

Incomes of people living in the rural area of Eastern Turkey are mainly from livestock production since this region has relatively fertile pastures and the climate is not suitable for economic crop production.

In a dairy farm, one of the main goals is to raise calves as economically as possible. Therefore, expenses in calf raising must be reduced by employing improved methods. For that reason, cold milk feeding could be helpful by reducing costs of electricity used for heating of milk-fed calves. Also, a considerable amount of labour can be saved by using the method.<sup>3,7</sup> In cold milk feeding, there is no need to maintain the milk at a constant temperature (38-40°C). Where cold feeding is practised, temperatures of between 12° and 20°C are recommended as being ideal.<sup>9</sup>

# Effects of cold and warm milk feeding on the growth characteristics of Holstein Friesian calves

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This study was undertaken to determine the effect of cold and warm feeding programmes on the growth characteristics of Holstein Friesian calves reared in the east region of Turkey.

## Material and method

The experiment was carried out at Atatürk University, Erzurum, Turkey. Twenty one new-born Holstein Friesian calves were used in this research. The calves were housed in the calf barn which contained individual pens, furnished with feeders and milk buckets.

Eleven male and 10 female calves were assigned to cold and warm milk feeding groups. The temperature of milk offered to the calves in the warm milk group was 36-38°C. After milking, a heater was used to keep the milk warm. Calves in the cold milk group were fed milk whose temperature ranged from 15 to 21°C (average 18°C). The milk temperature was maintained by keeping milk in the barn without heating.

The calves were weaned at 5 weeks of age as suggested by Yanar *et al.*<sup>11, 12, 13</sup> The amount of milk offered to the calves was 8% of their birth weights. The quantity of milk was kept constant during the milk feeding period. Milk was given once a day by using bucket as used by Yanar and Ockerman.<sup>10</sup>

During the experiment, hay in good quality and two different types of commercial starter was fed to the calves. Water was also available in the individual pens.

Body weights and measurements such as body length, chest depth, heart girth, height at withers were obtained at birth, weaning, 4 and 6 months of age. The experimental data were statistically analysed by using SAS statistics programme.<sup>8</sup>

## Results and discussion

The data related to various weights at birth, weaning, 4 and 6 months of age are presented in table 1.

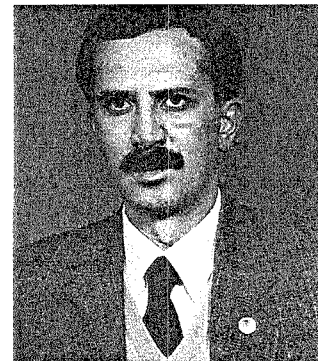
The average birth weights of the calves in the cold and warm milk feeding groups were 33.2 and 35.7 kg respectively. The birth weights of male and female calves

Table 1: Weights and Weight Gains in Holstein Friesian Calves

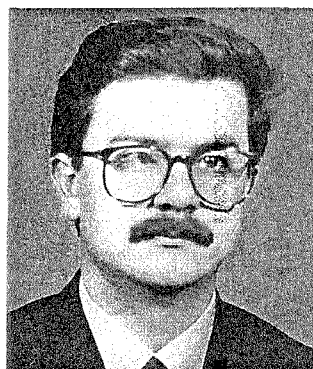
	Milk Temperature			Sex		
	Warm n = 11 X ± Sx	Cold n = 10 X ± Sx		Male n = 11 X ± Sx	Female n = 10 X ± Sx	
<b>Weights at (kg):</b>						
Birth	35.7 ± 1.6	33.2 ± 1.7	NS	35.6 ± 1.6	33.3 ± 1.7	NS
Weaning	43.5 ± 2.3	41.6 ± 2.4	NS	44.8 ± 2.3	40.3 ± 2.4	NS
4 Months	87.5 ± 4.7	97.1 ± 4.9	NS	99.4 ± 4.7	85.2 ± 4.9	NS
6 Months	130.3 ± 5.0	128.8 ± 5.3	NS	138.1 ± 5.0	121.0 ± 5.3	*
<b>Daily Weight Gains (kg)</b>						
<b>Between:</b>						
Birth - Weaning	0.22 ± 0.03	0.24 ± 0.03	NS	0.26 ± 0.03	0.20 ± 0.03	NS
Weaning - 4 Months	0.52 ± 0.03	0.65 ± 0.03	*	0.64 ± 0.03	0.53 ± 0.03	*
4 Months - 6 Months	0.71 ± 0.03	0.53 ± 0.03	**	0.64 ± 0.03	0.60 ± 0.03	NS
Birth - 6 Months	0.53 ± 0.02	0.53 ± 0.02	NS	0.57 ± 0.02	0.49 ± 0.02	*

NS : Non-Significant  
\* : P < 0.05  
\*\* : P < 0.01  
X ± Sx : Mean ± Standard Error of Mean

Dr Naci Tüzemen



Dr Feyzi Ugur has been studying in the Doctorate Programme of the Department of Animal Science at Atatürk University. Dr Mete Yanar was recently appointed to the Associate Professor position in the same Department. Dr Naci Tüzemen and Dr Macit Özhan have been working in the Department of Animal Science as full professors



Dr Feyzi Ugur



Dr Mete Yanar

Dr Macit Özhan



Table 2: The Gains in the Body Measurements of Holstein Friesian Calves

	Milk Temperature			Sex		
	Warm	Cold		Male	Female	
	n = 11 X ± Sx	n = 10 X ± Sx		n = 11 X ± Sx	n = 10 X ± Sx	
<b>Between Birth and Weaning</b>						
Body Length	4.3 ± 0.7	4.4 ± 0.7	NS	5.9 ± 0.7	2.8 ± 0.7	**
Height at Withers	2.7 ± 0.6	1.6 ± 0.6	NS	2.8 ± 0.6	1.5 ± 0.6	NS
Chest Depth	2.7 ± 0.4	2.5 ± 0.4	NS	3.1 ± 0.4	2.1 ± 0.4	NS
Heart Girth	5.9 ± 1.1	5.7 ± 1.1	NS	7.2 ± 1.1	4.4 ± 1.1	NS
<b>Between Weaning and 4 Months of Age</b>						
Body Length	13.5 ± 0.9	14.8 ± 0.9	NS	13.9 ± 0.9	14.4 ± 0.9	NS
Height at Withers	12.3 ± 0.9	13.5 ± 0.9	NS	12.6 ± 0.9	13.2 ± 0.9	NS
Chest Depth	7.4 ± 0.5	10.2 ± 0.5	**	9.1 ± 0.5	8.5 ± 0.5	NS
Heart Girth	21.8 ± 1.2	23.8 ± 1.3	NS	23.2 ± 1.2	22.4 ± 1.3	NS
<b>Between 4 and 6 Months of Age</b>						
Body Length	12.4 ± 1.1	11.2 ± 1.1	NS	11.9 ± 1.1	11.7 ± 1.1	NS
Height at Withers	8.7 ± 0.6	6.1 ± 0.6	**	7.5 ± 0.6	7.3 ± 0.6	NS
Chest Depth	4.8 ± 0.7	2.5 ± 0.7	*	3.2 ± 0.7	4.1 ± 0.7	NS
Heart Girth	14.6 ± 2.0	12.2 ± 2.1	NS	15.9 ± 2.0	10.9 ± 2.1	NS
<b>Between Birth and 6 Months of Age</b>						
Body Length	29.5 ± 1.3	30.1 ± 1.4	NS	30.8 ± 1.3	28.8 ± 1.4	NS
Height at Withers	23.9 ± 0.9	21.0 ± 0.9	*	22.7 ± 0.9	22.2 ± 0.9	NS
Chest Depth	14.9 ± 0.5	14.0 ± 0.5	NS	14.2 ± 0.5	14.7 ± 0.5	NS
Heart Girth	41.5 ± 2.5	42.6 ± 2.6	NS	44.5 ± 2.5	39.6 ± 2.6	NS

NS : Non-Significant

\* : P&lt;0.05

\*\* : P&lt;0.01

X ± Sx : Mean ± Standard Error of Mean

were 35.6 and 33.3 kg respectively. The findings are in agreement with results of Cengiz,<sup>1</sup> Tumer *et al.*<sup>6</sup> The weaning weights of the calves given cold and warm milk were 41.6 and 43.5 kg respectively. Milk temperature treatments did not have any significant ( $P>0.05$ ) influence on the weaning weights of the Holstein Friesian calves (table 1). Also, the daily weight gains between birth and weaning were not affected by milk temperatures.

The weights at four months of age were not significantly affected ( $P<0.05$ ) by the milk temperatures and sex (table 1). Four month weights of calves in cold and warm milk groups were 97.1 and 87.5 kg respectively. The daily weight gains between weaning and 4 months of age were significantly different ( $P<0.05$ ) for the milk temperatures as can be seen in table 1.

The average six month weights of Holstein Friesian calves were 128.8 kg for the cold milk group and 130.3 kg for the warm milk group. Two different milk temperatures did not have any significant effect on the 6 month weight and daily weight gains between birth and 6 months of age (table 1). Similar results were also reported by several researchers.<sup>2,4,5</sup>

The gains in the body measurements such as body length, height of withers, chest depth and heart girth were also not significantly affected by the milk temperature treatments (table 2).

### Conclusion

The results obtained from the study suggest that Holstein Friesian calves raised in Eastern Turkey could be fed cold milk instead of warm milk. Then, a considerable

amount of heating cost and labour could be saved and incomes of the calf breeders might increase.

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