

POSTER

Technical Session 5

From Milk Analysis to Decision Support: Unlocking Insights for Sustainable dairy management**Optimization of Differential Somatic Cell Count (DSCC) Threshold for Enhanced Early Screening of Escherichia coli mastitis in Dairy Cattle**Kuo Ya Hsin^[1], Yeh Yi Hsin^[1], Wang Szu Han^[1], Shiao Jen Wen^[1], Huang Jeng Fang^[2]^[1] Northern Region Branch, Taiwan Livestock Research Institute, ^[2] Taiwan Livestock Research Institute

The differential somatic cell count (DSCC) is a critical parameter representing the combined proportion of neutrophils and lymphocytes in milk. While the international standard is typically 65%, its sensitivity for acute pathogens like *Escherichia coli* (*E. coli*) often requires local optimization to serve as an effective early-warning tool. This study aims to establish a data-driven DSCC threshold, using the clinical somatic cell count (SCC) benchmark of > 200,000 cells/mL to maximize early *E. coli* detection.

Milk samples (n=100) from commercial farms were analyzed for SCC, DSCC, and bacterial culture. To ensure universal applicability, a likelihood ratio test (LRT) within a linear mixed model (LMM) was first used to confirm that farm-associated management had no significant impact on DSCC variation. Secondly, an LMM investigated the relationship between *E. coli* bacterial load and DSCC levels. Finally, the optimal threshold was determined via ROC curve analysis, and Fisher's exact test was used to calculate the odds ratio (OR) for infection risk.

The LRT results confirmed minimal farm-to-farm variation ($P = 0.595$, $ICC = 0.02$), justifying the pooling of data across environments. Subsequent LMM analysis revealed no significant linear correlation between *E. coli* load and DSCC ($P = 0.392$), supporting a "Saturated Immune Response" model where leukocyte recruitment reaches a biological maximum immediately upon pathogen detection. ROC analysis identified an optimal threshold of 59.3%, achieving an exceptional 96.7% sensitivity. Cows exceeding this threshold exhibited 3.12 times higher odds of harboring *E. coli* ($OR = 3.12$). In conclusion, the 59.3% threshold establishes DSCC as a highly sensitive alert trigger, enabling precise interventions before *E. coli* induces acute clinical outbreaks.