

Interdisciplinary intervention in German organic dairy farms – results on mastitis and metabolic disorders

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Abstract

A nationwide interdisciplinary intervention study in 106 German organic dairy farms was carried out in order to develop preventive animal health management strategies for mastitis and metabolic disorders and to implement and validate this concept. After an initial farm visit focusing on the health situation and the potential risk factors including housing, herd management, feeding and forage production, individual evidence-based advice was provided by the project team. Intervention measures to improve herd health were implemented and their effectiveness was monitored for two years. Udder health regarding milk somatic cell count and treatment incidence for mastitis improved significantly, whereas the percentage of dry-off-treatments with antibiotics and internal teat-sealers increased significantly. Considering indicators of metabolic health, there was an improvement in treatment incidence of milk fever and ketosis, but the percentage of cows with a fat-protein-ratio above 1.5 in the first 100 days in milk -as indication of subclinical ketosis- did not change.

Key words: organic dairy farming, animal health, intervention study, interdisciplinary approach, knowledge transfer

Introduction

Mastitis is one of the most prevalent health problems in organic dairy farming (e.g. Weller & Bowling, 2000) and metabolic disorders play as well a considerable role (Brinkmann et al. 2005). High milk yields pose a challenge in organic dairy farming, resulting from the conflict between the preferential use of in-house feedstuff and the restrictions on the choice of feedstuffs in organic farming and the ration requirements of the high producing animals (Sundrum & Schumacher, 2004). Improving health in dairy production should rely on preventive herd health management. Accordingly the present project pursued an interdisciplinary approach considering the whole production system, including e.g. grassland and ley farming, feed rationing, housing conditions and their relationship to the metabolic and udder health situation on the farms. It was the aim of this study to analyze the effectiveness of farm-individual evidence-based intervention measures to improve herd health within a one to two year period after advice had been provided.

Material and methodology

The intervention study was carried out between 2007 and 2010 in 106 German organic dairy farms (average herd size 57 ± 36 cows, range 18-252). All farms complied with a range of criteria (main breed Holstein Friesian, Simmental or Brown Swiss, free-stall housing, milk recording scheme data) and were located in different regions in Germany. In an initial farm visit the health situation (e.g. lameness, body condition, treatment records, and milk constituents) and a range of potential risk

factors including housing conditions, herd management, feeding and forage production was assessed.

Based on this initial assessment, scientists from different disciplines estimated the individual risks of each participating farm, identified the potential for improvement and developed recommendations. These suggestions regarding udder health and metabolic status as well as feeding and grassland management were fed back in the following farm visit(s) within one year and the effectiveness of this prevention-orientated herd health management was assessed using key figures of metabolic and udder health (Table 1). In total four farm visits were conducted until Winter 2009/10.

Incidences of treatments were obtained from farm records for the years 2007, 2008 and 2009 respectively as number of cases per cow and year. Repeated application of drugs connected to the same diagnosis with a maximum lag of seven days between treatments was counted as one event. The average for 2007 and 2008 was used as baseline health indicators. The implementation of recommendations was conducted at the 2nd visit at the end of 2008 and the developing of herd health was monitored for one (treatment incidences) respectively two years (milk recordings) afterwards. Mixed models for repeated measures were used to analyze the effect of time after intervention at farm level.

Results

Topics and implementation of measures

In total 1.268 farm-individual recommendations were worked out and most of these advices dealt with udder and metabolic health (494/456); further 180 recommendations were given with regard to grassland management, 63 to forage harvesting and forage conservation. To evaluate compliance, we assessed the degree of implementation on the farms at the 4th farm visit. About 57 % (702 measures) had been implemented (completely or partly; 39 times information on implementation was missing and about 40 % of the suggestions were assessed as not having been implemented yet). Compliance of the farmers was > 60% regarding the given recommendations to improve udder and metabolic health.

Development of herd health parameters

Whilst the average milk yield and herd size increased significantly (19.8 -> 20.9 kg per cow and day; 56.8 -> 60.4 cows/herd), mean herd age did not change over the project period (5.4 years). Milk somatic cell score (SCS) improved significantly from 2007/08 to 2010 and treatment incidence for mastitis decreased significantly from 2007/08 to 2009. At the same time the percentage of animals with antibiotic dry-off-treatments and internal teat-sealers increased significantly. Considering indicators of metabolic health, there was an improvement in treatment incidence of milk fever and ketosis, but the percentage of cows with a fat-protein-ratio ≥ 1.5 in the first 100 days in milk (DIM) - as an indication of imbalance energy supply - did not change (see Table 1). The fat-protein-ratio (FPR) in these early lactating cows was unchanged as well (mean: 1.28).

Discussion

In this study, levels of SCS and SCC were similar to values reported in other European studies (Gay et al. 2007, March et al. 2011). The initial incidence of allopathic treatments of mastitis was 17 % which is similar to the treatment incidence in 149 Norwegian organic dairy farms (Valle et al. 2007). However, other studies found higher incidences (Weller & Bowling 2000, March et al. 2011), partly including antimicrobial dry-off-treatments (Bennedsgaard et al. 2010, Ivemeyer et al. 2012). The occurrence of hypocalcaemia in organic farms ranges between 7 % (Ivemeyer et al. 2012, Hardeng & Edge 2001) and 12 % (Bennedsgaard et al. 2010). The former is similar with the initial situation 2007/08 in the 106 German farms in our present study and also with treatment rates stated in other studies in organic dairy herds (Brinkmann & March, 2010). In the present study there was an improvement with respect to antibiotic treatments of mastitis due to the farm-individual in-

tervention, which is in accordance with the results of Bennedsgaard et al (2010), Ivemeyer et al. (2012) and March et al. (2011), who investigated different approaches to improve dairy health in organic farms but which all emphasized farm specificity and farmer ownership. In contrast to the other studies, we found an increased use of internal teat-sealers and antibiotic dry-off-treatments, which may be seen as a first measure but is discussed controversially. In accordance with our findings, Ivemeyer et al. (2012) described a decrease in metabolic treatment incidence through herd health planning (1-year-period). On the other hand the incidence of metaphylactic treatments of hypocalcaemia, e.g. calcium boli, increased in our study and the incidence of imbalanced energy supply in risk period in the early lactation (<100 DIM) remained unchanged. One reason could be difficulties to influence the contents of feed-stuff on a short-term basis, particularly in organic agriculture, because changes in forage harvest and conservation may only be effective on a longer term.

Table 1. Development of selected parameters of herd health in all project farms; mean (sd) and level of significance for the effect of time in project (n=106)

		2007/08	2009	2010	Effect of year (p)
Somatic Cell Score (SCS)		3.4 (0.5)	3.2 (0.5)	3.1 (0.5)	< 0.001
Treatment incidence mastitis ²	[%]	17.0 (17.2)	13.5 (15.1)	- ²	0.003
Dry-off-treatments with antibiotics	[%]	17.1 (19.1)	27.3 (28.1)	- ²	< 0.001
Use of internal teat-sealer	[%]	9.4 (20.7)	16.9 (31.6)	- ²	0.001
Treatment incidence hypocalcaemia ²	[%]	6.0 (5.8)	4.8 (4.9)	- ²	0.038
Incidence metaphylactic treatments hypocalcaemia ³	[%]	2.6 (7.3)	3.7 (11.3)	- ²	n.s.
Treatment incidence ketosis ²	[%]	1.5 (3.3)	0.8 (2.0)	- ²	0.019
Percentage cows with FPR ≥ 1.5 in first 100 DIM	[%]	15.0 (9.9)	14.6 (8.7)	15.1 (9.3)	n.s.

¹ Only SCS used for analysis of variance In order to obtain normal distribution; denoted SCS is equivalent to a SCC of 280.000, 259.000 and 249.000 cells/ml milk, respectively.

² Treatment data is only available until 2009. ³ e.g. Ca-Bolus.

Suggestions to tackle the future challenges of organic animal husbandry

In conclusion, these findings provide evidence for improvements of the health situation in commercial organic dairy farms in response to farm-individual intervention measures through an interdisciplinary approach under practical conditions. However, additional studies are necessary to investigate the longer-term development of herd health, in particular to also reduce metaphylactic treatments and enhance preventive measurements regarding housing, feeding, etc.

References

- Bennedsgaard TW, Klaas IC, Vaarst M (2010): Reducing use of antimicrobials - Experiences from an intervention study in organic dairy herds in Denmark. *Livestock Science* 131:183-192.
- Brinkmann J, Winckler C (2005): Status quo der Tiergesundheitssituation in der ökologischen Milchviehhaltung – Mastitis, Lahmheiten, Stoffwechselstörungen. In: Heß J, Rahmann G (Hrsg) *Ende der Nische : Beiträge zur 8. Wissenschaftstagung Ökologischer Landbau*, Kassel, 1.-4. März 2005. Kassel: kassel university press, pp 343-346.
- Brinkmann J, March S (2010): Tiergesundheit in der ökologischen Milchviehhaltung - Status quo sowie (Weiter-) Entwicklung, Anwendung und Beurteilung eines präventiven Konzeptes zur Herdengesund-

- heitsplanung. Dissertation zur Erlangung des Doktorgrades der Fakultät für Agrarwissenschaften der Georg-August-Universität Göttingen.
- Gay E, Senoussi R, Barnouin J (2007): A spatial hazard model for cluster detection on continuous indicators of disease: application to somatic cell score. *Veterinary Research* 38, 585-596.
- Hardeng F, Edge VL (2001): Mastitis, Ketosis, and Milk Fever in 31 Organic and 93 Conventional Norwegian Dairy Herds. *Journal of Dairy Science* 84, 2673-2679.
- Ivemeyer S, Smolders G, Brinkmann J, Gratzner E, Hansen B, Henriksen BIF, Huber J, Leeb C, March S, Mejdell C, Nicholas P, Roderick S, Stöger E, Vaarst M, Whistance LK, Winckler C, Walkenhorst M (2012): Impact of animal health and welfare planning on medicine use, herd health and production in European organic dairy farms. *Livestock Science* 145:63-72.
- March S, Brinkmann J, Winckler C (2011): Improvement of udder health following implementation of herd health plans in organic dairy farms: results of a pilot study in Germany. In: Hogeveen, H., Lam, T.J.G.M., 2011 (Edt.): Udder health and communication. Proceedings of the international conference, 25.-27.10.2011, Utrecht/ The Netherlands, 91-99.
- Sundrum A, Schumacher U (2004): Milchviehfütterung unter systemorientierten Gesichtspunkten in der ökologischen Landwirtschaft. Proceedings of the Society of Nutrition Physiology 13, 09.-11.03.04, Göttingen, 183-184.
- Valle, PS, Lien G, Flaten O, Koesling M, Ebbesvik M (2007): Herd health and health management in organic versus conventional dairy herds in Norway. *Livestock Science* 112, 123-132.
- Weller RF, Bowling PJ (2000): Health status of dairy herds in organic farming. *Veterinary Record* 146, 80-81.

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