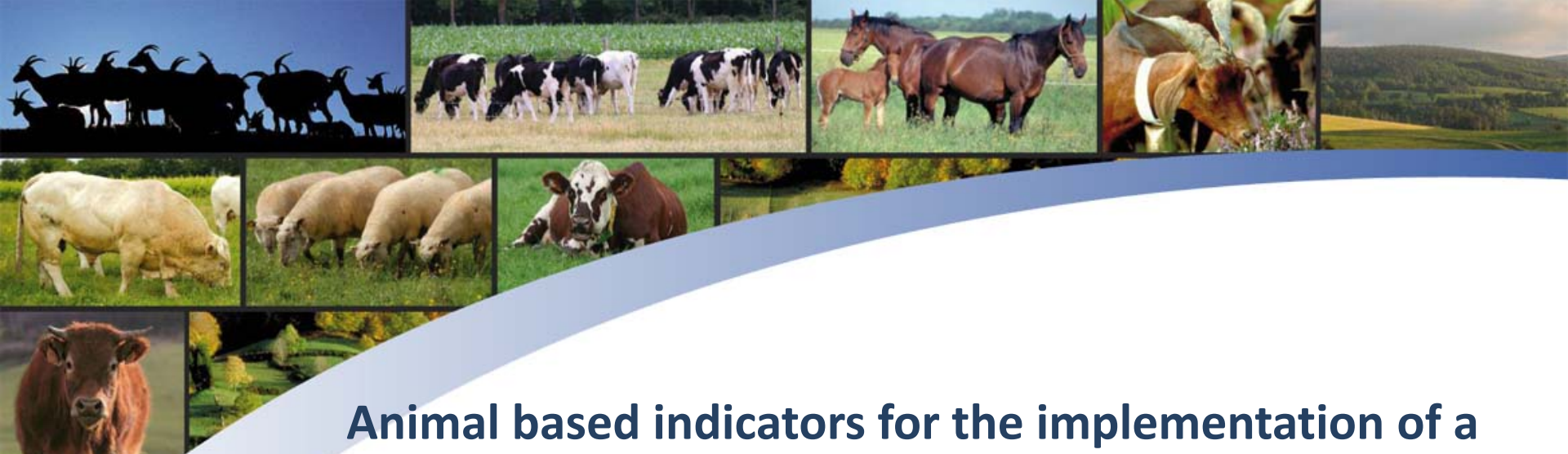


# Animal based indicators for the implementation of a selective usage of to anthelmintics in adult dairy cattle

N. Ravinet[1,2], A. Lehebel[3,2], A. Ponnau[2], C. Chartier[2,3], N. Bareille[2,3], A. Chauvin[2,3]

*[1] IDELE, French Livestock Institute, UMT Cattle Herd Health Management, France*
*[2] LUNAM Université, Oniris, Nantes-Atlantic College of Veterinary Medicine and Food sciences and Engineering, UMR BioEpAR, France*
*[3]INRA, UMR1300 Biology, Epidemiology and Risk Analysis in animal health, France*

# Introduction: context and issues

Prevalence of GIN infection in adult dairy cows is high:
**80 to 95%**


Possible negative impact on milk production

After anthelmintic treatment
+0,63Kg/day *(Gross et . 1999)*
+0,35Kg/day *(Sanchez et al. 2004)*

Control measure often proposed= whole herd anthelmintic treatment

Lack of reliable tools for the assessment of the parasitical risk

Drug use may be **often too intensive**

Which runs up against several limits

**Rationalization / optimisation of anthelmintic treatments:**
Is it possible in adult dairy cattle?

# Introduction: optimizing anthelmintic treatments?

**A decrease in milk production …**

**Herd-level variability**
often reported

**Individual-level variability**
expected

**We should only treat herds / cows whose MP is negatively impacted by GIN**
***Targeted selective treatment***

**We need indicators that allow the identification of herds / cows whose MP is affected**

# Objective

**Investigate in adult dairy cows, the relation between**
**6 indicators and the decrease in MP caused by GIN infection**

**3 herd-level indicators**
- % positive FEC
- Bulk Tank Milk *O. ostertagi* ODR
- Grazing history of cows

**3 individual-level indicators**
- FEC
- Serum *O. ostertagi* ODR
- Serum pepsinogen level

?

**Decrease in MP**
Measured indirectly by the milk production response after treatment for GIN

**Determine if these indicators would be factors of variation of the treatment response**
**(potential predictive factors of the treatment response?)**

**Useful tools for targeted selective treatment**

# Materials and methods: study design

Western France
**25 pastured dairy herds**
**1254 lactating cows**

**Visits: autumn 2010 and 2011**

| August | September | October | November | December | January | February | March | April |
|---|---|---|---|---|---|---|---|---|

**VISIT**

**Treatment:** Fenbendazole, Panacur ™ 10%

**Samples:** blood, feces and bulk tank milk

**Questionnaire:**
Collection of heifers' grazing management data (grazing history of cows)

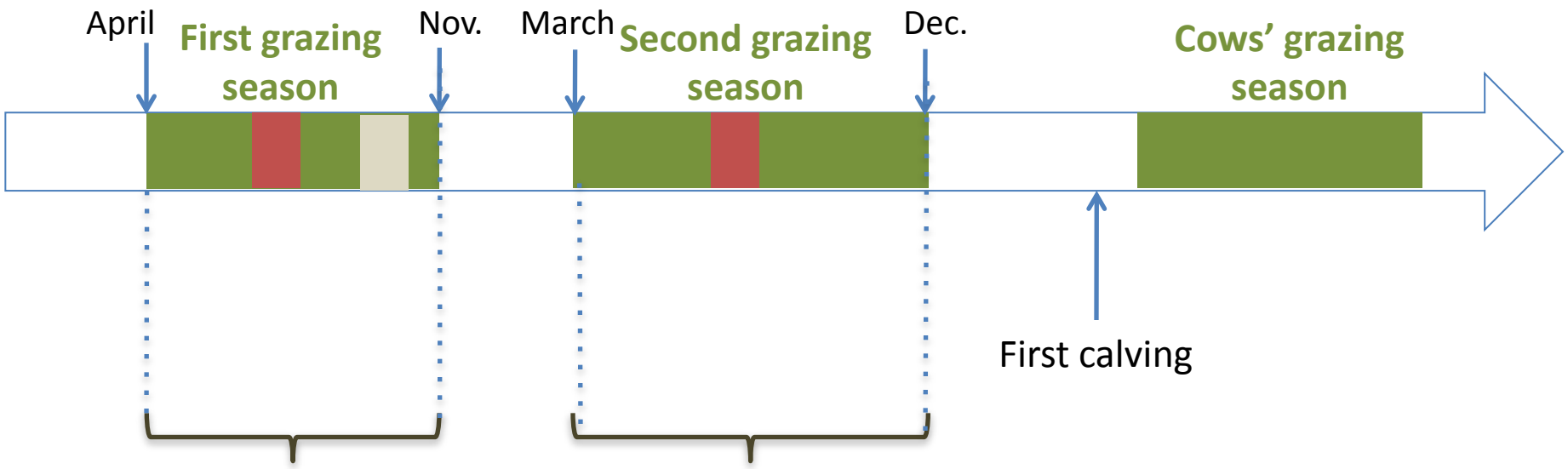
**Each cow characterized by**
-Treatment: yes (623 cow) / no (631 cows)
-FEC, individual ODR, pepsinogen level

**Each herd characterized by**
-% positive FEC
-BTM ODR
-Time of effective contact (**TEC**) with **GIN infective larvae** before the first calving

**Fenbendazole** = **best compromise** *for zero withdrawal time for milk + narrow spectrum on nematodes + no drawback related to pour-on formulation*

# Materials and methods

**Determination of the Time of Effective Contact with infective larvae (TEC) before the first calving**




$TEC_1$ = 7 months – 2 months
5 months

$TEC_2$ = 9 months – 1 month
8 months

**TEC before the first calving = 13 months**

*Drought and high supplementation*

*Persistent treatment*

-**TEC >= 8 months:** high-TEC herds
-**TEC < 8 months:** low-TEC herds

# Materials and methods: study design

Recruitment: France, Western
**25 pastured dairy herds**
**1254 lactating cows**

**Visits: autumn 2010 and 2011**

| August | September | October | November | December | January | February | March | April |
|---|---|---|---|---|---|---|---|---|

*Recording of daily MP data of all cows*

*14 days before treatment*

*60 to 100 days after treatment* → ***TREATMENT RESPONSE***

**VISIT**

**Treatment:** Fenbendazole, Panacur ® 10%

**Samples:** blood, feces and bulk tank milk

**Questionnaire:**
Collection of heifers' grazing management data (grazing history of cows)

**Each cow characterized by**
-Treatment: yes (623 cow) / no (631 cows)
-FEC, individual ODR, pepsinogen level

**Each herd characterized by**
-% positive FEC
-BTM ODR
-Time of effective contact (**TEC**) with GIN before the first calving (**reflection of the development of immuntity**)

# Materials et methods: statistical analysis

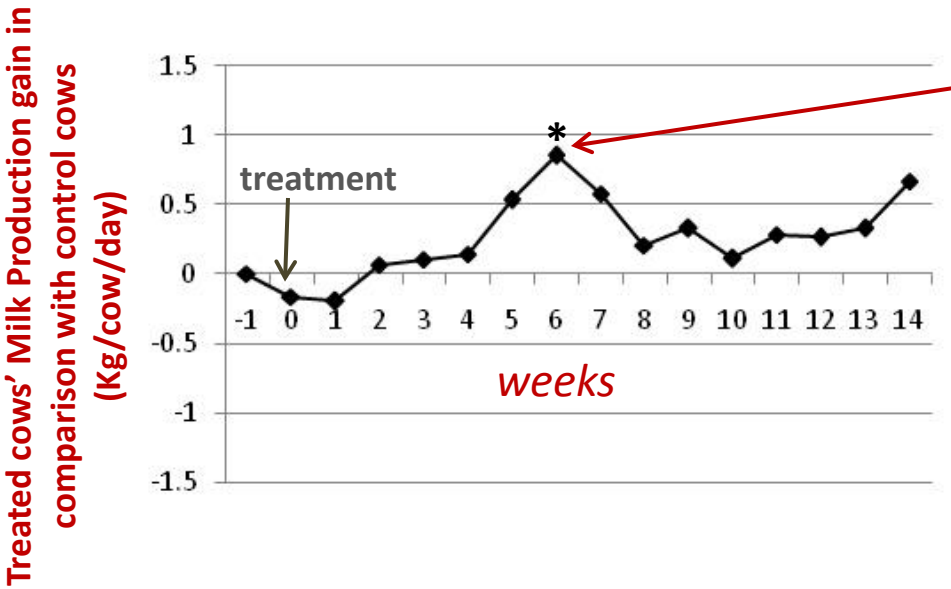
Assessment of the evolution of milk production after treatment and its factors of variation

- **1077 cows** : 533 treated cows/ 544 control cows
- Linear mixed models
- Outcome: **daily milk production averaged by week**
- Individual and herd-level indicators put in interaction with « treatment »

**Each week, the treated cows' MP gain (in comparison with control cows' MP) was calculated**

# Results: « pattern » of the global treatment response

**The overall treatment effect is significant but slight**
***(p<0, 0001)***



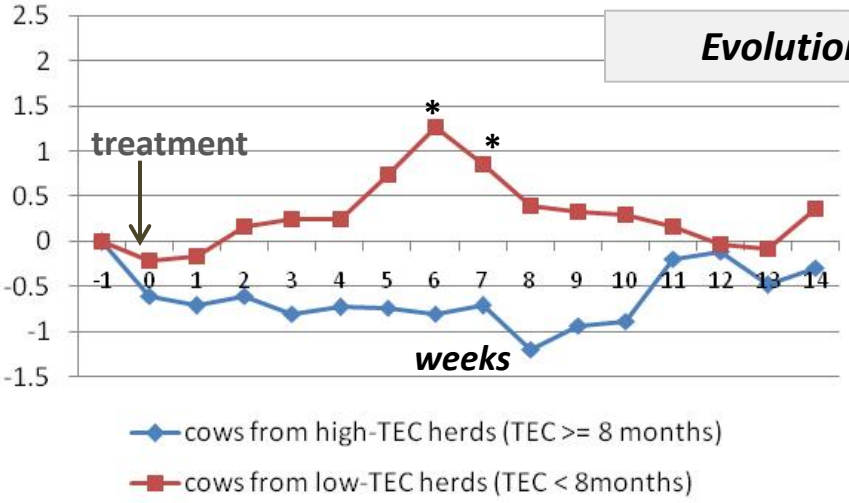

Maximal MP gain after treatment= +**0,85 Kg/cow/day** in week$_6$

Average MP gain after treatment= +**0,27 Kg/cow/day**

**Which herds / cows are contributing to this moderate global treatment response?**

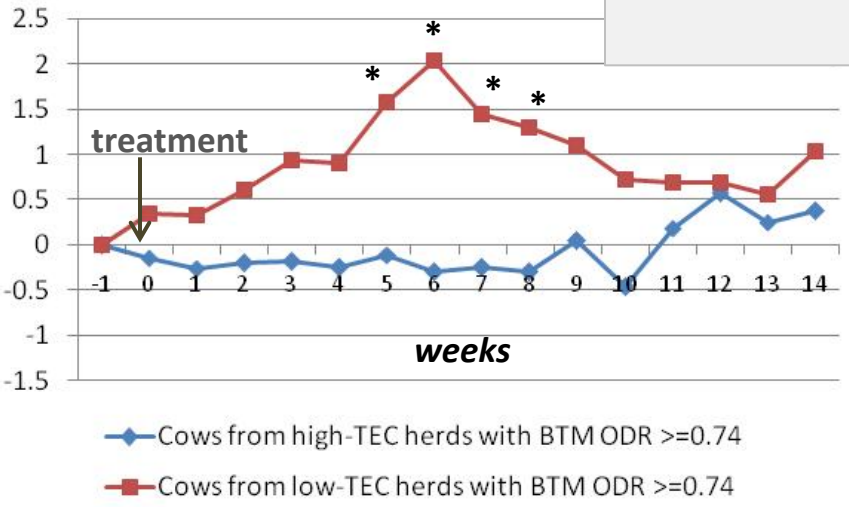
# Results: variation of the treatment response according to herd-level indicators

Treated cows' Milk Production Gain in comparison with control cows (kg/cow/day)




***Evolution of MP gain according to the TEC (p< 0,0001)***

| | Average Gain | Gain in week$_6$ |
|---|---|---|
| Low-TEC | +0.31 Kg/cow/d | +1.3 Kg/cow/d |
| High-TEC | -0.65 Kg/cow/d | -0.8 Kg/cow/d |




***Evolution of MP gain according to the TEC in herds with BTM ODR > = 0.74 (p< 0,0001)***

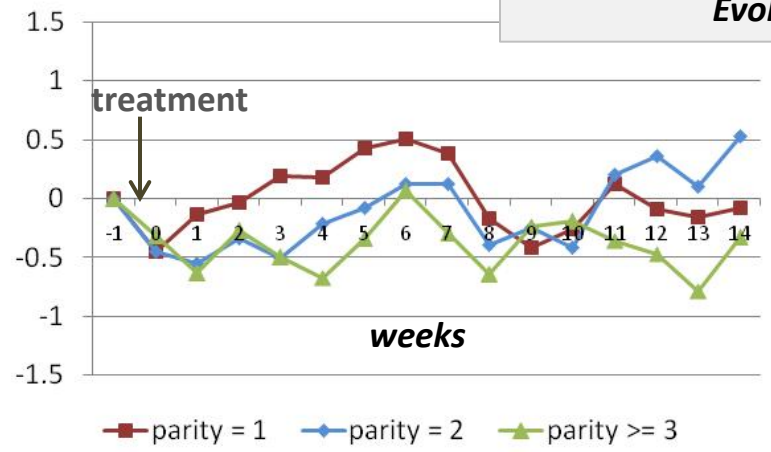
| | Average Gain | Gain in week$_6$ |
|---|---|---|
| Low-TEC and high BTM ODR | +0.95 Kg/VL/j | +2.0 Kg/VL/j |
| High-TEC and high BTM ODR | -0.06 Kg/VL/j | -0.3 Kg/VL/j |

***BTM ODR taken into account alone did not appear as a significant factor of variation (p=0.12)***

# Results: variation of the treatment response according to individual-level indicators (1)

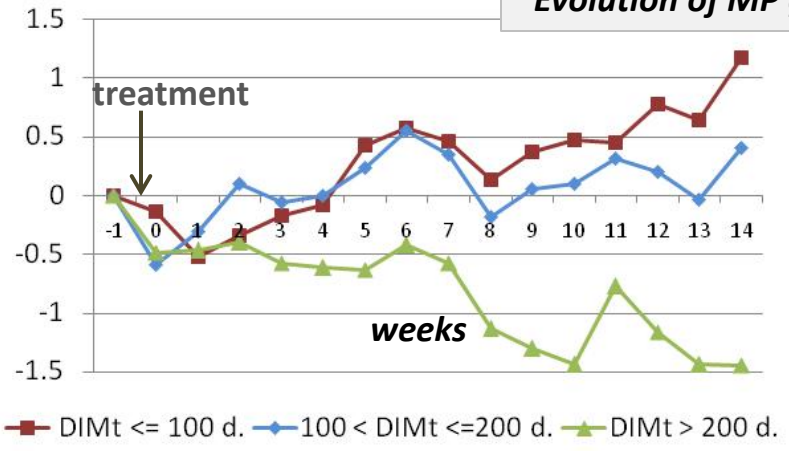
Treated cows' Milk Production Gain in comparison with control cows (kg/cow/day)

***Evolution of MP gain according to parity (p< 0,0001)***




| | Average Gain | Gain in week$_6$ |
|---|---|---|
| Parity =1 | +0.004 Kg/cow/d | +0.51 Kg/cow/d |
| Parity = 2 | -0.11 Kg/cow/d | +0.13 Kg/cow/d |
| Parity = 3 et + | -0.40 Kg/cow/d | +0.07 Kg/cow/d |

***Evolution of MP gain according to DIM at the time of treatment (p< 0,0001)***

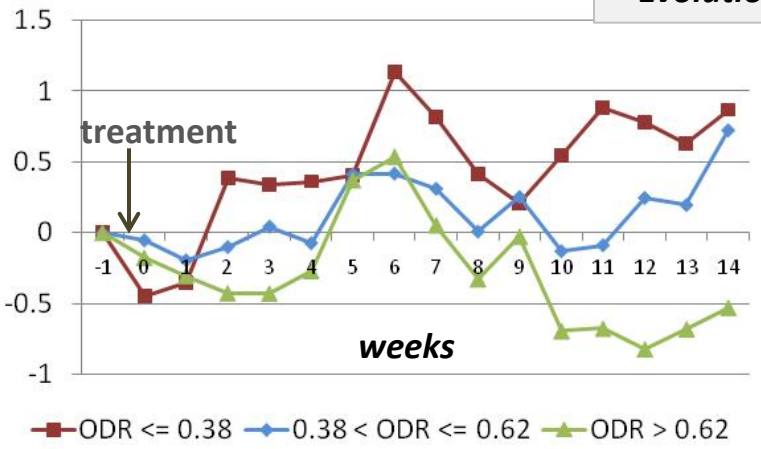



| | Average Gain | Gain in week$_6$ |
|---|---|---|
| DIMt <= 100 j. | +0,28 Kg/VL/j | +0,57 Kg/VL/j |
| 100<DIMt <= 200 j. | +0,07 Kg/VL/j | +0,55 Kg/VL/j |
| DIMt > 200 j. | -0,86 Kg/VL/j | -0,42 Kg/VL/j |

# Results: variation of the treatment response according to individual-level indicators (2)

**Individual FEC and pepsinogen level were not interesting factors of variation of the treatment response**

***Evolution of MP gain according to the individual serum ODR (p=0,005)***




| | Average Gain | Gain in week$_6$ |
|---|---|---|
| RDOind <= 0,38 | +0.47 Kg/cow/d | +1.14 Kg/cow/d |
| 0,38<RDOind<= 0,62 | +0.13 Kg/cow/d | +0.42 Kg/cow/d |
| RDOind> 0,62 | -0.29 Kg/cow/d | +0.54 Kg/cow/d |

**But 80% of these cows are cows from low-TEC herds…**

# Discussion

**Herd level indicators**

**Better treatment response**

**Low TEC herds**

**TEC = Development of resistance**

| Low-TEC | High-TEC |
|---|---|
| Low resistance to re-infection | High resistance to re-infection |
| **heterogeneous status** in the herd | **Homogeneous status** in the herd |

**combination**

**High BTM ODR**

**Exposure to GIN**
**During the last grazing season**

Mean value for the lactating herd

**Treatment response variable according to the development of resistance and the level of exposure**

**Individual level indicators**

Early lactating cows

Primiparous cows

Low individual ODR

**Low individual TEC ?**

# Conclusion

- **TEC: a new promising tool at herd level for targeted treatment**
- **Based on analysis of herd management**
- Rarely taken into account in studies dealing with this treatment response

- **Selective treatment within herd:**
  - Investigation of TEC at an individual level
  - Combination of several indicators
  - a maximum of easy-to-use and low cost indicators

# Thanks to…

- All the farmers who participated
- The team involved on the field and at the laboratory
- All the vets who helped us for the recruitment
- Financial support


✓ Financial support:
  - ✓ ***CIFRE – French livestock institute***
  - ✓ ***CASDAR project n°1127 (Ministère de l'Agriculture, de l'Agroalimentaire et de la Forêt)***

# *Thank you for your attention*