FAT METABOLISM AND PRECISION FEEDING

Feed-a-Gene

Adapting the feed, the animal and the feeding techniques to improve the efficiency and sustainability of monogastric livestock production systems

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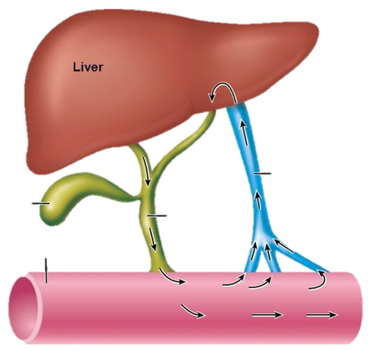
BACKGROUND

- Optimizing animal nutrition is one of the key aspects in PLF. There are numerous factors that may alter pig requirements, such as age, genetic type, gender, or environmental conditions.
- Much effort has been conducted in assessing absorption efficiency by the animal, but not much is known about **post absorption efficiency** of nutrients utilization:
  - *Is the efficiency constant?*
  - *Which factors influence the capacity of using the metabolized nutrients by the animal and incorporate them into the different tissues?*
  - *Protein levels can alter fat metabolism in pigs?*



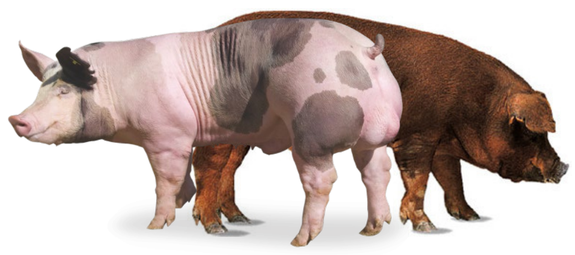
OBJECTIVES

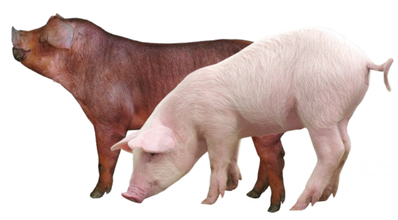
- Determine the Fat Incorporation rate (FIR) for different tissues:
  - Liver
  - Longissimus dorsi
  - Subcutaneous Tissue
- Establish variations due to genetic type, age and protein level in the diet

METHODOLOGY

ANIMALS AND DIETS

- 32 animals used in total:
  - 16 growing pigs (**29.4** ± 0.85 kg BW)
  - 16 finishing pigs (**88.5** ± 1.66 kg BW)





Purebred Duroc and ***F2 pigs*** (Pietrain ♂ x (Duroc x Landrace) ♀)

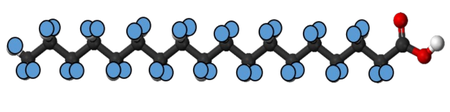
<u>LOW PROTEIN</u> (LP) DIET:

- **15% CP** in growing pigs
- **13% CP** in fattening pigs

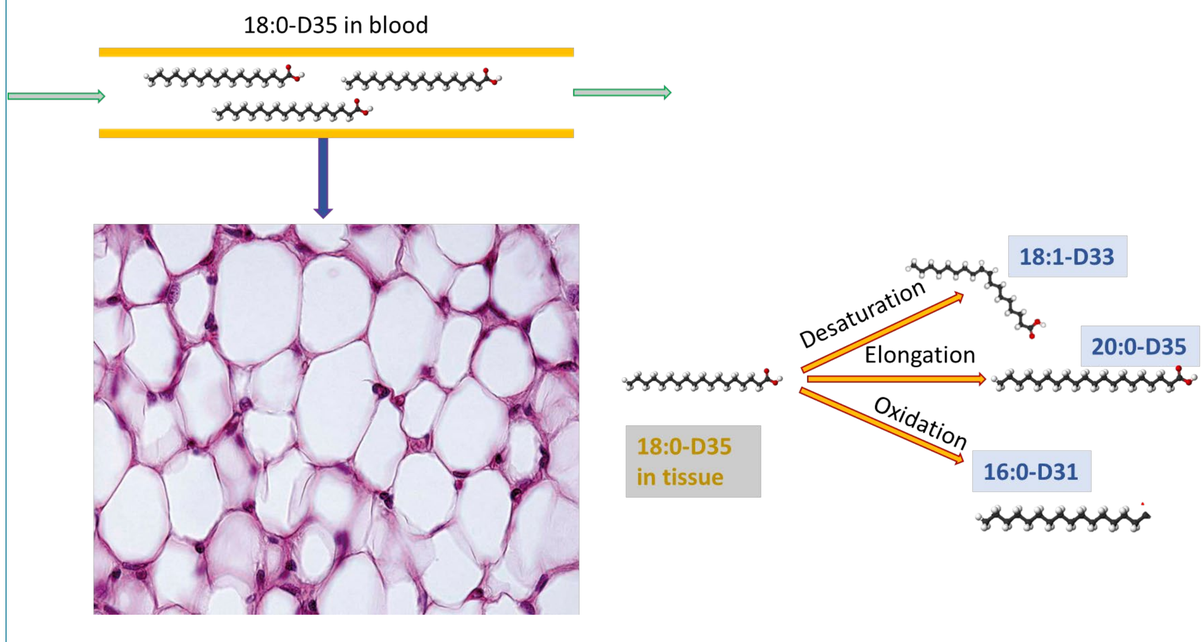
<u>STANDARD PROTEIN</u> (NP) DIET:

- **17% CP** in growing pigs
- **15% CP** in fattening pigs

INCORPORATION OF LABELLED FAT

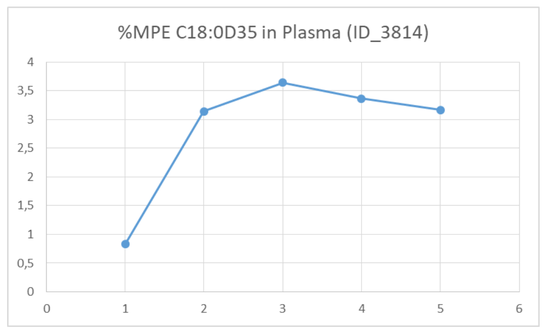


ISOTOPE LABELLED STEARIC ACID (C18:0 D35)



- **Administration the labelled fatty acid in the feed**
- **Determination of the Ste enrichment curve in plasma**
- **Determination of enrichment of isotope labelled Ste in tissues**

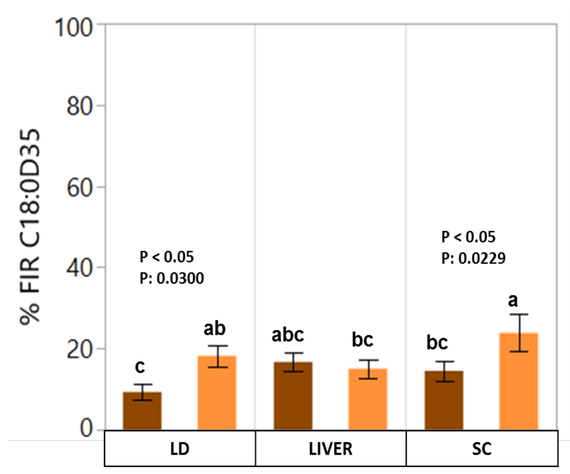
RESULTS



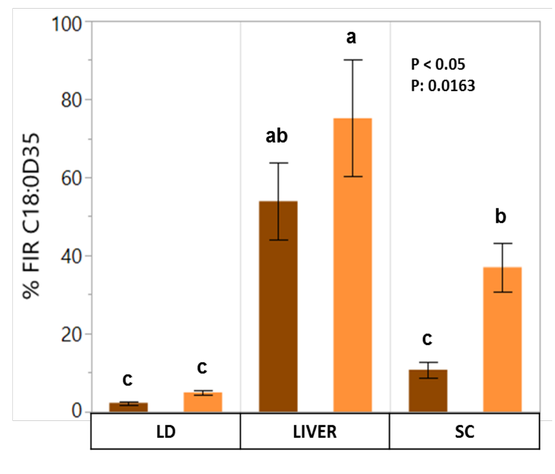
Initial enrichment in plasma until it reachs a plateau

$$\text{FIR (\%/day)} = \frac{MPE\ C18{:}0D35\ in\ tissue}{aveMPE\ C18{:}0D35\ in\ plasma} \times \frac{100}{t\ (days)}$$

GROWING

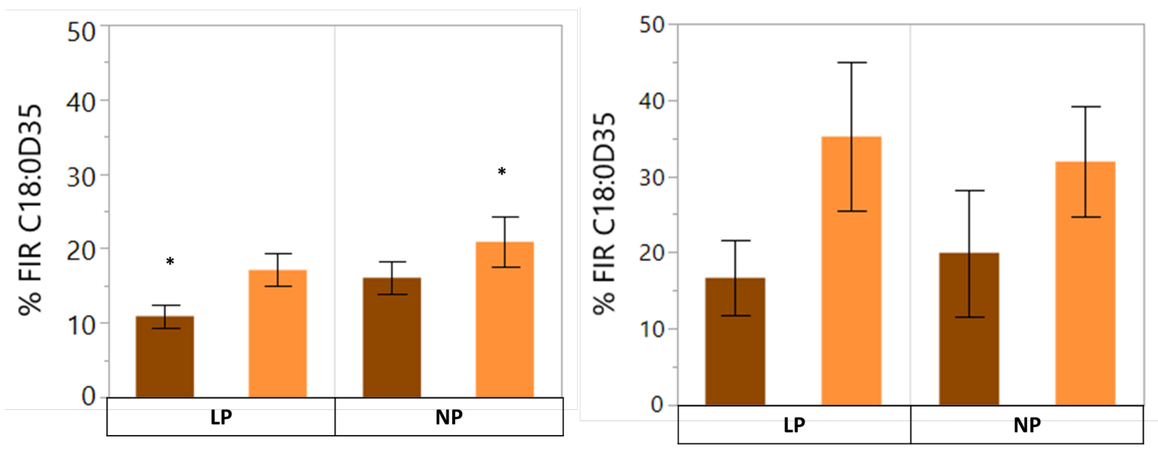


FINISHING



Duroc F2

- **Higher FIR in finishing than growing**
- **No major differences between tissues in growing**
- **Differences between breeds in finishing**



- **Higher fat metabolism in F2**

TAKE-HOME MESSAGE

Fat incorporation can be potentially affected by protein level.

The LIVER gets higher values than the other tissues in fattening pigs, due to the higher fat metabolism that occurs in this organ in this physiological phase.

The F2 pigs show higher results, which could be related to increased lipid activity, including mobilization.

It is essential to investigate fat transformation (oleic, palmitic, myristic…) and mobilization to understand full fat metabolism.

CONTACT

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Feed-a-Gene

Feed-a-Gene is a European H2020 project involving 23 partners which aims to adapt feeds, animals and feeding techniques to improve the efficiency and sustainability of pig, poultry and rabbit production systems. It is coordinated by INRAE (France), started in March 2015 and will last 5 years. The project aims to reduce the environmental impact of monogastric livestock production by improving and diversifying animal diets and feed technologies and by integrating new selection criteria for these animals. The Feed-a-gene project further aims to develop new management systems for precision feeding and precision farming and to evaluate the overall sustainability of the different management solutions proposed in the project.

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