COW AND QUARTER CHARACTERISTICS ASSOCIATED WITH TEAT DIMENSIONS

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Introduction

During the last decades, genetic selection in dairy cows has resulted in smaller teats. Nevertheless, there is still a considerable variation in teat sizes and shapes between herds and between cows belonging to the same herd (2). Still, cows within a herd are traditionally milked with the same milking machine settings. Obviously, these settings are for some of the cows far from optimal. Since good milking conditions are a necessity to preserve good teat condition, milking performances and udder health, it is not peculiar that some of the adverse effects related to machine milking could be avoided if teat size could be standardized within a herd (2). In order to obtain more uniform teat sizes in a herd, knowledge on which level (herd, cow, quarter) most variation resides as well as on the factors potentially related with teat dimensions is needed.

Materials and methods

Teat length and diameters were determined using an objective 2D vision based measuring device developed at ILVO (4). Data consisted of measurements of 2715 teats from 683 Holstein cows of 15 herds in Flanders from October 2008 to February 2009. All teats were measured prior to milking. Month (October-November, December, February), parity (1, 2, 3+), lactation stage (0-60, 61-120, 121-180, 181-240, 240+ days in milk), milk production near test-day and quarter position were added to the database. Linear mixed regression models were built with teat length and teat diameter at 75%, 50% and 25% of the total teat length, respectively, as dependent variables using MLwiN 2.19. To approximate normality, a reciprocal transformation of teat diameter multiplied by 1000 (D75, D50, D25) was used. Herd and cow were included as random effects whereas the different potentially associated factors were included as fixed effects. The regression-model building process to identify risk factors involved several steps as previously described (1).

Results and discussion

Table 1 shows the multilevel linear models for teat length and the reciprocal transformations of teat diameter (D75, D50, D25). Teat length and diameters at the barrel and the tip significantly vary between quarter positions. Hind teats are shorter and slightly smaller than front teats. Additionally, teat length and diameter increase with parity number and teats lengthen with advancing lactation, corresponding well with previous findings (2, 3). The observed decrease in teat diameters with lactation stage (Figure 1) is not supported by previous studies (2, 3). Those studies, however, monitored teats over time. To get more insight in the changes of teat dimensions over time, a longitudinal study is needed. The largest variation in teat length resides at the quarter level whereas for teat diameters the largest variation resides at the cow level (data not shown). Consequently, adapted milking installation settings for front versus hind teats and

for parity and lactation stage could most probably contribute to better teat condition and milking performances. Yet, continuous selective breeding remains essential.

References

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Table 1. Final multilevel linear models describing cow- and quarter factors associated with teat length and transformed teat diameter at 75%, 50% and 25% of the teat.

Independent variable	$N_{quarters}$	Length (mm)			D75 (mm)			D50 (mm)			D25 (mm)		
		β[1]	SE[2]	*P*-value	β	SE	*P*-value	β	SE	*P*-value	β	SE	*P*-value
Constant		52.0	0.7	…	36.5	0.5	…	39.4	0.5	…	46.8	0.4	
Quarter position				<0.001			NS			0.58			<0.001
LF	679	ref.[3]	…					ref.	…		ref.	…	
LR	678	-7.8	0.3					0.1	0.2		1.2	0.1	
RR	679	-8.0	0.3					0.0	0.2		1.4	0.1	
RF	679	-0.4	0.3					0.2	0.2		0.2	0.1	
Parity				<0.001			<0.001			<0.001			<0.001
1	959	ref.	…		ref.	…		ref.	…		ref.	…	
2	583	2.3	0.6		-1.4	0.3		-1.7	0.4		-2.1	0.4	
3+	1173	4.2	0.5		-2.9	0.3		-3.8	0.3		-3.9	0.3	
Lactation stage				0.04			<0.001			<0.001			NS
0-60	468	ref.	…		ref.	…		ref.	…				
61-120	631	0.5	0.7		1.4	0.4		1.4	0.4				
121-180	346	2.0	0.9		0.3	0.4		1.2	0.4				
181-240	321	1.7	0.9		2.0	0.4		1.6	0.4				
240+	949	1.7	0.7		2.2	0.3		1.9	0.4				
Quarter position*Parity	2715			NS			NS			0.04			NS

[1]Linear regression coefficient. [2]Standard error of the variance estimates of the parameter. [3]Reference.

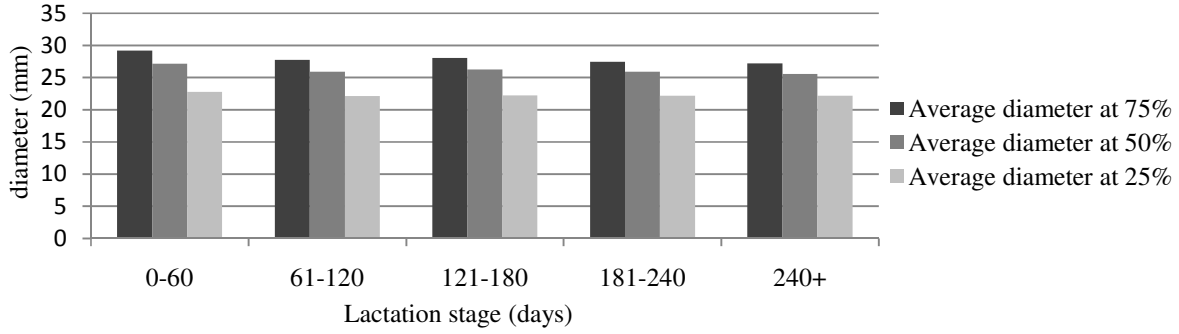

Figure 1. Average of measured, non transformed teat diameters per lactation stage.