DAIRY HERD HEALTH IMPROVEMENT SYSTEM IN QUÉBEC

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INTRODUCTION

The medical tradition in health supervision programs for small dairy production units is not firmly established. Research and development projects combining the knowledge of veterinary school faculty and the experience of practitioners seems to be a logical approach to develop this expertise. The research project: **"Quebec Dairy Herds Health Improvement"** (ASTLQ: Amélioration de la santé des troupeaux laitiers du Québec) was initiated for that purpose (1).

For the practice of population or production medicine, the dairy practitioner needs to consider the herd as a production unit consisting of many systems. Herd medicine can also be accomplished by comparing the performance of individual herds to identify "healthy" and "sick" herds. A veterinarian examines and treats a large number of animals, but can only supervise a few herds (20 to 40 small to medium size herds). While veterinarians generally accumulate practice experience and ability in the field of animal medicine, it is quite different for herd medicine. ASTLQ allows veterinarians to share experience and herd data with other colleagues and to develop the tools and methods necessary for the practice of population medicine.

The specific objectives of the research project were:

1) To create tools (software, communication network, continuing education) needed to calculate and interpret health and production indices and develop a methodology necessary to practice population medicine.
2) To build a data bank on animal health for dairy cattle.
3) From the data bank, to evaluate milk production losses due to potential mismanagement of reproduction, mastitis, production and culling.
4) To compare and rank herds with respect to calculated milk losses.

The project ended in 1993. Since then, the system is completely supported by dairy practitioners. The data collection software has evolved, the practitioners' network is still active, the databank is updated twice a year and continuing education meetings are taking place three times a year. The system is now used routinely by approximately 150 dairy practitioners in 50 veterinary clinics in Quebec and New-Brunswick.

ASTLQ DEVELOPMENT AND STRUCTURE

To reach the objectives of the research project, a network was first set up to transfer data, information and eventually knowledge between producers, veterinarians, and faculty members (central data bank).

Communication Network

A data-processing structure was organized to manage adequately the transfer of data and knowledge. Figure 1 summarizes the different activities carried out by the ASTLQ Network participants.

Each network node contributes to the data bank from which information can rapidly be obtained. This approach was used to stimulate the interest of the participants and ensures the quality of the data.

In addition to data transfer, the network now serves to share knowledge and experience through a web site and a communication list.

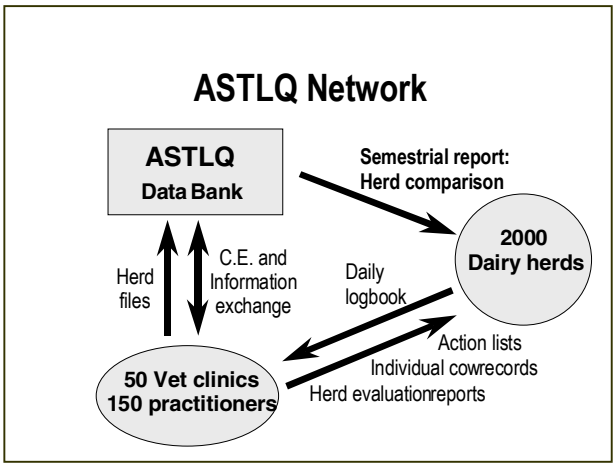


Figure 1 Communication Network

Software (DSA): records and reports

A computer program (DSA: Dossier de santé animale; *Animal Health Record*) for processing cow data and producing reports to submit to the veterinarian and producer was installed in each veterinary clinic. The first part of the project consisted in transferring data between the producers and the veterinary clinics and to standardize codes and diagnoses. The software was first developed on DOS and upgraded throughout the project to meet the ever changing requirements and to add new procedures. It is now available in Windows (95, 98, NT), in french and english. The DSA program can generate personalized reports and the list of animals to be examined for reproduction, udder health, foot problems, and different preventive acts. DSA also produces an annual summary of the herd's reproduction indices.

Training and continuing education (C.E.)

Training and standardization sessions for the participating veterinarians were held periodically. Some continuing education in epidemiology and production medicine was also provided. In addition to those objectives, the training sessions kept the research group aware of the needs and concerns of participants.

Data bank

The realization of this objective involved the transfer of data from veterinary clinics to the University research group and the development of computer support and software to manage transfer and data compilation. To insure data integrity, validation and standardization systems were introduced at the herd level. Reproduction and disease indices most commonly used by the DSA software are summarized in Tables 1 and 2. The indices are calculated from individual lactations and represent the situation of the data bank in 1999. In table 1, the calving-conception interval for heifers was replaced by the birth-breeding interval (age of the animal in days).

Table 1 ASTLQ annual report for selected reproduction indices for 1999

	Heifers	Cows
Number of animals:	16 157	69 618
INTERVALS (days):		
Calving - 1st heat:	470	53
Calving - 1st breeding:	511	84
1st – 2nd breeding:	40	42
2nd – 3rd breeding:	38	40
Calving – culling:	NA	167
Calving – conception (days open):	539	121
PROPORTIONS (%):		
1st breeding conception rate:	60	40
2nd breeding conception rate:	52	42
3rd breeding conception rate:	46	41

Table 2 Summary of diseases and culling rates (%) for ASTLQ databank for 1999.

Diseases	Percentage (%)	
Abortion and embryonic death	6.1	
Displaced abomasum	2.0	
Retained placenta	5.6	
Milk fever	4.4	
Metritis complex (endometritis,metritis, pus)	13.0	
Mastitis	27.8	(16.4)*
Lameness	6.1	
Digestive disease	2.4	
Dystocia:	2.1	
Ovarian cyst	10.6	
Culling	**Percentage (%)**	
Overall culling rate	32.6	
Reasons (% of culled cows):		
Reproduction	32.1	
Conformation	14.2	
Age	4.9	
Production	13.2	
Dead	11.1	
Mastitis	24.5	

*lactational

Analysis Modules and Alarm System(DSA)

Analysis modules were added to the reports, inventories and activity lists. The analysis modules help to interpret the data on mastitis, growth of replacement animals, dairy production management (quota management), reproduction, and most important diseases. All the modules are not presented in this paper.

An alarm system was developed to ensure that an abnormal situation in the herd would not go undetected by the attending veterinarian. The system is based on the comparison of the actual situation in the herd on a comparison between the current and past situation. It monitors reproduction and diseases data and can be considered as a quality control evaluation for the herd. The evaluation results are given in a graphical format.

COMPARATIVE HERD REPORT

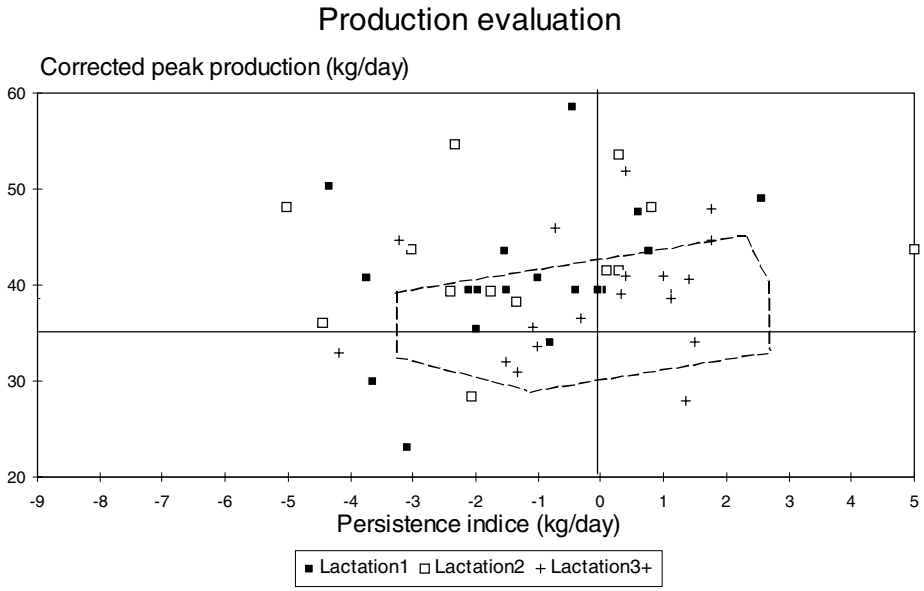
The last part of the project involved analysis of the data bank and the development of tools used to compare herds. The main achievement of this phase is a comparative semi-annual report for the herds monitored in the project. This quarterly report is explained in the next section

The ASTLQ data bank report is put together twice a year. It is used for comparison of the performance of the herds for production, health, and reproduction indices and it covers a one-year period. The report includes charts for persistence in production (figure 2), and reproduction performance (figure 3). It also includes a section (figure 4) that enables comparison of one herd with other herds from the databank, according to opportunity milk production. Finally, the report has two histograms, not presented in this paper, indicating the herd's percentile rank for reproductive and health indices.

Peak Production and Persistence

Figure 2 presents peak production and persistence during lactation. Each cow in the herd with five production records during the latest lactation is represented on the chart. The Y-axis gives the production peak in kg/day, corrected for lactation number. The X-axis represents the persistence index calculated in kg/day; it is corrected for the lactation production peak and the number of lactation. A high value is desirable for the two axes. The vertical and horizontal lines represent the median of the bank for the two indices. The area defined by a dash line corresponds to 80% of the individuals in the bank.

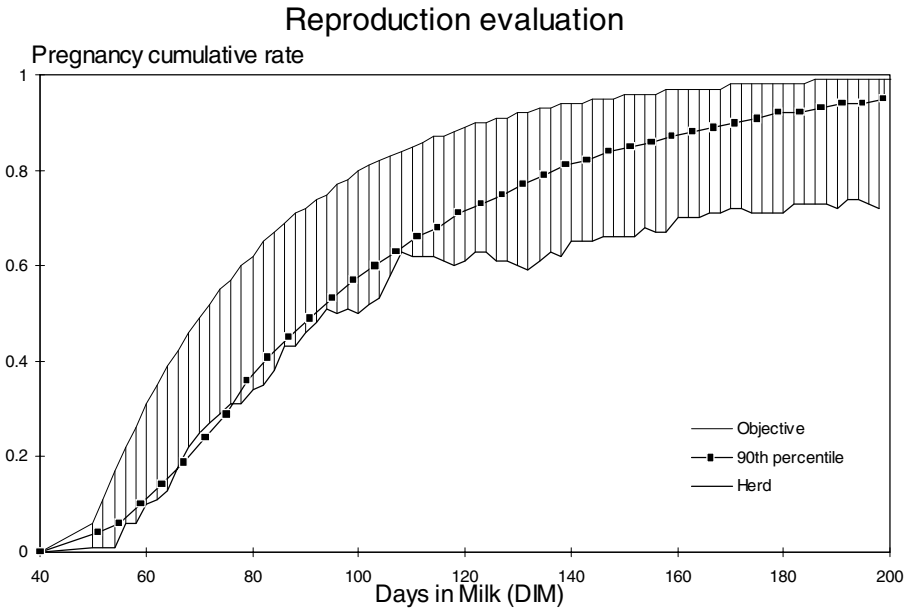
Figure 2 Peak production and persistence for all the cows in the herd compared with median for the databank.



Reproduction Evaluation Chart

This chart represents the cumulative proportion of cows pregnant as a function of the number of days in milk (JEL=DIM). The thin line is obtained from a model for a herd with a 365-days calving interval (50-day waiting period, conception rate of 60%, and a 31-day interval between breedings). The herd's result is represented by a dark line. The shaded area corresponds to the production loss between the model and the herd, it is reported in the report described below.

Figure 3 Reproduction evaluation chart: cumulative proportion of cows pregnant as a function of days in milk.



Comparison Report (figure 4)

This section allows a comparison of each herd with other herds of the databank, using opportunity milk production. That production is given in kg of non-produced milk and in percentage (%) of the herd's production

for different management areas. A rank from 0 to 100 is given to the herd, according to its percentile rank, in comparison with the other herds from the bank. Higher marks highlight positive aspects.

The report gives the opportunity milk production (kg/year and percentage of total herd production) in different areas of management. In each section, the herd is given a percentile rank based on milk losses following a comparison with other herds from the databank. A high mark corresponds to a more desirable result. The calculation methods are summarized in figure 5.

Figure 4 ASTLQ bi-annualy comparison report submitted to each farm.

DEMOGRAPHY							
Adult Cows:	**Number**	**%**	**Rank**	**Heifers:**	**Number**	**%**	**Rank**
Dry	**6**	**12**		**0 - 12 month**	**15**	**43**	
Lactation < 305	**36**	**74**	**26**	**> 12 month**	**20**	**57**	
Lactation > 305	**7**	**14**					
Total	**49**		**80**	**Calving age (month)**	**11**	**(26.1)**	**77**

Management Area	Rank	Production Loss kg/year	%	Remarks
POTENTIAL PRODUCTION	**45%**	**540 842**	**146**	Compared with the best herds, you could improve by 21% your actual production.
CULLING				
Other causes:	**53%**	**39 664**	**10.7**	
Diseases:	**9%**	**19 646**	**5.3**	
Production sales:	**%**	**0**	**0.0**	
MASTITIS				
Somatic Cells:	**80%**	**19 276**	**5.2**	
Clinical Mastitis:	**10%**	**16 310**	**4.4**	
REPRODUCTION				
Cows:	**48%**	**25 207**	**6.8**	
Heifers:	**81%**	**5 931**	**1.6**	
PERSISTENCY				
Cows:	**72%**	**26 690**	**7.2**	
Heifers:.	**55%**	**17 422**	**4.7**	
TOTAL:		**370 696**	**100**	

Figure 5 Explanation of ASTLQ bi-annual report

Demography
This section of the report gives the number of animals active in the herd at the time of the report.

Total Production (bottom of the report)
The annual production is evaluated from each cow's monthly production data. The total production should approach the herd's milk quota.

Potential Production (top of the report)
The potential production corresponds to the quantity of milk the herd should produce if the following estimated losses were eliminated:

Culling
The loss is the 305-days estimated production minus the total production of milk at time of culling.

- *sale for milk production:* loss for cows in production that are sold for milk production.
- *diseases:* loss for cows eliminated for causes involving diseases or death.
- *other causes:* loss for cows eliminated for causes other than those identified above.

Mastitis
Loss calculated from somatic cell count and clinical cases of mastitis.

- *somatic cells:* sum fo the losses calculated from the monthly logarithmic value of the somatic cell count and the estimated production of each cow.
- *mastitis:* sum of the losses calculated for each mastitis case, according to the lactation stage and production level of the cow. It includes: milk discarded during treatment, and decrease in production for the remainder of the lactation.

Reproduction
The loss is evaluated separately for cows and for heifers.

- *cows:* loss in kg/year, equivalent to the extra milk that the herd could produce if it complied with the reproduction model in figure 3 (calving interval of 365 days).
- *heifers:* loss is the expected production between the heifers' calving age and 24 months.

Persistency
Persistency is the loss of milk production after the lactation peak.

- *cows and heifers:* difference of each individual's production with a lactation curve model (data bank : 90th percentile) adjusted to peak production and days in milk at peak.

CONCLUSION

Since the veterinarian must keep records of treated animals for professional reasons and most producers see the necessity of having individual records for their animals, it is clear that data processing can be very profitable. Indeed, from cumulative data and the use of appropriate tools, the producer and his veterinarian can benefit from the following:

1. An immediate available report listing which animals must be examined.
2. Readily available information, such as activity lists, inventories, and animal records under several formats.
3. A complete analysis report on health problems detection and health management strategies (mammary, culling, etc.).
4. Access to historical data on the cows and the herd.
5. An "ALARM" system that flags unexpected situations.
4. A half-yearly comparative report evaluating and comparing the herd's performance.

Information reflecting the herd's performance is useful and encourages better data entry, which in return permits a finer analysis.

Acknowledgement
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Keywords: Herd Health, Population medicine, software, dairy cattle.

1 Bouchard, E., Bigras-Poulin, M., DuTremblay, D., Labrosse, P., 1991. ASTLQ, Amélioration de la Santé des Troupeaux Laitiers du Québec, a project for the development of population medicine in dairy cattle. Proceedings of the 6th ISVEE Symposium, Ottawa, Canada. p:517-519.