

# Availability Of Health Data For Breeding Purposes – Challenges And Key Factors Of Success

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## Introduction

Genetic improvement of health traits is gaining increasing importance. The availability of reliable phenotypes for direct health traits very often constrains breeding for disease resistance with both, traditional and advanced genomic methods.

In Austrian cattle breeds, functional traits have a weight of almost 50% within the total merit index. However, presently no direct health data are included. For mastitis and fertility the auxiliary traits somatic cell count and traits based on insemination and calving are considered, respectively. In Scandinavian countries, animal health data have been routinely collected and utilized for years (e.g. Aamand (2006)). An Austrian wide health monitoring system for cattle based on diagnoses data has been established in 2006. All farms under performance recording are free to participate. The present paper describes the challenges and key factors of success for the implementation of a system to record phenotypes for health traits for breeding purposes based on the Austrian experiences.

## Background and methods

**General.** Under the leadership of the Federation of Austrian Cattle Breeders (ZAR) a health monitoring system has been elaborated and implemented in close cooperation with the organizations involved in animal health issues. These are the Ministry of Health, the Ministry of Agriculture, Forestry, Environment and Water Management, the University of Veterinary Science, the University of Natural Resources and Applied Life Sciences Vienna, the Animal Health Organizations, the Chamber of Agriculture and the Chamber of Veterinarians.

### Data.

Data type and standardization: Diagnostic data from veterinarians, which have to be documented according the law of drug control, are standardized by the veterinarians using an elaborated key with 65 diagnoses subsumed to 10 groups. This key only includes on-site findings by veterinarians of major diagnoses relevant for breeding purposes but currently no laboratory results. Apart from the latter, further records on health traits could be based on observations by farmers or hoof trimmers.

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Data collection and data storage: Diagnostic data are stored in the cattle database. The data can be electronically transmitted by the veterinarians or recorded by the performance recording organizations. Supplementary information can be recorded by farmers.

Data security: Health data are very sensitive and therefore data security for farmers and veterinarians has to be warranted and given high priority.

Data validation: Precondition for the benefit of health data is a good data quality.

*Plausibility checks* concerning first diagnoses, identification of animal and herd are carried out before the data are stored in the database.

*Validation by farmers and veterinarians*: Farmers and veterinarians using the data for herd management provide a basis for correct data. Therefore the backflow of information is essential.

*Determination of farms with incomplete diagnoses data and farms with very low incidence rates*: Only data from farms fulfilling criteria concerning continuous and complete registration of diagnoses are included in genetic analyses (Egger-Danner et al. (2009), Koeck et al. (2010)).

**Broad participation.** Heritabilities for health traits are low (Heringstad et al. (2003), Zwald et al. (2004)) although genetic variation is present. For reliable breeding values the aim has to be that all farms testing progenies of bulls are also recording this information. It is important that not only herds with high management standards are included as there the genetic variation cannot be fully explored. This means that most of the farms under performance recording and their veterinarians have to be encouraged to participate.

**Benefit for key player.** Farmers and veterinarians are only ready to adopt new technologies and approaches, if they are convinced by the benefit and if the benefit-cost-analysis is to their advantage. Different expectations have to be fulfilled. Farmers and veterinarians are using this information to improve herd management. Ministries and animal health organisations are interested in monitoring of the health status. For consumers, food safety is of importance. For farmers and breeding organisation the use for breeding purposes is the main goal. A joint benefit can only be achieved if the system is developed in cooperation. For motivation, early and continuous information about the results is essential. To endure the joint benefit and to reduce costs it is important to link and use infrastructure jointly.

**Legal framework.** A continuous recording of health data based on broad participation is a big challenge. For the sustainability these traits have to be used routinely by the different organisations. Thus, legal frameworks for documentation and use of diagnostic data are very valuable (law of drug control, law of animal breeding). The inclusion of such traits in breeding goals and the use for preventive measures by veterinarians and animal health organisations is especially important. A level has to be reached where health traits are recorded and used like other fitness traits.

## Results and discussion

**Participation.** The challenge is to get valid phenotypes of the daughters of test bulls. Presently the average progeny size per test bull in Austria varies between 60 and 120 with differences between the regions. Inseminating each first calving cow with a test bull is compulsory. Therefore all farms being part of the Austrian Dairy Herd Recording System are motivated to actively participate in the Health Monitoring project.

In most regions, the project to establish an Austrian wide health monitoring system has started between September and December 2006. Table 1 shows the impact of implementation in different regions from 2007 till 2010. Some regions achieved a very high participation within a few months with slow, but continuous increasing support by the veterinarians. Regions like Lower Austria and Styria have participation close to 80%. About 80 to 90% of these farms presently provide veterinary diagnoses, which results in approximately 70% of health registered cows. The most essential prerequisite is the support of the opinion leaders in both, agricultural and veterinarian organizations. Surveys on farmers about their future breeding emphasis stress the desire to improve especially fertility and udder health. Nevertheless, continuous information to provide confidence in the system and to convince of the benefits are keys for success.

**Table 1: Number of dairy farms within the Austrian Dairy Herd Recording System, development of percentage of farms participating in the Health Monitoring (HM) and farms with veterinary diagnoses data in the database (HMVDR)**

Regions	farms		HM farms %			HMOVDR farms %			
	Feb.10	Feb.10	Feb.09	Feb.08	Feb.07	Feb.10	Feb.09	Feb.08	Feb.07
Burgenland	136	23	17	13	12	55	54	36	21
Carinthia	1,288	76	76	73	71	64	53	42	14
<b>L. Austria</b>	<b>3,925</b>	<b>78</b>	<b>77</b>	<b>77</b>	<b>76</b>	<b>90</b>	<b>80</b>	<b>64</b>	<b>21</b>
U. Austria	4,864	55	51	33	28	58	49	49	24
Salzburg	2,194	44	44	42	41	65	59	42	11
<b>Styria</b>	<b>3,383</b>	<b>79</b>	<b>66</b>	<b>63</b>	<b>61</b>	<b>85</b>	<b>82</b>	<b>66</b>	<b>37</b>
Tyrol	6,009	36	23	20	7	20	13	3	0
Vorarlberg	1,479	1	1	0	0	58	50	0	0
<b>Austria</b>	<b>23,278</b>	<b>54</b>	<b>48</b>	<b>42</b>	<b>37</b>	<b>66</b>	<b>61</b>	<b>50</b>	<b>23</b>

**Data quality.** Due to strict data validation presently 30% of the farms with health registration are excluded from breeding value estimation. On average, 0.61 first diagnoses are recorded per cow and year. Koeck et al. (2010) estimated heritabilities of 0.06 for reproductive disorders and 0.07 for clinical mastitis in Austrian Fleckvieh based on threshold models. To guarantee a good data quality, continuously constant monitoring by the performance recording organizations is very valuable. A survey based on 600 farms showed that despite of promotion not all farms and their veterinarians are ready to provide reliable health data. Thus, a system of test herds could be favourable (König et al. (2009)).

**Phenotypes for genetic evaluations.** Breeding values for mastitis based on more than 100 daughter records are currently only achieved by bulls with second crop daughters. Regions with about 70% of cows within health registration (Lower Austria and Styria) are on average reaching 50 progenies for their current test bulls (Table 2). This provides an accuracy above 0.60 for traits with heritability above 0.05 (Shook (1989)).

**Table 2: Numbers of records used of bulls for breeding value estimation for milk and mastitis only tested in regions with high participation in HM (Lower Austria/Styria)**

test program	No. bulls	No. records milk 100 d			No. records mastitis 50d		
		Avg	Min	Max	Avg	Min	Max
1999-2002	51	867	48	5,424	226	18	1,013
2003	16	100	53	165	50	20	78
2004	26	116	62	260	54	20	112

To increase the reliability of breeding values for health traits different measures could be taken: Broad participation within the farms under performance recording by increasing the progeny size per test bull. An alternative approach could be to concentrate progenies of test bulls on farms with reliable health registration. With genomic selection a reduction of the number of test bulls is expected. Therefore as long as data from the Dairy Herd Recording System are collected on a broad scale and health registrations are continued the number of progeny with health phenotypes will increase.

## Conclusion

Due to low heritabilities, a large amount of valid phenotypes is needed for reliable breeding values for health traits. According to Austrian experiences a participation of about 70% of the dairy cows is possible on voluntary basis, but supportive circumstances. To achieve sufficient phenotypes for direct health traits it is recommended to increase either the number of progenies per test bull or to concentrate progenies of test bulls on farms with reliable health registrations. Continuous health registration on a high level of participation is a big challenge, which will be more easily sustained if a benefit for the different key players involved is guaranteed. A legal framework and the support by opinion leaders from agricultural and veterinarian organisations are important.

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