b>	<b>Hide</b>	<b>Feces</b>	<b>Floor</b>	<b>Employee</b>
Feedlot	5.08(0.23) <sup>bcd</sup>	6.76(0.23) <sup>a</sup>	6.01(0.23) <sup>abc</sup>	5.67(0.23) <sup>abc</sup>
Dairy	3.85(0.27) <sup>a</sup>	6.17(0.27) <sup>ab</sup>	5.62(0.27) <sup>abc</sup>	4.84(0.27) <sup>bcd</sup>
Rangeland	3.67(0.28) <sup>d</sup>	6.65(0.28) <sup>abc</sup>	5.43(0.28) <sup>bcd</sup>	4.32(0.28) <sup>cd</sup>

a–d Least Squares means with distinct superscript letters are significantly different ( $P < 0.05$ ).

#### IV. CONCLUSION

The EB and APC counts from employee outerwear, pen floor, and fecal samples among all 3 facilities were similar. This suggests that employees working on the floor and in the places covered with animal feces were more likely to be exposed to higher levels of potential microbial contamination. Personal hygiene practices such as disinfection of the surface of employee outerwear and other practices such as manure management are needed to reduce the transmission of zoonotic bacteria from environment to farmworkers and subsequently improve occupational health.

Keywords: microbiological contamination, occupational health, production system of beef and dairy cattle