

### Association between milk yield and fertility by health status during early lactation

Opposite trends for milk yield and fertility traits have been reported. However, the confounding effect of health status adds complexity to these associations. Our objective was to test the association between milk yield during early lactation and fertility variables, considering the effect of health during the first 50 DIM. Holstein cows (n=11,733) calving in 16 farms in 4 regions (NE, MW, SE, and SW) were enrolled at parturition and monitored weekly for reproductive and health events. Pregnancy was diagnosed by ultrasonography on d32 after AI and monthly DHI milk yields were available. Cows with dystocia, twins, retained fetal membranes, metritis, clinical endometritis, subclinical ketosis, mastitis, displaced abomasum, or pneumonia within 50 DIM were considered as unhealthy (UH50; n=6,437) and the remaining cows were identified as healthy (HT50; n=4,052) to control for the effect of disease. Daily average milk until 90 DIM (MLK90) was categorized by quartiles into low, mid, and high. Fertility variables were pregnancy to first AI (PAI1) and pregnant at 305 DIM (P305). Logistic regression and ANOVA were used for the analyses, with parity number and calving season included as fixed effects and farm as a random effect in the models. Logistic regression and ANOVA results for UH50 and HT50 cows are presented in Table 1. Odds of PAI1 did not differ for UH or HT populations between MLK90 levels; in contrast, odds of P305 increased sequentially from low-med-high MLK90 categories. Similarly, MLK90 was greater in cows pregnant at 305 DIM in both populations.

Table 1: Odds (95%CI) of pregnancy at first AI and at 305 DIM and average MLK90 for different levels of milk yield (90 DIM) and pregnancy status in UH50 and HT50 subpopulations

MLK90 (kg)	UH50		MLK90 (kg)	HT50	
	PAI1	P305		PAI1	P305
Low (<32.7)	0.91 (0.78-1.06)	0.39 (0.33-0.46)	Low (<33.9)	1.06 (0.83-1.36)	0.50 (0.36-0.70)
Mid (32.7-45.8)	0.97 (0.86-1.08)	0.76 (0.66-0.86)	Mid (33.8-47)	0.97 (0.82-1.16)	0.84 (0.67-1.06)
High (ref; >45.8)	-	-	High (ref;>47)	-	-
	MLK90 (kg)-UH50			MLK90 (kg)-HT50	
Pregnant	no	38.5±0.16	37.8±0.27	39.6±0.22	36.4±0.23
	yes	38.2±0.20	38.5±0.14	39.3±0.28	38.5±0.12
p-value		0.21	0.02	0.36	<0.0001

Keywords: Milk, fertility

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**REVIEW:**

**REVIEWER COMMENTS:**

L14: What is "low-med-high"? Presumably this should read "from low to high" or "increased as MILK90 category increased".<BR> Please improve table layout, as it is difficult to decipher as presented.