More than 30 years of health recording in Norway

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Abstract

Data from the health recording system are used for many purposes, including genetic evaluation, herd management and research. The health records provide useful information for farmers, veterinarians and advisors in their daily work. Data from many years makes it possible to monitor trends of the most important diseases and estimate genetic and environmental factors affecting diseases.

Health records are crucial for improvement of animal health via genetics, preventive measures, epidemiological research, and environmental improvements.

Introduction

The aims of this presentation were to describe the Norwegian Cattle Health Recording System, illustrate how this information is used for genetic evaluation in Norwegian Red and to improve health management at herd level, present phenotypic- as well as genetic trends for important health traits, and discuss present and future possibilities and challenges regarding dairy cattle health recording.

The Norwegian Cattle Health Recording System

Health recording for dairy cows is well established in Norway, where each case of veterinary treatment has been registered on an individual cow basis since 1975. Figures for 2012 shows that 98% of the dairy cows participate in the Norwegian Dairy Herd Recording System (NDHRS), where individual health recording is integrated. Each animal has an individual "health card" where veterinarians record diagnoses by disease codes, and describe symptoms and treatment. This record follows the animal from birth to slaughter. Only veterinarians are allowed to distribute or prescribe medicine for animals, but they are not allowed to sell medicine, only pharmacies can do that. All veterinary treatments of individual dairy cows, calves and young animals are recorded, and veterinarians use these notes in their daily work to look at previous symptoms and treatments on the same animal.

The health recording system has been updated and revised several times since 1975 (Østerås *et al*., 2007). The first system included 10 traits or disease codes. This was extended to 46 traits in 1978. A new organ-related health code system was introduced in 1989, the number of disease codes increased to approximately 300, and the 90 most

Table 1. Summary of diagnoses and disease treatments reported to the Norwegian Cattle Health recording system in 2011. Total number of records (n) including cows, calves, and young animals, for disease codes with more than 100 recorded cases in 2011. For each group % of all treatments are given in parenthesis[1] (From Tine, 2012).

Diagnoses	No.	Diagnoses	No.
Infectious diseases (1 %)		**Reproductive system/obstetrical conditions (8 %)**	
Erlichiosis	110	*Uterus prolapsed*	344
Piroplasmosis	127	*Torsion of the uterus*	466
Contagious diarrhea	197	*Prolonged gestation*	369
Contagious respiratory disease	393	*Dystocia*	2449
		Vaginal prolapsed	589
Respiratory, cardiovascular and hematopoietic systems (3 %)		*Retained placenta*	5992
Unspecific respiratory disease			
	4220	**Reproductive and urinary systems(13 %)**	
Digestive system (6 %)		*Abortion*	401
Indigestions	2422	*Aneastrus*	3566
Colic/gastrointestinal dislocation/abomasal dislocation	588	*Heat synchronization*	3770
Traumatic gastritis	1401	*Silent heat*	2998
Gastritis/enteritis	2969	*Metritis,vaginitis and salpingitis*	2086
Parasitic diseases	553	*Cystic ovaries*	2519
Bloat	159	*Castration*	568
		Repeated breeding	492
Skin and claw (7 %)			
		Nervous system and sense organs (0.2 %)	
Dehorning due to injury		*Eye infection*	111
Laminitis	142		
Hoof diseases	899	**Musculo-skeletal system (3 %)**	
Lice infection	3675	*Tendinitis and bursitis*	385
Scab	2495	*Fractures*	162
Wounds, injuries	135	*Arthritis*	3070
	837	*Paresis due to pelvic and muscular injury*	275
Mammary system (41 %)			
Agalactia		**Non-organ related (16 %)**	
Severe/moderate clinical mastitis	129	*Abscesses/phlegmons*	1402
Mild clinical mastitis	30689	*Hypomagnesaemia/grass tetany*	249
Subclinical mastitis	15920	*Ketosis*	6855
Teat injuries	1826	*Milkfever*	11284
Dry cow therapy	2219	*Paresis – except parturient paresis*	425
	4512	*Deficit of vitamins or minerals*	420
Prophylactic treatment2			
Vaccination			
Dehorning	2681		
Prophylactic treatment of parasites	57345		
Milk fever	18351		
Mastitis	633		
	226		

[1]In 2011 the total number of recorded treatments was 132,358, of these 112,503 were treatments of dairy cows, the total number of dairy cows was 334,104, and the number of cow-years was 220,965.
[2]Total number of prophylactic treatment was 85,133, of these 95 % were treatments of calves / young animals.

used codes where printed on the health card. Prophylactic treatment can be noted for each disease code by adding 500 to the code number. Individual health cards for calves and young animals have been available since 1989. Some new disease codes for mastitis and reproductive disorders were introduced in 1999, when the mastitis codes where adapted to the International Dairy Federation (IDF) recommendations (1999).

Table 1 shows a summary of diagnoses and disease treatments reported to the Norwegian health recording system in 2011. The diseases codes are grouped in 10 organ-related groups. Disease codes with more than 100 recorded cases in 2011 were included in the table. For a complete overview see Østerås (2012). Clinical mastitis, milk fever, ketosis and retained placenta were the 4 most common diseases in dairy cows, and accounted for 61% of all veterinary treatments of cows in Norway.

Figure 1. Total no of veterinary treatments and no of cows treated per cow-year from 1975 to 2012 (from Tine, 2012)

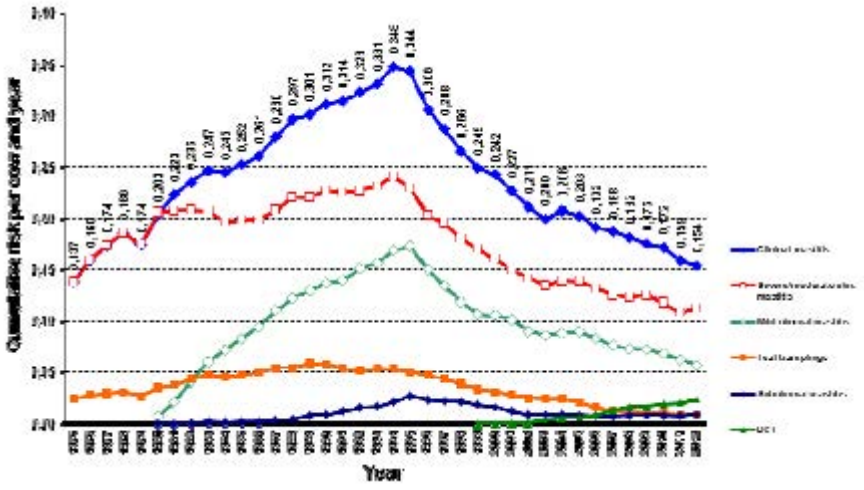

Figure 2. Veterinary treatments of mastitis per cow-year year from 1975 to 2012 (from Tine, 2012)

These 4 were the only diseases with more than 2 records per 100 cow-years at risk, while claw diseases, teat injuries, dry cow therapy, dystocia, aneastrus, silent heat, and cystic ovaries had 1-2 records per 100 cow-years at risk (Tine, 2012).

Phenotypic trends

Figure 1 show that the total number of veterinary treatments and number of treated cows per cow-years increased from 1975 to around 1990, and then decreased gradually since 1994. The main reason was changes in clinical mastitis treatments as shown in Figure 2.

Figure 2 shows that the incidence of clinical mastitis decreased gradually since 1994 while the incidence of veterinary treated subclinical mastitis and dry cow therapy increased slightly in recent years. Approximately 30% of the reduction in clinical mastitis is a result of genetic improvement of Norwegian Red cows (Heringstad *et al*., 2003). The rest is due to an action by the farmer's organizations to reduce the unnecessary use of antibiotics which changed the treatment strategies, establishment of Norwegian Cattle Health Service, and development of mastitis control programs, advisory- and herd management tools. The health periodicals generated from the NDHRS with information about key figures on the epidemiological aspects of mastitis dynamics in each herd is one example.

The overall treatment rate of Norwegian dairy cows was reduced by 61% from 1994 to 2011 (Tine, 2012). The health records have been a crucial tool for this achievement, as they are the basis for development of herd management tools and for genetic improvement.

Data quality

Because antibiotics and other drugs can be prescribed only by veterinarians in Norway, these

health records are viewed as good quality. This was confirmed by a recent project finding that only 10-12% of the health events were unreported (Espetvedt *et al*., 2013). Comparisons of retail sales of intramammary antibiotics used for mastitis therapy and the incidence rate of clinical mastitis over 30 years revealed parallel curves and ensures that the trend shown in Figure 2 is a true reduction in mastitis treatments (Østerås *et al*., 2007)

Recent developments

Veterinarians report directly to central database. It has been possible for veterinarians to report health data directly to the central database, NDHRS, since 2008. From January 1st 2012 veterinarians are obliged by regulations to report all use of medication to the Norwegian food authorities. This can easily be done by combining electronic journals and reporting health data to NDHRS. Since autumn 2012 more than 60% of the health data are reported directly from veterinarians to NDHRS. This has increased the number of recorded calf- and young stock health events, and reduced the lag-time from the day of treatment to the event is recorded in the central database.

Health recording for calves and young animals. Health recording for calves and young animals has improved during recent years. Gulliksen *et al*. (2009) indicated that about 60% of the health events for calves were reported to NDHRS in 2004-2007. This has increased and year 2012 was the first year with more reported health data from calves and young stock than from dairy cows. Dehorning and prophylactic

treatment for parasites were the most frequent health events reported for these groups of animals (Tine, 2012). Respiratory disease is the most frequent disease in dairy calves in Norway.

Claw health. A system for recording of claw health was introduced as part of NDHRS in 2004 (Sogstad et al., 2007). The claw trimmers record whether the cow has normal (healthy) claws or if one or more of 9 claw disorders are present. More than 70,000 claw health records from 3,000 herds were reported to NDRHS in 2012. The first genetic analysis of claw health based on these data was presented by Ødegård *et al.* (2013) and Geno, the breeding organization for Norwegian Red, aim to implement genetic evaluation based on claw health data. Systems for electronic recording and direct transfer of data from claw trimmers to the central database will soon be available, based on the same system as in the other Nordic countries.

Mastitis pathogens. Bacteriological milk sample results from the mastitis laboratories have been recorded routinely into the NDHRS since 2001. This development made studies of pathogen specific mastitis possible (Whist *et al.*, 2007; Haugaard *et al.*, 2012).

Health data used for genetic evaluation of Norwegian Red

Mastitis and other diseases have been included in the breeding objective of Norwegian Red since 1978. In the current total merit index the relative weight on mastitis is 21% (Geno, 2013). Routine genetic evaluation of mastitis and other diseases are based on information from the health recording system. All data from 1978 onwards are available and used for genetic evaluation. Health traits have generally low heritability, so large daughter groups are needed in progeny testing to obtain reliable breeding values for these traits. In Norway a 7- trait model is used for genetic evaluation of mastitis (Svendsen and Heringstad, 2006), where clinical mastitis is defined as a binary trait within 7 defined periods of the first 3 lactations based on whether or not the cow had at least one recorded treatment of clinical mastitis. The trait "other diseases" has 2 % weight in the total merit index and includes milk fever, ketosis and retained placenta (Geno, 2013).

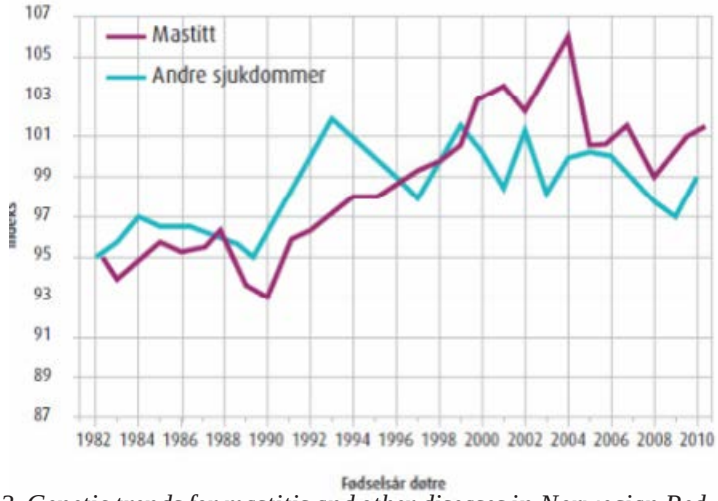

Figure 3. Genetic trends for mastitis and other diseases in Norwegian Red, given as mean index for mastitis (red) and other diseases (green) by birth year of daughters (From Geno, 2013b)

The Norwegian Red breed has been selected for improved mastitis resistance over the longest time period worldwide and represents one of few cattle populations where assessment of effects of long-term selection against mastitis is possible in a large scale. Figure 3 shows genetic trends for mastitis and other diseases in Norwegian Red (Geno, 2013b). The genetic change for mastitis from 1990 to 2010 was on average 0.4 index points per year. Despite unfavorable genetic correlations between milk yield and mastitis it is possible to obtain genetic improvement of both traits if estimated breeding values are precise (traits recorded for large enough daughter groups), and if selection is sufficiently intense, i.e. traits receive an appropriate weight in the total merit index used for selection of sires.

Results from a Norwegian selection experiment illustrate that it is possible to obtain large selection response for clinical mastitis if enough weight is put on the trait, and that selection for increased milk production will result in an unfavorable correlated increase in mastitis incidence, if resistance to the disease is ignored in the breeding program (Heringstad *et al*., 2007). After 5 cow generations the genetic difference between the 2 lines, selected strongly for high protein yield and low mastitis incidence, respectively, were about 10%-units clinical mastitis (Heringstad *et al*., 2007).

Implementation of genomic selection in dairy cattle breeding programs will not change the need for large scale recording of health traits. Genomic breeding values can be predicted with reasonably good reliability for production traits but so far with much lower reliability for traits with low heritability like health and fertility (Luan *et al*., 2009). Therefore reliable phenotypic data for large reference populations are needed for these traits.

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