

# SENSITIVITY OF BEEF COW REPRODUCTION TO BODY LIPIDS DYNAMICS

## A MODELING APPROACH

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**CONTEXT**

## Beef cattle production systems

- Grazing systems

- 1 calf/year/cow

Future production conditions



↘ availability of concentrates for beef production

beef cow systems ⇔ More extensive

Limited availability of concentrates

⇒ diets mainly based on locally available feed resources

⇒ feeding systems more sensitive to climate hazards such as droughts



***Risk of an increase of unexpected underfeeding periods that may occur at different stages of the production cycle of cows with various amplitudes and durations.***



**Robustness of beef cow production systems ??**

**Cow performances ??**

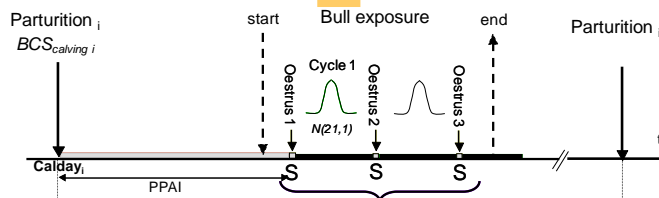
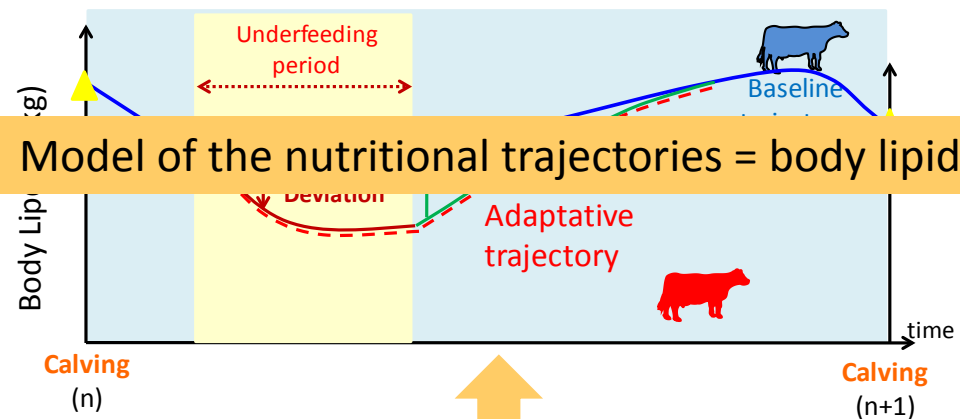


## **Modeling approach**

- to predict the effects of body condition dynamics on the reproductive performance of beef cows**
- to study the sensitivity of the cow to changes in nutritional environment at the lifetime scale**

# The BREsNUS model

A model of **Beef** cattle **RE**production sensitivity to **NU**tritional trajectories



A model of the reproductive performance

- time of resumption of cyclicity after calving
- time of ovulations and oestruses
- time of conception

Reproductive event): resumption of cyclicity  
oestrus expression  
conception

Empirical laws to connect the effects of the nutritional trajectories to reproductive events

Lipids deviation

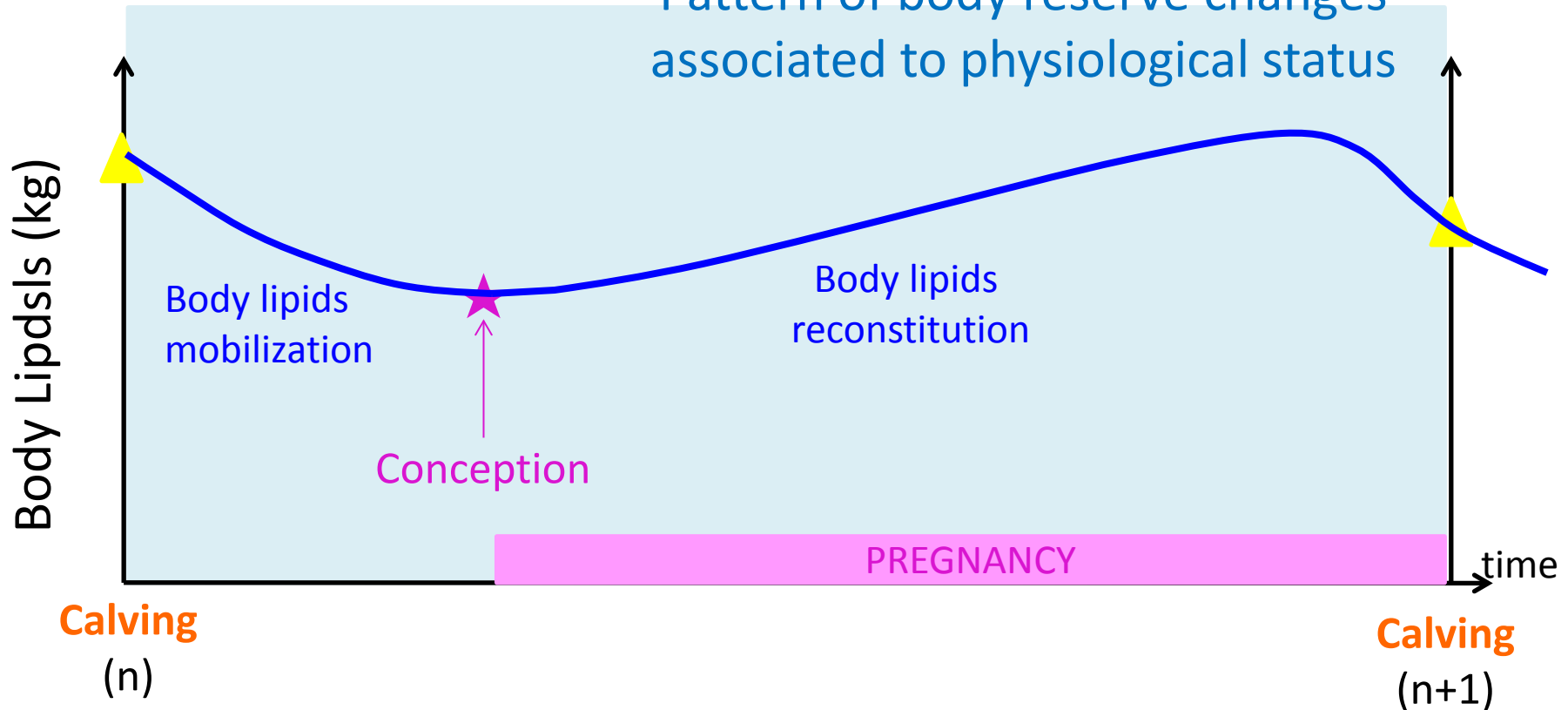
Model of the nutritional trajectories  $\Rightarrow$  body lipids dynamics

*Friggens et al, 2011*

Energy requirements covered

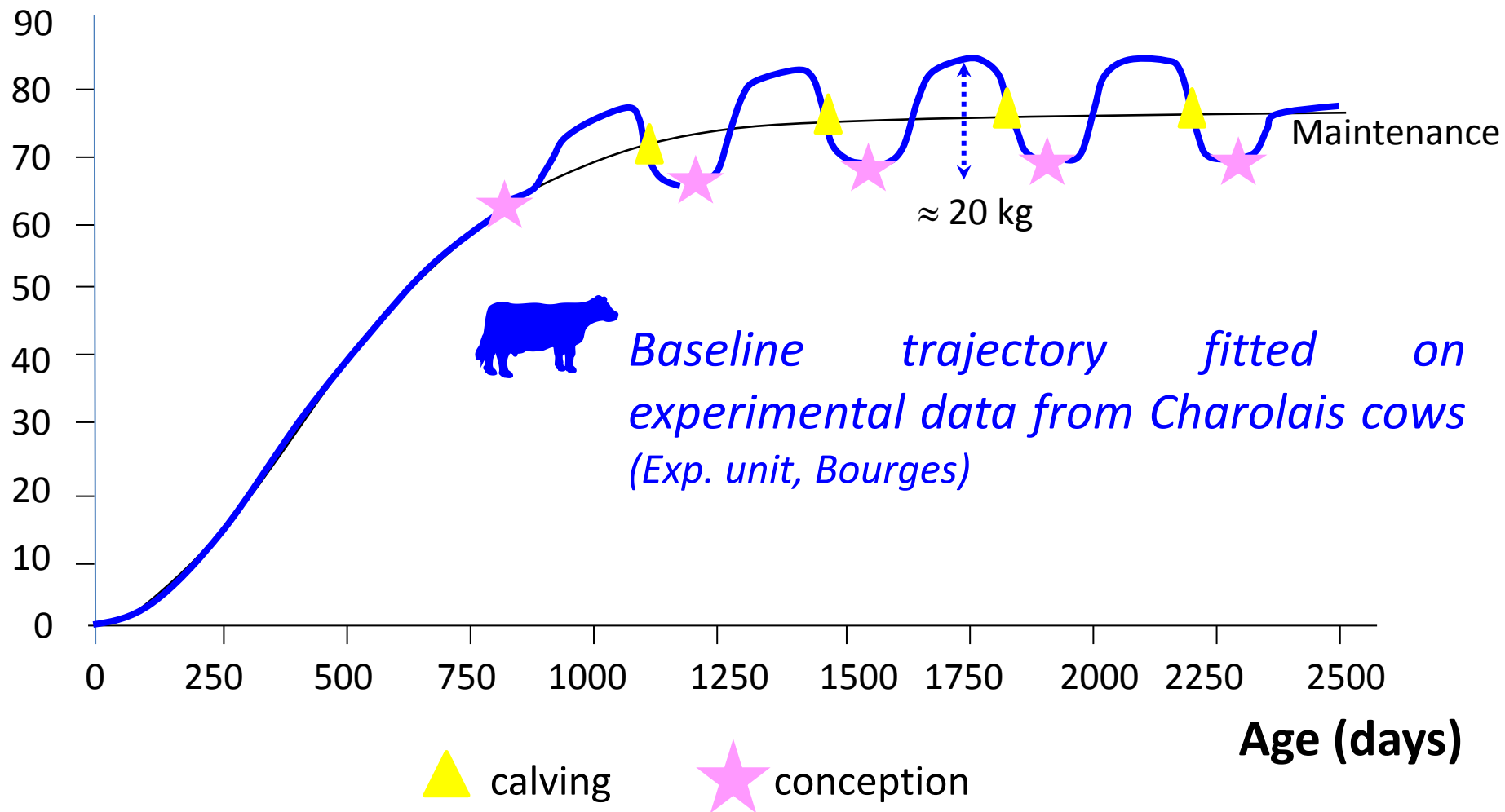
Baseline trajectory : 

Pattern of body reserve changes associated to physiological status



# BREsNUS simulates body lipids changes and reproductive performance at the lifetime scale

## Body Lipids (kg)





Context

Approach

Results

Implications

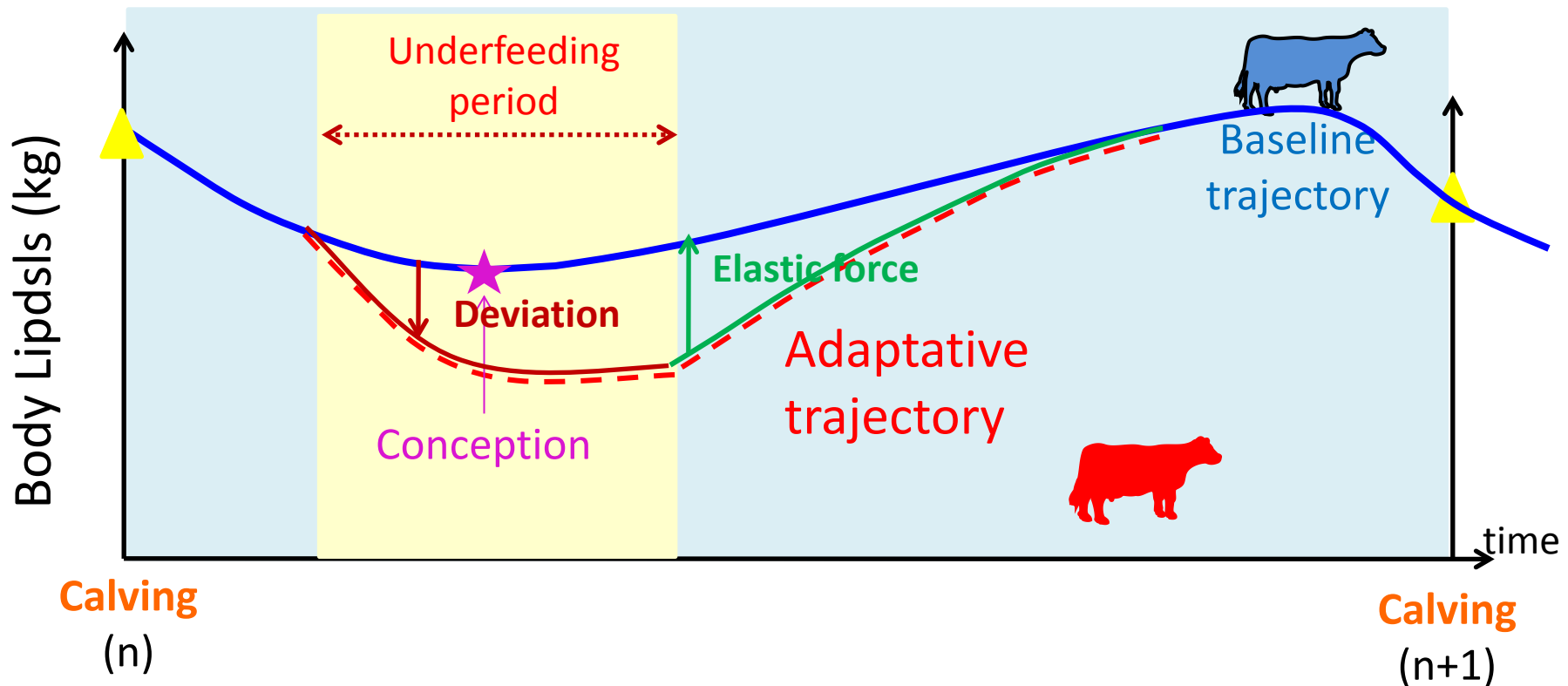
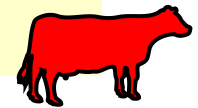
Model of the nutritional trajectories  $\Rightarrow$  body lipids dynamics

Energy requirements covered



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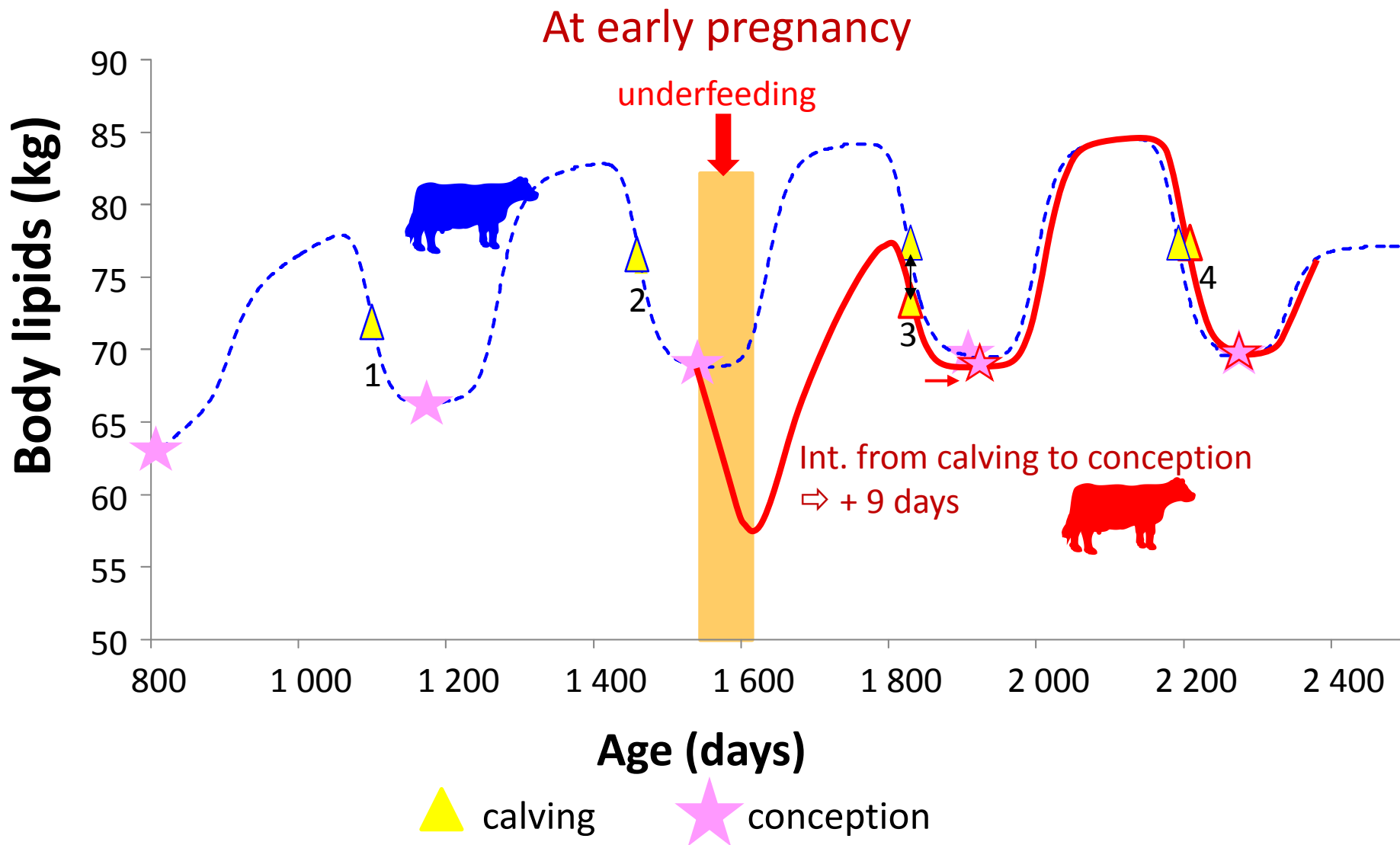
Variable nutritional environment





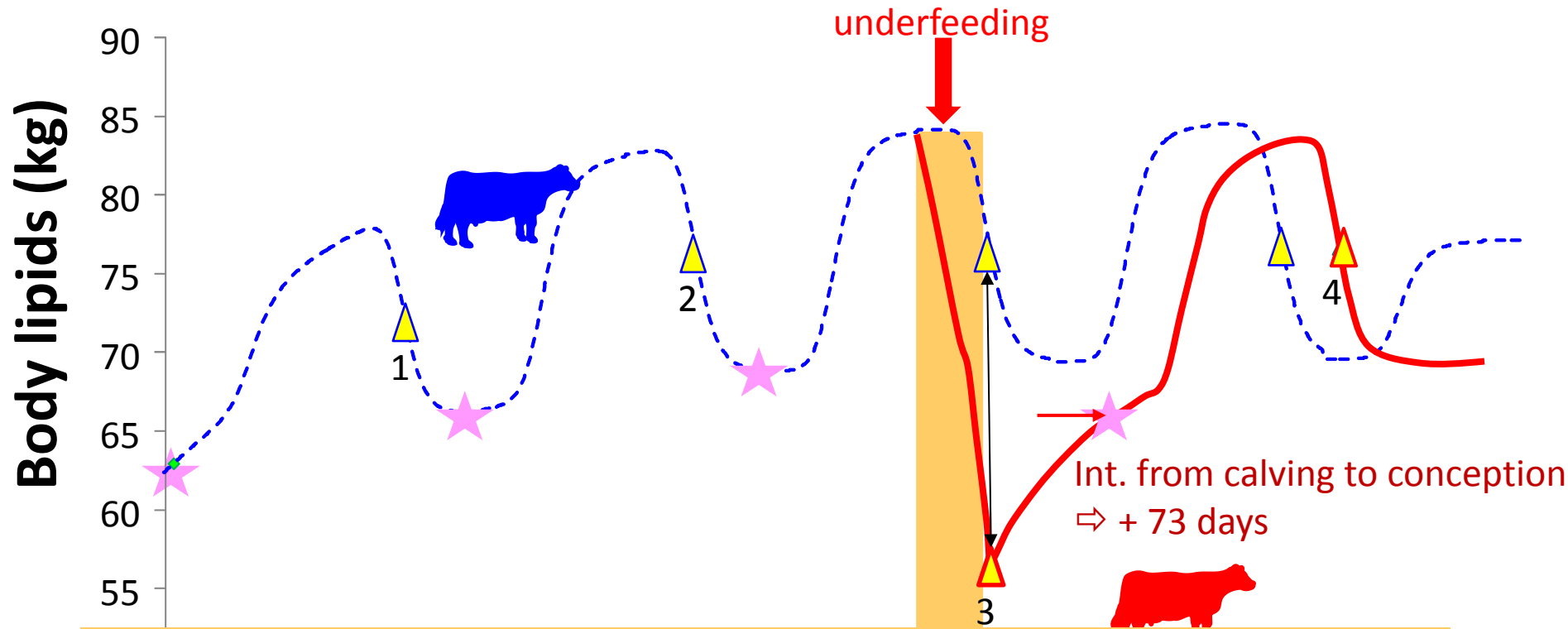
**BREsNUS a tool to explore beef cows sensitivity to nutritional disturbances**

## Perturbations have different effects according to the time when they occur



# Perturbations have different effects according to the time when they occur

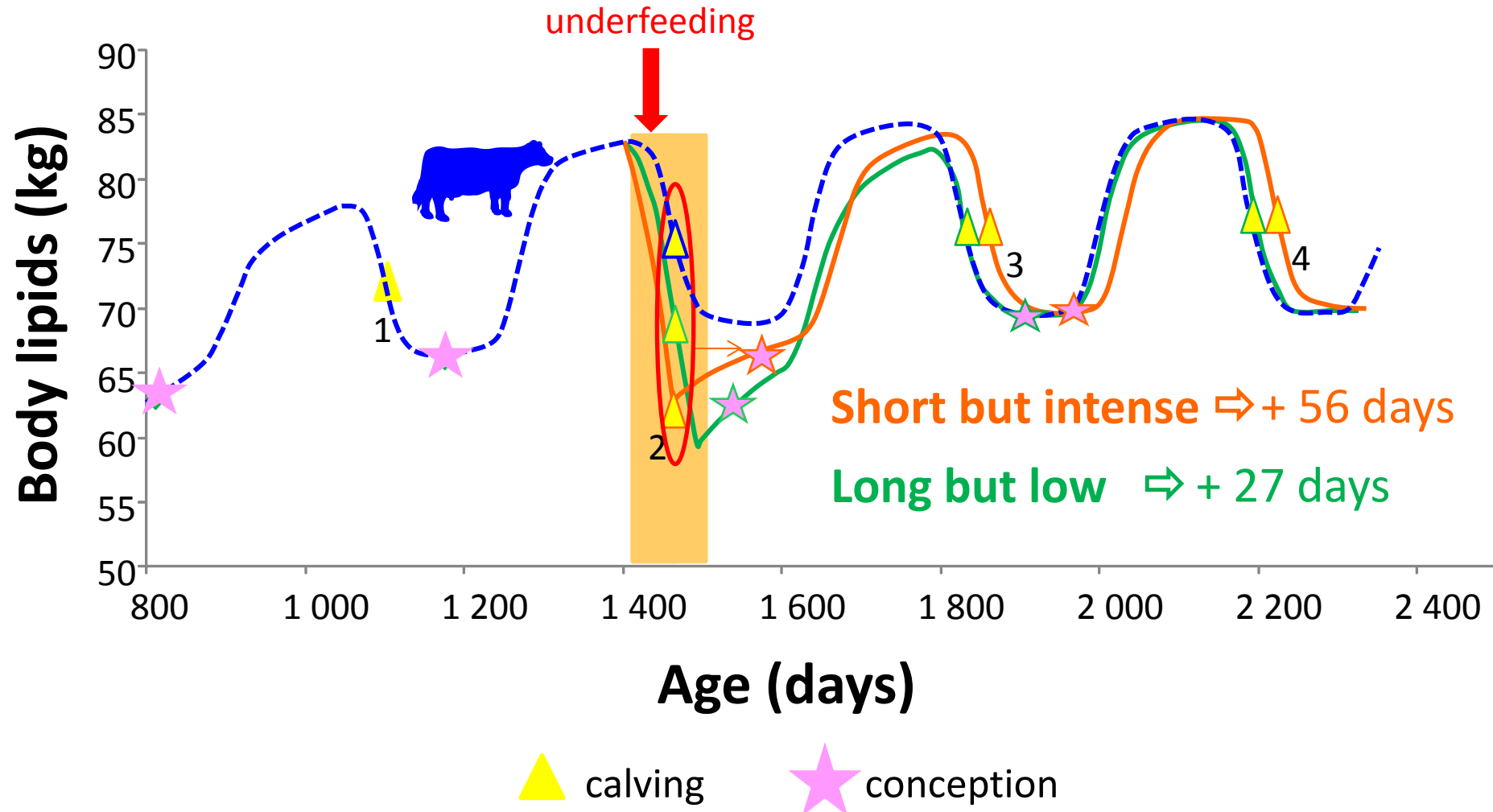
At late pregnancy



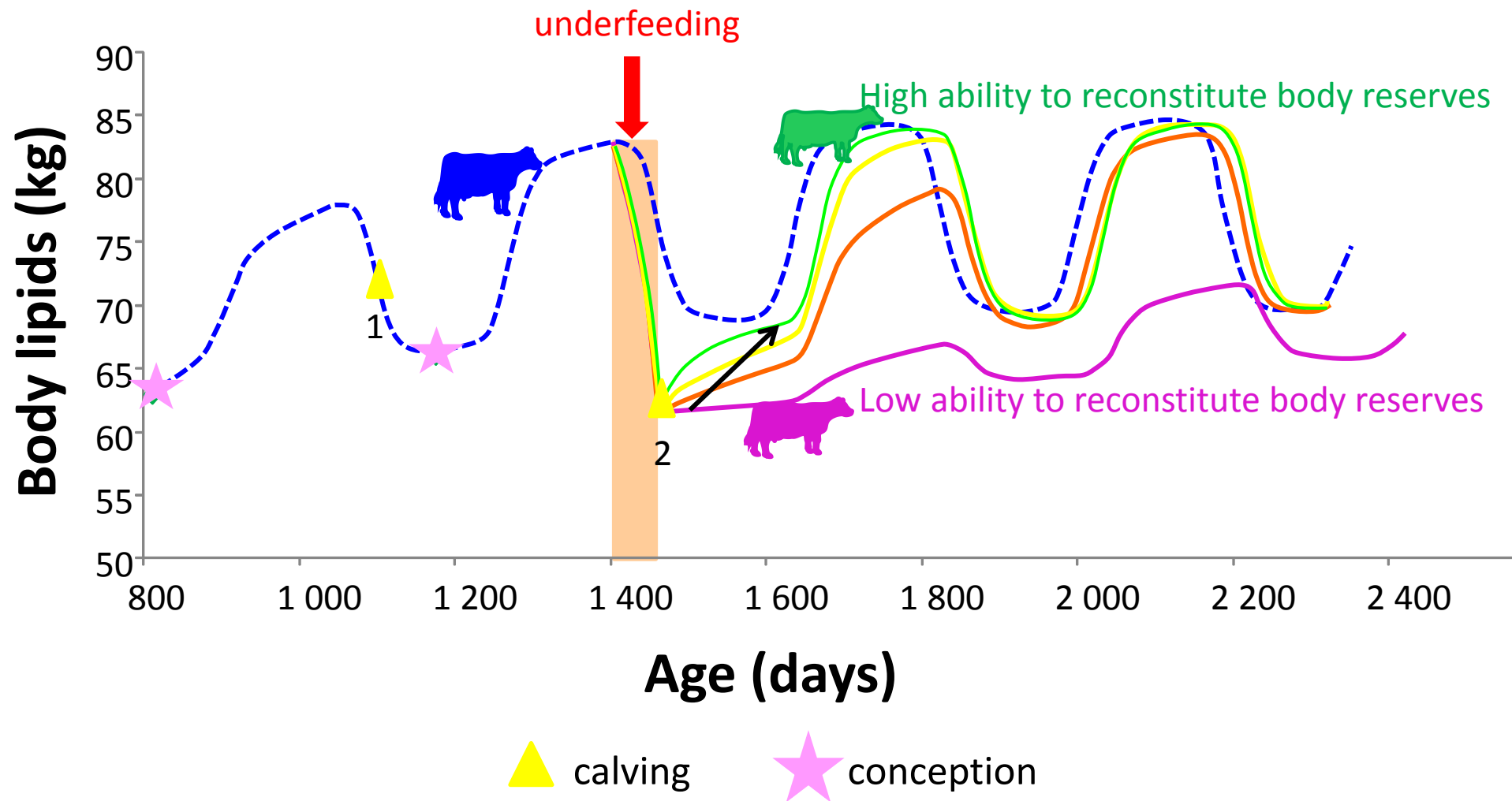
*Underlying physiological dynamics of body lipids influences the pattern of the adaptative trajectory and the effects on the reproductive performance*

**Nutritional perturbations have different effects according to their intensity and duration**

# Nutritional perturbations have different effects according to their intensity and duration



# Cows with different abilities to cope with underfeeding perturbation





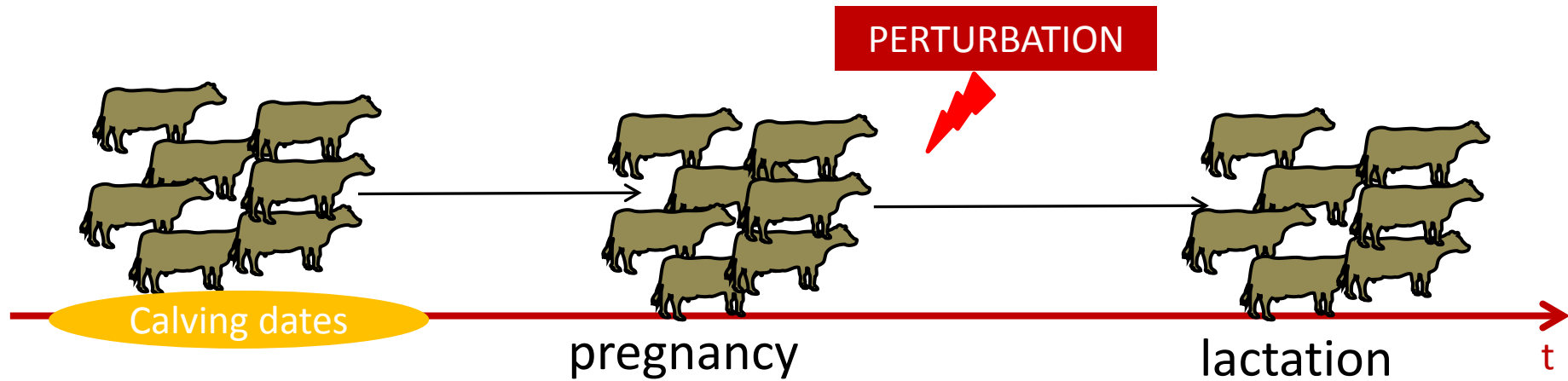
**CONCLUSION**



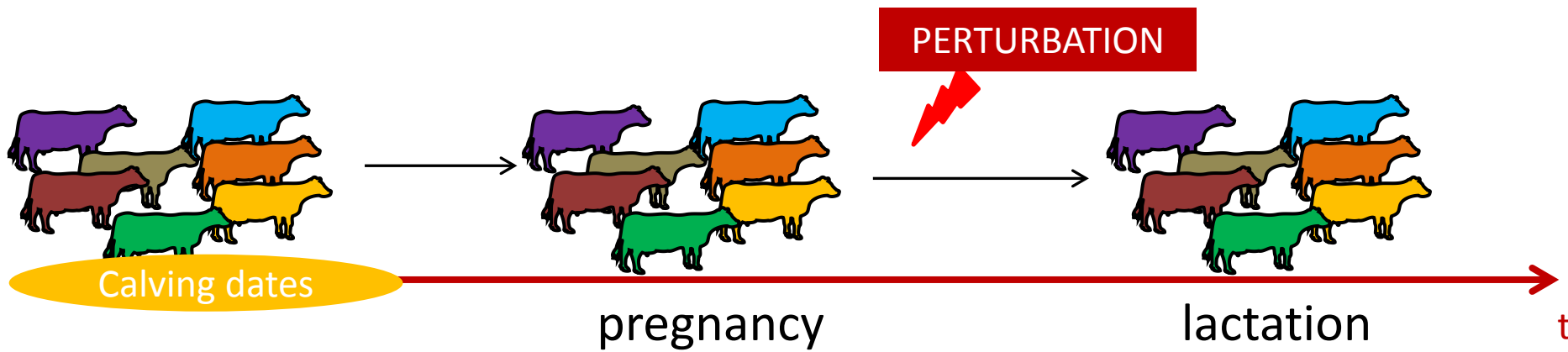
- BREsNUS = a model to study the sensitivity of productivity of beef cows to a variable nutritional environment at the lifetime scale.
  
- As a perspective, a tool to explore robustness of the herd according to the combination of adaptative types of cows and to the diversity of their physiological states.

# BREsNUS : a tool to analyse robustness at the herd level ?

Cows with similar coping abilities



Cows with a various coping abilities



**THANK YOU FOR YOUR  
ATTENTION**

