136 Changes in milking procedures on US dairy operations: 1996–2014. Jason E. Lombard*[1], Charles P. Fossler[1], Ashley E. Adams[1,2], Chelsey B. Shivley[1,2], Natalie J. Urie[1,2], Christine A. Kopral[1], and Lindsey P. Garber[1], *[1]USDA:APHIS:VS:Center for Epidemiology and Animal Health, Fort Collins, CO, [2]Colorado State University, Fort Collins, CO.*

The National Animal Health Monitoring System conducted national dairy studies in 1996, 2002, 2007, and 2014. In all 4 studies, information regarding milking procedures was collected via face-to-face interviews. Although the states participating in each study varied slightly, the goal for all the studies was to account for close to 80% of dairy operations and 80% of dairy cows in the US. An objective of this study was to describe how milking facilities and practices have changed over the last 18 years. In 1996, the average herd size on US dairies was 70 cows, and by 2014 herd size had more than doubled to about 160 cows. During this time, the average bulk-tank somatic cell count decreased from 300,000 to approximately 200,000 cells/mL. Although the majority of operations (52.8%) still milk cows in a tie stall or stanchion barn, parlor use increased from 28.8% of operations in 1996 to 45.7% in 2014. In 1996, 54.9% of cows were milked in a parlor compared with 86.0% in 2014. Although the percentage of operations that milked cows twice daily has remained around 90% since 1996, the percentage of operations that milked 3 times per day nearly doubled from 5.8% in 1996 to 10.2% in 2014. Glove use during milking has almost doubled at both the operation level (32.9% of operations in 2002 and 59.1% in 2014) and at the cow level (48.7% of cows in 2002 and 87.9% in 2014). Forestripping all cows has increased from 44.5% of operations in 2002 to 71.5% in 2014. From 1996 to 2014, compounds containing iodine were the most frequently used pre-milking and post-milking teat disinfectants. Automatic take-off use increased from 36.0% of operations in 2002 to 49.1% in 2014, while operations using a backflush system has remained between 6 and 7% since 2002. The US has seen an increase in dairy herd size over the past 18 years, and this increase is associated with more cows being milked in parlors, more operations using gloves and checking for mastitis via forestripping, and an improvement in milk quality, as evidenced by lower somatic cell counts.

Key Words: milking practice, parlor, milk quality

137 Assessing the farm-level cost of mastitis. Jacqueline Holland*[1], Jason Lombard[2], Joleen Hadrich[1], and Christopher Wolf[3], *[1]Dept. of Agricultural and Resource Economics, Colorado State University, Fort Collins, CO, [2]USDA:APHIS:VS:Center for Epidemiology and Animal Health, Fort Collins, CO, [3]Department of Agricultural, Food, and Resource Economics, Michigan State University, East Lansing, MI.*

Although mastitis is the most common disease of dairy cattle, estimates of financial losses due to mastitis vary within the literature. The objective of this research is to create a cost-calculation tool that allows dairy producers to estimate their farm's losses due to mastitis, and to provide dairy managers with more accurate information for making decisions about mastitis control and prevention. The tool takes into account direct and indirect loss components, including fatalities; early culling; milk-yield loss; and costs for treatment, labor, and replacement animals. The tool allows dairy producers to input their herd information (e.g., mastitis prevalence, treatment costs) into a cost worksheet and obtain an estimate of the cost of mastitis on their operation. Information from the National Animal Health Monitoring System's Dairy 2014 study was used to estimate mastitis prevalence, outcome percentages, as well as treatment and labor costs at the farm level. All operations in the study had at least one case of clinical mastitis; overall, 24.1% of cows were affected with mastitis during 2013. Of affected cows, 72.9% recovered, 24.0% were sold, and 3.1% died. The operation average cost of treating a single case of mastitis in 2013 was $42.05. Additionally, cow-level records from DHIA Dairy Records Processing Centers (DRPCs) throughout the US were used to determine milk-yield losses due to mastitis, as milk-yield reduction accounts for the largest loss associated with mastitis. A hierarchal model using cow-level lactation information from the DRPCs was used to construct milk-yield curves of varying production levels, taking into account herd effects. The construction of yield curves through the hierarchal model allows for the comparison of cows based on lactation average somatic cell counts, thus establishing a loss value. The resulting mastitis-cost estimation tool focuses on determining an accurate cost of mastitis, which justifies investment in mastitis prevention measures.

Key Words: mastitis losses, mastitis management, animal health economics

138 Associations between housing and management practices on the incidence of lameness, hock lesions, and thin cows on US dairy operations. Ashley E. Adams*[1,2], Jason E. Lombard[2], Ivette N. Roman-Muniz[1], Charles P. Fossler[2], and Christine A. Kopral[2], *[1]Colorado State University, Fort Collins, CO, [2]USDA:APHIS:VS:Center for Epidemiology and Animal Health, Fort Collins, CO.*

The objective of this study was to determine the association among different on the incidence of lameness, hock lesions, and thin cows on US dairy operations. This study was conducted as part of the National Animal Health Monitoring System's Dairy 2014 study, which included dairy operations in 17 states. Size categories were assigned as follows: small (30–99 cows), medium (100–499 cows), and large (≥500 cows). Trained assessors visited 192 dairy operations between March and July 2014, and recorded locomotion and hock scores (on a 3-point scale), and the number of thin cows (BCS <2.25) on a total of 22,773 cows (average 119 cows per farm). The majority of dairy cows (90.3%) were considered to be sound (LS = 1), 6.9% were mild/moderately lame (LS = 2), and 2.8% were severely lame (LS = 3). Similarly, most dairy cows (87.3%) had no hock lesions (HS = 1), 10.1% had mild lesions (HS = 2), and 2.6% had severe hock lesions (HS = 3). A limited percentage of cows (4.2%) were thin. Univariate comparisons were performed using PROC LOGLINK, which accounts for study design and weighting. Statistical significance was declared at $P < 0.05$. Herd size had an effect on all parameters examined, with the percentage of cows scored as LS2, LS3, HS2, HS3, and thin increasing as herd size decreased. Additionally, the percentage of cows scored as LS2, HS2, and HS3 differed by housing type, primary flooring type, and primary bedding material used, and cows scored LS3 differed by housing type and primary bedding used. Operations that housed cows on pasture had fewer LS2 and LS3 cows than those that housed cows in tie-stalls or freestalls, whereas operations that housed cows in open/dry lots had fewer HS2 and HS3 cows than those that housed cows in tie-stalls, freestalls, or on pasture. Feeding a TMR and having a nutritionist balance rations for dairy cows was associated with a lower percentage of thin cows. Although herd size

was found to be an important indicator of the percentage of LS2, LS3, HS2, HS3, and thin cows on dairy operations in the US, other housing and management practices were also found to have an effect.

Key Words: dairy cow, lameness, hock lesions

139 Management of nonambulatory dairy cows on US dairy operations. Ashley E. Adams*[1,2], Jason E. Lombard[2], Ivette N. Roman-Muniz[1], Charles P. Fossler[2], and Christine A. Kopral[2], *[1]Colorado State University, Fort Collins, CO, [2]USDA:APHIS:VS:Center for Epidemiology and Animal Health, Fort Collins, CO.*

The objective of this study was to describe practices used on US dairy operations for the management and care of nonambulatory dairy cattle. This study was conducted as part of the National Animal Health Monitoring System's Dairy 2014 study, which included dairy operations in 17 states. Information on the management of nonambulatory dairy cows was collected on 1,261 dairy operations via in-person interviews. For the purpose of this study, nonambulatory cows were defined as those unable to stand at any time during a period of at least 24 h. The majority of operations (76.5%) had at least one nonambulatory cow in 2013, with an average of 2.6% of US dairy cows becoming nonambulatory during the year. Less than a quarter of all operations (22.6%) had written guidelines for handling nonambulatory cattle: 57.1% of large dairies (≥500 cows) had written guidelines, compared with just 24.1% of medium dairies (100–499 cows), and 15.5% of small dairies (30–99 cows). After becoming nonambulatory, cows were offered water within 1 h on 62.6% of operations, within 4 h on 83.0%, and within 12 h on 92.6% of operations; 2.6% of operations did not offer nonambulatory cows water. Food was offered to nonambulatory cows within 1 h on 60.6% of operations, within 4 h on 81.3%, and within 12 h on 91.6% of operations; 3.4% of operations did not offer food to nonambulatory cows. Cows were offered shelter within 1 h after becoming nonambulatory on 65.5% of operations, within 4 h on 80.1%, and within 12 h on 84.9% of operations; 9.1% of operations did not offer shelter to nonambulatory cows. Of nonambulatory cows, 30.0% recovered, 49.7% were euthanized, and 17.7% died. Of those that were euthanized, 59.1% were euthanized within 2 d of being recognized as nonambulatory. With 17.7% of nonambulatory cattle dying, and 41.9% being nonambulatory for 2 d or more before being euthanized, an opportunity exists for dairy producers to improve in this area. Implementing written guidelines, including the identification of cows that qualify for humane euthanasia, may help ensure the welfare of nonambulatory dairy cattle.

Key Words: dairy cattle, nonambulatory, management practices

140 Morbidity and mortality of preweaned dairy heifer calves. Natalie J. Urie*[1,2], Jason E. Lombard[1], and Chelsey B. Shivley[1,2], *[1]USDA:APHIS:VS:Center for Epidemiology and Animal Health, Fort Collins, CO, [2]Colorado State University, Fort Collins, CO.*

During the calf component of the National Animal Health Monitoring System′s Dairy 2014 study, information was collected on morbidity and mortality in preweaned dairy heifers. In addition, data were collected on birthing parameters, serum IgG, and treatments administered. Data have been collected from 851 calves on 89 farms in 12 of the nation's top dairy states. These results from the interim analysis are based on approximately 25% of the total number of calves expected to be enrolled in the study. The objective of the study was to assess morbidity and mortality of preweaned dairy heifers in the US to aid management decisions and increase heifer survival. Of the 851 calves, 33.4% experienced at least 1 disease event, and 6.1% had more than 1 disease event. The maximum number of disease events reported was 6. Clinical signs of morbidity were classified as dull; dehydrated; gastrointestinal; respiratory; lameness; and neurological. Gastrointestinal signs were observed in 18.0% of calves, while dullness was reported in 13.3% of calves and respiratory signs in 10.6%. Of the 33.4% of calves with clinical signs, 93.3% received treatment. Medications, including antibiotics, were administered to 82.4% of calves and electrolytes were administered to 35.6% of calves. Interestingly, of the 5.4% of calves that died, 39.1% died without displaying clinical signs before dying. The average age at death was 22.8 d, with a range from 3 to 78 d. Birthing parameters, including calving-ease score, number of calves born, and disinfection of the navel were not associated with morbidity or mortality. Serum IgG was collected and calves were classified as excellent ≥15.0 g/L (71.2%); fair 10.0–14.9 g/L (11.4%); or failure <10.0 g/L (17.4%) of passive transfer. Calves with fair passive transfer had higher levels of morbidity (44.3%) compared with calves with excellent passive transfer (30.4%). Serum IgG categories were not associated with mortality. High serum IgG levels were associated with decreased morbidity. Digestive and respiratory diseases were the 2 most common causes of morbidity in preweaned heifer calves.

Key Words: preweaned dairy calf, morbidity, mortality

141 Evaluation of colostrum quality and passive transfer status of dairy heifer calves on US dairy operations. Chelsey B. Shivley*[1,2], Natalie J. Urie[1,2], Deborah M. Haines[3,4], Jason E. Lombard[2], and Manuel F. Chamorro[3], *[1]Colorado State University, Fort Collins, Colorado, [2]USDA:APHIS:VS:Center for Epidemiology and Animal Health, Fort Collins, Colorado, [3]Research and Technical Services, The Saskatoon Colostrum Company, Saskatoon, SK, Canada, [4]Department of Veterinary Microbiology, Western College of Veterinary Medicine, Saskatoon, SK, Canada.*

Passive transfer of immunity is essential for the short- and long-term health of dairy calves. The objective of this study was to evaluate colostrum quality and the passive-transfer status of US dairy heifer calves. This study was conducted as part of the calf component of the National Animal Health Monitoring System's Dairy 2014 study, which included 92 dairy operations in 13 states. Dairy 2014's calf component is a yearlong longitudinal study focused on dairy heifer calves from birth to weaning; data were collected on 851 calves. The results from the interim analysis are based on approximately 25% of the total number of calves expected to be enrolled in the study. The mean colostrum IgG level was 74.9 g/L (SE 1.2), with 66.3% of samples having IgG levels above 50 g/L. The mean serum IgG level was 22.2 g/L (SE 0.4), and 71.2% of calves had serum IgG levels above 15 g/L. The highest percentage of calves (60%) received colostrum from their dam. Pasteurized colostrum was fed to 9.6% of calves. On average, colostrum was fed within 3.4 h following birth. The mean volume of colostrum fed at first feeding was 3.0 L, and the mean volume of colostrum fed in the first 24 h of life was 4.5 L. The highest percentage of calves (63.7%) were fed colostrum by bottle, while 31.3% were fed colostrum by esophageal feeder. Backward elimination model selection in Proc Mixed was used to determine which colostrum management factors were most important for determining serum IgG levels. The model using initial results included grams of total colostrum fed at the first feeding, the number of hours following birth that calves received their first colostrum feeding, and the calves' birth weight. Serum IgG increased with more grams of total colostrum fed at first feeding; serum IgG decreased as the number of hours from birth to first feeding increased; serum IgG also decreased as birth weights increased. These results show that feeding appropriate

amounts of high-quality colostrum shortly following birth is crucial to the passive-transfer status of dairy calves.

Key Words: dairy heifer calf, colostrum quality, passive transfer

142 Evaluation of the Brix refractometer for measuring colostral and serum IgG concentrations. Manuel F. Chamorro*[1], Ron Sargent[1], Deborah M. Haines[2,1], and Jason Lombard[3], *[1]The Saskatoon Colostrum Company Ltd., Saskatoon, Saskatchewan, Canada, [2]Western College of Veterinary Medicine, Saskatoon, Saskatchewan, Canada, [3]Center for Epidemiology and Animal Health USDA, Fort Collins, CO.*

The objective of this study was to evaluate the use of a digital Brix refractometer to assess the levels of IgG in maternal colostrum and to measure passive transfer in newborn calves. Colostrum (n = 1,590) and serum (n = 1,756) samples from 1- to 5-d-old calves were collected from 130 dairy farms across the US from April through December 2014. Colostrum and serum IgG were determined by radial immunodiffusion (RID), and a digital refractometer was used to indirectly estimate IgG concentrations by %Brix. The mean IgG colostrum level was 76.7 g/L (SEM ± 0.84) with a range of 3.0 to 227.4 g/L. The mean %Brix in colostrum samples was 23.3 (SEM ± 0.12) with a range of 2.3% to 40%. The mean IgG serum level was 21.8 g/L (SEM ± 0.26) with a range of 0.1 to 79.3 g/L. The mean %Brix in serum samples was 9.1 (SEM ± 0.02) with a range of 6.4% to 18.7%. The %Brix in colostrum and serum samples was highly correlated with IgG levels in colostrum and serum (r = 0.76 and r = 0.85, respectively). A receiver-operating characteristic curve was created to plot the true positive rate against the false positive rate for consecutive %Brix values for colostrum and serum samples. Compared with a cut-point of 50 g/L IgG (consistent with good quality) as determined by RID in colostrum samples, the lowest false-positive rate occurred at 22% Brix, with a combined sensitivity and specificity of 78% and 84%, respectively. The positive predictive value (PPV) and negative predictive value (NPV) of 22% Brix were 94% and 53.5%, respectively. For serum samples, the optimal combination of sensitivity (88.8%) and specificity (90.6%) compared with a cut-point of 10 g/L (consistent with adequate passive transfer) occurred at 8.4% Brix. The PPV and NPV of 8.4% Brix were 98.3% and 56.9%, respectively. The digital brix refractometer is a convenient method to assess colostrum quality and adequacy of passive transfer in calves at the herd level. However, individual %Brix values below these threshold values underestimate the actual IgG level in about 45% of the samples.

Key Words: colostrum IgG, serum IgG, Brix

143 Prevalence of *Cryptosporidium* and *Giardia* in preweaned dairy heifer calves. Natalie J. Urie*[1,2], Jason E. Lombard[1], Ronald Fayer[3], Monica Santin-Duran[3], and Chelsey B. Shivley[1,2], *[1]USDA:APHIS:VS:Center for Epidemiology and Animal Health, Fort Collins, CO, [2]Colorado State University, Fort Collins, CO, [3]USDA:ARS:NEA:BARC: Environmental Microbial and Food Safety Lab, Beltsville, MD.*

As part of the calf component of the National Animal Health Monitoring System′s Dairy 2014 study, fecal samples were collected from 782 calves on 87 farms in 11 of the top dairy states. These results from the interim analysis are based on approximately 25% of the total number of calves expected to be enrolled in the study. The samples were examined for *Cryptosporidium* (*Crypto*) and *Giardia* by immunofluorescence microscopy. Samples were collected from 612 calves in the East [IA, MI, MN, MO, NY, OH, PA, VT, VA, WI] and from 239 calves in the West [CA, CO, WA]. Calves were from 3 to 54 d of age at the time of sampling, with a mean age of 22 d. Overall, 48.2% of calves were infected with *Crypto* and 36.5% were infected with *Giardia*. One fifth of calves (20.0%) were infected with both *Crypto* and *Giardia*; 28.3% were infected with *Crypto* only, and 16.5% were infected with *Giardia* only. Approximately one-third of calves (35.3%) were not infected with either organism. *Crypto* was detected in 54.1% of calves 21 d of age or younger (n = 442) and in 40.6% of calves older than 21 d of age (n = 340). *Giardia* infection also differed between age groups: *Giardia* was detected in 32.4% of calves 21 d of age or younger and in 41.8% of calves older than 21 d of age. The percentage of samples positive for *Crypto* was similar between the East and West (47.4 and 50.2%, respectively). A higher percentage of calves in the East were infected with *Giardia* compared with calves in the West (40.0 and 27.8%, respectively). Calves were sampled from March through December 2014; 29.5% were sampled in April–June (spring), and 58.6% were sampled in July–September (summer). Only 11.9% were sampled during October–December (fall). The prevalence of *Crypto* was not different between seasons. *Giardia* levels differed among the seasons with a prevalence of 36.8% in the spring, 33.8% in the summer and 48.4% in the fall. *Giardia* prevalence in calves was lower than *Crypto*, but *Giardia* was more prevalent in the East region and during the fall. Species and assemblage identification for *Crypto* and *Giardia*, respectively, for these and additional samples await molecular applications.

Key Words: calves, *Cryptosporidium*, *Giardia*

144 Evaluation of average daily gain in preweaned dairy heifer calves based on different liquid diets and management practices. Chelsey B. Shivley*[1,2], Natalie J. Urie[1,2], and Jason E. Lombard[2], *[1]Colorado State University, Fort Collins, CO, [2]USDA:APHIS:VS:Center for Epidemiology and Animal Health, Fort Collins, CO.*

The objective of this study was to evaluate average daily gain (ADG) in US dairy heifer calves based on different liquid diets and management practices. This study was conducted as part of the calf component of the National Animal Health Monitoring System's Dairy 2014 study, which included 123 dairy operations in 13 states. Dairy 2014's calf component is a yearlong longitudinal study focused on dairy heifer calves from birth to weaning; data were collected on 851 calves from 92 operations. The results from the interim analysis are based on approximately 25% of the total number of calves expected to be enrolled in the study. Liquid diets were categorized by type (i.e., milk replacer, waste/whole milk, or a combination of the 2 (combination)) and by volume (i.e., > 4.9 kg/d or ≤ 4.9 kg/d). The mean ADG was 0.7 kg per day, and calves were fed liquid diets an average of 58.8 d. Backward elimination model selection was used to determine which diet and management practices significantly affected ADG. Using initial results, the model included liquid diet (P = 0.004), disease ($P < 0.001$), housing (P = 0.0189), and dehorning (P = 0.001). After controlling for other independent variables in the model, calves fed a combination diet gained, on average, 0.14 kg/day more than calves fed any milk replacer or a low volume of milk. Calves fed a high volume of milk outgained calves fed milk replacer or a low volume of milk by 0.15 kg/day. Calves without any disease events gained 0.07 kg/day more than calves with one or more disease events. Calves housed in groups gained 0.15 kg/day more than calves housed individually. Preweaned heifer calves that were dehorned gained 0.11 kg/day more than calves that were not dehorned. These initial results indicate the type of liquid diet fed, the amount fed, as well as other management practices unrelated to feeding, affect ADG.

Key Words: dairy heifer calf, average daily gain, liquid diet

145 Prevalence of *Campylobacter* spp. in bulk tank milk and filters from US dairies. Laura P. Del Collo*[1,3], Jeffrey S. Karns[1], Debabrata Biswas[3], Jason E. Lombard[2], R. Camilla Kristensen[2], Charles P. Fossler[2], and Jo Ann S. Van Kessel[1], *[1]USDA-ARS-NEA Environmental Microbial and Food Safety Laboratory, Beltsville, MD, [2]USDA:APHIS:VS:Center for Epidemiology and Animal Health, Fort Collins, CO, [3]Dept. of Animal and Avian Sciences, University of Maryland, College Park, MD.*

Campylobacter spp. is an important zoonotic bacterial pathogen that caused the majority of US outbreaks associated with nonpasteurized milk from 2007 to 2012. Bulk tank milk and milk filter samples were collected from 234 dairy operations in 17 top dairy states from March through July 2014 as part of the National Animal Health Monitoring System's Dairy 2014 study. Overall, 234 bulk tank samples and 396 milk filter samples were collected. Bulk tank and milk filter pairs were collected from 231 operations, and only bulk tank samples were collected from 3 operations. Bulk tank milk and buffered peptone water extracts of milk filters were enriched in Bolton Broth and struck onto mCCDA plates. A real-time PCR method was used to determine the presence of pathogenic species (*C. jejuni*, *C. coli*, and *C. lari*) in enrichments and to confirm isolates. Analysis of prevalence (%) incorporated operation weights to reflect the population from which samples were collected. Positive operations were those with either a positive milk filter or a positive bulk tank sample (or both). PCR indicated the presence of pathogenic *Campylobacter* spp. in enrichments from 24.3% of operations, while isolates were obtained from 12.0% of operations. *Campylobacter* was more frequently identified in samples from operations in the west region than in the east region (46.5% and 21.8%, respectively) and was more common in medium and large operations than in small operations (42.8%, 47.3%, and 4.9%, respectively). Based on multiplex PCR analysis, 41 (91.3%) of the *Campylobacter* isolates were *C. jejuni,* 3 were *C. lari*, and 1 was identified as *C. coli.* This first national survey of *Campylobacter* spp. in bulk tank milk and milk filters suggests that pathogenic *Campylobacter* spp. are common on US dairies and, therefore, are a continued risk for foodborne disease outbreaks.

Key Words: *Campylobacter*, bulk tank milk, milk filter

146 *Salmonella* Dublin antibodies in bulk-tank milk on U.S. dairy operations. Jason E. Lombard*[1], Belinda S. Thompson[2], Paul D. Virkler[2], Bettina Wagner[2], R. Camilla Kristensen[1], and Charles P. Fossler[1], *[1]USDA:APHIS:VS:Center for Epidemiology and Animal Health, Fort Collins, CO, [2]Animal Health Diagnostic Center, College of Veterinary Medicine, Cornell University, Ithaca, NY.*

Bulk-tank milk was collected and tested for antibodies to *Salmonella* Dublin during the National Animal Health Monitoring System's Dairy 2014 study. Information regarding management practices and dairy-cow health and productivity was also collected via 2 face-to-face interviews. One objective of the Dairy 2014 study was to estimate the herd-level prevalence of *Salmonella* Dublin antibodies and associated factors. A single bulk tank sample was collected from 230 operations from March through July 2014. After adjusting for study design and incorporating weighting procedures, estimates indicated that 8.0% of dairy operations had *Salmonella* Dublin antibodies present in bulk-tank milk. A higher percentage of operations with 500 or more cows (39.2%) had bulk-tank antibodies compared with operations with 100–499 cows (2.1%), and 30–99 cows (1.0%). In the West region (CA, CO, ID, TX, WA), 52.1% of bulk tanks were antibody positive, and in the East region [IA, IN, KY, MI, MN, MO, NY, OH, PA, VT, VA, WI] 2.8% of operations were antibody positive. Although bulk tanks in closed herds were not at lower risk of being antibody positive, bulk tanks on a higher percentage of operations that reared heifers offsite (20.6%) were antibody positive compared with bulk tanks on operations that did not raise heifers offsite (6.0%). In addition, bulk tanks on operations that reared heifers offsite and commingled heifers with cattle from other operations were at higher risk of being antibody positive (28.0%) compared with bulk tanks on operations in which heifers did not have contact with other cattle at the offsite facility (3.2%). Operations with *Salmonella* Dublin antibodies detected in bulk-tank milk had rolling herd average milk production of 10,764 kg compared with 9,672 kg for operations in which antibodies were not detected. Operation-level mortality of pre-weaned and weaned heifers did not differ by Dublin result. Results suggest that large operations, operations in the West and operations that raise heifers offsite are more likely to have *Salmonella* Dublin antibodies detected in milk.

Key Words: *Salmonella* Dublin, bulk milk, prevalence

147 Prevalence of *Salmonella* and *Listeria monocytogenes* in bulk tank milk and filters from US dairies. Jo Ann S. Van Kessel*[1], Jeffrey S. Karns[1], Jason E. Lombard[2], R. Camilla Kristensen[2], and Charles P. Fossler[2], *[1]USDA-ARS-NEA Environmental Microbial and Food Safety Laboratory, Beltsville, MD, [2]USDA:APHIS:VS:Center for Epidemiology and ANimal Health, Fort Collins, CO.*

Zoonotic bacterial pathogens are frequently isolated from the feces of dairy animals and their environments; therefore, bulk tank milk (BTM) and meat from culled dairy animals are at risk for contamination. As part of the National Animal Health Monitoring System's (NAHMS) Dairy 2014 study, 234 BTM and 396 milk filter (MF) samples were collected from 234 operations in 17 states from March through July 2014. BTM and MF pairs were collected from 231 operations, and only BTM samples were collected from 3 operations. Samples were enriched for *Salmonella* and *Listeria* spp. in selective broths. The presence of *Salmonella* was determined by real time PCR, and positive enrichment broths were struck onto selective agar for isolation. *L. monocytogenes* was distinguished from other *Listeria* species via the presence of phosphatidylinositol-specific phospholipase. Analysis of prevalence (%) incorporated operation weights to reflect the population from which samples were collected. Positive operations were those with either a positive MF or a positive BTM sample (or both). PCR analysis indicated that 18.6% of operations were positive for *Salmonella*. *Salmonella* isolates were obtained on 96.5% of these PCR-positive operations. Sixteen *Salmonella* serotypes were identified, with multiple serotypes detected on 9 operations. The most common serotypes were Cerro, Montevideo, Kentucky, and Newport, which were isolated from 33, 8, 5, and 5 operations, respectfully. *Listeria* spp. were isolated from 20.0% of operations and *L. monocytogenes* was isolated from 3.0% of operations. Prevalences of *Salmonella* and *L. monocytogenes* increased as herd size increased. The 2014 prevalences of *Salmonella* and *L. monocytogenes* are significantly lower than the prevalences from the NAHMS 2007 Dairy study (28.1% for *Salmonella*, 7.1% for *L. monocytogenes*). A significant presence of *Salmonella* and *L. monocytogenes* in BTM or MF samples indicates potential health risks to raw milk consumers.

Key Words: *Salmonella*, *Listeria*, bulk tank milk

148 Dry-off procedures on US dairy operations. Jason E. Lombard*[1], Gosia Zobel[2], Ashley E. Adams[1,3], Charles P. Fossler[1], Chelsey B. Shivley[1,3], Natalie J. Urie[1,3], and Christine A. Kopral[1], *[1]USDA:APHIS:VS:Center for Epidemiology and Animal Health, Fort Collins, CO, [2]University of British Columbia Animal Welfare Program, Vancouver, BC, Canada, [3]Colorado State University, Fort Collins, CO.*

The National Animal Health Monitoring System′s Dairy 2014 study collected information via face-to-face interviews from 17 states. An objective of the study was to describe dry-off procedures on US dairy operations. Size categories were created based on number of lactating and dry cows: small (30–99 cows), medium (100–499 cows), and large (500 or more cows). During 2013, the operation average dry period length was 57.1 d. Almost all operations (98.8%) dried off at least some cows based on a set schedule, and 81.3% of operations dried off at least some cows based on a minimum milk-production level. Overall, 88.1% of cows were dried off on a set schedule and 11.9% were dried off based on milk production. Almost 3-fourths of operations (73.6%) abruptly stopped milking some cows at dry-off, while 47.5% of operations gradually stopped milking some cows at dry-off. However, only 10.2% of cows experienced gradual cessation of lactation, while 89.8% experienced abrupt cessation. At dry-off, 15.0% of operations performed a California Mastitis Test; 65.7% reduced the quality/energy content of feed; 10.9% restricted access to feed; and water was restricted on 3.9% of operations. More than 3-fourths of operations (80.3%) treated all cows with dry-cow intramammary antibiotics and, overall, 93.0% of cows were treated. Cephapirin benzathine was the single most commonly administered antibiotic (31.6% of cows dry-treated). Alcohol pads were used to clean teat ends before administering dry-cow antibiotics on 90.3% of operations. Dry-cow intramammary antibiotics were not used on 9.2% of operations. Internal teat sealants were used on 37.3% of operations, while external teat sealants were used on 14.5%. The percentage of operations using sealants on all cows increased as herd size increased. The operation average cost of antibiotics and sealants used at dry-off was $13.09 per cow. Gradual cessation of milking, which may reduce new intramammary infections during dry-off, is infrequently practiced in the US. Most cows are treated with antibiotics at dry-off, but this practice may be examined due to pressure to reduce antibiotic use in livestock and poultry.

Key Words: dry-off procedure, antibiotic, teat sealant