models contribute to the study of CW and CCI, and could be employed to predict the productive and reproductive response of primiparous beef cows grazing Campos grassland.

Key Words: rangeland, grazing management, cow production

686 Associations between milk quality, type of bedding, and milking management on large Wisconsin dairy farms. Robert F. Rowbotham*[1,2] and Pamela L. Ruegg[1], [1]*University of Wisconsin-Madison, Madison, WI,* [2]*Grande Cheese Company, Brownsville, WI.*

The objective of this study was to determine bedding and milking management practices associated with bulk tank (BT) quality (SCC and TBC), on large Wisconsin dairy farms. Ninety percent (325 of 360) of Wisconsin dairy farms producing in excess of 11,340 kg of milk daily participated in a personally administered survey consisting of 60 scripted questions. Milk quality test results were obtained from milk marketers for a 2-year period for 255 farms. Results were analyzed for 230 farms using the same bedding type (IB = Inorganic, MB = Manure solids, OB = Other organic) in all pens during the entire study period. Farms milked between 270 and 8,100 cows (mean = 908), selling an average of 33,714 kg daily. Farms which herd tested (n = 204) had an average RHA of 12,831 kg (IB), 11,746 kg (MB), or 11,973 kg (OB). The relationships between bulk tank somatic cell score (BTSCS), bedding type, and management practices were analyzed in a repeated measures model using PROC MIXED (SAS 9.4). Bulk tank SCS was least in the winter and spring, intermediate in the fall, and greatest in the summer with seasonal differences decreasing with increasing farm size ($P < 0.001$). Farms using Iodine based postdip had greater BTSCS than those using other postdips ($P = 0.011$) and BTSCS was lower on farms drying teats and wiping off predip than on those not drying teats ($P < 0.001$). Farms with a WMP using MB had a greater BTSCS than those using IB or OB. The SCS for farms without a WMP was less for herds using IB as compared with herds using OB ($P < 0.05$). Bulk TBC did not vary seasonally (Tukey adjusted $P > 0.2$) or among bedding types (Tukey adjusted $P > 0.75$).

Table 1 (Abstr. 686). Bulk tank SCS and SCC among farms with differing bedding types and presence of written milking protocols (WMP)

WMP	Bedding	n	SCS	SE SCS	SCC ($\times 10^3$)
Yes	Inorganic	122	4.06^b	0.08	210^b
Yes	Manure	17	4.55^c	0.14	293^c
Yes	Other organic	31	4.09^b	0.11	213^b
No	Inorganic	34	3.76^a	0.10	169^a
No	Manure	8	3.87^{ab}	0.16	183^{ab}
No	Other organic	18	4.30^{bc}	0.13	245^{bc}

[abc]Results with different superscripts within column differ (Tukey adjusted $P < 0.05$).

Key Words: bedding, milk quality, SCC

687 Using routinely recorded herd data to predict and benchmark herd and cow health status. Kristen L. Parker Gaddis*[1], John B. Cole[2], John S. Clay[3], and Christian Maltecca[4], [1]*Department of Animal Sciences, University of Florida, Gainesville, FL,* [2]*Animal Genomics and Improvement Laboratory, ARS, USDA, Beltsville, MD,* [3]*Dairy Records Management Systems, Raleigh, NC,* [4]*Department of Animal Science, North Carolina State University, Raleigh, NC.*

Genetic improvement of dairy cattle health using producer-recorded data is feasible. Estimates of heritability are low, indicating that genetic progress will be slow. Improvement of health traits may also be possible with the incorporation of environmental and managerial aspects into herd health programs. The objective of this study was to use the more than 1,100 herd characteristics that are regularly recorded on farm test days to benchmark herd and cow health status. Herd characteristics were combined with producer-recorded health event data. Parametric and nonparametric models were used to predict and benchmark health status. Models implemented included stepwise logistic regression, support vector machines, and random forests. At both the herd- and individual-level, random forest models attained the highest accuracy for predicting health status in all health event categories when evaluated by 10-fold cross validation. Accuracy of prediction (SD) ranged from 0.59 (0.04) to 0.61 (0.04) in logistic regression models, 0.55 (0.02) to 0.61 (0.04) in support vector machine models, and 0.61 (0.04) to 0.63 (0.04) with random forest models at the herd level. Accuracy of prediction (SD) at the cow level ranged from 0.69 (0.002) to 0.77 (0.01) for support vector machine models and 0.87 (0.06) to 0.93 (0.001) with random forest models. Results of these analyses indicate that machine-learning algorithms, specifically random forest, can be used to accurately identify herds and cows likely to experience a health event of interest. It was concluded that accurate prediction and benchmarking of health status using routinely collected herd data is feasible. Nonparametric models were better able to handle the large, complex data compared with traditional models. Further development and incorporation of predictive models into herd management programs will help to continue improvement of dairy herd health.

Key Words: health, machine learning, prediction

688 Using parlor data to map liner performance. John F. Penry*[1], Stefania Leonardi[2], John Upton[3,1], Paul D. Thompson[1], and Douglas J. Reinemann[1], [1]*University of Wisconsin-Madison, Madison, WI,* [2]*Universita delgi Studi di Milano, Milan, Lombardia, Italy,* [3]*Animal & Grassland Research & Innovation Centre, Teagasc, Moorepark, Co. Cork, Ireland.*

Liner performance can be described in terms of milking gentleness, speed and completeness of milk-out, with gentleness being the most important. It is widely accepted that peak milking speed will be increased as vacuum and the milking phase of pulsation are increased, but it is also known that raising the vacuum and b-phase duration increases teat end congestion. Increasing liner compression (LC) also results in higher milk flow rates while also elevating the risk of teat end hyperkeratosis. The aim of this experiment was to characterize the average milk flow rate of 8 liners, representing differing LC estimates, across a range of pulsation and vacuum settings. The 36-d trial involved an 80-cow herd milking 2× at the UW-Madison Dairy Cattle Centre. The parlor was fitted with 8 commercial liners (round, triangular, vented and non-vented models), which were rotated through all stalls during the trial. Treatments were a combination of selected system vacuum and pulsation settings with a fixed 295ms d-phase. Nine treatments were used representing commercially applied settings for vacuum and pulsation applied over 3 equal periods in a central composite experimental design. Treatment settings for system vacuum level ranged from 36 to 49 kPa and pulsator ratios from 50:50 to 70:30. During the course of each 9 treatment cycle, the central point (42.3 kPa and 60:40 pulsator ratio) was applied every third day allowing for an estimate of within treatment variability. Parlor average milk flow (AMF) data were analyzed using a MIXED model in SAS 9.3. This model assessed the effect of liner, treatment, milking stall, milking time and milker. The SAS RSREG procedure was used to produce individual liner response surfaces. Liners with lower LC did not produce as high an AMF under high vacuum and long b-phase