

## Incidence of Endemic Diseases in Dairy Herds in Burdur, Konya, and Kırklareli Provinces in Turkey

Cengiz YALÇIN<sup>1,\*</sup>, Savaş SARIÖZKAN<sup>2</sup>, Ahmet Şener YILDIZ<sup>1</sup>, Aytekin GÜNLÜ<sup>3</sup>

<sup>1</sup>Department of Animal Health Economics and Management, Faculty of Veterinary Medicine, Ankara University, Ankara - TURKEY

<sup>2</sup>Department of Livestock Economics, Faculty of Veterinary Medicine, Erciyes University, Kayseri - TURKEY

<sup>3</sup>Department of Livestock Economics, Faculty of Veterinary Medicine, Selçuk University, Konya - TURKEY

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**Abstract:** A prospective longitudinal observation study was carried out with 150 randomly selected dairy herds from among 1684 Turkish Dairy Breeding Association (TDBA) herds in Burdur, Konya, and Kırklareli provinces. The herds were stratified as small scale (less than 11 milking cows) and medium-large scale (more than 10 milking cows). The survey was conducted between October 2003 and September 2004, and each herd was visited at least once per month. As the weighted average of 3 provinces, the most frequent events were fertility disorders (30.2%) and udder diseases (28.3%), followed by puerperal disorders (18.3%) and locomotor system disorders (10.0%). There was, however, wide variation in the incidence rates of several diseases between the provinces, and the differences in the incidence rates of most of the disease categories between the provinces were statistically significant at  $P < 0.05$ . Incidence rates for diseases in all disease categories were higher in small-scale herds than in medium-large scale herds; however, the differences in the incidence rates of metabolic and locomotor system disorders between herd sizes were not statistically significant at  $P < 0.05$ .

**Key Words:** Dairy, endemic, herd-health, incidence, Turkey

### Burdur, Konya ve Kırklareli İlleri'ndeki Süt Sığırcılık İşletmelerinde Endemik Hastalıkların İnsidensi

**Özet:** Burdur, Konya ve Kırklareli illerinde, Türkiye Damızlık Sığır Yetiştiricileri Merkez Birliği'ne bağlı 1684 işletmeden tesadüfi olarak seçilen 150 süt sığırcılığı işletmesi üzerinde ileriye yönelik uzak erimli gözlemsel bir araştırma yürütülmüştür. İşletmeler küçük ölçekli (< 11 sağmal) ve orta-büyük ölçekli (> 10 sağmal) olarak 2 gruba ayrılmıştır. Araştırma Ekim 2003-Eylül 2004 tarihleri arasında (12 ay) yürütülmüş ve her işletme ayda en az bir defa ziyaret edilmiştir. İncelenen 3 ilin ağırlıklı ortalamasına göre en sık görülen hastalıklar fertilité bozuklukları (% 30,2), meme hastalıkları (% 28,3), doğuma ilişkin sorunlar (% 18,3) ve lokomotor sistem hastalıkları (% 10,0) şeklinde sıralanmıştır. Hastalık insidensleri bakımından iller arasında istatistiksel açıdan önemli farklılıklar bulunmuştur ( $P < 0,05$ ). Küçük ölçekli işletmelerdeki hastalık insidensleri, orta ve büyük ölçekli işletmelerinkinden daha yüksek bulunmuştur. Ancak lokomotor ve metabolik hastalıklar arasındaki bu farklılık istatistiksel açıdan  $P < 0,05$  düzeyinde önemli bulunmamıştır.

**Anahtar Sözcükler:** Süt sığırcılığı, endemik, sürü sağlığı, insidens, Türkiye

### Introduction

Endemic livestock diseases are defined as health problems that are always present in livestock production systems to a greater or lesser extent. The main endemic diseases in dairy herds are those related to fertility, udders, locomotion, metabolism, the digestive system, and puerperal disorders.

Endemic diseases are among the most important factors determining the success of a dairy operation. They result in serious declines in the yield of dairy cows and profitability of dairy operations (1,2). For instance, Dijkhuizen (1) reported that financial losses from endemic diseases accounted for 10% of the value of gross output and 40%-50% of farm income of an average Dutch dairy farm.

\* E-mail: cyalcin@veterinary.ankara.edu.tr

Successful management of such diseases in dairy herds is important. For this, dairy farmers need to know the incidence rates of endemic disease, not only in their herds, but also in other herds in the same region. Then, it is possible to establish a target disease incidence and create an economic index (3) to show the losses due to unnecessarily high levels of endemic disease (deviation from target disease incidence). Farmers and/or their veterinary advisors can then use this information to support their decisions related to better control of endemic diseases.

Because collection of such information is beyond the ability of individual farmers, disease related data have been collected by government and/or research institutions in many countries. In some countries regular database systems were developed for this purpose (2-4) and in other countries this is accomplished by conducting ad hoc surveys (5-8).

Despite the fact that endemic diseases and the losses they cause to Turkish livestock farms have been considered important for a long time (9), research aimed at calculating the rates of disease incidence and financial/economic loss to livestock production systems is rare. Studies of this nature have generally focused on a single disease problem (10) or disease occurrence during a restricted production period (11).

Therefore, the Incidence of Endemic Diseases and Its Financial Costs to Dairy Herds of the Turkish Dairy Breeding Association (TDBA) Project was launched in order to calculate the incidence rates of the main endemic diseases and the financial losses associated with them. The project was restricted to Burdur, Konya, and Kirklareli provinces, which represent 3 important milk production regions in Turkey (Mediterranean, Central Anatolia, and Thrace).

The project was implemented in 3 steps: 1. The producer's characteristics, production systems, and hygiene and disease control methods were investigated; 2. The incidence rates of the main endemic diseases in the dairy herds were calculated; 3. The cost of each endemic disease to the herds was estimated and a health index depicting overall endemic disease-related financial loss due to deviation from the target incidence level was created.

Herein the findings of the project's second step—the incidence rates of endemic diseases in dairy herds in the

Turkish provinces of Burdur, Konya, and Kirklareli—are reported.

## Materials and Methods

A prospective longitudinal observation study was carried out with 150 dairy herds (50 in each of 3 provinces) randomly selected from among 1684 TDBA herds (828 herds in Burdur, 424 herds in Konya, and 432 herds in Kirklareli).

Herds were characterized as small scale (less than 11 milking cows) and medium-large scale (greater than 10 milking cows). The study was conducted between October 2003 and September 2004 (12 months), and each herd was visited at least once per month.

Before the study was implemented, a meeting was organized with the DBA directors in the 3 study provinces, and they were informed about the study's aims and methods. Then, the study herds were visited with the DBA personnel in charge of data collection to inform the farmers about the objective and details of the study, to explain the benefits to disease management of collecting health data, and to convince them of the confidentiality of the data recorded for the study.

### Diseases were grouped into 7 main categories:

- a) Fertility diseases (including clinical metritis, anestrus, cystic ovaries, follicular cysts, false pregnancy, and vaginitis);
- b) Udder diseases (including clinical mastitis and other mammary problems);
- c) Puerperal diseases (including dystocia, abortion, prolapsed uterus, retained placenta, uterine torsion, and vaginal tear);
- d) Metabolic system diseases (including milk fever, ketosis, and acidosis);
- e) Locomotor system diseases (including sole ulcer, digital diseases, interdigital dermatitis, and arthritis);
- f) Digestive system diseases (including displaced abomasum, bloat, diarrhea, enteritis, and other gastro-intestinal problems);
- g) Other diseases (including diseases excluded from the above disease categories).

Incidence rates were calculated using the following formula:

$$I = \frac{\text{Number of new case of disease occurred in a herd in 1 year}}{\text{Average herd size}}$$

Due to the dynamic nature of livestock movement (cows bought in and sold out, culling, in-herd replacement, and death) the number of cows in each herd varied during the project period. For this reason, as suggested by Thrusfield (12), average herd size (sum of the number of cows in a herd at the beginning and end of the project period divided by 2) was used in the formula.

Because each herd contained a different number of cows, weighted average incidence rates were calculated when reporting the incidence rates for different herd sizes and provinces. To calculate the weighted average incidence rates, the incidence rates calculated for individual herds were weighted by the number of cows in each herd.

The data were analyzed using Excel-XP software (Microsoft, Redmond, WA, USA) and SPSS v.15.0 (SPSS, Inc., Chicago, IL, USA).

To determine the most suitable statistical tests for this study, the data were subjected to the Kolmogorov-Smirnov test to determine if they were normally distributed. Since the n's were independent and data for all the disease categories were not normally distributed, non-parametric statistical tests were used. For this purpose the Kruskal-Wallis test was used to test overall

statistical significance among the provinces. Then, the Mann-Whitney U-test was used for pair-wise comparisons between the provinces and herd sizes.

## Results

Calculated incidence rates at the province level and overall mean for the 7 endemic disease categories are presented in the Table.

When overall mean incidences were examined, fertility diseases (30.2%) and udder diseases (28.3%) were the most prevalent endemic disease categories. Metritis accounted for 66.9% of fertility diseases, and mastitis accounted for 93.0% of udder diseases. The other endemic diseases, in order of prevalence, were as follows: puerperal (18.3%), locomotor system (10.0%), digestive system (6.0%), and metabolic system (3.6%). The endemic disease incidence rates varied among the provinces, and the difference in the incidence rates of most of the disease categories between the provinces was significant ( $P < 0.05$ ).

The incidence rate of fertility disease in Kırklareli (23.1%) was significantly lower than in Burdur (35.2%) and Konya (32.2%) ( $P < 0.01$ ). The lowest incidence rate for mastitis and locomotor system disease was recorded in Konya (13.9% and 5.3%, respectively), whereas the rates in Burdur (29.5% and 13.5%, respectively) and Kırklareli (43.3% and 13.2%, respectively) were 2-3

Table. Incidence of endemic diseases according to province and herd size (%).

Disease categories	Provinces			Herd size			Overall mean (n = 1074)
	Burdur (n = 353)	Kırklareli (n = 265)	Konya (n = 456)	Small scale dairy herds (n = 364)	Medium-large scale dairy herds (n = 710)	P values for the herd sizes	
A. Fertility disorders	35.2	23.1	31.2	40.9	31.4	0.000	30.2
-Metritis	24.9	20.1	21.9	21.3	17.2	0.000	20.2
B. Udder disorders	31.0 <sup>b*</sup>	47.6 <sup>a</sup>	15.2 <sup>c</sup>	41.5	21.5	0.000	28.3
-Mastitis	29.5 <sup>b</sup>	43.3 <sup>a</sup>	13.9 <sup>c</sup>	36.7	21.0	0.000	26.3
C. Puerperal disorders	10.7 <sup>b</sup>	9.1 <sup>c</sup>	21.4 <sup>a</sup>	19.1	12.8	0.000	18.3
-Abortion	2.7 <sup>c</sup>	3.7 <sup>b</sup>	8.9 <sup>a</sup>	8.6	4.0	0.008	5.6
-Retained placenta	5.7 <sup>b</sup>	4.0 <sup>c</sup>	6.4 <sup>a</sup>	5.7	5.6	0.000	5.6
-Dystocia	1.3	1.4	5.8 <sup>a</sup>	4.5	2.6	0.000	3.2
D. Metabolic system disorders	3.7 <sup>b</sup>	5.4 <sup>a</sup>	2.4 <sup>c</sup>	4.7	3.0	0.076	3.6
E. Locomotor system disorders	13.5 <sup>a</sup>	13.2 <sup>b</sup>	5.3 <sup>c</sup>	12.5	8.7	0.300	10.0
F. Digestive system disorders	5.1 <sup>b</sup>	4.6 <sup>b</sup>	7.4 <sup>a</sup>	8.8	5.4	0.001	6.0
G. Other disorders	7.4 <sup>a</sup>	9.3 <sup>a</sup>	4.3 <sup>b</sup>	9.1	5.7	0.014	6.6

\* Different superscript letters in the same row refer to statistically significant differences.

times higher. Contrary to the above findings, the incidence rate of puerperal disease in Konya was more than double that recorded in the other provinces.

Incidence rates of all disease categories were higher in small-scale herds than in medium-large scale herds (Table); however, the differences in the incidence rates of metabolic and locomotor system diseases between herd sizes were not significant ( $P > 0.05$ ).

## Discussion

The most important obstacles faced during ad-hoc longitudinal surveys are loss of farmer interest and the failure to record health events (the majority of dairy farmers are not in the habit of regularly recording health events) (4-7). Farmers tend to record only events for which a vet was consulted, and do not record health events they think are unimportant.

In order to overcome the above-stated problems, particular measures, as described in the Materials and Methods section, were implemented; nonetheless, some farmers lost interest in the study, particularly during the summer season when they allocated the majority of their time to harvesting. During monthly visits those farmers that showed a lack of interest and had inconsistent records (21 herds), and those whose records were incomplete (40 herds) were excluded from the analysis. Similarly, Jong et al. (4) and Fourichon et al. (5) excluded 11% and 17% of participant farmers, respectively, from their analyses due to the same reasons. Despite the fact that Frei et al. (6) offered about \$500 to each participant as an incentive to provide good and reliable health records, only 42% of the farmers agreed to participate in their study. This, on the one hand, highlights the difficulty of obtaining reliable health data via long-term prospective longitudinal observation. On the other hand, such problems are not limited to developing countries where agriculture is dominated by small-scale farms, but is also observed in developed countries.

In the present study, statistically significant differences were observed between the provinces in the incidence rates of most of the disease categories. This variation could be explained, to some extent, by geographical differences as well as differences in farmer characteristics, production systems, and hygiene methods. The details of such differences between the study herds are presented elsewhere (13); however, the

notably lower mastitis incidence rate in Konya, as compared to the other provinces, could be explained by better producer characteristics and hygiene methods. Compared to those in Burdur and Kirklareli, the producers in Konya were: a) better educated and more up to date with new technologies related to dairy production, b) more hygiene conscious (for instance, a greater number of producers cleaned their hands and the heads of milking machines with antiseptics before milking, and applied udder wash-and-dry), and c) more effectively used mastitis control methods (they generally administered mastitis vaccine twice per year, whereas it was generally administered once per year in other provinces), more frequently changed the rubber on milking machines, and a greater number of herds used CMT to detect sub-clinical mastitis).

On the other hand, in Kirklareli, where the mastitis incidence rate was the highest, average milking time was longer, antiseptic hand cleaning before milking and use of gloves during milking were non-existent, and post milking teat dipping was rare. Another important finding that could be related to the higher mastitis incidence rate in Kirklareli was that almost all of the farmers were unaware of sub-clinical mastitis.

A survey of the literature revealed that, generally, the incidence of only 1 disease at a time has been studied under Turkish field conditions. Only 2 studies used long-term prospective longitudinal observation to investigate a group of endemic disease conditions in Turkey. Erdogan et al. (11) reported incidence and prevalence rates of several endemic diseases in Kars province in Turkey. However, they reported the incidence rates of distocia, infertility, mastitis, retained placenta and hypocalcemia in postpartum periods, therefore, were not suitable for comparison with the findings of this study. Yıldız (14) investigated the incidence of endemic disease in Ankara province. The reported incidences in that study were 34.4% for fertility diseases, 40.9% for udder diseases, 41.5% for puerperal diseases, 18.4% for locomotor system diseases, 10.6% for metabolic system diseases, 24.2% for digestive system diseases, and 2.6% for other diseases. The findings reported by Yıldız (14) for fertility and udder diseases are within the range of the incidence rates reported in the 3 provinces in the present study. Nevertheless, the incidence rates of puerperal, locomotor, metabolic, and digestive system diseases in Yıldız (14) are considerably higher than those observed in the 3

provinces in the present study. Yıldız (14) ascertained that several management problems faced by dairy farmers in Ankara were the cause of the high disease incidence rates.

Numerous studies from different countries have reported endemic disease incidence rates, including Esslemont and Kossaibati (15) in the United Kingdom, Frei et al. (6) in Switzerland, Stevensen (8) in Australia, Jong et al. (4) in S. Korea, Fourichon et al. (5) in France, Leonard et al. (7) in Ireland, Ingvarstsen et al. (16) in Denmark, McLaren et al. (17) in Canada, and the USDA (18) in the USA. Nonetheless, there is enormous variation in the reported disease incidence rates. The reported incidence rate is 3%-59.2% for fertility diseases, 5%-41% for udder diseases, 3%-25% for puerperal diseases, 0.3%-17% for locomotor system diseases, 1%-12% for metabolic system diseases, and 2%-7% for digestive system diseases; however, the common finding in all these studies is that fertility and udder diseases were the 2 most prevalent endemic disease categories in dairy herds. The incidence rate findings of the present study are in agreement with the literature.

There may be several reasons for the large variation in reported endemic disease incidence rates in dairy herds from different countries. Firstly, variation is expected between dairy herds in different countries and/or geographic regions, and between producer characteristics, farming systems, disease control methods, and other hygiene methods. Secondly, animals in modern dairy herds are more susceptible to disease and fertility problems. Until recently, incentives have been

given to more intensive farming systems and high milk yield. The criteria in selection indexes have been designed accordingly and omit the disease and fertility status of animals. Despite the fact that hygiene and disease control methods in modern dairy herds have been improving, a significant decrease in the incidence of clinical mastitis has not been reported (19), and a sharp decline in the fertility rate of dairy cows has been observed (20) in developed countries. Fourichon et al. (5) reported a higher incidence of clinical mastitis and fertility disorders in Holstein cows, which are regarded as the best breed for milk yield, than in other breeds in France. This supports the findings of the above-mentioned studies. Thirdly, uniformity does not exist in the methodology and disease definitions used in these studies. There were differences in disease categories and diseases in each category. For instance, although only diseases were included in fertility diseases category in the majority of the studies, Frei et al. (6) and Jong et al. (4) also included repeat breeder cases, which are only the result of disease. Some studies, however, did not list the diseases included in each of the disease categories. Furthermore, some studies calculated incidence rates at the herd level (3,5) and others at the animal level. This issue highlights the need for creating both a uniform methodology and disease definitions in this area of research.

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