More than 30 years of health recording in Norway

Bjørg Heringstad\textsuperscript{1,2} and Olav Østerås\textsuperscript{3}

\textsuperscript{1}Department of Animal and Aquacultural Sciences, Norwegian University of Life Sciences, Ås, Norway
\textsuperscript{2}Geno Breeding and A.I. Association
\textsuperscript{3}TINE Norwegian Dairies BA /The Norwegian Cattle Health Services,

Health data conference, ICAR 2013, Århus, Denmark, May 30

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Aims

- Describe the Norwegian Cattle Health Recording System
- Illustrate how information from this system is used for
  - genetic evaluation in Norwegian Red
  - improved health management at herd level
- Phenotypic- and genetic trends for important health traits
- Future possibilities and challenges regarding dairy cattle health recording
Health recording in Norway

- Since 1975
- Includes >98 % of dairy cows in Norway
- Integrated part of the Norwegian Dairy Herd Recording System (NDHRS)
- Each animal has their individual health card
  - follows the animal from birth to slaughter
- Recording of all veterinary treatments
  - Disease codes (diagnoses), date of treatment, vet id
  - Can describe symptoms and treatment.
History

Started in 1975
- Norwegian Red (NRF)
- Norwegian Veterinary Association

Health Code/Card Committee
- 1975 – 1994

From 1979: TINE SA included
- Health data in NDHRS

From 1980: Ministry of Agriculture
Norwegian Cattle Health Service

- Established 1994
- Collaboration between:
  - Dairy cooperative TINE SA (main contributor and manager)
  - Breeding organisations
    - Geno and TYR
  - Beef cooperative (Nortura) and organisations (KLF)
  - Norwegian Veterinary Association (DNV)
  - Ministry of Agriculture (withdrawed from 1996)
- Common code system for all production animals

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Norwegian Cattle Health Service

- **Aims:**
  - Improve animal health and welfare
  - Improve economy in dairy production
  - Contribute to quality control systems in agriculture

- **Tasks:**
  - Health recording
  - General advisor services regarding animal health
  - Advisor services at herd level

Nationwide organisation (central, regional and local)
Each animal has their individual health card
Organ-related health code system (% of all treatments)

1. Infectious diseases (1 %)
2. Respiratory, cardiovascular and hematopoietic systems (3 %)
3. Digestive system (6 %)
4. Skin and claw (7 %)
5. Mammary system (41 %)
6. Reproductive system/obstetrical conditions (8 %)
7. Reproductive and urinary systems (13 %)
8. Nervous system and sense organs (0.2 %)
9. Musculo- skeletal system (3 %)
10. Non-organ related (16 %)
+ Prophylactic treatment
### Examples

<table>
<thead>
<tr>
<th>Mammary system (41 %)</th>
<th>No of records</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Agalactia</em></td>
<td>129</td>
</tr>
<tr>
<td><em>Severe/moderate clinical mastitis</em></td>
<td>30689</td>
</tr>
<tr>
<td><em>Mild clinical mastitis</em></td>
<td>15920</td>
</tr>
<tr>
<td><em>Subclinical mastitis</em></td>
<td>1826</td>
</tr>
<tr>
<td><em>Teat injuries</em></td>
<td>2219</td>
</tr>
<tr>
<td><em>Dry cow therapy</em></td>
<td>4512</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reproductive and urinary systems (13 %)</th>
<th>No of records</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Abortion</em></td>
<td>401</td>
</tr>
<tr>
<td><em>Aneastrus</em></td>
<td>3566</td>
</tr>
<tr>
<td><em>Heat synchronization</em></td>
<td>2998</td>
</tr>
<tr>
<td><em>Silent heat</em></td>
<td>3770</td>
</tr>
<tr>
<td><em>Metritis, vaginitis and salpingitis</em></td>
<td>2086</td>
</tr>
<tr>
<td><em>Cystic ovaries</em></td>
<td>2519</td>
</tr>
<tr>
<td><em>Castration</em></td>
<td>568</td>
</tr>
<tr>
<td><em>Repeated breeding</em></td>
<td>492</td>
</tr>
</tbody>
</table>
Health recordings in Norway

- The most frequent diseases (2011):

<table>
<thead>
<tr>
<th>Disease</th>
<th>No of records</th>
<th>Records per 100 cow-year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe/moderate clinical mastitis</td>
<td>30,689</td>
<td>13.8</td>
</tr>
<tr>
<td>Mild clinical mastitis</td>
<td>15,920</td>
<td>7.2</td>
</tr>
<tr>
<td>Milk fever</td>
<td>11,284</td>
<td>5.1</td>
</tr>
<tr>
<td>Ketosis</td>
<td>6,855</td>
<td>3.1</td>
</tr>
<tr>
<td>Retained placenta</td>
<td>5,992</td>
<td>2.7</td>
</tr>
</tbody>
</table>

- Diseases with 1-2 records per 100 cow-year (2011):
  - Claw diseases, teat injuries, dry cow therapy, dystocia, silent heat, and cystic ovaries
Recorded veterinary treatments / treated cows per cow-year
Recorded veterinary treatments of mastitis per cow-year
Decreased frequency of veterinary treatments after 1994

- Genetic improvement
- Action by the farmer’s organizations to reduce the unnecessary use of antibiotics
  - changed the treatment strategies
- Establishment of Norwegian Cattle Health Service,
  - development of mastitis control programs, advisory- and herd management tools.

➢ Health recordings crucial tool
Recent developments health recording

- **Direct recording from veterinarians**
  - Veterinarians submit health data directly to the central database (NDHRS) since 2008
  - Since January 2012: Report all use of medication to the Norwegian food authorities
  - More than 60% of the health data are now reported directly from veterinarians to NDHRS
  - Increased the number of recorded calf- and young stock health events
  - Reduced the lag-time from the day of treatment to the event is recorded in the central database
Recent developments health recording

- **Recording of claw health at claw trimming**
  - Introduced in 2004
  - Integrated part of the NDHRS
  - 70,000 claw records from 3000 herds in 2012
  - The claw trimmers record whether the cow has normal (healthy) claws or if one or more of 9 claw disorders are present
  - Systems for electronic recording and direct transfer of data from claw trimmers to the central database will soon be available
Recent developments health recording

- **Mastitis pathogens**
  - Data from mastitis laboratory
  - Recorded in NDHRS since 2000
  - Studies of pathogen specific mastitis

- **Health recording for dairy calves**
  - Improved recording on calves and young animals in recent years
  - Dehorning and prophylactic treatment for parasites were the most frequent health events
  - Respiratory disease is the most frequent disease in dairy calves in Norway.
Data quality

- Medicine for animals can only be distributed and prescribed by veterinarians in Norway
- Data quality confirmed by a recent project (Espetvedt et al., 2013)
  - only 10-12% of the health events were unreported
- Comparisons of retail sales of intramammary antibiotics and the incidence rate of clinical mastitis over 30 years revealed parallel curves (Østerås et al., 2007)
Use of health data for dairy cows

- Herd management
- Important tool / source of information for veterinarians and advisors
  - Health records on cow and herd level are electronically available for farmer, veterinarian and advisor
- Breeding program for Norwegian Red
  - Genetic evaluation of health traits
- Research
  - Animal breeding and genetics
  - Epidemiology
  - Identify factors affecting animal health
- Government
  - Monitoring health situation
  - Statistics
Norwegian Red

- Population size: 240,000 cows in the recording system (98%)
- 10,500 dairy herds
- 95% of the dairy cows in Norway are Norwegian Red
- 90% of calves have an A.I. sire
- Selected for a broad breeding objective with emphasis on functional traits like health and fertility over the last 40 years
Selection against mastitis

- **Direct selection**
  - Veterinary treatments of clinical mastitis
  - Health recording system

- **Indirect selection**
  - Genetically correlated traits e.g. SCC
  - Genetic correlation far from 1

- **Genetic markers**

- **Genomic selection**
  - Phenotypic records still required
  - Reference population
Selection against mastitis

- Heritability of mastitis is low
  - Many daughters needed in progeny testing to obtain reliable breeding values of sires

- Unfavorable genetic relationship to milk production
  - Genetic correlation 0.4 between 305-d protein yield and mastitis in 1. lactation Norwegian Red
  - Selection for increased milk yield -> genetic deterioration of mastitis resistance

- Positive genetic correlation between mastitis and other diseases
  - Selection against mastitis -> genetic improvement of resistance to other diseases as correlated response
Relative weight on traits included in the total merit index used for selection of Norwegian Red sires

<table>
<thead>
<tr>
<th>Trait groups</th>
<th>Relative weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk production</td>
<td>28</td>
</tr>
<tr>
<td>Mastitis</td>
<td>21</td>
</tr>
<tr>
<td>Fertility</td>
<td>18</td>
</tr>
<tr>
<td>Udder conformation</td>
<td>15</td>
</tr>
<tr>
<td>Leg conformation</td>
<td>6</td>
</tr>
<tr>
<td>Growth rate</td>
<td>6</td>
</tr>
<tr>
<td>Temperament</td>
<td>2</td>
</tr>
<tr>
<td>Diseases other than mastitis</td>
<td>2</td>
</tr>
<tr>
<td>Milking speed</td>
<td>1</td>
</tr>
<tr>
<td>Calving difficulty</td>
<td>0,5</td>
</tr>
<tr>
<td>Stillbirth</td>
<td>0,5</td>
</tr>
</tbody>
</table>
Relative weight on traits included in the total merit index used for selection of Norwegian Red sires.
Selection against mastitis in Norwegian Red

- Mastitis included in total merit index since 1978
- Information on veterinary treatments of clinical mastitis (CM) from health recording system
- CM defined as 0/1 in 7 intervals of lactation 1-3
  (-15, 30), (31-120), (121-305) d in 1st lactation, and
  (-15, 30) and (31, 305) d in 2nd and 3rd lactation
- Data from 1978 onwards used for genetic evaluation
- Increasing weight on mastitis from less than 3 % in 1978 to 21 % in 2013
Genetic trends for mastitis and other diseases in Norwegian Red

Mean index

Birth year daughters

- Mastitis
- Other diseases

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Selection against mastitis in Norwegian Red

- Genetic change for mastitis from 1990 to 2010 was on average 0.4 index points per year.
- Genetic improvement of mastitis and milk production simultaneously
  - Despite
    - unfavourable genetic correlation
    - low heritability of health traits
  - Because
    - Large daughter groups – reliabile EBV
    - Weight on mastitis in total merit index used for selection of elite sires
CONCLUSIONS

- Improvement of animal health
  - Genetics
  - Preventive measures
  - Epidemiological research
  - Environmental improvements

- Health recordings a crucial tool!