



Nutritional flexibility of Charolais cows

Anne de La Torre, Fabienne Blanc, David Egal, Jacques Agabriel

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Nutritional flexibility of Charolais Cows

DE LA TORRE Anne, UR 1213 Herbivores, INRA Clermont-Fd/Theix

BLANC Fabienne, VetAgro Sup, Lempdes

EGAL David, UEMA, INRA Clermont-Fd/Theix

AGABRIEL Jacques, UR 1213 Herbivores, INRA Clermont-Fd/Theix

BACKGROUND

Beef cattle systems

- Maximisation of fodder self sufficiency
- Feeding management more economical and sustainable



Winter undernutrition is commonly used

French dietary guidelines for cattle (INRA 2007)

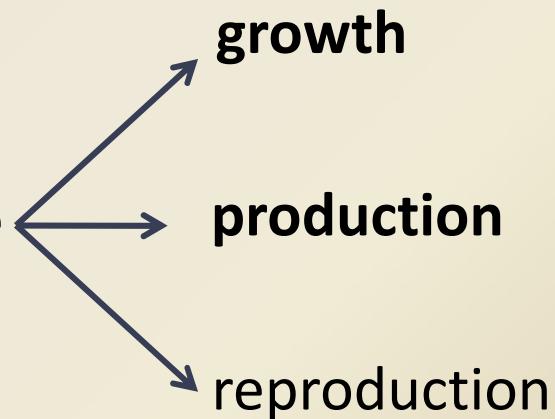
- Cows can be fed under their requirements
- *Abilities of cows to mobilize their body reserves, especially adipose tissues*
- * Data largely refer to **multiparous cows**

Background



Under feeding restriction conditions

How **Primiparous cow** will manage



Post-partum adaptive response of
primiparous and **multiparous** cows
to a nutritional challenge ?

Experimental Scheme

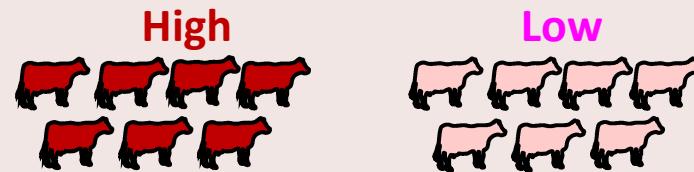
14 Multiparous

$5 \pm 1,4$ years old
 798 ± 26 kg
BCS : $2,4 \pm 0,3$

14 Primiparous

$3 \pm 0,1$ years old
 748 ± 38 kg
BCS: $2,4 \pm 0,1$

CALVING



Hay/ Concentrate: 70/30

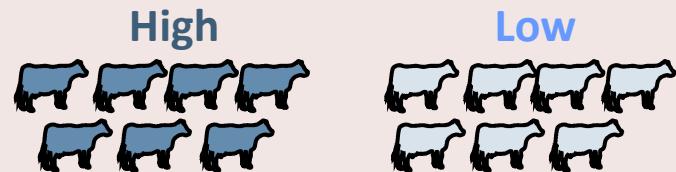
88 MJ/d

90/10

59 MJ/d

Mid-May

INDOOR (110 days)



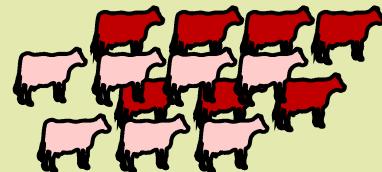
70/30

90/10

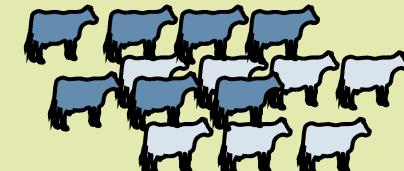
87 MJ/d

60 MJ/d

PASTURE (63 days)

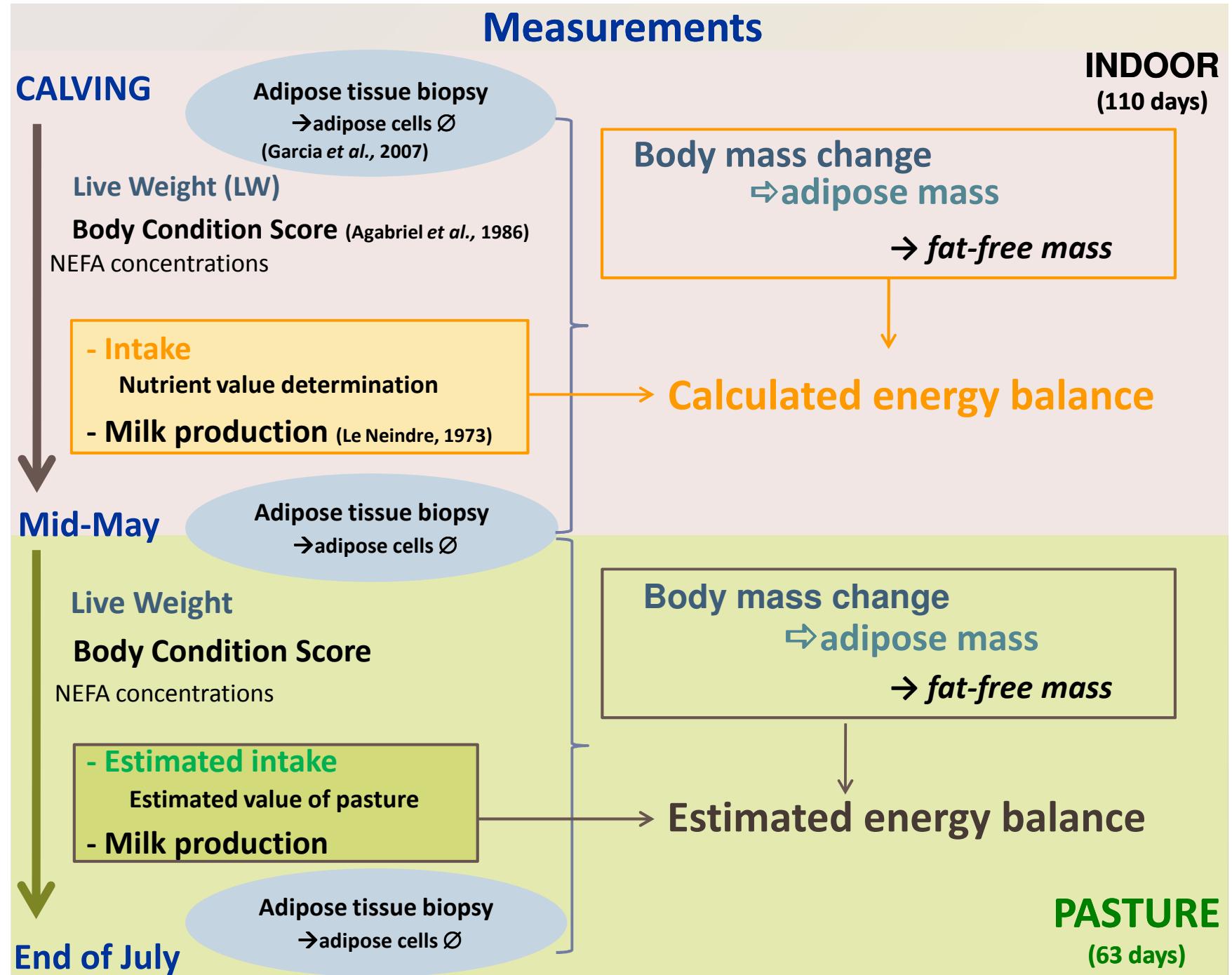


35 ares per cow/calf pair

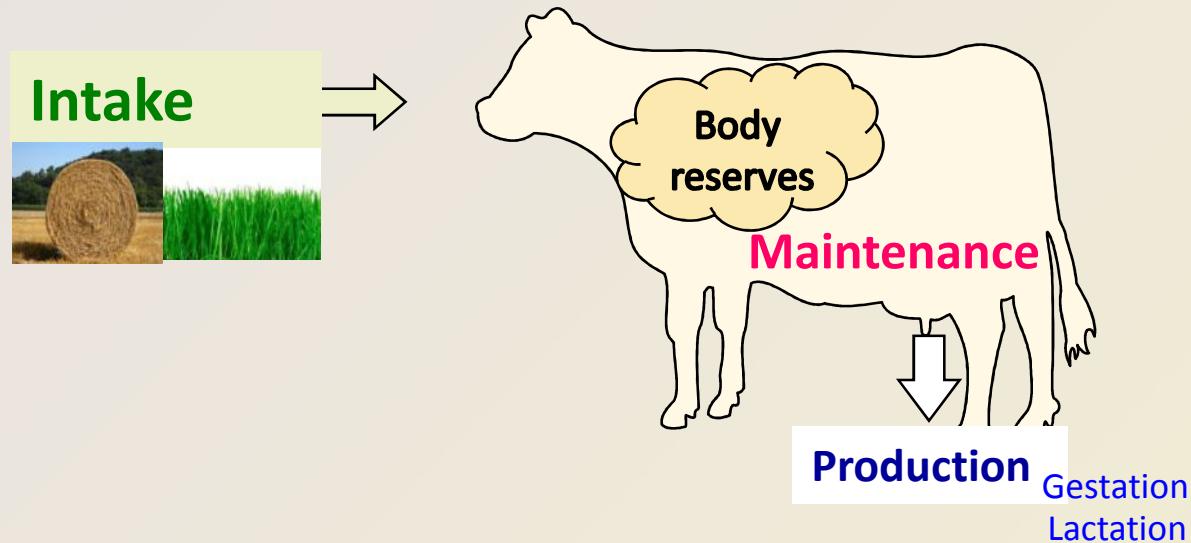


Non-limited permanent pasture with high nutritive quality

End of July



Estimation of Energy available for maintenance (Eam)



$$E_{\text{maintenance}} (\text{MJ}) = \text{Intake} - E_{\text{production}} - E_{\text{stored (or mobilized)}}$$

Hypothesis: No difference in nutritive values according to feed level

$$E_{\text{milk}} = 3.2 \text{ MJ/kg}$$

$$K_{\text{tissues}} \rightarrow \text{milk} = 0.8$$

$$\Delta \text{ kcal tissue} = 9,37 \times \% \text{ lipids} + 5,48 \times \% \text{ proteins}$$

$$K_{\text{lipid deposit}} = 0,8$$

$$K_{\text{protein deposit}} = 0,6$$

INRA, 2007



E_{maintenance}

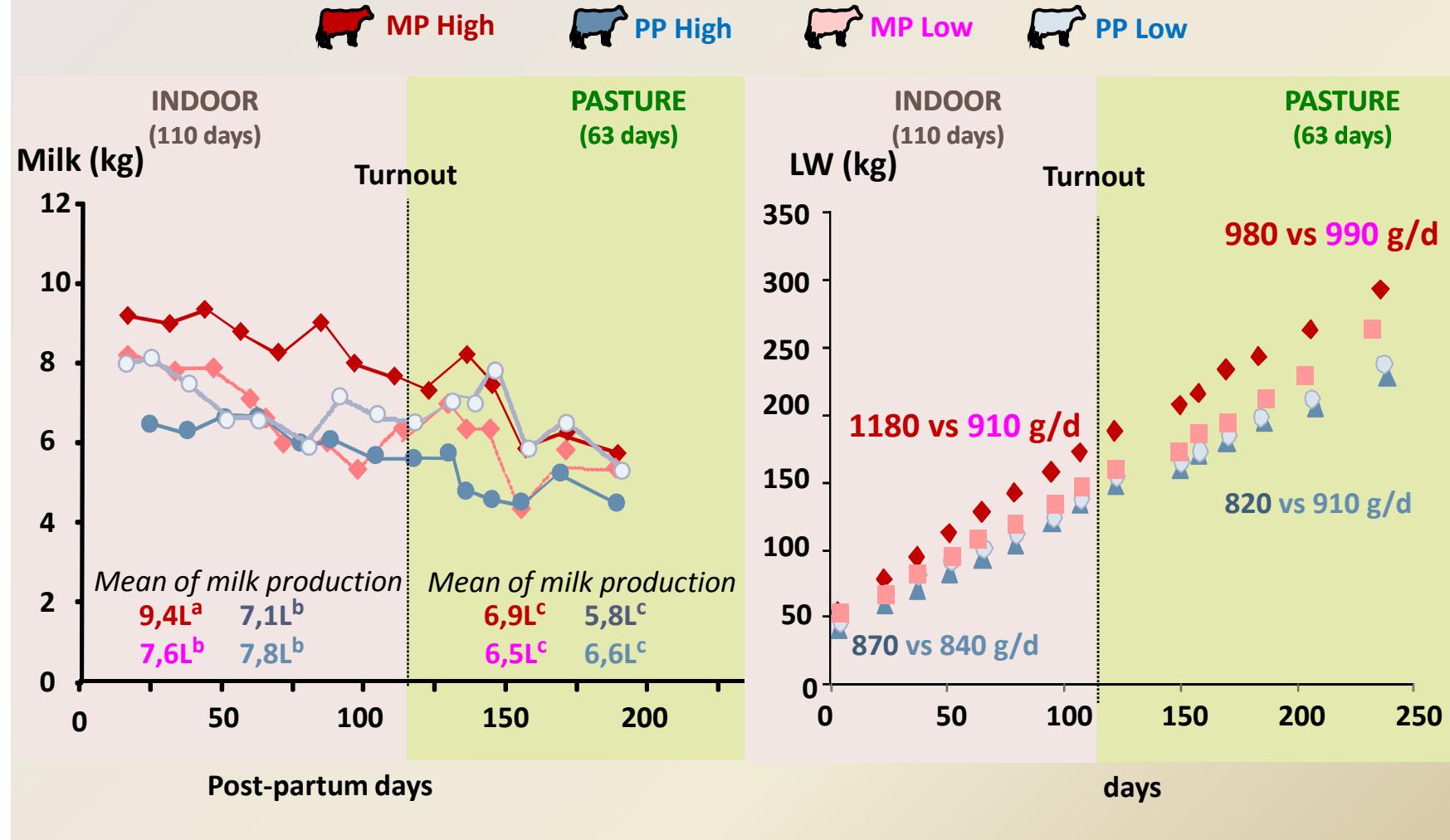
*theoretical value expressed
in net energy of lactation MJ/d/kg^{0,75}*

$$= 0.29 \text{ MJ/d/kg}^{0,75} + 10\% \text{ in stalls}$$

or + 20% at pasture

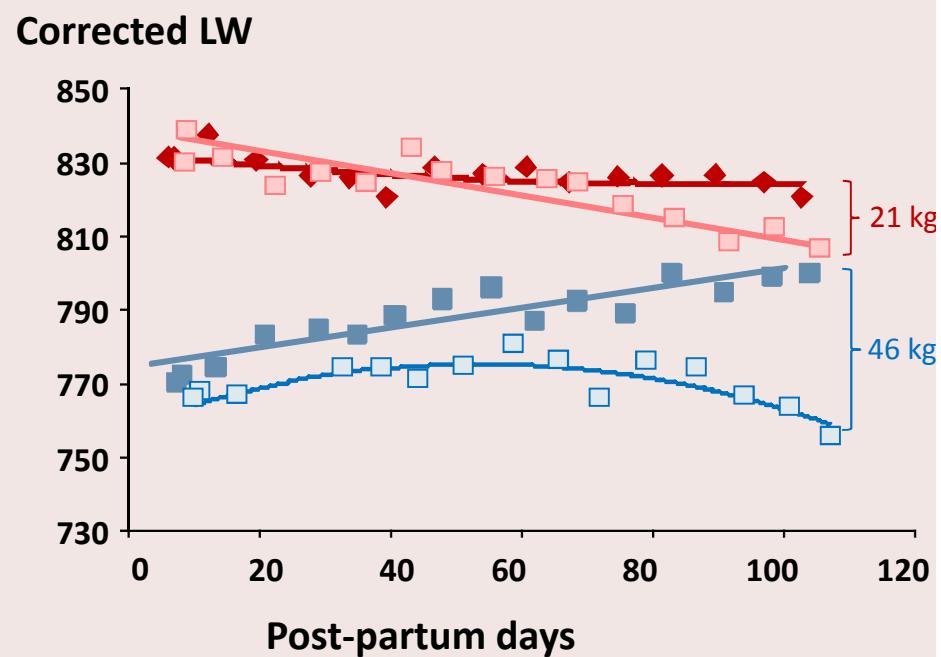
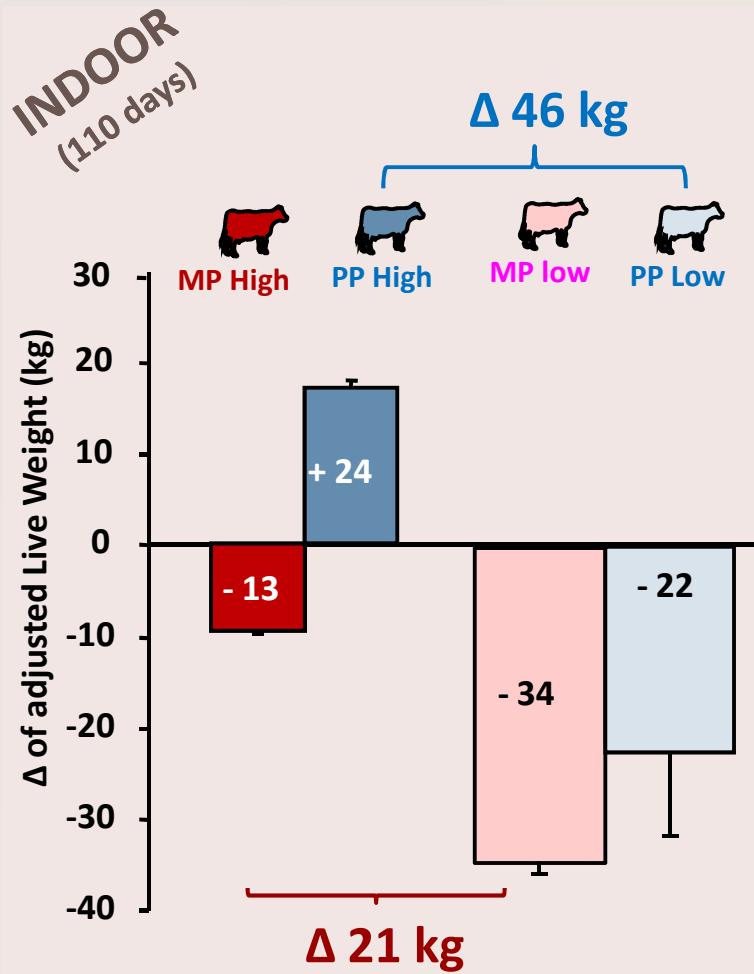
Results

Function of production: Milk production and calves' growth rate



Nutritional challenge doesn't affect
the function of production

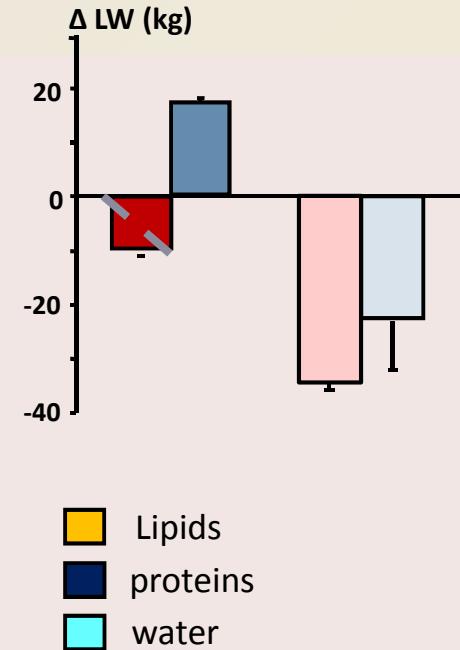
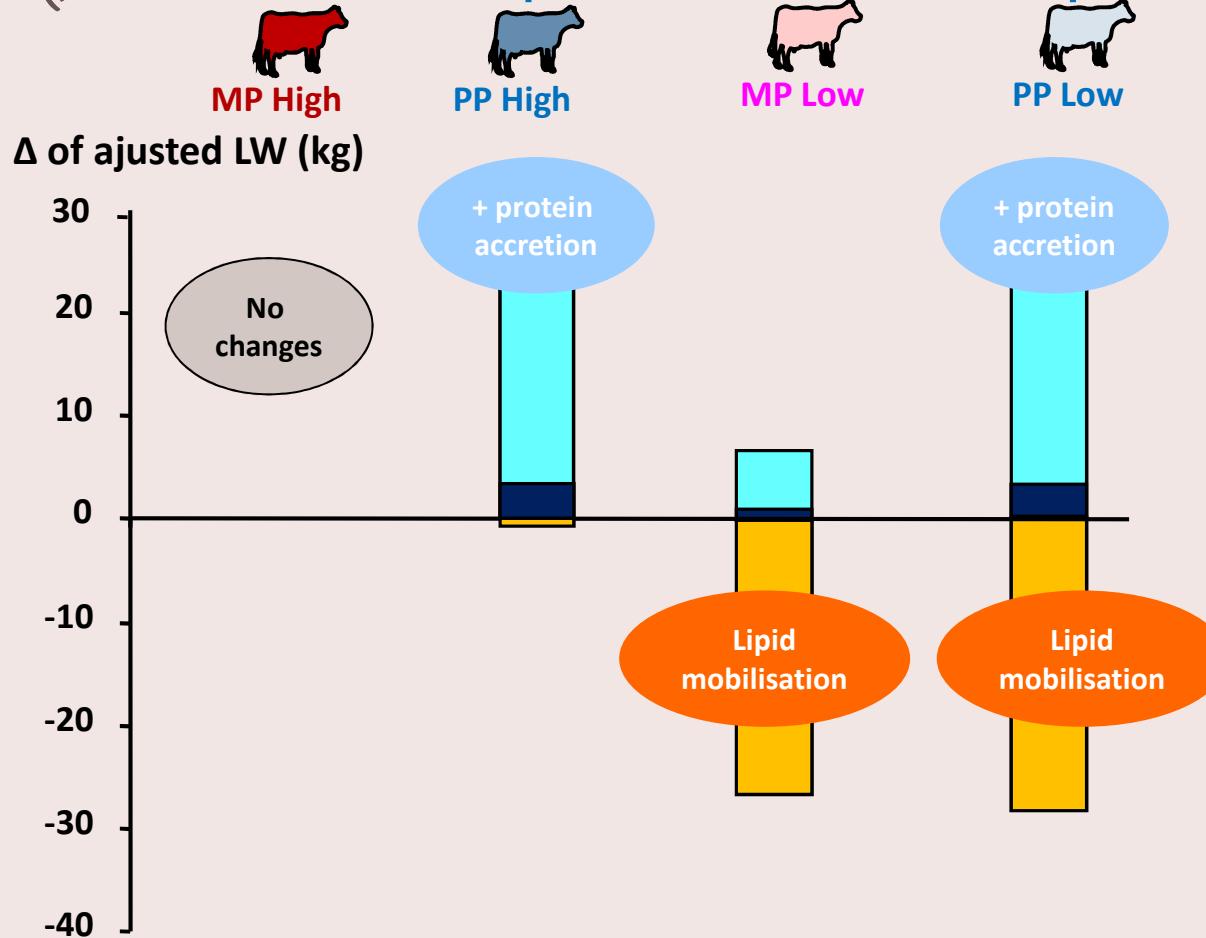
Dynamic body mass changes



PP are more sensitive to the nutritional challenge than MP cows
Dynamic weight changes differ according to the parity

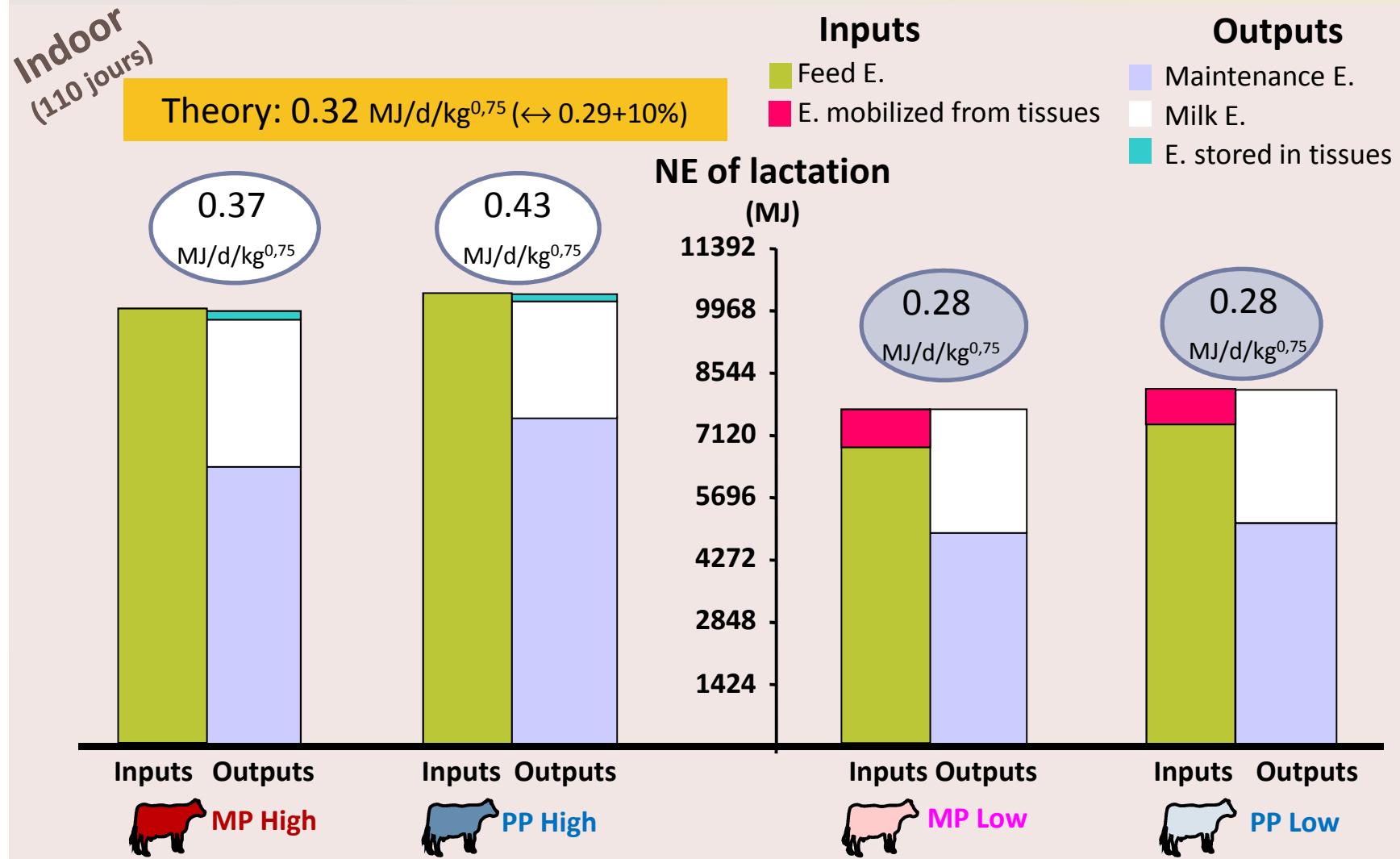
Body COMPOSITION changes

INDOOR
(110 days)



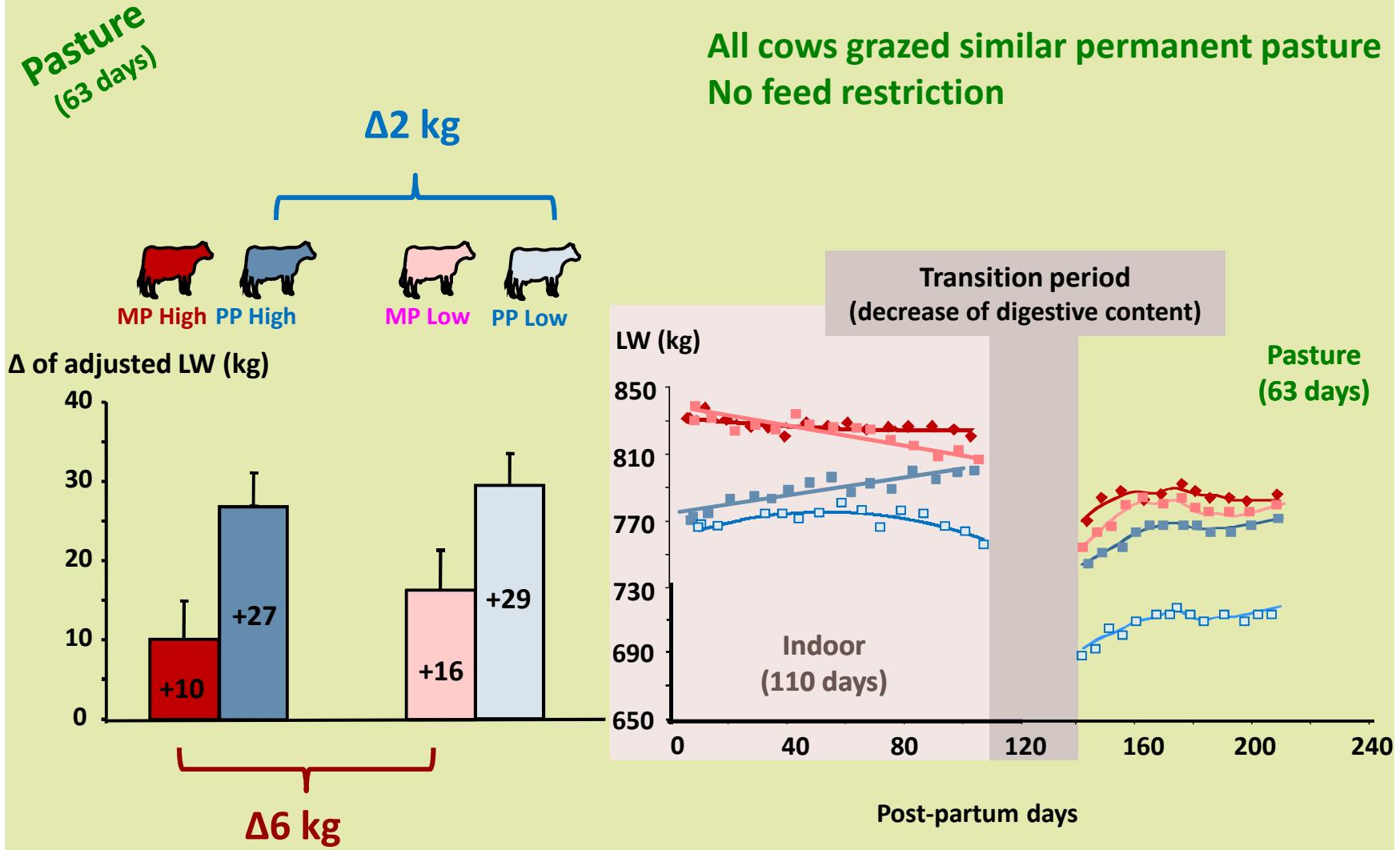
Nutritional challenge doesn't affect
the potential of growth of primiparous cows

Energy partitioning during indoor period



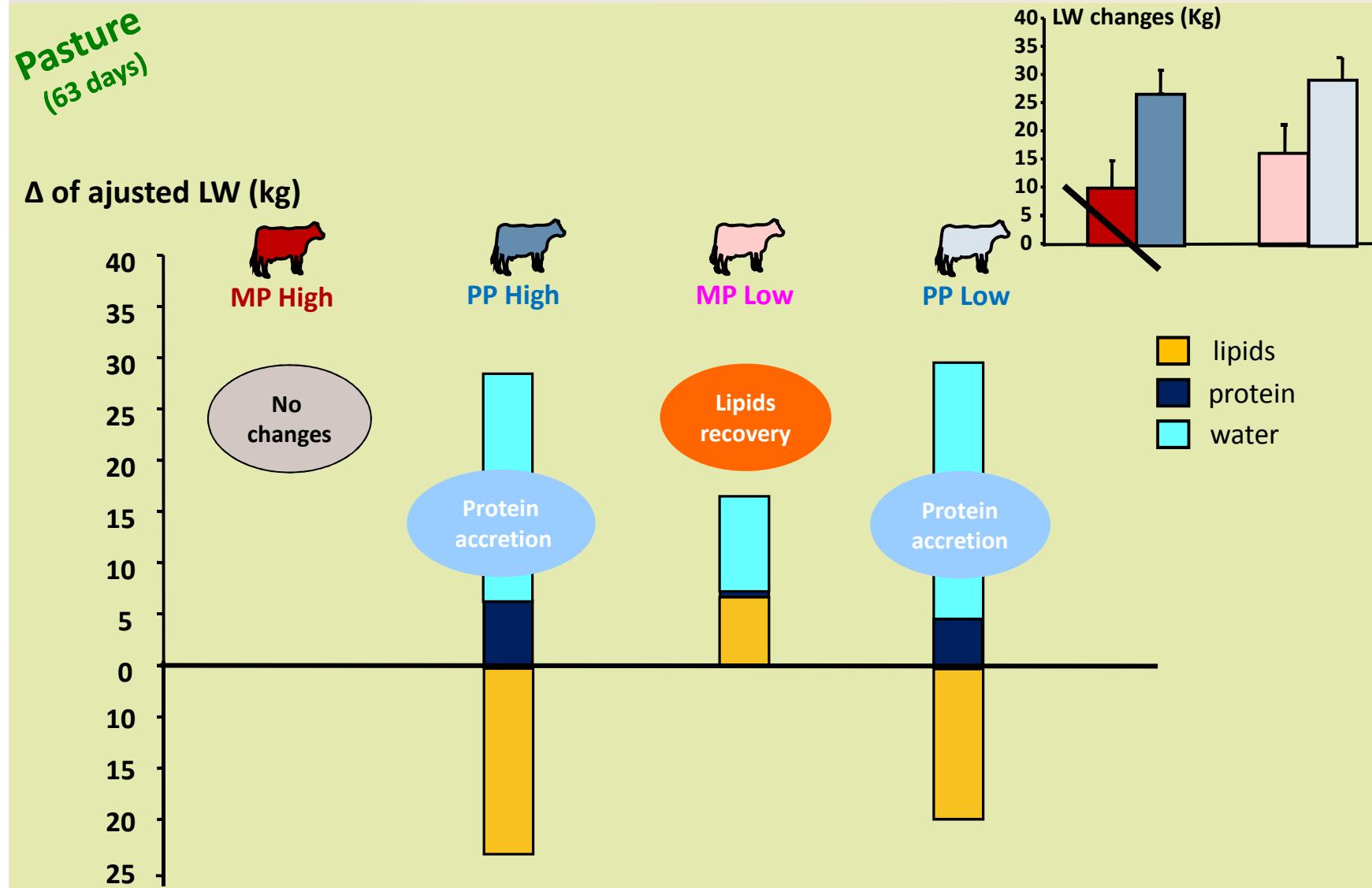
- Nutritional challenge induces a metabolic adaptation: ↴ 30% Eam ($0.28 \text{ vs } 0.40$)
- Eam differs from the theoretical value

Dynamic body mass changes



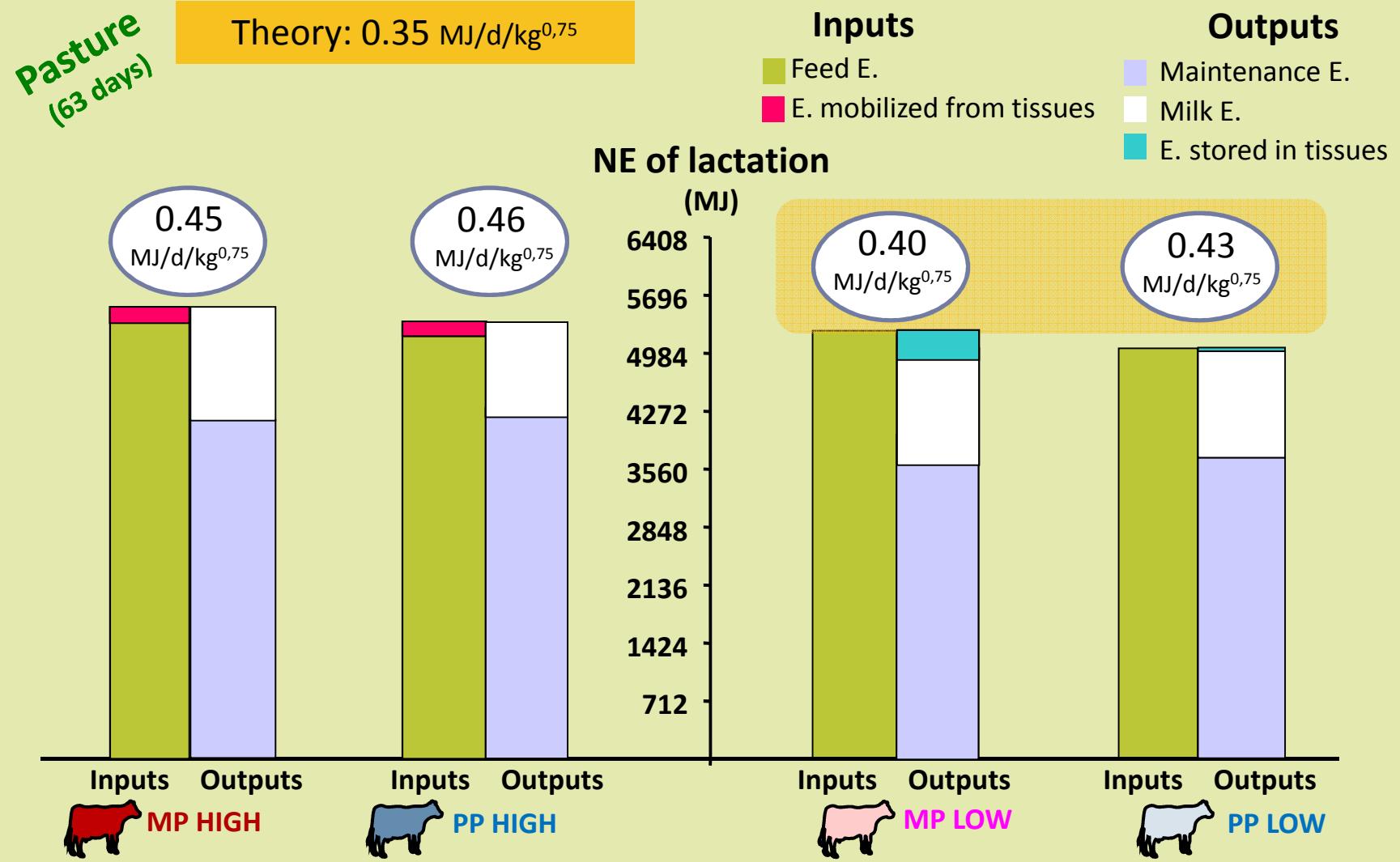
**Body weight gain is observed in both PP and MP cows
Dynamic of body weight change is similar**

Body composition changes



**At pasture : MPL cows recover part of their body lipids
PP cows continue to grow**

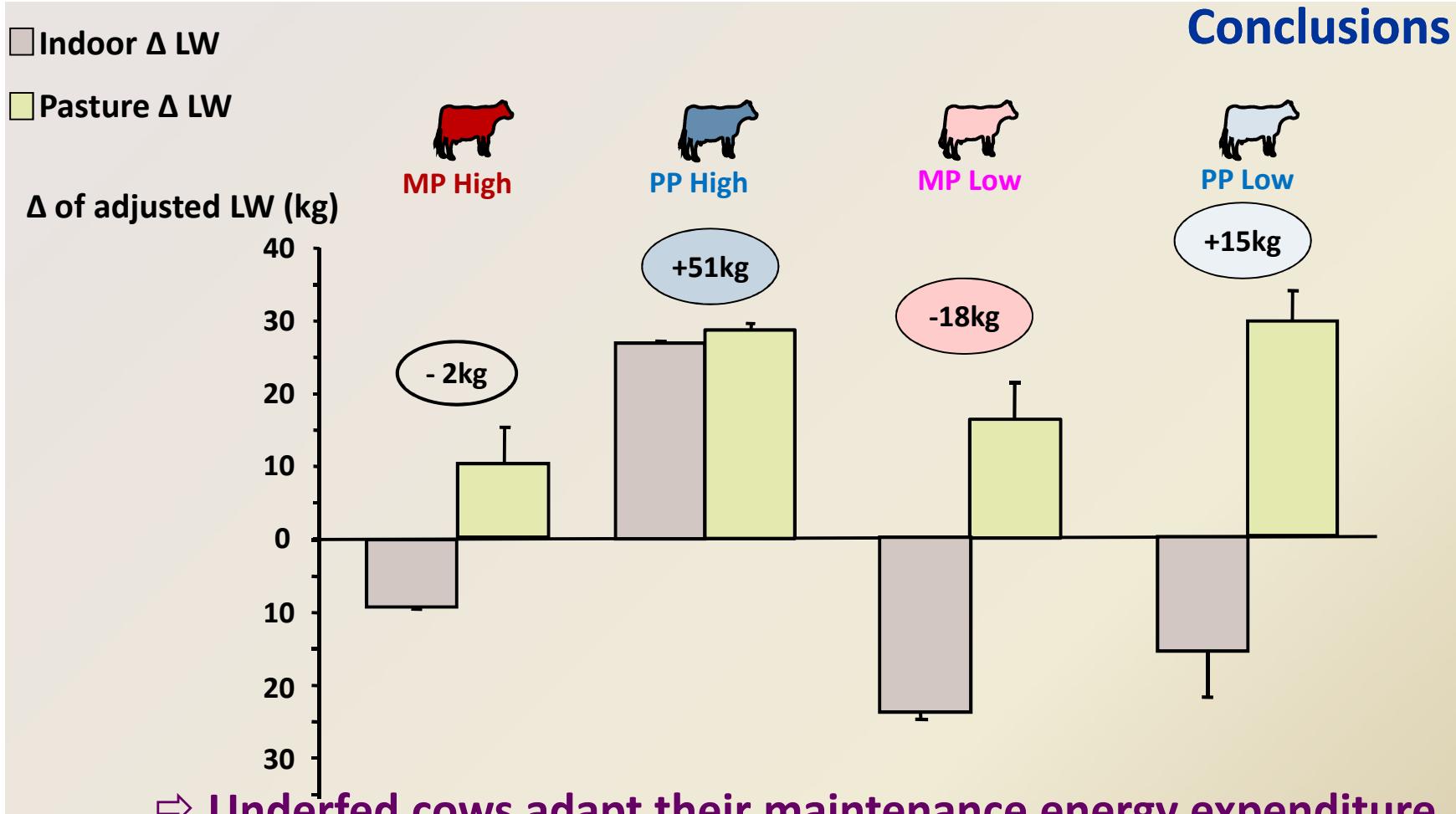
Energy partitioning at pasture



- Eam is lower in winter feed restricted cows
→ retention of metabolic adaptation at least on the first part of pasture ?
- At pasture, Eam > theoretical value +20%

Conclusions

Conclusions



⇒ Underfed cows adapt their maintenance energy expenditure
- Function of growth remains priority



What could be the adaptive response of primiparous cows ?

- younger, early maturing breed, minor body development and/or BCS
- longer feed restriction period (from housing to turnout)

Perspectives

⇒ Differences between observed and theoretical values



Improvement of energy for maintenance prediction

⇒ Take into account the energy balance changes
during the production cycle



**Development of a dynamic predictive model
of energy partitioning in beef cows**

Thank you...



Acknowledgements:

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