M131 Interactions among pregnancy rate, turnover ratio, and herd structure. W. Li* and V. Cabrera, *University of Wisconsin-Madison, Madison, WI.*

The aim of this study was to investigate the interactions among 21-d pregnancy rate (21-d PR), herd turnover rate (TR), and herd structure demographics over time. We developed a monthly Markov chain model that mimics calf, heifer, and cow transition events according to 21-d PR and TR probabilities. The model was used to simulate a 100-adult cow herd with 16% 21-d PR and 35% TR and their corresponding calves and heifers. Monthly herd statistics were extracted and summarized by months of age for young stock, and lactation, milking, dry, pregnancy, and days in milk (DIM) for adult cows when the adult herd reached steady state after a managerial change was imposed. As expected, the overall proportion of pregnant cows increased from 48.4% to 59.5% as the 21-d PR increased to 25%, but this increase occurred only in multiparous cows (from 27.0% to 37.7%), which overcompensated a lower proportion of pregnant primiparous cows (from 22.5% to 21.8%). The percentage of dry cows increased by 1.9% points (to 11.4%). The relationship of the greater 21-d PR and lactation period was that there were 1.2% points more early lactation cows (<120 DIM), while 2.3% points less late lactation cows (>240 DIM). Increased 21-d PR decreased overall culling (0.57 heads/ mo), increased the proportion of non-reproductive culling (6.8% points to 86.9%), increased the percent of pregnant cows in DIM < 150 (14.2% points), decreased the herd average DIM (12.91 d), and increased the positive balance of replacements by 1.20 heads/ mo. When decreasing TR from 35 to 25%, the non-reproductive culling proportion of primiparous cows decreased (3.9% points), but the reproductive culling proportion increased for all cows (2.5% points). With lower TR, the average DIM of the herd increased by 3.44 d together with a greater proportion of middle and late lactation cows (1.1% points). Our results indicate that the relationship of the adult herd 21-d PR versus TR to breakeven the supply and demand of replacements followed a quadratic function: 21-d PR = $0.7036(TR)^2 - 0.1198(TR) + 0.1448$ (R^2 = 0.9998) portraying a diminishing return of 21-d PR to compensate same change of TR at greater levels of 21-d PR.

Key Words: herd structure, 21-d pregnancy rate, turnover ratio