(UQAR, Institut des Sciences de la Mer de Rimouski, Quebec, Canada) and Céline Audet (UQAR, Institut des Sciences de la Mer de Rimouski, Quebec, Canada)

The aim of this study was to investigate the effects of dietary highly unsaturated fatty acid (HUFA) content on the fatty acid composition of juvenile winter flounder (*Pseudopleuronectes americanus*) and the ensuing consequences on the expression of genes involved in key metabolic processes developing during metamorphosis.

Three groups of fish were fed from the pelagic larval stage until 30 days after settlement on rotifers enriched with different blends of microalgae providing different HUFA profiles: the Nanno diet was rich in eicosapentaenoic acid (EPA) and arachidonic acid (AA), the Tiso diet was rich in docosahexaenoic acid (DHA), and the cocktail diet was rich in EPA, DHA and AA.

Fish growth performance was not limited by the dietary HUFA contents. Growth hormone gene expression seemed to depend almost entirely on the DHA dietary content at settlement, however, while EPA and AA were required in addition to DHA after settlement to sustain it. Fifteen days after settlement, oxidative defences measured through *superoxide dismutase* (*sod*) gene expression decreased in the cocktail group, while it remained constant in the Tiso and Nanno groups at the same time. This would indicate that different EPA, AA and DHA dietary content would have an impact on the reactive oxygen species production in fish cells.

Taken together, these results allow a better understanding of the effect of dietary HUFA on the juvenile metamorphosis process of winter flounder, which is a promising candidate for coldwater marine aquaculture in North America.

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12:30 Saturday 30th June 2012

# A6.5
## Do polyunsaturated fatty acids impact on lactation in MF1 mice?

Julia Diels (Veterinary University, Vienna), Nadine Lenzhofer (Veterinary University, Vienna) and Teresa Valencak (Veterinary University, Vienna)

Lactation is not only the most energy-demanding period for female mammals, but is also known to induce hyperthermia in the animals as all organs are working at sustained levels and they have to synthesize milk on top of this. Thus, laboratory mice from the MF1 strain are limited by their capacity to dissipate heat while raising young. Identifying ways in which heat dissipation can improved will likely improve the lactation performance of females.

Polyunsaturated fatty acids (PUFAs) are essential dietary constituents that mammals cannot synthesise *de novo*. Once ingested, however, they can be further elongated and desaturated enzymatically. PUFAs play an important role as constituents of biological membranes, as signalling molecules, and they influence torpor and hibernation in mammals. Based on these findings, we hypothesized that PUFAs might relate to body temperature. To test the idea, we subcutaneously implanted transponders into 45 female MF1 mice that also allow for skin temperature readings. After three weeks, we provided the animals with three isocaloric diets that were enriched with saturated, omega-3 or omega-6 PUFAs. After a couple of weeks and daily measurements of skin temperature, we paired a subset of the females with males and later observed them throughout lactation by assessing skin temperature, food intake, litter mass and body weight.

Our results might help in understanding the regulation of body temperature during lactation.

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# A6.6
## Metabolome in obesity and its comorbidities

Matej Oresic (VTT Technical Research Centre of Finland, Finland)

Primary obesity and psychotic disorders and their treatments share similarities in their associated changes in energy balance and cardiometabolic comorbidities, including metabolic syndrome. The specific underlying mechanisms linking the expansion of adipose tissue to these comorbidities, however, are unknown. These disease associations do not demonstrate causal links, but instead suggest that specific causes of and metabolic disturbances associated with obesity could also play a pathogenic role in these comorbidities, potentially even before obesity develops. Both brain and peripheral metabolic organs use metabolites including lipids as components of their integrated homeostatic system to control energy balance as well as in regulating their peripheral insulin sensitivity. Metabolomics has played an important role in elucidating the underlying pathways behind obesity and its comorbidities, including diabetes and psychotic disorders as well as cancer and Alzheimer's disease. Knowledge of common and specific mechanisms could help in aetiopathogenic understanding, early disease detection and the identification of individuals who might benefit from specific treatments to prevent or treat the comorbidities of obesity. Such knowledge might also lead to the discovery of unexpected novel therapeutic avenues.

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# A6.7
## On the allometric scaling of fatty acids in the phospholipids of metabolically-active fowl tissues

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In our recent studies, domesticated fowl species in the range from 150 g (Japanese quail, *Coturnix coturnix japonica*) to 19 kg (turkey, *Meleagris gallopavo*) were analysed to elucidate the supposed allometric relationship of the membrane lipid fatty acids (FAs). The basis of all studies was the theory of 'membranes as pacemakers of metabolism' by Hulbert (*Lipids*, 2007; 42: 811–819). Negative allometric scaling was found for docosahexaenoic acid (DHA) first in the myocardium (B = -0.6), later in the avian kidney (-0.18) and lung (-0.24), and in the liver (-0.2). In the membrane FAs of all these tissues, balanced polyunsaturation, negatively scaling n3 and unsaturation index and negatively related n6 and monounsaturated FA molar levels were described.

In the lavaged avian lung surfactant phospholipids, we found similar negative allometry for DHA. In contrast, avian brain phospholipid FA composition failed to provide body mass relation. We found unexpected results (positive allometry for n3 FAs, DHA and unsaturation index) in the m. pectoralis superficialis phospholipids during turkey ontogenesis. In the aforementioned splanchnic organs the concentration of whole-tissue malondialdehyde was negatively related to body mass (B=-0.16, -0.05, -0.17 and -0.13 in the heart, lung, kidney and liver, respectively).

Results indicate a special regulatory role for DHA, in agreement with the membrane pacemaker theory, while suggest a strong predisposition and linking role for this acid and the polyunsaturated n3 FAs towards non-enzymatic lipid peroxidation.

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