A Review of the Quebec Dairy Herds Health Improvement (A.S.T.L.Q.) Project
(ASTLQ: Amélioration de la Santé des Troupeaux Laitiers du Québec)

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Introduction

In population medicine, the practitioner should consider the herd (production unit) as a new individual composed of many systems. There is no medical tradition in health supervision programs for animal production units. Developing herd medicine can be accomplished by comparing "individual herds" with others to identify "healthy" and "sick" herds. Research seems essential to develop this expertise. The research project: **"Quebec Dairy Herds Health Improvement"** (A.S.T.L.Q. - *Amélioration de la santé des troupeaux laitiers du Québec*) was initiated for that purpose (Bouchard *et al,* 1991).

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 becomes quite different for herd medicine. Consequently, in the practice of population medicine, one must have the possibility to make comparisons. A.S.T.L.Q. serves the purpose for a veterinarian to share experience and herd data with other veterinarians and to develop a methodology that is now used routinely by approximately 150 veterinarians in 45 veterinary clinics in Quebec and New-Brunswick.

The main objective of the A.S.T.L.Q. Project was to create new tools for the practicing veterinarian in reaching diagnoses and suggesting treatments to individual herds. This requirement was expected to help the veterinarians in assisting the producers to improve the profitability of their business. The specific objectives of the research project were as follows:

1) To build a data bank in animal health for dairy cattle.
2) From the data bank, to calculate health indices from associations between reproduction, produc-
tion, disease and culling parameters.
3) To compare herds with regard to the indices calculated and to classify them as "healthy" or "sick".
4) To create tools (software, network, education ...) to calculate and interpret the indices necessary to make a diagnosis in population medicine.

A.S.T.L.Q. Development

To reach the objectives of the research project, a network was created to transfer information between the producers, the veterinarians, and the central data bank. In addition to transferring data, the network serves to share knowledge and experience. The final aspect of this network is the result of the various development phases of the project which stretched over a three-year period.

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 A.S.T.L.Q. Network participants. Each network node contributes to the data bank from which information can rapidly be obtained. This approach stimulates the interest of the participants and insures the quality of the data.

Software (DSA): Records and Reports

A software (D.S.A.: 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 clinic. This software was developed on DOS computers and upgraded throughout the project to meet the requirements, and add new
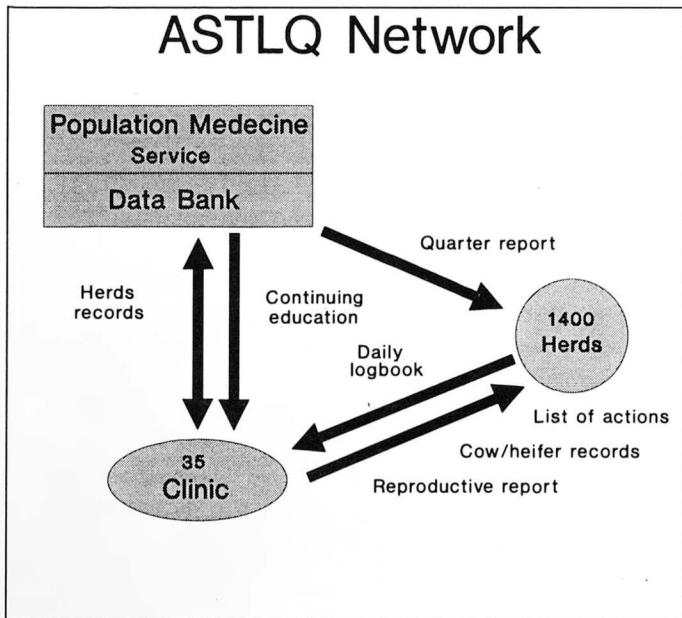
ASTLQ Network

Figure 1. Communication Network

Table 1. ASTLQ Annual Report for Selected Reproduction Indices for 1996.

	Heifer (n)	Cows (n)
Number of animals:	12 628	57 708

INTERVALS:	days	days
Calving - 1st heat:	484	53
Calving - 1st exam:	548	49
Calving - 1st breeding:	535	84
1st breeeding - 2nd:	45	41
2nd breeding - 3rd:	41	39
Calving - culling		174
Calving - conception (days open):	539	116
Age at calving:		52

PROPORTIONS:	%	%
1st breeding success:	60	46
2nd breeding success:	50	47
3rd breeding success:	42	45
Culling before 1st breeding:	5	17
Culling before 2nd breeding:	1	5
Culling after 2nd breeding:	4	13

Table 2. Summary of Diseases and Culling Annual Rate (%) and Calving (ASTLQ databank) for 1996.

Disease		Percentage (%)
ABORTION and EMBRYONIC DEATH:		5.2
DISPLACED ABOMASUM:		1.1
RETAINED PLACENTA:		6.0
MILK FEVER:		4.8
REPRODUCTIVE PROBLEMS (METRITIS, PUS):		15.0
TOTAL MASTITIS		12.9 [*]
LAMENESS:		4.8
DIGESTIVE DISEASE:		-
DYSTOCIA:		1.7
OVARIAN CYST:		9.6

Culling		Percentage (%)
CULLING RATE:		30.1
Reproduction:	30.9	
Conformation:	12.4	
Age:	4.5	
Production:	18.9	
Dead:	6.8	
Mastitis:	26.4	

[*] N.B. If only validated herds are used for the mastitis activity (n=237), the incidence of mastitis is 33%.

procedures. 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 DSA can generate a variety of personalized reports and the list of animals to be examined for reproduction, udder health, foot problems, and different preventive acts. The veterinarian can also submit an annual summary of the herd's reproduction indices.

Data Bank

The second part of the project consisted in creating a data bank. It included transferring data from the clinics to the University research group, and developing a computer support and softwares to manage the transfer and accumulate data. To insure data integrity, validation and standardization systems were introduced at the herds' level.

Reproduction indices and disease indices most currently used by the D.S.A. Software are summarized in two tables. These indices are calculated from individual lactations and represent the situation of the data bank in 1996. Table 1 summarizes the calving-conception intervals, the successful breedings, and the culling of the animals in lactation. Indices are also given for the heifers. In that case, the calving-conception intervals were replaced by birth-breeding intervals (age of the animal in days). Table 2 summarizes the disease and culling rates of the animals in lactation.

In-service Training

Training and standardization sessions for the participating veterinarians were held periodically. In addition to those two objectives, the training sessions enabled the research group to be in contact with the participants and informed of their concerns.

Analysis Modules (DSA)

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

Comparative Quarterly Report

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

Comparative Herd Report

The A.S.T.L.Q. data bank report is published three times a year. It is used for comparison of participating herds under production, health, and reproduction indices. The report is partially presented in figures 2 to 4. The entire reports cover a one-year period.

The report includes charts for persistence in production (figure 2), and on the performance in reproduction (figure 3). It also includes a section (figure 4, with explanations in accompanying frame) that enables comparison of the herd with other herds of 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 Peak (Figure 2)

This is an explanation of the chart in figure 2. The chart represents peak production and persistence during lactation. Each cow in the herd with five production records during the most current lactation is represented on the chart. Y-axis gives the production peak in kg/day corrected for lactation. 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.

Évaluation de la production
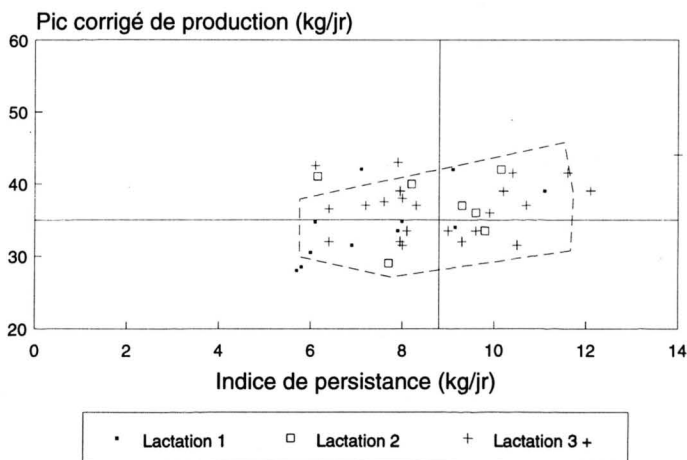(tirée des courbes de lait)

Figure 2. Peak production and persistence for all the cows in the herd.

Reproduction Evaluation Chart (Figure 3)

This chart represents the cumulative proportion according to the number of days in milk (JEL=DIM). A model that permits obtaining an interval of 365-day (thin line) is calculated from a 50-day waiting period, conception rate of 60%, and a 31-day interval between breedings. The herd's performance is represented by a dark line. The shaded area corresponds to the production difference between the model and the herd's performance; this amount is reported in the report described below.
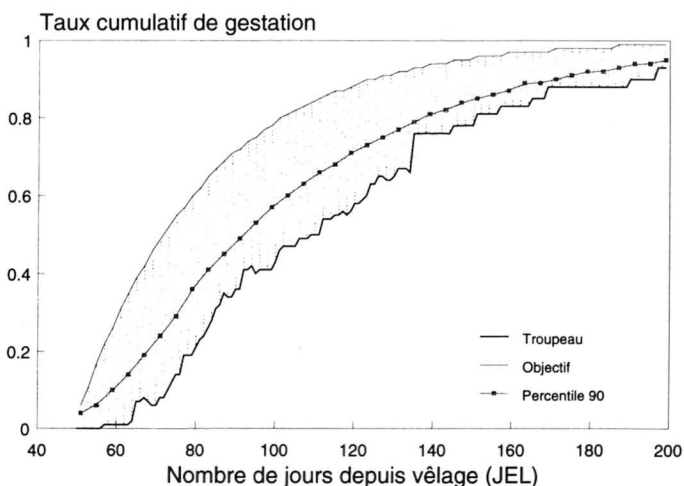
Évaluation de la reproduction

Figure 3. Reproduction evaluation chart: cumulative proportion of cows pregnant according to days in milk.

Comparison Report (Figure 4)

This section is for comparison of the herd with other herds of the databank, according to opportunity milk production. That production is given in kg of non-produced milk and in percentage (%) of the herd's production for different areas of activity. A rank from 0 to 100 is also given to the herd, according to its percentile rank, in comparison with the other herds in the bank. The highest mark always indicates a positive aspect.

Conclusion

Considering that the veterinarian must keep records of the treated animals, and that most producers see the necessity of having individual records for their animals, it is evident that data processing is very profitable. Indeed, from accumulative data and appropriate tools, the producer and his veterinarian can obtain the following:

1. An immediate available report listing what animals must be examined.
2. Readily available information as activity lists, inventories, and animal records under many different formats.
3. A complete analysis report concerning health, prob-

lems detection, and health management strategies (mammary, culling, etc.).

4. A quarterly comparative report evaluating and monitoring the herd's performance.

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

References

Bouchard, E., Bigras-Poulin, M., DuTremblay, D., Labrosse, P., 1991. A.S.T.L.Q., 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.

Figure 4. ASTLQ Quarterly 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		540 842	146	
CULLING Other causes: Diseases: Production sales:	53% 9% %	39 664 19 646 0	10.7 5.3 0.0	
MASTITIS 🔔 Somatic Cells: Clinical Mastitis:	80% 10%	19 276 16 310	5.2 4.4	
REPRODUCTION Cows: Heifers:	48% 81%	25 207 5 931	6.8 1.6	
PERSISTENCY Cows: Heifers:.	72% 55%	26 690 17 422	7.2 4.7	
TOTAL:		370 696	100	

Explanation of ASTLQ Quarterly Report (figure 4)

This report gives the opportunity milk (kg/year and percentage of total herd production) in different areas of management. The herd is given a percentile rank based on milk losses for each section when compared with herds of the databank. A high mark always corresponds to a desirable result. The calculation methods for losses are as follows:

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 data. The total production should approach the herd's milk quota. For herds whose production is not available, only a loss in percentage is written..

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

Culling
It is assumed that each cow eliminated from the herd should have completed its lactation. The loss is therefore the difference between the 305 days estimated production, and the total production at culling.
- *sale for milk production:* loss for cows in production that are sold for milk production.
- *diseases:* loss for cows in production that are eliminated for causes of peripartum diseases or death within the first 30 days in milk.
- *other causes:* loss for cows in production that are eliminated for causes other than those identified above.

Mastitis
It is calculated from the somatic cell count and clinical cases of mastitis.
- *somatic cells:* loss calculated according to the monthly logarithmic value of the somatic cell count and from the estimated production of each cow.
- *mastitis:* loss calculated for each mastitis case, according to the lactation stage and to each cow's production level. The losses related to clinical mastitis include the following: 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 calculated from the expected cumulative conception rate to obtain a calving interval of 365 days. The loss in kg/year is equivalent to the quantity of extra milk that the herd could produce if it complied with the reproduction model.
- *heifers:* loss calculated from the heifers' calving age, and compared with the ideal age of 24 months.

Persistency
Persistency is the loss of milk associated with production after the lactation peak. The loss is evaluated separately for cows and heifers.
- *cows:* difference of each cow's production when it is compared to a lactation curve model (data bank : 90th percentile) adjusted to peak production and to the number of days in milk at peak.
- *heifers:* ditto, for each heifer.