# SURVEILLANCE AND MANAGEMENT IN DAIRY CATTLE HERDS AFTER IMPLEMENTATION OF AUTOMATIC MILKING: IS THE HACCP CONCEPT USEFUL?

**Jan Tind Sørensen, Tine Rousing & Ilka C. Klaas**
*Danish Institute of Agricultural Sciences, Dept of Animal Health and Welfare, Research Centre Foulum, P.O. Box 50 DK-8830 Tjele*

## Introduction

The transition from traditional milking to automatic milking (AM) causes dramatic changes in management procedures in a dairy cattle herd (4). In many new AM-herds there have been problems with mastitis and somatic cell count (8) and further problems with water contamination and hygienic quality in the milk (3). Also animal welfare may be compromised in new AM-herds due to less efficient health surveillance. Lameness is found to be a general problem in AM-herds (2). Thus, there is a need for a surveillance and management tool in new AM-herds.

At the Danish Institute of Agricultural Sciences a three-year project was initiated in January 2004 aiming at the development of a tool for surveillance and management in new AM-herds. The purpose of this paper is to suggest a concept for such a tool.

## The HACCP-concept

A generally accepted method for systematic surveillance is a HACCP concept (Hazard Analysis Critical Control Points). This concept was developed in the food industry to cover food hazards (human health risks). However, it has been suggested to be relevant also for dairy cattle herds (5, 1, 9, 10). A HACCP-system for a primary production, such as a dairy cattle herd, will fit well into a whole product chain surveillance system (from stable to table). However, it need to cover a range of quality issues and will not be confined to human health risks.

The idea is to prevent specified problems by continuous control of critical control points (CCP's) indicating an increase of a certain risk of the problem. If an alarm value (AV) for a certain control point is reached then a predefined action should be taken in order to decrease the risk.

Development of a HACCP concept follows 7 steps:

1. Identification of potential hazards
2. Description of critical control points
3. Definition of alarm values for each control point
4. Description of a programme for measurements of each critical control point
5. Description of appropriate actions to take when alarm occurs for a critical control point
6. Making a test procedure validating the surveillance system
7. Documenting all procedures and actions

## How to develop a HACCP concept for an AM-herd

The surveillance system should be focused on problem areas and at the same time be system oriented. We have initially chosen to focus on six problem areas for a new AM-herd, namely:

- Milk quality
- Cow health
- Udder health
- Reproduction
- Milk production and feed management
- Animal welfare

Milk quality is assumed to include parameters such as bacteria counts, freezing point and free fatty acids. Cow health is likely to include factors such as lameness, body condition score and skin lesions. Udder health may include new infections, electric conductivity and teat lesions. Reproduction may be reduced to heat detection and milk production may include milking interval and incomplete milkings. Animal welfare may include queuing time, lying time, and lying behaviour.

Risk factors for each problem area will be identified through literature review. Besides, the identification of risk factors, CCPs and AVs must be specified.

Many parameters would be candidates to be included. Each parameter need to measurable in a robust way and need also to be controllable by the farmer. We need an operational system with relatively few CCP's. Therefore, not all parameters will be covered by CCP's. Some of the parameters may be controlled by a description of Good Farming Practises (7).

Since AM is still a new technology little relevant knowledge on how to quantify the risks is published. Across Europe there are several advisors and applied researchers with valuable experiences in robotic milking systems that can be used for the setting of CCPs and AVs. Therefore, we have chosen to use an expert panel analysis to establish CCPs and AVs. CCP's and AVs will be identified using a Delphi method, comparable to the methods described and applied by Sørensen et al. (11).

The expert panel will be asked to suggest CCPs individually. Then the expert panel will be asked to score each CCP on a scale from 1 to 5 (no relevance to mostly relevant). Based on the evaluation a full set of CCPs will be established. The expert panel will then be asked to suggest alarm values for each CCP. Based on their opinion a set of alarm values will be established.

## How should we evaluate the prototype?

A surveillance and management tool needs several qualities in order to be relevant to the farmer. The system should be operational, efficient and economically beneficial.

An on-farm evaluation is necessary to test if the developed HACCP prototype is operational.
The developed prototype will be applied on 16 AM-herds during a year. A control group of 16 AM-herds with a production system (housing, herd size, milk yield) and AM-experience similar to the HACCP-herds is set up as well. The HACCP system will be implemented and all alarms and implemented actions will be recorded. The effect of the HACCP system will be evaluated by means of epidemiological methods, semi-structured qualitative interviews and systems analysis.

The effect of implementing a HACCP –system on milk production, milk quality and herd health will be analysed by means of epidemiological methods using the cohort-design with HACCO-herds and control herds.

The applicability of the HACCP-system will be evaluated using a semi-structured qualitative interview technique (12). The farmers will be interviewed about their experience using the HACCP-system and their opinion of the possibilities and limitations in the HACCP-system for new AM-herds.

The economic consequences of implementing the HACCP concept will be analysed by means of simulation models. The analysis will be conducted by the SimHerd III-model (6). The long-term economic effect of application of the HACCP-system is predicted and the overall economic consequences in terms of costs and benefits can be analysed.

**Acknowledgement**
This project is funded by Stiftelsen Hofmansgave

**References**

1 Cullor, J.S. 1997. HACCP (Hazard Analysis Critical Control Points): Is it coming to the dairy? J. Dairy Sci. 80, 3449-3452.
2 Klaas, I.C., Rousing, T., Fossing, C., Hindhede, J. & Sørensen, J.T. 2003. Is lameness a welfare problem in dairy farms with automatic milking systems? Animal Welfare 12, 599-604
3 Klungel, G.H., Slaghuis, B.A. & Hogeveen, H. 2000. The effect of the introduction of automatic milking systems on milk quality. J. Dairy Sci. 83, 1998-2003.
4 de Koning, K. & Rodenburg, J. 2004. Automatic milking: state of the art in Europe and North America. In: Automatic milking a better understanding. Wageningen Academics Publichers 27-40.
5 Noordhuizen, J.P.T.M & Frakena, K. 1999. Epidemiology and quality assurance: applications at the farm level. Prev. Vet. Med. 39 93-110
6 Østergaard, S., Sørensen, J.T. & Houe, H. 2003. A stochastic model simulating milk fever in a dairy herd. Prev. Vet Med. 58, 125-143.
7 Rasmussen, M.D. 2003. Good farming practices in dairy farms. TEMCAL XX Reunião-Porto '2003, Porto, Portugal, 9-16.
8 Rasmussen, M.D. Blom, J.Y., Nielsen, A.H. & Justesen, P. 2001. Udder health of cows milked automatically. Livest. Prod. Sci. 72 147-156.
9 Rasmussen, M.D. & Larsen, L.B. 2003. Milking hygiene: New issues and opportunities from automatic milking. Proceedings from satellite symposia: effects of the robotic milking systems on milk quality with reference to typical products August 30 2003 Rome. Ital. J. Anim. Sci. 2(4), 283-289
10 Reed, B.A. & Grivetti, L.E. 2000. Controlling on-farm inventories of bulk-tank raw milk- An opportunity to protect public health. J. Dairy Sci. 83, 2988-2991.
11 Sørensen, J.T, Østergaard, S., Houe, H. & Hindhede, J. 2002. Expert opinions of strategies for milk fever control. Prev. Vet. Med. 55, 69-78.
12 Vaarst, M. Paarup-Laursen, B. Houe, H. Fossing, C. & Andersen, H.J. 2002. Farmers choice of medical treatment of mastitis in Danish dairy herds based on qualitative research interviews. J. Dairy Sci. 85, 992-1001.