MASTITIS IN DANISH ORGANIC DAIRYING

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SUMMARY

An overview is given of the development of Danish organic dairy farming with special emphasis on udder health and handling of mastitis during the past decade. Risk factors and challenges, which exist within the organic production system, are discussed. Treatment strategies are discussed briefly. It is concluded that the mastitis situation in organic herds does not differ from the situation in conventional herds – and in cases where it does, it has not been in favour of the organic production system during the past few years. Former studies in ‘old organic herds’ indicate a better udder health in the study herds, which was explained by care-taking and consequent intervention when needed. One of the major future challenges is the search for solutions, in accordance with the organic ideas and goals, to improve the mastitis to organic milk production.

INTRODUCTION: ORGANIC DAIRY PRODUCTION IN DENMARK

Organic dairy farming can be defined by a set of basic ideas and values. On the overall farm level, recycling of nutrients, closeeness between farming society and consumers (2,3), and harmony between levels in the farm (e.g. number of animals per hectare) are important. Organic farming involves a set of governmental legislation and rules, whose overall purpose is to explain practically how organic farmers may ‘live up to the organic production method’.

- 85% organic food; no feed additives. A recent agreement between dairy farmers and dairies that organic cows are fed 100% organic food.
- Calving must be carried out in calving pens.
- Cows and calves must stay together for at least 24 hours after calving.
- All animals must receive littered bedding.
- Group housing of calves is called for after one week.
- The suckling instinct of the calf must be satisfied (through the use of teat buckets, nurse cows or blind teats).
- Animals older than 3 months must have access to grazing for 150 days during summer.
- All antibiotic treatment of dairy cows must be administered by a veterinarian. The initial treatment of calves with antibiotics and other drugs must be administered by a veterinarian, but with calves, the farmer can administer subsequent treatment for 5 days, if the calf's identification and the date are clearly indicated on the medicine bottle.
- No prophylactic medical treatment of disease is allowed.
In Denmark, organic dairy production has increased rapidly over the past few years. During a 5-year period, the number of organic dairy herds increased from 132 to 722 in December 2000 (almost stagnating from 1999 until now). Now, organic milk comprises approximately a quarter of the Danish milk for direct consumption, and approximately 7% of the total amount of milk received at the dairies from farms. Organic dairy herds are usually big; in average 87.3 cows/year in herds with dual-purpose breeds, and 74.9 in Jersey herds. There were 65.7 cows/year in 2000 in average in Danish dairy herds overall. The average milk production per cow was approximately 7500 kg (4% fat content) for dual-purpose breeds, and around 6500 kg (4% fat content) for Jersey cows. The total amount of organic milk was 333 million kg in 1998 (in Denmark), increased from 39 million kg in 1993.

In the organic production system, a lot of challenges are given with regard to handling disease. In the dairy herd, mastitis is definitely the most dominant disease problem. Risk factors connected to the environment, the organic rules and the structure of organic milking herds can be mentioned – and in each case, more of these will most likely be involved, since the causal background for mastitis and udder health problems definitely is very complex.

In the following, aspects of mastitis in organic dairy farms will be discussed. Examples from Danish studies will lead to a discussion about potential risk factors for mastitis given within the organic production system. Mastitis treatment in organic dairy farming will shortly be discussed. Finally, future challenges and perspectives will be presented for future discussion.

The mastitis situation in organic dairy production

The current mastitis situation in Danish organic dairy herds

Based on bulk milk somatic cell counts and milk quality (Table 1), no difference between organic and conventional milk production seems to be present in Denmark.
Table 1. Somatic cell count (bulk milk delivered to dairies) data from organic herds from 1996-2000. As a background, the average for all herds (including organic herds) in Denmark, is given

<table>
<thead>
<tr>
<th>Year</th>
<th>Organic dairy herds</th>
<th>Denmark (all dairy herds)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Geom. Average (x1000)</td>
<td>% lower than 100,000</td>
</tr>
<tr>
<td>1996</td>
<td>255</td>
<td>2.3</td>
</tr>
<tr>
<td>1997</td>
<td>260</td>
<td>2.4</td>
</tr>
<tr>
<td>1998</td>
<td>254</td>
<td>2.0</td>
</tr>
<tr>
<td>1999</td>
<td>268</td>
<td>1.5</td>
</tr>
<tr>
<td>2000</td>
<td>250</td>
<td>2.0</td>
</tr>
</tbody>
</table>

In a recent study, the udder health situation in a number of Danish organic dairy herds did not differ from the situation in conventional herds, measured through the same period (Table 2).

Table 2. Key figures for production and udder health in 27 organic and 57 conventional herds (participating in the project on development of health advisory service in Danish organic herds and in the Kongeå-project, respectively), during the period December 1998 to December 1999 (8,22)

<table>
<thead>
<tr>
<th>Production and udder health parameter</th>
<th>Organic</th>
<th>Conventional</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25%</td>
<td>75%</td>
</tr>
<tr>
<td>Number of cows per year</td>
<td>74</td>
<td>130</td>
</tr>
<tr>
<td>Milk yield in 1st lactation cows, EKM per day*</td>
<td>19.7</td>
<td>23.0</td>
</tr>
<tr>
<td>Milk yield in &gt;3rd lactation cows, EKM per day</td>
<td>22.8</td>
<td>28.8</td>
</tr>
<tr>
<td>Mastitis treatments, % lactating cows per month</td>
<td>1.8</td>
<td>5.1</td>
</tr>
<tr>
<td>Acute increase in SCSCC, % lactating cows/month</td>
<td>5.4</td>
<td>7.5</td>
</tr>
<tr>
<td>Chronic elevated SCSCC, % lactating cows</td>
<td>9.4</td>
<td>18.6</td>
</tr>
<tr>
<td>Bulk milk SCC (calculated from SCSCC)</td>
<td>260</td>
<td>401</td>
</tr>
</tbody>
</table>

*EKM = kg milk with 4% fat content
‘An old Danish case’: what can we learn from that about mastitis handling?

From 1991-1994, a Danish on-farm research project including 15 organic dairy herds took place. Since a parallel project in conventional dairy herds was carried out, it was possible to compare udder health between the two study groups. The pattern of micro-organisms involved in clinical mastitis cases did not differ significantly from that found in conventional herds (23). Few coliforms were cultivated, but 20% of the samples were no-growth cases, and could potentially have been coli-cases. As shown in Table 3, the udder health – expressed through a number of different parameters – was found to be better in organic dairy herds than in conventional herds.

Table 3. Results from organic and conventional herds participating in on-farm studies at Research Centre Foulum in the early 1990s (24). Only herds having monthly milk yield control on single cow level are included in this Table (12 organic and 20 conventional herds)

<table>
<thead>
<tr>
<th>Udder health parameters</th>
<th>Organic herds</th>
<th>Conventional herds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Median</td>
<td>10-90% percentiles</td>
</tr>
<tr>
<td>Mastitis treatment, % of lactations</td>
<td>5</td>
<td>0-14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>31</td>
</tr>
<tr>
<td>SCC, % cows &gt;500,000 cells/ml</td>
<td>14</td>
<td>3-26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>Sub-clinical mastitis, % cows</td>
<td>28</td>
<td>11-44</td>
</tr>
<tr>
<td></td>
<td></td>
<td>43</td>
</tr>
<tr>
<td>SCC(x1000) at herd level, based on SCSCC</td>
<td>240</td>
<td>148-452</td>
</tr>
<tr>
<td></td>
<td></td>
<td>347</td>
</tr>
<tr>
<td>Bulk milk SCC (x1000)</td>
<td>210</td>
<td>90-350</td>
</tr>
<tr>
<td></td>
<td></td>
<td>315</td>
</tr>
</tbody>
</table>

Since these herds were followed for a number of years, and daily management routines were explored both through interviews and through observation, the way of handling mastitis and preventing disease in general was well described (19). With regard to mastitis, no ‘particular and distinct organic characteristics’ could be identified. The fact that they were fed with organic food, were grazed during summer and had access to straw bedding did not seem to create any clear and unambiguous difference, compared to conventional farms. There was wide variation within both groups (conventional and organic). One factor, that seemed to characterise the majority of organic farms, was the relatively high degree of what was characterised as care-taking. Included in these routines were extra milking-out by hand between machine milking very early in a mastitis case, providing of extra bedding in critical situations (e.g. after calving), and careful inspection of milk and udders. A high degree of consequent intervention – also very work demanding intervention such as udder massage and milking-out by hand, as mentioned above – was described in many of the organic herds participating in the study. The difference is consequently not explained by ‘being organic’ – but rather by ‘being good dairy herd managers’, and having time enough to take care of the cows and
the preventive (and health promoting) efforts as a part of the daily routines. The basic ideas of organic farming can be claimed to stimulate such an effort – in combination with the restrictive antibiotic policy. In interviews, many of these farmers described a ‘conversion in the herd’ which made them feel responsible for their own animals in a different way to before, when they considered a veterinary treatment to be sufficient in order to solve a mastitis case. When referring to recent studies in newly converted organic herds, this ‘conversion’ with regard to care-taking routines to a similar level as described above, does not seem to have taken place (yet?) in the new organic herds. The pressure on the organic farm – demanding less working hours per animal per year – may not allow such an effort towards single animals, groups of animals or the whole herd. This must be regarded as a substantial challenge for organic dairy farming: when claiming that animal welfare should be increased through non-medical methods, a structure allowing this should definitely be allowed within the system. Otherwise, organic dairy farming will be characterised by an unacceptable level of disease problems.

Conversion to organic farming: a situation of chaos and changes

In a recent study, involving interviews of veterinarians, cattle advisors (agricultural scientists giving advice to cattle herds) and newly converted farmers, it became clear that the conversion period was very often related to changes in the farm. Herd size very often increased and housing system was changed in connection to the conversion. This led to a further demand of changes in daily management (21,25). During the conversion process, there was generally much focus on the crop production (without fertiliser and pesticides), and the interaction between the herd and fields (grazing management and roughage production). In contrast, there seemed to be very little focus on health issues specifically related to the dairy cows, calves and heifers. The knowledge about and understanding of organic animal husbandry was relatively limited among many animal health professionals (veterinarians), and since organic herds apparently ‘look like’ conventional herds, very little search for solutions fitting to an organic context and the goals for organic farming was carried out. In many cases, the farmer had to explain to the veterinarian about the restrictions and organic production conditions. This is unacceptable for a farmer seeking and paying for advice from a professional advisor, who is supposed to be the one basing his/her advice on knowledge – not only about disease and health, but knowledge about factors which can influence the solutions. The fact that the conversion of the herd is very little in focus, and that health professionals have so little knowledge about organic farming – and in particular the goals for organic farming – points at some future challenges, and ways of improvement.
Mastitis in organic dairy herds in other European studies

In other European studies, the level of mastitis in organic dairy herds appears to be the same as in conventional herds (13,14,28,5,17,18). Ebbesvik and Loes (9) found a lower mastitis incidence in organic compared to conventional dairy herds. The results in these studies are often based on mastitis treatments, which definitely is not the same as the occurrence of mastitis! The farmer’s decision to treat mastitis is as complex as the nature of mastitis itself (27), and more information should be included in order to support the conclusion about overall mastitis levels in dairy herds in general. There is – however – basis for concluding that mastitis is a dominating problem in organic dairy farming, and that much more effort and attention seem to be needed to solve the problems.

Potential risk factors for mastitis, related to organic farming production conditions

The risk of mastitis may be related to some production conditions, which are present in organic herds. Not all of these conditions are present ONLY in organic dairy herds; e.g., summer grazing is practised in many dairy herds – not only organic herds! In the following some of these risk factors, which were found to be of potential importance for the occurrence of mastitis in Danish studies in organic herds, will be listed:

Summer grazing

- In general, there is a better hygiene during the grazing period. Cows (including udders and teats) are cleaner.
- Bulk tank milk somatic cell counts are often higher in late summer (may be influenced by intensive clover feeding, climatic factors and a disproportion between energy supply and milk yield).
- Sun burns on teats and udder (some breeds – e.g. Holstein-Friesians with ‘white udder skin’ - are particularly disposed).
- Access to grass ad libitum may complicate the drying off process and lead to increased weight gain in dry cows (fat cows) and consequently metabolic disease and reduced udder health.

Feeding strategies

- Organic feeding is very much based on roughage. This has to be of good quality in order to ensure enough uptake. Stimulation of rumen function should lead to a good health situation, including udder health.
- High yielding cows (genetically stimulated to high milk yield) can get into negative energy balance during the high yielding period of their lactation. This may cause increased risk of metabolic diseases and imbalance, also increasing the risk of mastitis. Organic dairy cows in Denmark are genetically of the same origin as conventional cows – which means bred
for high milk yield. If fed sufficiently and with a good energy input-output balance, high yield does not necessarily lead to increased disease levels!

**Access to bedding area for all animals**

- Straw yards or deep litter very often lead to an increased risk of mastitis involving *S. uberis* and *E. coli*. In practice, it can be shown that the housing systems built for deep litter systems, do not provide enough fresh air, which leads to a very poor quality of the immediate environment – followed by severe problems of environmentally based udder infections.
- Deep straw bedding might improve the hygiene and decrease the risk of teat injuries, hock lesions etc., but increases the demand for claw trimming.
- Sand is also accepted for bedding – in Denmark, this is relatively new, but the preliminary results from herds using sand bedding seem promising.

**Drying off**

- Prohibiting antibiotics for preventive use when drying off may increase the risk of clinical mastitis during the dry period and the following lactation. In practice, dry cow mastitis is relatively often seen in organic herds.
- (Drying off can be difficult during summer, see above)

**Access to daily exercise**

- Less risk of teat injuries in loose housing systems.
- Well exercised animals: better condition, better locomotory system (also leading to reduced risk of traumas and teat injuries).
- In tied-housing systems, outdoor exercise should be provided daily during winter. In some cases - depending on weather conditions – this would lead to reduced teat skin quality. In practice, this is an ‘historical problem’, since the amount of organic tied housing systems is very low now.

**Access to suckling – and cow-calf relationship during the first 24 hours of the calf’s life**

- In Denmark, suckling in dairy herds is mostly practised by having some cows (e.g. cows with high somatic cell counts) with 3-4 calves each, either in single boxes or common ‘suckler areas’. The introduction of calves to suckler cows (called ‘suckler aunts’, since it is not the biological mother of the calves) is shown to be most successful if the calf was allowed to suckle its own mother before introduction to an ‘unknown cow’ (26).
- Some studies and practical experiences indicate that suckling can reduce somatic cell count in cows with sub-clinical mastitis, and prevent clinical mastitis.
- For several reasons – including udder health – keeping the cow and calf together (after calving and as suckler cows) should not lead to omission of post partum udder control. Practical experience indicates that cross suckling (in systems allowing this) may lead to avoidance of milking of single glands (maybe mastitic glands, from where the milk tastes more salty and less attractive to the calf). This increases the need for daily inspection.

Other and more specific problems related to udder health may occur in organic dairy herds. In practice, very many heifers in Danish organic herds are kept in deep litter areas in herds, whilst the dairy cows are kept on slatted and concrete floors with beds. This may lead to a need for a gradual introduction, claw trimming before first calving and a recommendation to make an area of concrete or slatted floor in the heifer area – e.g. in the feeding place.

**Treatment strategies in organic herds**

The restrictions on antibiotics may positively lead to a more intensive health promotion and disease prevention effort, and to consequent and early intervention in case of disease, as discussed above. It may – also positively – lead to reduction in antibiotic resistant mastitis pathogens, and to a culling strategy, where e.g. cows infected with *S. aureus* are culled instead of treated with antibiotics in spite of a bad prognosis. In this way, antibiotics are administered in a more sensible and responsible way.

On the other hand, the restrictions on antibiotic use may negatively lead to a non-treatment policy, where animals requiring treatment will not be treated. This may lead to experimenting with non-antibiotic treatment strategies without any documented effect, and/or carried out by persons with little education and experience with such disease treatment methods. In case of farmers ‘suffering’ from the idea that conversion to organic farming automatically will lead to a better health situation, it is hazarded to stimulate a ‘non-treatment strategy’ in their herds, without simultaneously introduction of a profound surveillance and care-taking effort.

With regard to mastitis, an outbreak of dry cow mastitis is a particular concern. This is not only the case for organic herds in Denmark, since preventive medical dry cow therapy has been prohibited in all Danish dairy herds since 1995. Dry cow mastitis or mastitis at calving (indicating the presence of mastitis in the dry period) is a problem in some herds. The practical solution is very often selective treatment at drying off, when verifying the presence of bacteriological udder infection through cultivating of milk. There is without doubt need for more knowledge about robust and non-medical drying off routines and dry cow management.

A critical antibiotic policy has been stimulated during recent years from increasing concern about antibiotic resistance. A large proportion of antibiotics used for treatment of production animals is estimated to be
unnecessary (29,1), and/or based on vague and non-documentated ground (see Baadsgaard (6) for statistical analyses and discussions of this with regard to antibiotic use in non organic pig herds).

Homoeopathic and other ‘alternative treatment methods’

The EC-Regulation (No. 1804/1999) – explicitly favours homeopathic treatment to allopathic treatment (defined more or less as bio-medical treatment). The interest for homoeopathy is wide-spread among organic farmers also in Denmark (20), and homoeopathy is used as a part of the treatment regime in organic herds in more European countries (11,4). Hovi and Roderick (12) reported that 627 of 1259 clinical mastitis cases were treated with homoeopathy in a survey of organic herds.

Homoeopathy is based on holistic ideas of health and disease, and the treatment aims to stimulate the whole organism (physically, emotionally and mentally) to cure, rather than to attack specific micro-organisms. These ideas seem to be well in accordance with the basic ideas of organic farming (7,30,16), besides the fact that the homoeopathic medicines is 'non-chemical'. Homoeopathy – as well as many other ‘alternatives’ to bio-medical disease treatment – is not immediately in accordance with the bio-medical model of health and disease, and therefore not accepted. Descriptions and research, which can be communicated across these borders of common understanding, are definitely needed, and very few of such studies do exist (10,15). The homoeopathic treatment method demands specific education in order to be used correctly. Treating homoeopathically also demands knowledge about the animals in the herd, and a good dialogue between the persons involved in the treatment (e.g. farmer and veterinarian).

CONCLUSION AND FUTURE CHALLENGES: DEVELOPMENT OF ‘ORGANIC SOLUTIONS’

A number of studies indicate that the level of mastitis in organic herds does not differ significantly from the level in conventional herds – and where it does, it is not in favour of the organic dairy farming. The way of producing organic milk in Northern-Western Europe seems also to be basically similar to the production of conventional milk. Since many farmers have converted to organic production during the past few years, some of the mastitis problems may be due to a chaotic situation (e.g. in Denmark, conversion is often related to new housing system and increase in number of cows). When focusing on health promotion in organic farming, it is clearly not satisfactory to face substantial disease problems.

Organic livestock farming provide many challenges for good herd management. Good animal health and welfare is definitely shown not to come as a ‘natural consequence of conversion to organic farming’, but rather through an increased effort to build up a good and robust system and implement good care-taking routines into the daily management. A major
future challenge is to develop health promotion routines, which are based on – and aim to develop – the basic ideas of organic farming. It is a challenge for animal health professionals to develop a good dialogue with organic farmers, and it is a challenge for organic farmers to direct and include the health professionals in the development of the herd in a way, which stimulates the herd individual development.

ACKNOWLEDGEMENTS

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