

The Investigation on the Effects of Free and Dependent Housing Types on Cow Foot Diseases and Claw Deformations in Turkey, Mus Province

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Abstract: This study aims to determine the effects of different housing types on cow foot diseases and claw deformations in Turkey, Mus Province. The study group consisted of 1292 animals which were randomly selected and sheltered in 48 free and 33 dependent stables between July 2011 and August 2012. The rate of deformity observed in claws of cows in free stables was found to be 61.48% while this rate was 38.16% in dependent stables. The studies found the rates of cow claw deformities in free stables as follow: 2.3% blunt claw, 3.50% scissors claw, 6.01% sharp claw, 3.13% split claw, 2.63% flat and plump claw and 4.38% twisted claw. The rates in dependent stables are as follow: 1.62% blunt claw, 1.83% scissors claw, 3.65% sharp claw, 1.62% split claw, 1.82% flat and plump claw and 1.22% twisted claw. The rates of foot diseases of cows in free stables were found to be as follow: 3.13% heel erosion, 2.13% heel apse, 1.00% interdigitalhyperplasia, 1.75% interdigital phlegmon, 1.38% laminitis, 1.00% digital dermatitis, 2.63% white line disease, 4.01% heel and plantar crush. These rates in dependent stables are as follow: 1.83% heel erosion, 1.22% heel apse, 0.81% interdigital hyperplasia, 0.61% interdigital phlegmon, 2.2% laminitis, 0.81% digital dermatitis, 0.81% white line disease, 1.42% heel and plantar crush.

Key words: Claw lesions, tie stalls, free stalls, foot diseases, prevalence

INTRODUCTION

All around the world, dairy cows are analyzed in a wide spectrum within different climate areas, housing and husbandry systems (Andreassen and Forkman, 2012; Clarkson *et al.*, 1996; Cook, 2003). Claw lesions are common in dairy cows raised with different husbandry systems. These diseases result in significant economic losses such as decrease in fertility, early disposal in husbandry and treatment costs (Green *et al.*, 2002; Sagliyan *et al.*, 2010). The individual factors that lead to lameness are as follows: animal age, weight, leg and claw structure (Manson and Leaver, 1989), lactation process, presence of foot lesion (Arkins, 1981; Barker *et al.*, 2009; Holzhauser *et al.*, 2008). Other factors regarded as risk factors for herds in cow husbandry are as follow: housing systems (Arkins, 1981), nutrition pattern, size and animal capacity of stable (Sagliyan *et al.*, 2010), floor characteristics, exposure to excretion and humidity (Wells *et al.*, 1995).

Dairy cow housings generally have a negative effect on the incidence of claw lesions. Especially, covered dairy cow systems could have negative effect but a well-designed housing system could decrease this effect (Bergsten, 2001). Many studies (Cook and Nordlund,

2009; Thysen, 1987) showed that the rates of foot lesion of cows raised in free housings are higher than those in dependent stables. Studies conducted on lameness prevalence in North America showed that these rates rate 20-22% in dependent stables and 23-27% in free stables (Cook, 2003; Zurbrigg *et al.*, 2005). Studies conducted on prevalence of foot lesions in cow husbandry enterprises in Europe showed that 50% of the lesions result from dependent stable systems (Sogstad *et al.*, 2005), 70-80% result from free housing systems (Sogstad *et al.*, 2005; Somers *et al.*, 2003). In their study, conducted on foot diseases of cow herds risen in 33 free stables in Germany, Dippel *et al.* (2009) found that prevalence of lameness related to foot lesions could be >48%.

According to claw disorder etiologies, they can be divided into three main categories being infectious, metabolic, mechanic and traumatic (Greenough and Vermunt, 1991). Contagious or partly contagious claw lesions such as digital dermatitis, heel erosions and interdigital phlegmon are mostly affected from environmental factors. The reasons of lesions such as claw deformations and laminitis are in variety. The prevalence and intensity of these lesions vary by mechanic factors such as housing floors, abnormal claw or leg structures and systematic factors such as Rumen

acidosis, ketosis, endotoxemia and malnutrition (Cook and Nordlund, 2009; Sogstad *et al.*, 2005). Individual factors such as lactation period, weight and genetic structure, housing conditions, environment, herd management and nutrition are also effective on claw lesions (Bergsten, 2001; Heinonen *et al.*, 2013; Smilie *et al.*, 1996).

This study aims to determine the effects of different housing types on cow foot diseases and claw deformations and the conditions of existing housings used for cow husbandry in Mus Province.

MATERIALS AND METHODS

In field study, a total of 81 housings were visited. These housings were randomly selected from city center, districts and towns of Mus province where animal population was intense between June 2011 and August 2012. Of these housings, 48 (n = 799 cows) were free and 33 (n = 493 cows) were dependent housings. The study population consisted of 1292 cows which were raised in these housings and had different species, sex and age.

Initially, a detailed anamnesis of enterprises was taken from the enterprise owners in visited housings during the research. Afterwards, clinical examination of animals was performed for foot diseases. Lameness and lameness intensity were determined by means of inspection on standing and walking animals. After the diseased foot was cleaned, Classical Holding and Tying Methods were used for examination and treatment where necessary. In this examination, the proportion between claw size and animal body, claw deformations, disorders in heel and plantar, disorders in interdigital region and corona region were investigated. All the detected cases were recorded to be evaluated. Animal owners were informed about the reasons of claw deformations and foot diseases, precautions, period of claw cutting and cutting techniques.

The obtained data records were processed in Herd Observation Record Forms. SPSS for Windows 17.0 (IBM)

Descriptive Statistics Analysis Crosstabs Method and χ^2 -test were used to evaluate the data records and the findings were analyzed in terms of the effect of free and dependent stable systems on foot diseases and claw deformations of cows. The obtained results were considered to be significant as $p < 0.5$ and 0.001 .

RESULTS

It was found that both free and dependent housings were generally insufficient and unplanned as usage area for animals. In addition, it was found that ventilation systems were insufficient (n = 15) or did not exist (n = 11) in housing enterprises therefore, there was a sharp ammoniac and stools scent. Only 7 of these enterprises had a stable plan which was in accordance with dependent cow husbandry. Most of the stable floors were concrete or tile (n = 26) and others were soil ground. In addition, it was found that due to the lack of (n = 9 housings) or insufficient/inappropriate (n = 17) excretion and urinary in housing grounds, excretion and urinary accumulate on the ground and especially the back feet of animals stay in stools and urinary accumulations. It was found that the housing grounds of the free enterprises were not appropriate. It was observed that 14 enterprises had soil and 37 had concrete ground. It was observed that urinary accumulated in holes and the cleaning was not sufficient.

In investigations, it was found that the necessary importance was not attached to claw care and the extended claws were not cut in time. In animals, claws of which were cut, it was found that the inappropriate cutting process resulted in claw shape deformities and diseases.

The data on claw deformations in cows sheltered in dependent and free stables by field study are presented in Table 1 and the data on foot diseases are presented in Table 2. The rate of claw deformities and foot diseases of cows sheltered in free stables were found to be 61.84% and this rate was 38.16% in dependent stables.

Table 1: Distribution of claw deformities of cows sheltered in free and dependent stables

Housing types	Claw deformities						No. deformation	Total
	Blunt claw	Scissors claw	Sharp claw	Split claw	Flat and plump claw	Twisted claw		
Free stable								
Count	18.00	28.00	48.00	25.00	21.00	35.00	624.00	799.00
Within housing type (%)	2.25	3.50	6.01	3.13	2.63	4.38	78.10	100.00
Within claw deformity (%)	69.23	75.68	72.73	75.76	70.00	85.37	58.92	61.84
Dependent stable								
Count	8.00	9.00	18.00	8.00	9.00	6.00	435.00	493.00
within housing type (%)	1.62	1.83	3.65	1.62	1.82	1.22	88.24	100.00
Within claw deformity (%)	30.77	24.32	27.27	24.24	30.00	14.63	41.08	38.16
Total								
Count	26.00	37.00	66.00	33.00	30.00	41.00	1059.00	1292.00
Within housing type (%)	2.01	2.86	5.11	2.55	2.32	3.17	81.97	100.00
Within claw deformity (%)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table 2: Distribution of foot diseases of cows sheltered in free and dependent stables

Housing types	Diseases									Total
	Erosion ungulae	Heel apse	Interdigital hyperplasia	Interdigital phlegmon	Laminitis	Digital dermatitis	White line disease	Heel and plantar crush	Healthy	
Free stable										
Count	25.00	17.00	8.00	14.00	11.00	8.00	21.00	32.00	663.00	799.00
Within housing type (%)	3.13	2.13	1.00	1.75	1.38	1.00	2.63	4.01	82.98	100.00
Within diseases (%)	73.53	73.91	66.67	82.35	50.00	66.67	84.00	82.05	59.84	61.84
Dependent stable										
Count	9.00	6.00	4.00	3.00	11.00	4.00	4.00	7.00	445.00	493.00
Within housing type (%)	1.83	1.22	0.81	0.61	2.23	0.81	0.81	1.42	90.26	100.00
Within diseases (%)	26.47	26.09	33.33	17.65	50.00	33.33	16.00	17.95	40.16	38.16
Total										
Count	34.00	23.00	12.00	17.00	22.00	12.00	25.00	39.00	1108.00	1292.00
Within housing type (%)	2.63	1.78	0.93	1.32	1.70	0.93	1.93	3.02	85.76	100.00
Within diseases (%)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

In free stables, claw deformations of cows were found to be as follow: 2.25% blunt claw, 3.50% scissors claw, 6.01% sharp claw, 3.13% split claw, 2.63% flat and plump claw and 4.38% twisted claw. The rates in dependent stables were as follow: 1.62% blunt claw, 1.83% scissors claw, 3.65% sharp claw, 1.62% split claw, 1.82% flat and plump claw and 1.22% twisted claw.

Investigating the effect of free and dependent stables on claw deformations, this study showed that the value $p < 0.0018$ indicates a significant relationship between housing type and claw deformations.

The foot diseases of cows in terms of free stables were found to be as follow: 3.13% heel erosion, 2.13% heel apse, 1.00% interdigital hyperplasia, 1.75% interdigital phlegmon, 1.38% laminitis, 1.00% digital dermatitis, 2.63% white line disease, 4.01% heel and plantar crush. These rates in dependent stables are as follow: 1.83% heel erosion, 1.22% heel apse, 0.81% interdigital hyperplasia, 0.61% interdigital phlegmon, 2.2% laminitis, 0.81% digital dermatitis, 0.81% white line disease, 1.42% heel and plantar crush.

The effect of free and dependent housing types on foot diseases of cow was found to be statistically; $p < 0.5$ and $p < 0.001$. Therefore, it was assumed that there was a statistically significant relationship between housing types and foot diseases.

DISCUSSION

Sogstad *et al.* (2005) and Somers *et al.* (2003) found that in European cow raising enterprises, the rates of foot lesions were 50% in free housing systems and 70-80% in dependent housing systems. In other research (Calderon and Cook, 2011; Cook, 2003; Manske *et al.*, 2002b), it was found that the rates of claw lesions were higher in free stables compared to dependent stables. In this study, the rates of foot lesions were found to be 61.84% in free stables and 38.16% in dependent stables.

Fjeldaas *et al.* (2006) found that the rates of abnormal claw structures in free stables were higher than those in dependent stables. In their study conducted on 13 free cow housings (Smilie *et al.*, 1996) found the rate of horn claw disorders to be 34.8%. The claw deformities in free stables of Mus and its surroundings were found to be as follows: 2.25% blunt claw, 3.58% scissors claw, 6.01% sharp claw, 3.13% split claw, 2.63% flat and plump claw and 4.38% twisted claw. The rates in dependent stables were as follow: 1.62% blunt claw, 1.83% scissors claw, 3.65% sharp claw, 1.62% split claw, 1.82% flat and plump claw and 1.22% twisted claw.

In studies conducted on the effects of free and dependent housing types on foot diseases of cows (Cook, 2003; Cramer *et al.*, 2009; Manske *et al.*, 2002b; Simensen *et al.*, 2010), it was found that the rates of foot lesions were higher in free stables than in dependent stables. The research (Manske *et al.*, 2002a) found that the cases of digital dermatitis and plantar-heel erosion were more common in free stables than in dependent stables. The lesions in that study were found to be as follow: 1.08% heel erosion and 0.8% digital dermatitis in dependent stables. These rates were 3.1% heel erosion and 1.8% digital dermatitis in free housing enterprises. The findings are parallel with the results of the research.

In their study on dairy cows, Manske *et al.* (2002b) found that the rates of white line lesions are more common in free stables compared to those in dependent stables. In their study on foot diseases in 37 herds in free stables of UK (Murray *et al.*, 1996) found the following rates: 8% sole hemorrhage, 28% sole ulcer, 22% white line disease, 2% double plantar, 5% foot rot, 4% heel erosion, 5% interdigital hyperplasia. Warnick *et al.* (2001) found following rates in cows sheltered in free stables: 19% sole ulcer, 9% white line disease, 32% heel crush, 11% foot rot. Sogstad *et al.* (2005) found following rates in free stables: 5.7% digital dermatitis, 38% heel erosion, 13.6% white line

hemorrhage, 20.4% solea hemorrhage, 3.2% soleulcer, 9.7% white line erosion. These rates were as follow in dependent stables: 4.2% digital dermatitis, 7.9% heel erosion, 7.3% white line hemorrhage, 11.7% sole hemorrhage, 2.8% sole ulcers, 5.5% white line lesion. In a study conducted on 50 herds in free stables (Kossaibati and Esslemont, 2000) found following rates: 2% sole hemorrhage, 20% sole ulcer, 9% white line disease, 20% heel erosion, 13% foot rot, 2% interdigital hyperplasia. The rates of foot diseases in free stables were found to be as follow: 3.13% heel erosion, 2.13% heel apse, 1,00% interdigital hyperplasia, 1.75% interdigital phlegmon, 1.38% laminitis, 1.00% digital dermatitis, 2.63% white line disease, 4.01% heel and plantar crush. These rates were as follow in dependent cows: 1.83% heel erosion, 1.22% heel apse, 0.81% interdigital hyperplasia, 0.61% interdigital phlegmon, 2.23% laminitis, 0.81% digital dermatitis, 0.81% white line disease, 1.42% heel and plantar crush. These findings were interpreted as foot diseases of cows could differ by housing type and environment.

There is a multi-dimensional interaction between claw and housing floor. Especially hard materials such as concrete result in claw erosion (Vermunt and Greenough, 1995). The floor of housings is very important in terms of claw health. There are some studies which show that soft flooring such as straw and robber mats reduce the pressure on foot (Somers *et al.*, 2003) and remove claw lesions (Hinterhofer *et al.*, 2005). Phillips and Morris (2001) found in their study that the hard floor results in discomfort in cows while walking on such floors reduce the contact between claw and floor. In their study conducted on housing environment (Manske *et al.*, 2002a) found that of 77 stables, 40 had concrete, 32 had rubber and 5 had soil floor. They also found that 7 had robber, 8 had wood rasping and bran on the ground.

CONCLUSION

To conclude, in this study which was conducted in Mus and its surroundings, the effects of housing types on foot diseases and claw deformities of cows were analyzed. Based on the obtained data and observations, it was found that dependent housings are more appropriate areas for foot health of cows compared to free stables. It is believed that the reason of this finding is the suitable housing conditions of dependent stables and the regular foot care in these stables. Moreover, it was found that transmission of pathogen factors from animal to animal could be controlled more easily.

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