Regulation of body composition and/or product quality by tissue metabolism. (WS2a)

ISEP 2007

Vichy, France

Aguer, Mercier, Yong, Bordenave, Metz, Kitzmann

- IMC lipid increased in human myotubes from people with type 2 diabetes.
- There was constitutive phosphorylation on IRS-1 in these cells.
- There is also defective mitochondrial lipid oxidation.

Louveau, Damon and Gondret France

- Demonstrated changes in the transcriptome between adipocytes from the trapezius muscle and subcutaneous, perirenal and intermuscular areas.

- 25 % of genes were increased, 75 % decreased in intramuscular adipocytes compared to others.

Doran, Whittington, Hallett and Wood
UK

- Reduction of protein % in the diet from 21 to 18 % over 40 to 100 kg LBW in male pigs:

- Increased marbling but not backfat
- Increased expression of ACC, FAS and SCD

Kolditz, Borthaire, Lefèvre, Quillet, Médale
France

- Rainbow trout selected for increased or decreased muscle fat had to 186 differentially expressed genes in the muscle.
- 64 were related to metabolism
- There were ~176 differential expressions in the liver, with a downregulation of lipid oxidation genes.

Katsumata, Matsumoto, Ieiri and Kaji

- Feeding bread co-products (crumbs) to gilts from 62 to 110 kg BW increased IMF content in *l. dorsi.*

- Slight (NS) reduction in weight gain (5 d)

Kjaer, Vegusdal, Todorcevic, Gjoen, Rustan, Torstensen, Ruyter Norway

- Atlantic salmon hepatocytes made more lipid when fish were fed rapeseed oil (higher n-6) compared to fish oil, EPA and DHA (higher n-3).
- The n6/n3 ratio also declined when increased n-3 fats were fed.

Todorcevic, Vegusdal, Djakovic, Kjaer, Torstensen, Ruyter Norway

- Feeding fats enriched in n-3 fatty acids (FO, EPA, DHA increased the proportion of n-3 and decreased n-9 in PL and TAG of adipose tissue, mitochondria and peroxisomes in atlantic salmon.
- FO increased mitochondrial b-oxidation compared to RO, EPA and DHA were zero.
- Perixisomal b-oxidation was greatest when DHA was fed.

Marounek , Skrivanova and Dokoupilova, Czech Republic

- Feeding CLA (Luta-CLA) to growing rabbits increased SFA and PUFA in loin muscle; increased SFA in liver, and increased PUFA in perirenal fat.

Gruffat, Remond, Durand, Loreau, Bauchart France

- Subcutaneous adipose tissue from Charolais cull cows took up 60 to 80 % more VA and c9, t11 CLA than steers-likely a faster metabolic rate.
- VA conversion to c9, t11 CLA was greater in cull cows
- C9, t11 CLA to c6, c9, t11 18:3 was greater in steers
- [faster metabolic rate in cull cows-see McN & H; role of sex steroids on desaturases—see Estergreen in 1960s]

Jatkauskas and Vrotniakiene Lithuania

- Feeding rapeseed (canola) oil to finishing bulls decreased saturated fatty acids and increased C18:2 n6 and PUFA in beef and heart fat.

- Probably NOT mediated through rumen microflora

Observations

- General: specific fatty acids alter tissue metabolism and composition in a tissue-dependent fashion across species.
- Specific: specific enzyme activities and gene expressions are affected

My Inference

- We need a good bio-mathematical model of fatty acid metabolism in all agricultural species, with the objective of testing hypotheses on the effects of specific fatty acids on tissue metabolism.
- Should be, at the start, integrated with transcriptome maps.
- *Merci*