
Benefits of recording of diagnostic data. A veterinarian perspective

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In 2006 a health monitoring system for cattle in Austria was started. Since 2011 monitoring of health data is integrated into the breeding programs of Austrian cattle breeders and therefore compulsory for all breeding herds. Veterinarian diagnoses are standardized, validated and recorded in a central cattle database.

Besides the use of diagnostic data for routine evaluation of health traits, the information obtained can be used for management decisions to improve the health status in cattle herds. Veterinarians receive health reports for the herd management to consult their farmers. These health reports include all already existing information from performance recording as well as diagnostic data. Health reports are used by veterinarians for auditing the member farms of the Austrian animal health organisations.

Using the experiences from the health monitoring system recordings of treatments and the use of veterinary medicinal products shall be implemented into the health monitoring system on a voluntary basis. As a result, the central cattle database will serve as a register for treatment data and therefore simplify the documentation of treatments by farmers and veterinarians.

From the end-consumer's perspective the food safety and the health risks caused by drug resistant bacteria are increasingly of particular interest. There is growing demand for consumer confidence in animal health and drug use. Associating diagnostic data with treatment data can give valuable information on prudent use of veterinary drugs and serve as a basis for further research on the impact of drug use in cattle production on antimicrobial resistance.

Keywords: health monitoring system, consultancy, health reports, animal health, drug use

Abstract

Introduction

As a result of vast changing conditions of production in the livestock industry and after the eradication of classical infectious diseases, diseases caused by various environmental conditions are responsible for major production losses in livestock. A modified veterinary approach to the problems is therefore necessary. The treatment of the individual animal loses importance compared to the care of the herd.

The cost pressure in animal production led to an increased use of veterinary medicinal products without adequate diagnostics, instructions by a veterinarian and documentation in livestock. With the Law on the Control of Veterinary Medicinal Products (2002) a new legal framework for the use of veterinary drugs by veterinarians and farmers in Austria was created. The Animal Health Service (AHS) aims to give advice and supervision on farmers and their livestock. This in turn should minimize the use of veterinary drugs and prevent diseases caused by farming conditions in animal production. Within the scope of the AHS farmers may use veterinary drugs in their animals, however only with close guidance, supervision and written documentation by the veterinarian.

The contracted veterinarian has to perform regular audits on the farms. The frequency, the content and the way of documentation of the audit are determined by the Animal Health Service Regulation (2009). In cattle farms the audit needs to be carried out at least once a year by the contracted veterinarian. The central point of the audit is to assess the health status of the herd. After the diagnosis of existing problems, a plan of action has to be determined. The veterinarian is obliged to evaluate the measures taken and to accurately document these. The final reports of each audit have to be submitted to the AHS office.

To assess the health status of dairy cattle, the analysis of data from the milk performance recordings, the indicators of the herd's fertility and the evaluation of the frequency of clinical conditions are essential. The milk performance recordings, calving and insemination data and the somatic cell counts are collected in farms under performance recording. Data is then stored in the central cattle database. The basis for the documentation of diagnoses is the receipt that is created by the veterinarian for any drug application or drug release. The receipts also have to be added to the medication documentation of the farm (Egger-Danner *et al.*, 2010).

In 2006 a health monitoring system for cattle in Austria was established (Egger-Danner *et al.*, 2012). Since then, any diagnosis stated on the drug receipt is to be completed with a 2- digit diagnostic code. The identity of the animal as well as the identity of the farm, the diagnostic code and the date of the diagnosis is recorded. Diagnoses are validated and saved in the central cattle database.

Management decisions to improve the health status

The data analysis is performed by the Association of Austrian Cattle Breeders. Reports are made available for the veterinarians.

Since January 2008, data of the health monitoring is integrated into reports that are available to farmers after each milk recording (Egger-Danner *et al.*, 2010). The information obtained can be used for management decisions to improve the health status in cattle herds. Veterinarians receive health reports for the herd management to consult their farmers. These health reports include all already existing

information from performance recording as well as diagnostic data. Health reports are provided in accordance to the performance recording in a 5-week interval (Obritzhauser et al., 2008).

Health reports present information on calving (age at first calving, calving to calving interval, calving ease, premature births). For each cow of the herd the calving to first service interval, the calving to conception interval and the number of AI's are given. Diagnoses are marked with "D" (Figure 1).

Fertility

In addition somatic cell count (SCC) of individual cows measured, the distribution of SCC in the herd during the past year is graphically shown on the health report. Cows with an increased SCC and cows with a recorded udder disease are then summarized in a list (Figure 2).

Udder Health

Tier Nr. R	Name Lebensnummer	Abkalbung		Belegung			Leistungsdaten							
		Lakt. Eka/Zkz	Abk.dat. Rast/SP	Bel.datum Stiename	Sollkalb. Stiennummer	Gzw R	M-kg Mbk	lfd. Standardlaktation	Laktation					
	TANNE FL AT 999.118.846	11 384	23.04.07						12,0	190	3.942	4,12	3,59	304
	GRAZIA FL AT 999.561.611	8 462	27.09.07(S)						22,0	33	726	3,79	3,11	50
	LORE FL AT 999.920.434	6 412	12.05.07 58/128	ⓓ17.09.07(2) RODEO AT 999.985.247	03.07.08	121 FL		24,0	171	5.073	3,96	3,09	358	
	DESY FL AT 999.894.142	6 348	10.04.07 67/212	ⓓ08.11.07(4) SERAPHIN RED DE 05 34346761	24.08.08	HF		14,8	203	5.556	3,87	2,93	378	
	GLORIA FL AT 999.906.442	5 370	08.05.07 88/88	ⓓ04.08.07(1) REMUS AT 999.066.734	20.05.08	123 FL		13,2	175	3.281	4,14	3,48	250	
	GERLINDE FL AT 999.027.542	5 390	05.06.07 92/114	ⓓ27.09.07(2) LEO AT 999.146.534	ⓓ13.07.08	114 FL		18,0	147	3.324	4,28	3,15	247	
	GAZELLE FL AT 999.034.442	4 373	16.04.07 96/193	ⓓ26.10.07(3) MAIKOENIG AT 999.907.945	11.08.08	122 FL		14,8	197	4.353	3,41	3,20	288	
	LIESCHEN FL AT 999.853.347	3 605	20.07.07 68/68	26.09.07(1) RESS AT 999.995.433	12.07.08	126 FL		18,4	102	2.722	4,46	3,62	220	

Figure 1. Health report provided in a 5-week interval - fertility

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Eutergesundheit

Kühe mit Zellzahl über 200.000 oder mit Euterdiagnosen

Nr.	Name	Lebensnummer	L.	Tg.	17.09.07 Zellzahl	01.08.07 Zellzahl	18.06.07 Zellzahl
MICA		AT 999.117.842	5	103	625	165	103
UNIVERSUM		AT 999.942.245	4	168	392 (D)	43	39
SILVI		AT 999.382.747	4	76	344	25	T
SUPER		AT 999.510.734	7	26	231	T	472
UNIKA		AT 999.370.907	1	41	49 (D)		
UNO		AT 999.268.707	1	113	23	67 (D)	S

Figure 2. Health report provided in a 5-week interval – udder health.

Metabolism

To evaluate the energy and protein supply of the cows in the herd (especially in the first lactation) the milk yield as well as the fat-, protein- and urea contents have to be assessed. Deficiencies in the nutritional management of the cows are easily recognizable through the graphical presentation of the results of the performance recordings (Figure 3).

Auditing the member farms of the Austrian animal health organisations

In accordance with the provisions of the Animal Health Service Regulation (2009), audits need to be conducted by contracted veterinarians in member farms of the Austrian Animal Health Service (Obritzhauser, 2012). The health status of the cattle of supervised farms can be evaluated on the basis of diagnoses and performance parameters that were collected since the last audit. The annual reports of health monitoring provide the basis for evaluating the general health situation of the herd.

Annual reports summarize the results of milk performance recordings and diagnostic monitoring collected throughout the period of one year (Figure 4).

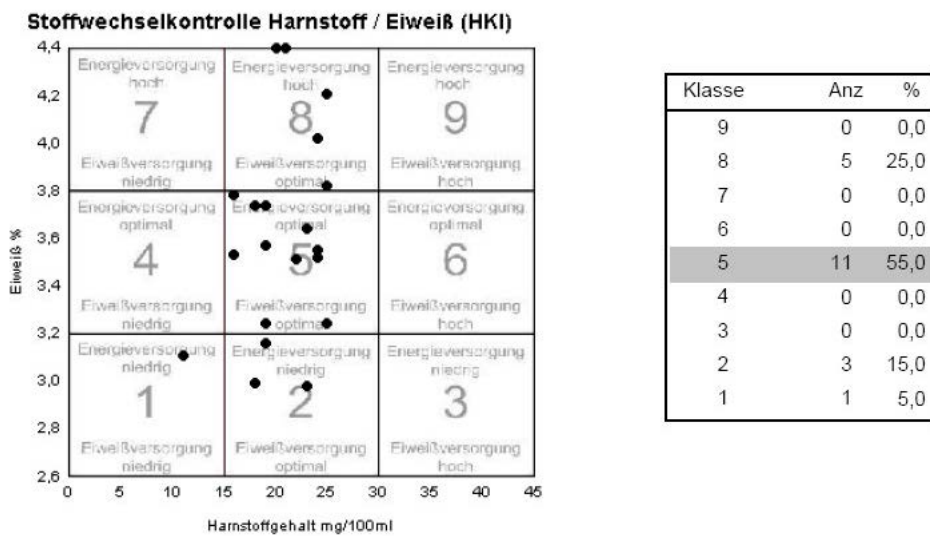


Figure 3. Health report provided in a 5-week interval – energy and protein supply.

	Einheit	Anzahl	Betrieb aktuell	Betrieb Vorjahr	Bezirk	Land
Auswertez Zeitraum 14.11.2011 - 13.11.2012 im Vergleich zu Jahresbericht 2011						
Allgemein						
Kuhzahl	Anzahl		15,0	16,7	18,3	
Milchmenge	kg		9.249	7.734	7.400	
Fett	%		4,34	4,18	4,22	
Eiweiß	%		3,45	3,45	3,50	
Abgänge gesamt	%	3	17,6	20,0	27,4	29,4
Fruchtbarkeit						
Anzahl der Abkalbungen	Anzahl		17	15		
erwartete Zwischenkalbezeit	Tage	9	442		419	408
Erstbesamungsindex	Anzahl	15	2,9	2,9	1,7	1,7
Abgänge Unfruchtbarkeit	Anzahl		0	2		
Summe Diagnosen Fruchtbarkeit	Anzahl		14	15		
Eutergesundheit						
Zellzahldurchschnitt	in 1000	142	128	204	195	182
Anzahl Zellzahl über 200.000	Anzahl		30	43		
Anteil Zellzahl über 200.000	%	30	21,1	33,1	22,3	21,2
Abgänge Euterkrankheiten	Anzahl		0	0		
Summe Diagnosen Euter	Anzahl		2	4		
Stoffwechselbereich						
Ø Fett-Eiweißquotient 1. - 100.Laktationstag	F/E	39	1,33	1,41	1,26	1,25
Summe Diagnosen Stoffwechsel	Anzahl		4	0		
Klauen und Gliedmaßen						
Summe Diagnosen Klauen und Gliedmaßen	Anzahl		0	6		
Kälber bis 6 Monate						
Anzahl Totgeburten/Verendung	Anzahl		2	1		
Summe Diagnosen Durchfallerkrankung	Anzahl		0	0		

Figure 4. Annual health report – Summary of indicators.

Current annual reports can be accessed at any time from the central cattle database. These summarize data that demonstrate fertility, udder health and metabolic status of the herd in tabular and graphical form (Schwarzbacher *et al.*, 2010). Statistics on the frequency of diseases are important for the farm manager to ensure accurate strength-weakness analysis in comparison to historical operating data (vertical comparison) and in comparison to other farms with similar production conditions (horizontal comparison). With these figures, the health and performance can be assessed (Figure 5).

The audit itself must not be misunderstood as a formal control measure. The contracted veterinarian may not control the herd supervised by himself. The contracted veterinarian however has to assess the animal health situation of the farm in terms of a self-evaluation process together with the farmer. The AHS audit is an essential element of the legally obligatory self-monitoring (Food Safety and Consumer Protection Act 2006).

A summarized analysis of performance and health indicators of the population is provided to AHS offices and the Austrian veterinary authorities once a year. The data is used to monitor the population in order to detect long-term negative trends and as an early warning system. The information about the health status is used for the elaboration of training programmes, the identification of target groups and the development of animal health policies. The overviews contain health indicators for

Information about the health status of the population

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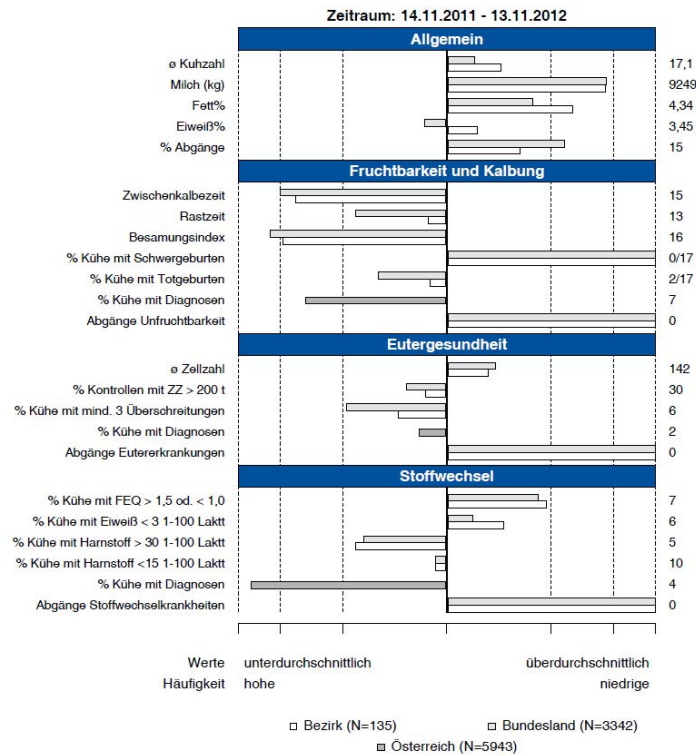


Figure 5. Annual health report – graphical summary of indicators.

Auswertung Kühe über alle Laktationen	Österreich		
	2011	2010	2009
Anzahl Kühe in der Auswertung	236.250	171.986	166.900
Allgemein			
Kuhzahl	17,3	16,6	16,2
Milchmenge	7.106	6.955	6.899
Fett %	4,2	4,2	4,2
Eiweiß %	3,4	3,4	3,4
Abgänge gesamt	23,7	24,4	24,3
Fruchtbarkeit und Abkalbestörungen			
Zwischenkalbezeit	397	396	396
Rastzeit	75	75	75
Besamungsindex	1,6	1,6	1,6
Erstbesamungsindex(Bes/Erstbes)	1,8	1,8	1,8
Anteil Schweregeburten	3,24	3,74	3,93
Anteil Totgeburten, Verendungen	9,1	9,5	9,1
Anteil Kühe mit Diagnosen *	26,2	26,3	27,1
Abgänge Unfruchtbarkeit	24,2	24,9	24,9
Eutergesundheit			
Zellzahldurchschnitt	177	183	185
Anteil Zellzahl über 200.000	20,6	21,2	21,6
Anteil Kühe mit mind. 3 Überschreitungen	23,3	24,9	25,6
Anteil Kühe mit Diagnosen Euter *	16,5	16,0	17,0
Abgänge Eutererkrankungen	11,5	12,5	13,2
Stoffwechsel			
Anteil FEQ 1. - 100 Tg unter 1,00 oder über 1,50	24,5	25,1	25,8
Anteil Eiweißgehalt 1. - 100. Tg kleiner 3,00	26,2	28,1	29,5
Anteil Harnstoffgehalt 1. - 100. Tg über 30,0	8,6	7,9	7,8
Anteil Harnstoffgehalt 1. - 100. Tg unter 15,0	32,6	33,2	35,0
Anteil Kühe mit Diagnosen Stoffwechsel *	5,1	4,4	4,9
Abgänge Stoffwechselerkrankungen	2,6	3,0	3,2
Klauen			
Anteil Kühe mit Diagnosen Klauen, Gliedm. *	4,5	4,4	4,5
Abgänge Klauen- u. Gliedmaßenkrankungen	6,9	7,4	7,6

Figure 6. Annual health report population – Summary of indicators.

the Austrian dairy cattle population for the last three years and are further broken down by province. To ensure the validity of the data, only information from farms with more than 10 cows and farms whose diagnostic data are transmitted electronically from the veterinarians are used (Figure 6).

All data from the milk performance recordings and health monitoring are available at any time via the Internet (RDV4M) for the farmer. Currently, an internet platform is being developed to always give access to the current performance and health information to the contracted veterinarians too. Additionally, management aids (action lists), and vet-specific evaluations for the herd management will be available for the veterinarian.

An overall aim of the health monitoring system is a contribution to food safety. The increased attention to health traits in cattle breeding and to improved animal health through management measures shall result in a minimization of the use of veterinary medicines. In particular, the use of antibiotics in animal production is under growing criticism. Which antibiotics are going to be approved for veterinary use in the future essentially depends on the prudent use of these substances. Critically important antimicrobials may only be used for specific veterinary needs and the use must be justified by objective diagnostic measures.

In Austria, the documentation of treatments is obligatory by law. With each application of veterinary medicinal products the identity of the farm and the animal, the date of application, the drugs applied or dispensed and the withdrawal period have to be documented by all veterinarians and farmers. A pilot project to estimate the amounts of antibiotics used in the Austrian cattle, pig and poultry production was completed in 2010 (Obritzhauser *et al.*, 2011). With this project, the methodological basis for the compulsory documentation of the type and quantity of antimicrobials used in livestock production was created.

Using the experiences from the health monitoring system recordings of treatments shall be implemented on a voluntary basis. As a result, the central cattle database can serve as a register for treatment data and therefore simplify the documentation of treatments by farmers and veterinarians. The documentation of treatment data along with diagnostic data can be done by the veterinarian with reasonable effort. The use of electronic devices will be prerequisite, as it simplifies and minimizes administrative work. The benefits of the easy access to performance recordings and health reports outweigh the costs for the participating veterinarian.

The Austrian Agency for Health and Food Safety was assigned by the Austrian Ministry of Health to develop methods with which the quantity of antimicrobials, applied or dispensed by veterinarians to livestock, can be determined and monitored. Within this project an attempt for the assessment and statistical evaluation of the consumption of antimicrobial substances in dairy cattle farms

Further developments

Internet platform for veterinarians

Central register for treatment data

Preliminary results of use of antibiotics in dairy cattle

Table 1. Prescribed daily doses of antibiotics used per year in dairy farms associated with different diagnoses

ATCvetCode	Antibiotic	Infertility, diseases ass. with parturition		Udder diseases		Diseases of claws and legs		Diseases of the respiratory tract		Other diseases		Antibiotics total		Critically important antibiotic total	
		PDD/LU	%	PDD/LU	%	PDD/LU	%	PDD/LU	%	PDD/LU	%	PDD/LU	%	PDD/LU	%
QJ01A	Tetracyclines	0.005		0.001		0.001		0.004		0.001		0.013		0.013	
QJ01B	Ampenicolones	0.000		0.000		0.000		0.001		0.000		0.001		0.001	
QJ01C	Beta-Lactam/Antibacterials, Penicillins	0.001		0.032		0.002		0.000		0.008		0.045		0.045	
QJ01D	Other Beta-Lactam Antibacterials	0.004		0.010		0.042		0.003		0.012		0.074		0.074	
QJ01E	Sulfonamides and Trimethoprim	0.002		0.002		0.004		0.002		0.004		0.022		0.022	
QJ01F	Macrolides, Lincosamides and Streptogramins	0.000		0.042		0.000		0.001		0.002		0.046		0.046	
QJ01G	Amnoglycoside Antibacterials	0.000		0.002		0.000		0.001		0.001		0.003		0.003	
QJ01M	Quinolones and Quinoxaline	0.001		0.025		0.000		0.010		0.007		0.048		0.048	
QJ01R	Combinations of Antibacterials	0.001		0.001		0.008		0.078		0.025		0.196		0.196	
QJ51C	Beta-Lactam Antibacterials, Penicillins for intramammary use	0.012		0.379		0.000		0.000		0.003		0.392		0.392	
QJ51D	Other Beta-Lactam Antibacterials for Intramammary use	0.001		0.137		0.000		0.000		0.004		0.143		0.143	
QJ51F	Macrolides, Lincosamides and Streptogramins for Intramammary use	0.000		0.002		0.000		0.000		0.000		0.002		0.002	
QJ51R	Combinations of Antibacterials for Intramammary use	0.000		0.280		0.000		0.000		0.002		0.283		0.283	
QJ51X	Other Antibacterials for Intramammary use	0.000		0.002		0.000		0.000		0.000		0.002		0.002	
Total QJ01		0.016		0.115		0.057		0.099		0.058		0.448		0.448	
Total QJ51		0.012		0.800		0.000		0.000		0.009		0.822		0.822	
Total QJ		0.028		0.914		0.057		0.099		0.067		1.271		1.271	
		3.5		12.7		4.5		22.2		7.8		13.0		13.0	
		1.5		0.0		0.0		0.0		0.0		1.1		1.1	
		2.2		4.5		0.099		22.2		7.8		5.3		5.3	
		0.016		0.099		0.000		0.000		0.009		0.448		0.448	
		0.012		0.000		0.000		0.000		0.009		0.822		0.822	
		0.028		0.099		0.057		0.099		0.067		1.271		1.271	
		37.6		17.6		24.7									
		0.169		0.145		0.313									

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Challenges and benefits of health data recording for food chain quality, management and breeding

under performance recording in Austria was made. The data is derived from 8,234 treatment records and prescriptions acquired from 8 veterinary practices active in dairy cattle farms between 2008 and 2010. As units of antimicrobial consumption, the amount of active substances (g) per livestock unit (LU) per year applied and the number of prescribed daily doses (PDD) per LU per year was considered. This parameter was estimated applying Monte Carlo simulation techniques, where uncertainties in the annual working hours in the veterinary practices, in the number of produced animals and in the proportion of the non-treated population were taken into account.

3.29 g/LU (median) of active antimicrobial substances per year were applied to cattle in dairy cattle farms. Correspondingly, a median of 1.69 PDD/LU per year (quantiles: 1.28 – 2.13) were used. Three quarters of the consumed doses (median of 1.27 PDD/LU) belonged to the ATCvet group QJ (antiinfectives for systemic use). Antibiotics ranked as critically important antimicrobials (3rd and 4th generation Cephalosporines, Macrolides and Quinolones) were used by the participating veterinarians (median of 0.31 PDD/LU). Cephalosporins of the 3rd and 4th generation (median of 0.22 PDD/LU) were most frequently applied to dairy cattle in the therapy of udder diseases and diseases of claws and legs.

From the end-consumer's perspective the food safety and the health risks caused by drug resistant bacteria are increasingly of particular interest. There is growing demand for consumer confidence in animal health and drug use. Associating diagnostic data with

treatment data can give valuable information on prudent use of veterinary drugs and serve as a basis for further research on the impact of drug use in cattle production on antimicrobial resistance (Table 1).

Since 2011 monitoring of health data is integrated into the breeding programs of Austrian cattle breeders and therefore compulsory for all breeding herds. The health monitoring in cattle is thus part of a surveillance programme for cattle health. The cooperation of representatives of agriculture, veterinarians and science for the development of the health monitoring programme has proven well. New benefits for the participating farmers and veterinarians are created through the further development of an electronic data exchange platform for performance, diagnostic and treatment-data. The health monitoring is important for improving health and productivity in cattle husbandry. It provides a valuable contribution to the safety and the quality of food products from cattle production. This in turn is only achievable with a well working partnership between farmers and veterinarians, and the voluntary self-commitment to consumer demands for comprehensive health surveillance and disease prevention as well as for the maximum possible transparency in food production.

Conclusion

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