



Investigation of reproduction problems in dairy herds: a systematic approach to identify potential causes

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Assumption #1

- ▶ Veterinarians know that management of reproduction is important in dairy herds and they know the diseases that can affect the reproductive performance of a dairy herd



Assumption #2

- ▶ Veterinarians are generally able to identify and investigate a current reproduction problem in a dairy herd but some steps of this investigation process remains unclear...



Outline of the presentation

- ▶ Population medicine concept
- ▶ Why do we care about reproduction?
- ▶ The good and not so good metrics of reproduction at the herd level
- ▶ Is the reproduction of this herd going well?
- ▶ When reproduction is not going well...
- ▶ Case studies

Learning Objectives

- ▶ To be able to identify a herd with poor performance in reproduction
- ▶ To be able to follow a standardized and hierarchical analysis procedure to identify potential causes of the problem

Population Medicine Concept

- ▶ Traditional approach (individual medicine)
 - To care about 1 individual
 - Classic example
 - Ensuring the “success” of cow #72



Population Medicine Concept

- ▶ Population medicine approach
 - Ensuring the “success” of the herd



Population Medicine Concept

- ▶ For hockey fans...



Population Medicine Concept

- ▶ Concept
 - What is the most important?
 - To fill up your production quota and get a pay check?
 - To have the best cow in the province?
 - A producer should be able to fill up his production quota and ideally to do it with the smaller number of cows as possible
 - Having the best cow in the province in your herd does not guarantee that you will have a good milk paycheck

Population Medicine Concept

- ▶ Key points
 - The population success is more important than the individual success
 - To help a client, we need to know what is going on now...
 - To know what is going on, we need to collect and look at relevant herd data...

Population Medicine Concept



Why do we care about reproduction?

“To optimize the annual profit of each stall by maximizing the lifetime of a dairy cow spent at its most profitable stage”

LeBlanc, 2007

Herd metrics used in reproduction

- ▶ Pregnancy rate
- ▶ Insemination rate
- ▶ Conception rate
- ▶ Calving to conception interval
- ▶ Calving to calving interval
- ▶ Non return rate
- ▶ # breeding / pregnancy
- ▶ Proportion of pregnant cows at veterinary visit

Herd metrics used in reproduction

- ▶ Objectives when using these metrics
 - To accurately know what is going on in the herd currently...
 - To be able to help our clients to make decisions
 - To detect changes over time
 - To quickly react when a problematic situation occurs

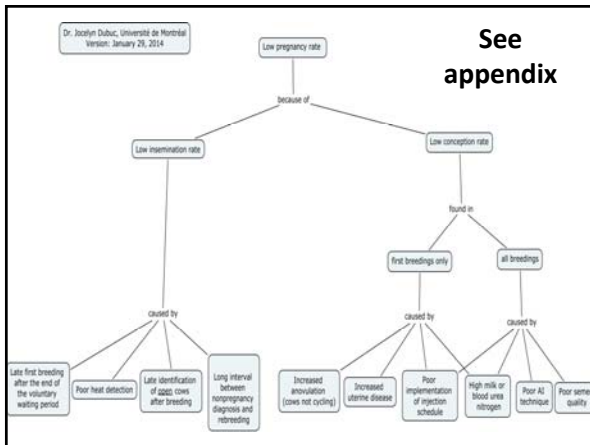
Metrics to prioritize



- ▶ 1. Pregnancy rate***
 - Reflects the global situation of all cows eligible to reproduction
- ▶ 2. In combination
 - A. Insemination rate
 - Are cows bred at a sufficient rate (speed)?
 - B. Conception rate
 - Are bred cows found pregnant in a sufficient proportion?

Metrics to avoid

- ▶ To use with care
 - Calving to conception interval
 - Proportion of pregnant cows at veterinary visit
- ▶ Do not use
 - Calving to calving interval
 - Non return rate
 - # breeding / pregnancy

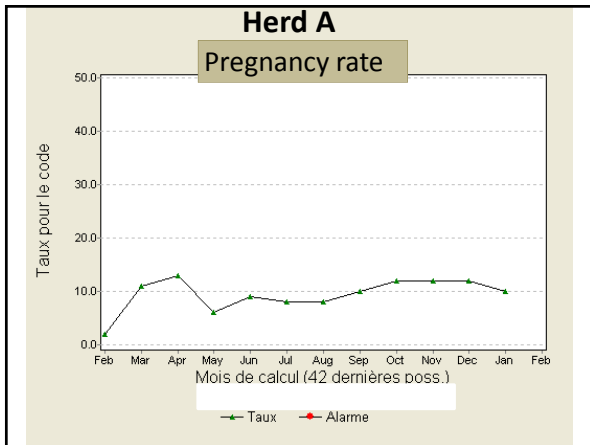


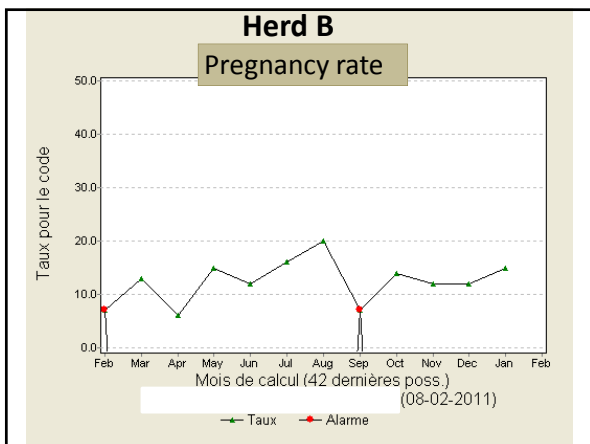
Is the reproduction of this herd going well?

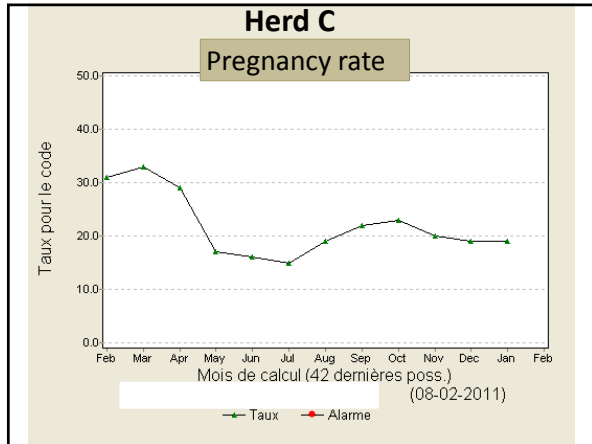
- ▶ Is the pregnancy rate $\geq 25\%$?
 - If yes, the reproductive performance is acceptable
 - Québec and Canada average $\approx 16\%$
 - Acceptable goal: $\geq 25\%$ (best quartile of our practice)
 - Exceptional goal: $\geq 30\%$
 - Mathematical ideal goal: 35%
 - * All these values are based on a voluntary waiting period (WVP) of 50 days. If you change the WVP, these values might not be useful.

Is the reproduction of this herd going well?

- ▶ Is the pregnancy rate $\geq 25\%$?
 - If not, there is a problem
 - The situation need to be investigated
 - Is it because of a low insemination rate ?
 - Is it because of a poor conception rate?



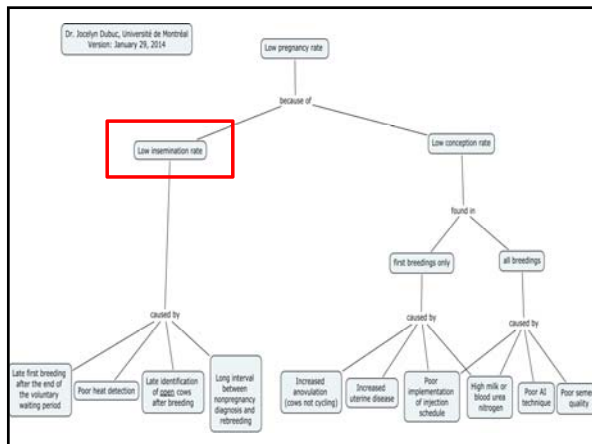




When reproduction is not going well...

- ▶ First basic key point in reproduction
 - Cows must be bred to become pregnant...
 - Insemination rate is the first thing to be validated
 - Once done, conception rate will be looked at





When reproduction is not going well...

Step 1

**Is the insemination rate
≥ 61 %?**

When reproduction is not going well...


▶ **Step 1:** Is the insemination rate ≥ 61 %?

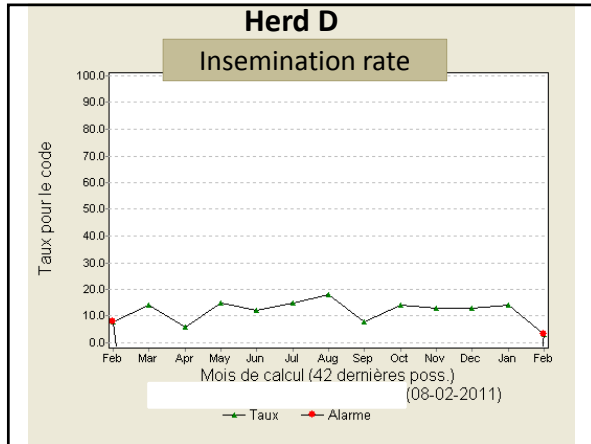
- If yes, the problem is probably with the conception rate
- Québec and Canada average ≈ 43 %
- Acceptable goal: ≥ 61 % (best quartile of our practice)
- Exceptional goal: ≥ 70 %
- Mathematical ideal goal: ≈ 90 %

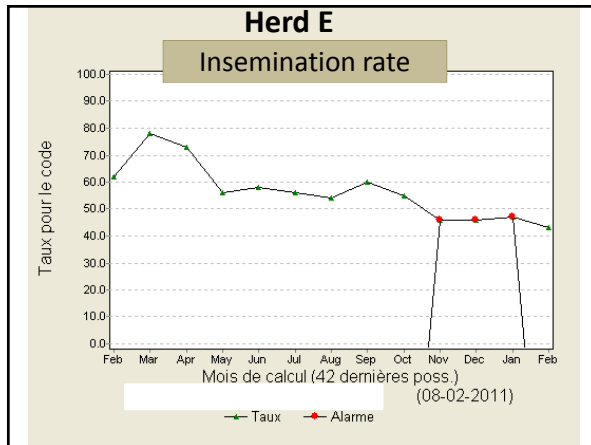
When reproduction is not going well...

▶ **Step 1:** Is the insemination rate ≥ 61 %?

- If no, there is a problem with the intensity of insemination
- We need to find why...



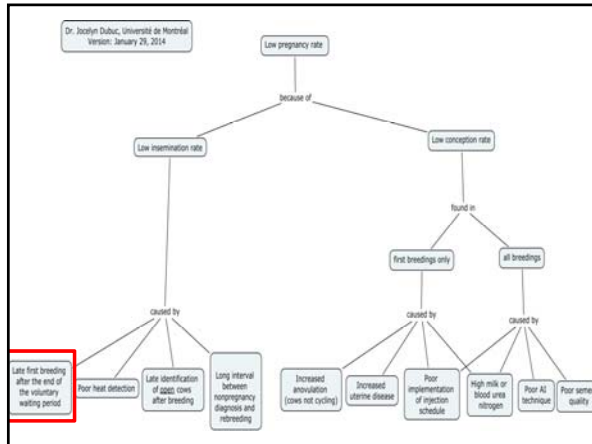




When reproduction is not going well...

- ▶ The 4 key points for having a high insemination rate
 1. To have a first insemination quickly after the end of the voluntary waiting period
 2. To perform good heat detection
 3. To identify early open cows after insemination
 4. To have a short interval between non-pregnancy diagnosis and re-insemination

IMPORTANT!



When reproduction is not going well...

Step 1.1

Is the calving to first insemination interval ≤ 66 days?

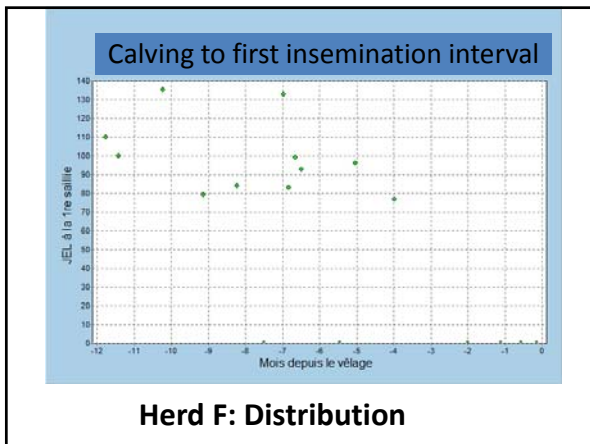
When reproduction is not going well...

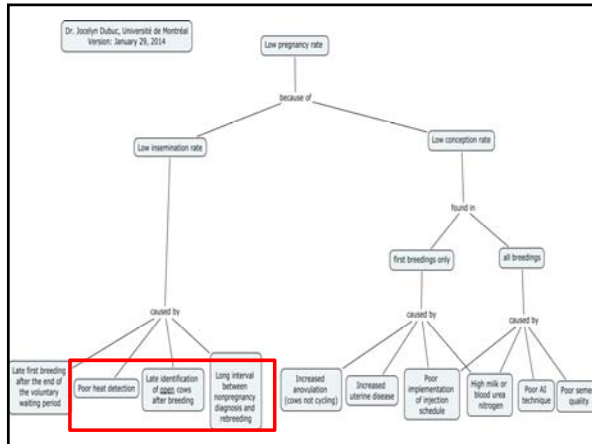
- ▶ **Step 1.1:** Is the calving to first insemination interval ≤ 66 days?
 - If yes, the problem is probably somewhere else
 - If no, the first insemination occurs too late
 - Cows are eligible to reproduction as soon as 50 DIM
 - Cows not bred cannot be pregnant...
 - The use of ovulation synchronization protocols could help (such as ovsynch, presynch, double-ovsynch, etc.)

When reproduction is not going well...

- ▶ **Step 1.1:** Is the calving to first insemination interval ≤ 66 days?
 - The use of ovulation synchronization protocols could help (such as ovsynch, presynch, double-ovsynch, etc.)
 - Double-ovsynch works generally better when a high proportion of anovular cows is present compared to ovsynch or presynch10-12...
 - Need to consider how the transition period is going (prevalence of excessive negative energy balance)

Herd F: Average	Rapport annuel rétrospectif	
	Actuel	-3 mois
Généralités (nombre d'animaux)		
Nombre de vaches actives	22	24
Nb de sail. de sécurité		
Âge en mois au vêlage	53	56
Intervalles jours		
Vêlage - 1ère chaleur		
Vêlage - 1er examen	44	63
Vêlage - 1ère saillie	103	141
1ère saillie - 2ème	34	35
2ème saillie - 3ème	36	48
Vêlage - réforme	189	318
Vêlage - saillie fécondante	161	166
Proportions %		
Succès 1ère saillie	22	35
Succès 2ème saillie	38	53
Succès 3ème saillie	13	20
Ref. avant 1ère saillie	23	8
Ref. avant 2ème saillie	0	4
Ref. après 2ème saillie	15	20






When reproduction is not going well...

Step 1.2

Is the interval between inseminations ≤ 36 days?

When reproduction is not going well...

- ▶ **Step 1.2:** Is the interval between inseminations ≤ 36 days?
 - If yes, the problem is probably somewhere else

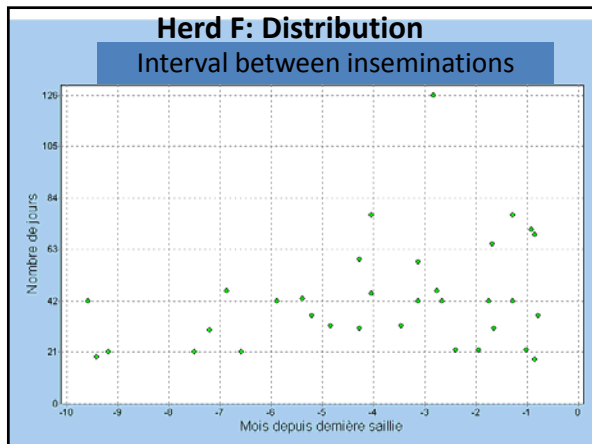


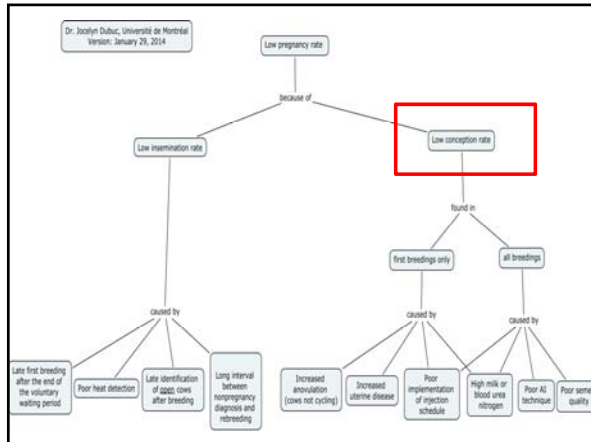
When reproduction is not going well...

- ▶ **Step 1.2:** Is the interval between inseminations \leq 36 days?
 - If no, there is too much time between inseminations
 - To organize more frequent veterinary visits
 - Every 2 weeks instead of every 4 weeks
 - To diagnose open cows earlier (\geq 30 days)
 - Rectal palpation with/without ultrasonography
 - Research project at d20
 - Pregnancy associated glycoprotein
 - Recent research found one to be tested at d18

When reproduction is not going well...

- ▶ **Step 1.2:** Is the interval between inseminations \leq 36 days?
 - If no, there is too much time between inseminations
 - To ensure that open cows are re-inseminated quickly
 - Ovulation synchronization protocols (short vs. long)
 - Tools for improving detection of cows in heat after insemination
 - Visual detection or mechanical detection (Kamar)
 - Activity monitors or pedometers
 - In-line progesterone testing (Herd Navigator)





When reproduction is not going well and insemination rate is OK...

Step 2

Is the overall conception rate $\geq 42\%$?

When reproduction is not going well and insemination rate is OK...

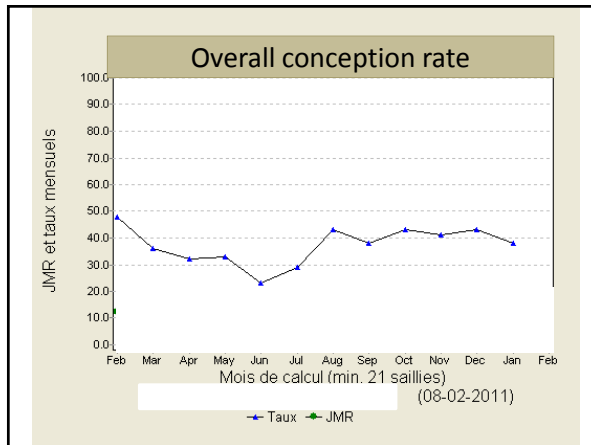
► **Step 2:** Is the overall conception rate $\geq 42\%$?

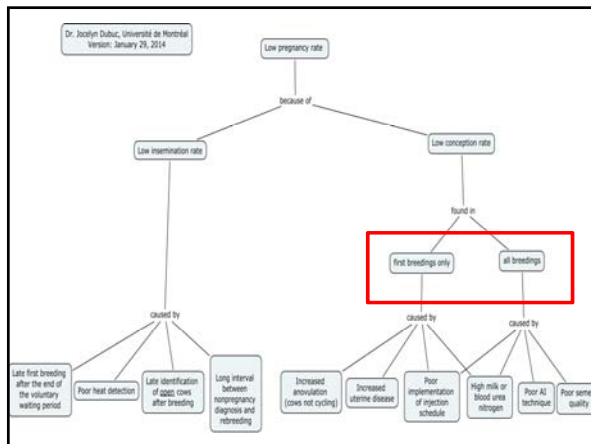
- If yes, the problem is probably somewhere else
- Québec and Canada average $\approx 38\%$
- Acceptable goal: $\geq 42\%$ (best quartile of our practice)
- Exceptional goal: $\geq 50\%$
- Mathematical ideal goal: $\approx 40-50\%$

When reproduction is not going well and insemination rate is OK...

- ▶ **Step 2:** Is the overall conception rate $\geq 42\%$?
 - If no, there is a problem with conception
 - We need to understand what is involved...







When reproduction is not going well and insemination rate is OK...

Step 2.1

Is the conception rate at first insemination similar to the one for inseminations 2+?

When reproduction is not going well and insemination rate is OK...

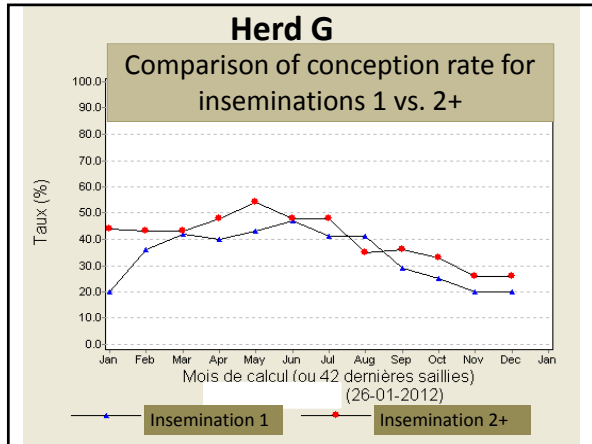
▶ **Step 2.1:** Is the conception rate at first insemination similar to the one for inseminations 2+?

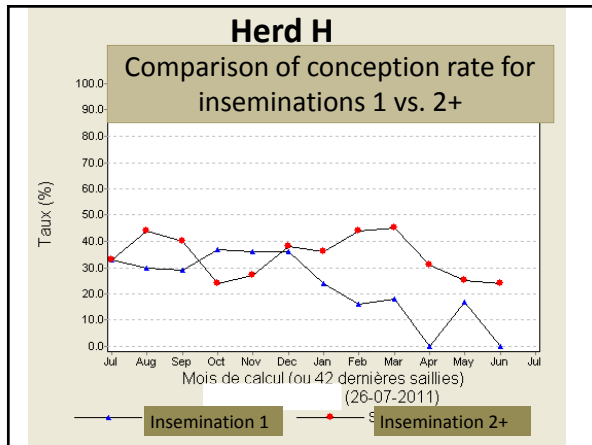
- If yes, the problem affects all inseminations
 - High milk urea nitrogen
 - Poor AI technique
 - Poor semen quality
 - Poor implementation of injection schedule

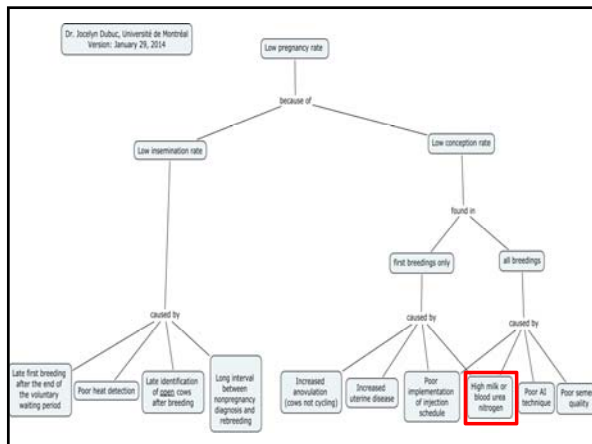
When reproduction is not going well and insemination rate is OK...

▶ **Step 2.1:** Is the conception rate at first insemination similar to the one for inseminations 2+?

- If no, the problem affects a subgroup of animals
- Generally, the conception rate at first insemination is lower
 - High milk urea nitrogen (for the first 100 DIM)
 - Poor implementation of injection schedule (first service protocol)
 - Increased proportion of uterine disease
 - Increased proportion of anovulation







When reproduction is not going well and insemination rate is OK...


Step 2.2

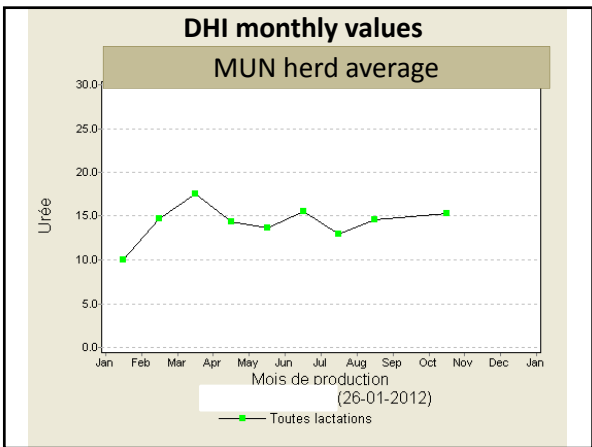
Is milk urea nitrogen too high?

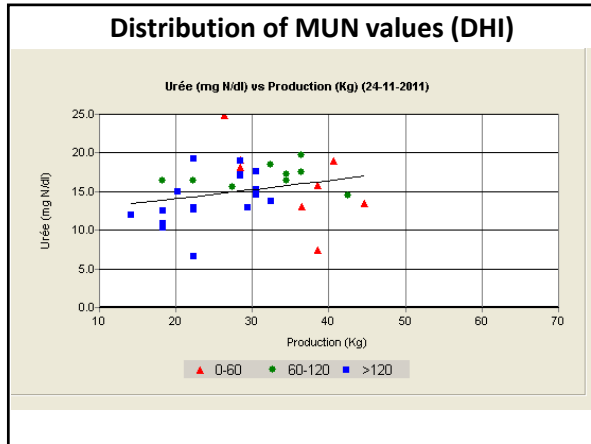
When reproduction is not going well and insemination rate is OK...

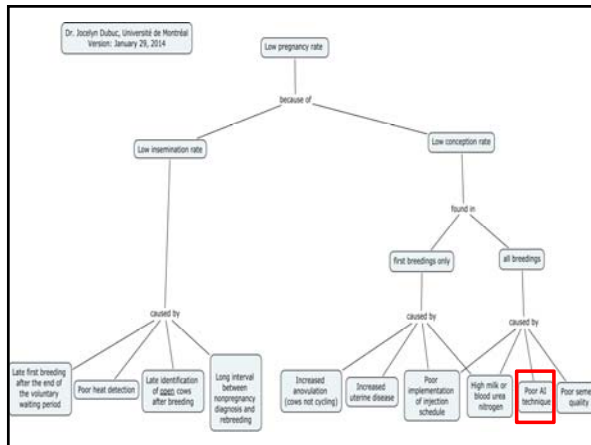
► **Step 2.2: Is milk urea nitrogen too high?**

- Suspicious when herd average is > 14 mg/dL
 - Careful when using a herd average value
 - Make sure to see the distribution of values
 - Individual problem for cows with ≥ 18 -20 mg/dL
 - DHI values vs. pay check values
 - If yes, the problem might affect all the cows or only a subgroup of animals









When reproduction is not going well and insemination rate is OK...

Step 2.3

Is the AI technique OK?

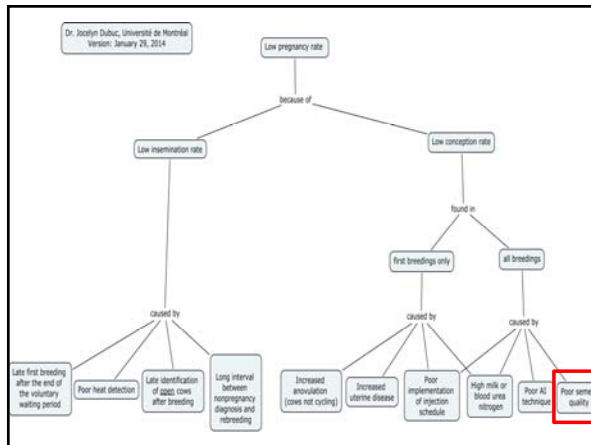
When reproduction is not going well and insemination rate is OK...

► **Step 2.3: Is the AI technique OK?**

- Was there a change or AI technician?
 - Poor timing for AI?
 - Wrong location of semen?
- Often hard to evaluate by veterinarian
- Difficult subject to discuss sometimes...

- If no, the problem will affect all insemination





When reproduction is not going well and insemination rate is OK...

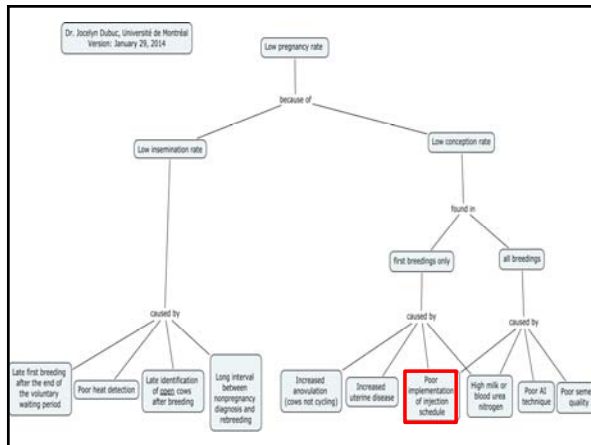
Step 2.4

Is the semen quality OK?

When reproduction is not going well and insemination rate is OK...

- ▶ **Step 2.4:** Is the semen quality OK?
 - Need to check the management of the nitrogen tank?
 - Need to ensure that there is no leak
 - Delay between extraction of semen from tank until breeding? How many AI thawed simultaneously?
- If no, the problem will affect all cows





When reproduction is not going well and insemination rate is OK...

Step 2.5

How is the implementation of injection schedule?

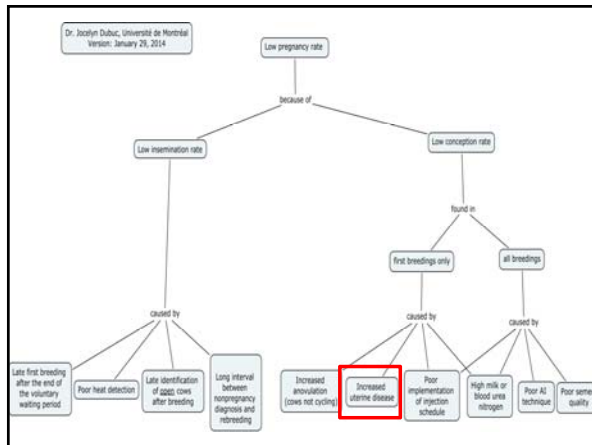
When reproduction is not going well and insemination rate is OK...

► **Step 2.5:** How is the implementation of injection schedule?

- Right product?
- Right dose?
- Right moment?
- Right cow?



- If no, the problem can affect all cows or might be worst for insemination 1 (if a lot of ovulation synchronization protocols are used)



When reproduction is not going well and insemination rate is OK...

Step 2.6

Is the prevalence of purulent vaginal discharge too high at 30 DIM?

- ≥ 10% when criteria is mucopurulent or worse
- ≥ 5% when criteria is purulent or worse

When reproduction is not going well and insemination rate is OK...

- ▶ **Step 2.6:** Is the prevalence of PVD ≥ 10 %?
 - Systematic surveillance is important
 - Metricheck or vaginoscope or gloved hand
 - Ideal timing around 30 DIM
 - Cows positive if mucopurulent or purulent vaginal discharge
 - Detrimental impact on repro; proven treatment if needed
 - If yes, the project will affect only insemination 1
 - Semen and embryo vs. inflammation



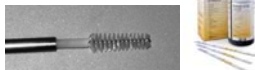
When reproduction is not going well and insemination rate is OK...

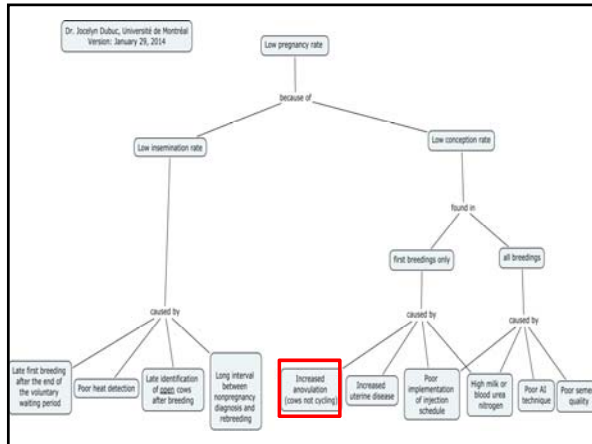
Step 2.6.1*

Is the prevalence of cytological endometritis using the leukocyte esterase test ≥ 35 % at 30 DIM?
 ≥ 19 % when criteria is cytology ≥ 6 % PMN

When reproduction is not going well and insemination rate is OK...

- ▶ **Step 2.6.1:** Is the prevalence of LE ≥ 35 %?
 - Systematic surveillance can be useful in some cases
 - Leukocyte esterase testing is easier than cytology
 - Ideal timing around 30 DIM
 - Cows positive if ≥ 1 (small amount or worse) after 2 min.
 - Detrimental impact on repro; proven treatment if needed
 - If yes, the project will affect only insemination 1
 - Semen and embryo in inflammation





When reproduction is not going well and insemination rate is OK...


Step 2.7

Is the proportion of postpartum anovulation $\geq 21\%$ at 50 JEL?

When reproduction is not going well and insemination rate is OK...

► **Step 2.7:** Is the proportion of postpartum anovulation $\geq 21\%$?

- Most of the time, this proportion is unknown
- **Direct systematic surveillance**
 - Ultrasonography of ovaries at intervals of 14 days (e.g. 36 et 49 JEL)
 - Blood sampling at intervals of 14 days
 - Avoid rectal palpation of ovaries because inaccurate
 - Anovulation is declared if no CL found at both exams
 - Ideal method but...



When reproduction is not going well and insemination rate is OK...

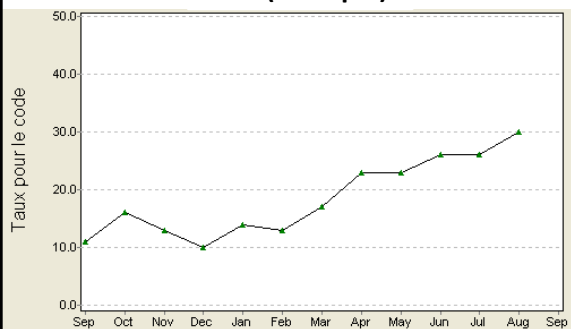
► **Step 2.7:** Is the proportion of postpartum anovulation $\geq 21\%$?

- Indirect systematic surveillance
 - Hyperketonemia surveillance 1-14 DIM $\geq 12\%$?
 - PVD prevalence 30-43 DIM $\geq 10\%$?
 - LE surveillance 30-43 DIM $\geq 35\%$

- If yes, the problem will affect only insemination 1



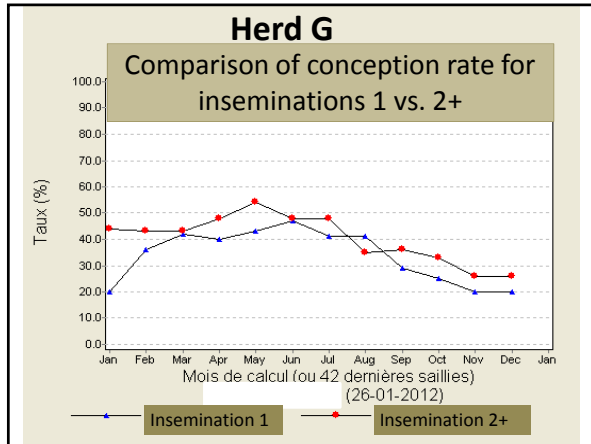
Proportion of anovular cows at 50 DIM in a herd (exemple)



When reproduction is not going well and insemination rate is OK...

Let's return to our farm examples

What are the potential causes?



When reproduction is not going well and insemination rate is OK...

► **Herd G: CR is similar for inseminations 1 and 2+**

- Suggests a problem that affects all the inseminations
 - High milk urea nitrogen?
 - Poor AI technique?
 - Poor semen quality?
 - Poor implementation of injection schedule?

When reproduction is not going well and insemination rate is OK...

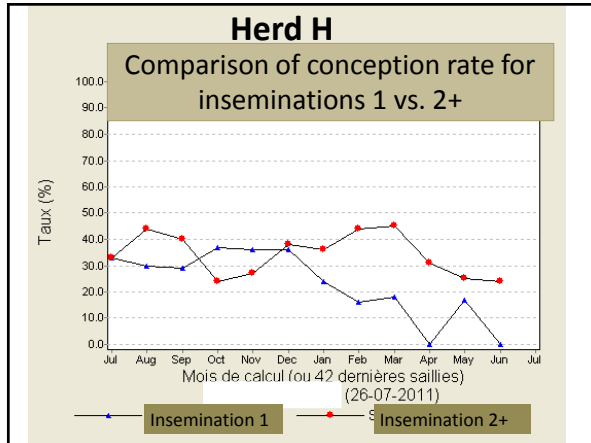
► **Herd G: CR is similar for inseminations 1 and 2+**

- Potential solutions
 - Milk urea nitrogen
 - Nutritional management of the herd
 - Discussion with nutritionist and producer
 - Easy-to-identify and to solve problem generally
 - AI technique
 - AI technician management
 - Technique revision (open questions)
 - Identification of AI tech when breeding (e.g. DC305)

When reproduction is not going well and insemination rate is OK...

► **Herd G: CR is similar for inseminations 1 and 2+**

- Potential solutions
 - Semen quality
 - Management of nitrogen tank
 - Delay between extraction of semen from tank and inseminations
 - How many semen doses are prepared at the time
 - Open questions
 - Implementation of injection schedule
 - Need to understand how injections are done (open questions are useful)



When reproduction is not going well and insemination rate is OK...

► **Herd H: CR at insemination 1 is worst than 2+**

- Suggests a problem that affects only insemination 1
 - Milk urea nitrogen in cows < 100 DIM?
 - Implementation of injection schedule?
 - Prevalence of PVD? LE?
 - Prevalence of anovulation?

When reproduction is not going well and insemination rate is OK...

- ▶ **Herd H: CR at insemination 1 is worst than 2+**
 - Potential solutions
 - Milk urea nitrogen
 - Nutritional management of cows < 100 DIM
 - Discussion with nutritionist and producer
 - Easy-to-identify and to solve problem generally
 - Implementation of injection schedule
 - Need to understand how injections are done (open questions are useful)

When reproduction is not going well and insemination rate is OK...

- ▶ **Herd H: CR at insemination 1 is worst than 2+**
 - Potential solutions
 - PVD (and sometimes LE)
 - Peripartum period management
 - Bacterial uterine contamination
 - Immune fonction (NEFA/BHBA, Vit. E/Se, Ca)
 - Anovulation
 - Peripartum period management
 - Prevalence of hyperketonemia
 - Prevalence of uterine disease

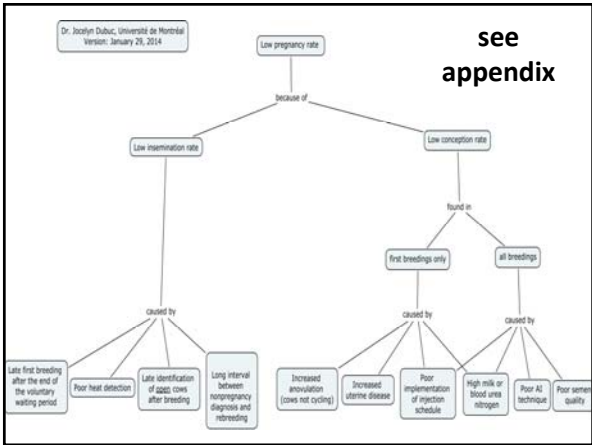
Take Home Message

- ▶ **The 4 key points for having a high insemination rate**
 1. To have a first insemination quickly after the end of the voluntary waiting period
 2. To perform good heat detection
 3. To identify early open cows after insemination
 4. To have a short interval between non-pregnancy diagnosis and re-insemination

Goal: IR ≥ 62 %

Take Home Message

- ▶ How to find the cause of a low conception rate?
 - To find the cause, we need to follow a standardized investigation method to know what is going on... The appendix can help you in this process.
 - To know what is going on, we need representative data of the current situation...
 - To have representative data of the current situation, we need to do surveillance of some diseases...



Take Home Message

- ▶ Herd reproduction management
 1. Increase insemination rate
 2. Increase conception rate, if needed
 3. Be happy
 4. Manage problems soon when they occur

Learning Objectives - Recall

- ▶ To be able to identify a herd with poor performance in reproduction
- ▶ To be able to follow a standardized and hierarchical analysis procedure to identify potential causes of the problem



