

Aquaculture-related research at the Faculty of Natural Resources and Agricultural Sciences

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SLU*

Departments at NL with activities and strategy within the aquaculture field

- ▶ *Aquatic Sciences and Assessment*
- ▶ *Chemistry*
- ▶ *Department of Aquatic Resources*
- ▶ *Food Science*
- ▶ *Microbiology*
- ▶ *Molecular Biology*
- ▶ *Soil and Environment*
- ▶ *SOL and more*

Diverse activities within the NL-faculty

Project financed by FORMAS: (examples)

Mats Sandgren: Microbial hemicellulose to high value fatty acid conversion for sustainable biofuel and animal feed production from lignocellulose

Johan Östergren: Genetiska konsekvenser av kompensationsutsättning av lax i Östersjön

Johan Dannewitz: Bevarande och uthålligt nyttjande av en hotad art: flodkräftan i Sverige

MISTRA / FORMAS new applications (call October 31st 2013)

Jana Pickova/Torbjörn Lundh, DJ Koning mfl,
SLU/KTH/Linne/ Diversification of Swedish aquaculture –
Establishing larvi culture, brood-stock and breeding
program for pike perch and turbot

Anders Alanära/ Tobias Vrede /Martin Futter mfl SLU/UmU/
Ecosystem effects and governance of fish farming in hydro-
power reservoirs

Anders Kiessling/Volkmar Passoth mfl/ SLU / SU Resilience
Inst Closing the nutrient loop – sustainable system
development and environmental performance analyses in a
Swedish, Baltic and global perspective (NutriLoop) Johan

Microbiology/molecular biology/ chemistry, food science and aquaculture

- ▶ Waste transformed to valuable feed/food proteins and lipids
- ▶ Single cells in culture to provide feed raw materials
 - proteins
 - lipids
 - optimisation of fatty acid production
- ▶ Biofilter microbiology in RAS (recirculating aquaculture systems)

Ongoing:

- * Projects within the Baltic program ex .

 - Aquabest

- * Formas projects

 - Dept of aquatic resources

- * Centers for aquaculture activities

 - NKfV:

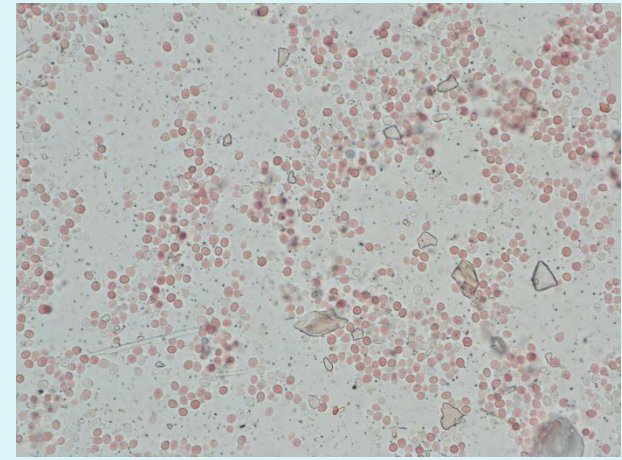
 - Nationellt Kompetenscentrum för

 - Vattenbruk, samt

 - Vattebrukscener Öst, Väst och Norr

....cont....

- ▶ Chemistry/ Food Science/ Microbiology/
Molecular biology
 - Chemical absorbants of nutrients
 - Absorbance of inorganic compounds
 - Metabolomic response on microbial feeds in fish
 - Metabolomics in food and health
 - Fish as a model for human studies





Fruitful collaboration

Food Science/Animal nutrition/ Game fish and Environmental studies/ Chemistry/Microbiology/ Molecular biology

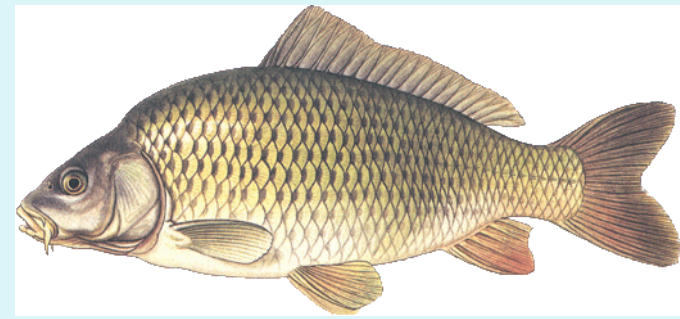
KoN activities, common PhD students
publications and projects proposals as well as projects

several PhDs in different departments

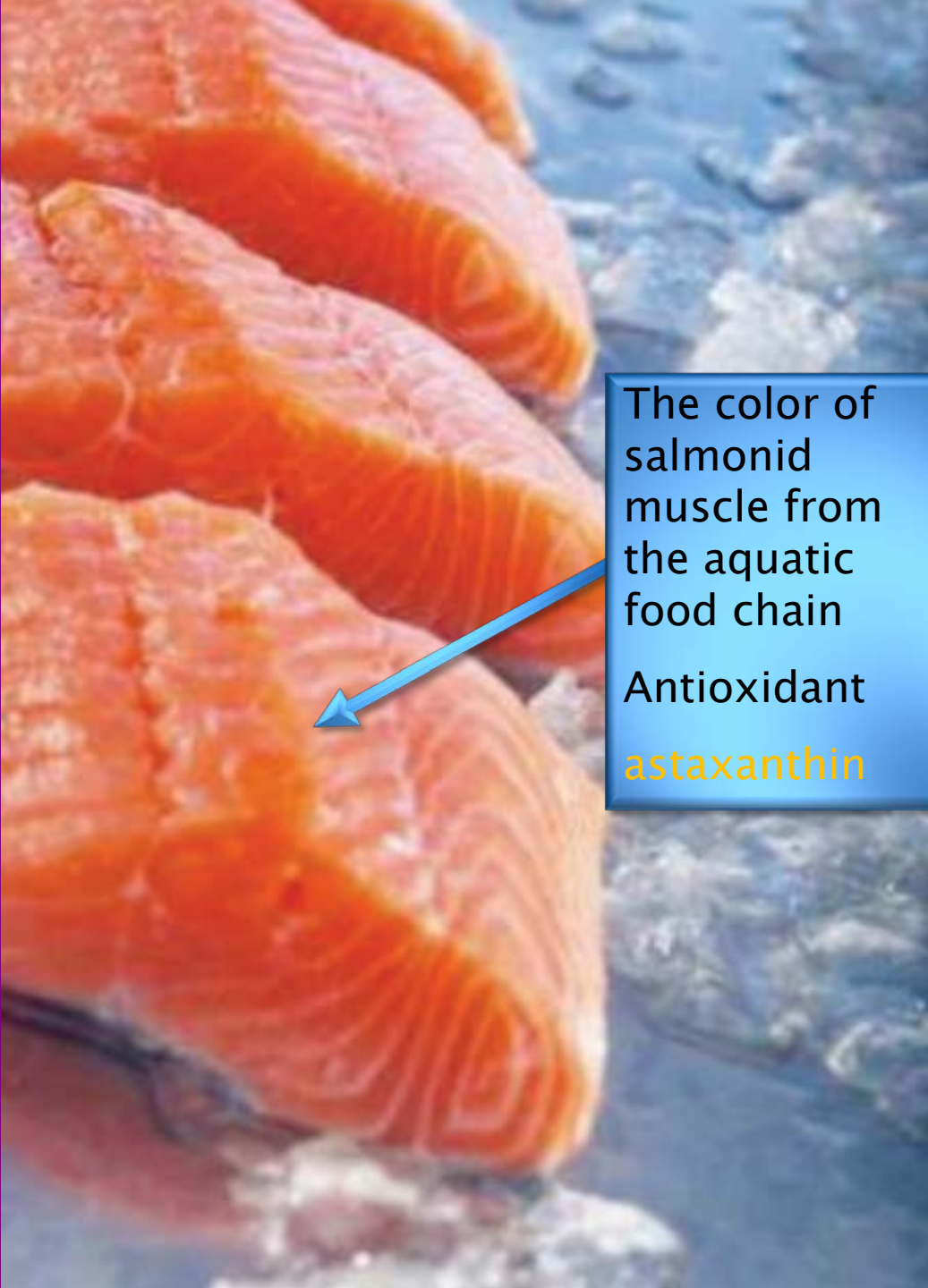
collaboration with South Bohemian University and Inst of
cardiac and experimental medicine, IKEM, Prague



two PhDs



Development of farming practises and feeds



The color of salmonid muscle from the aquatic food chain
Antioxidant
astaxanthin

- Different raw products as lipid and as protein source
astaxanthin
- Effect in fish
- Food and health in human

Studies include fish quality

in Food chain; sustainable systems

microalgae (fatty acids, protein, antioxidants...)

micro fungi

bioactive compounds

new crops

fish/shellfish/other animal products based foods

nutrition and health

lifestyle


Global food supply and security



OMEGA-3

Lipid metabolism in fish

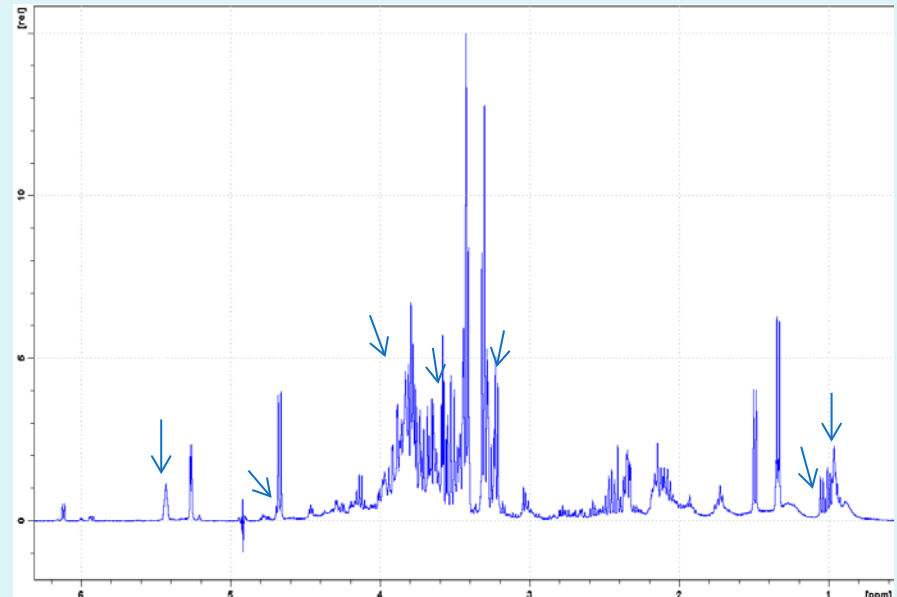
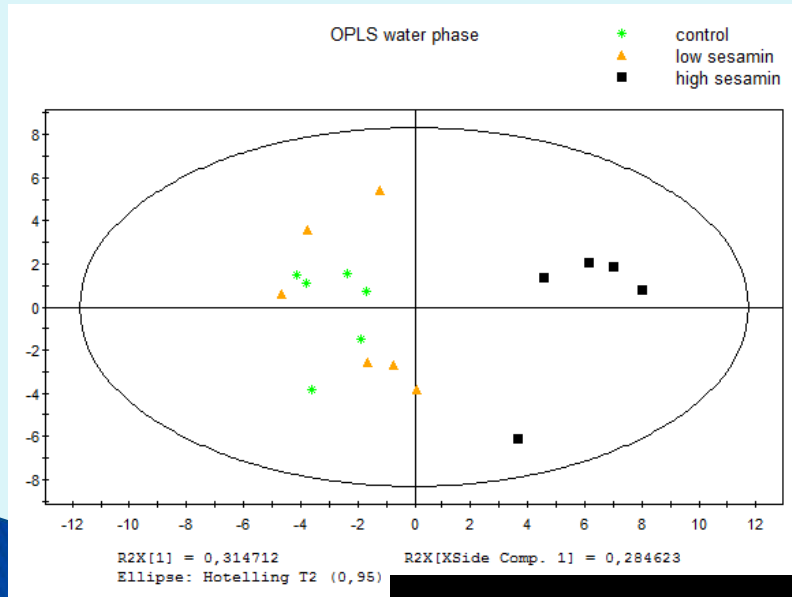
- 18:2n-6 and 18:3n-3 are essential FAs
- FAs can be elongated and desaturated in the liver of some fish species to LCPUFAs.
(e.g. 18:3n-3 to EPA and DHA)
- Salmon store most lipids in myosepta between muscle bundles.
- Lipids may be used for energy (β -oxidation) in liver and muscle.



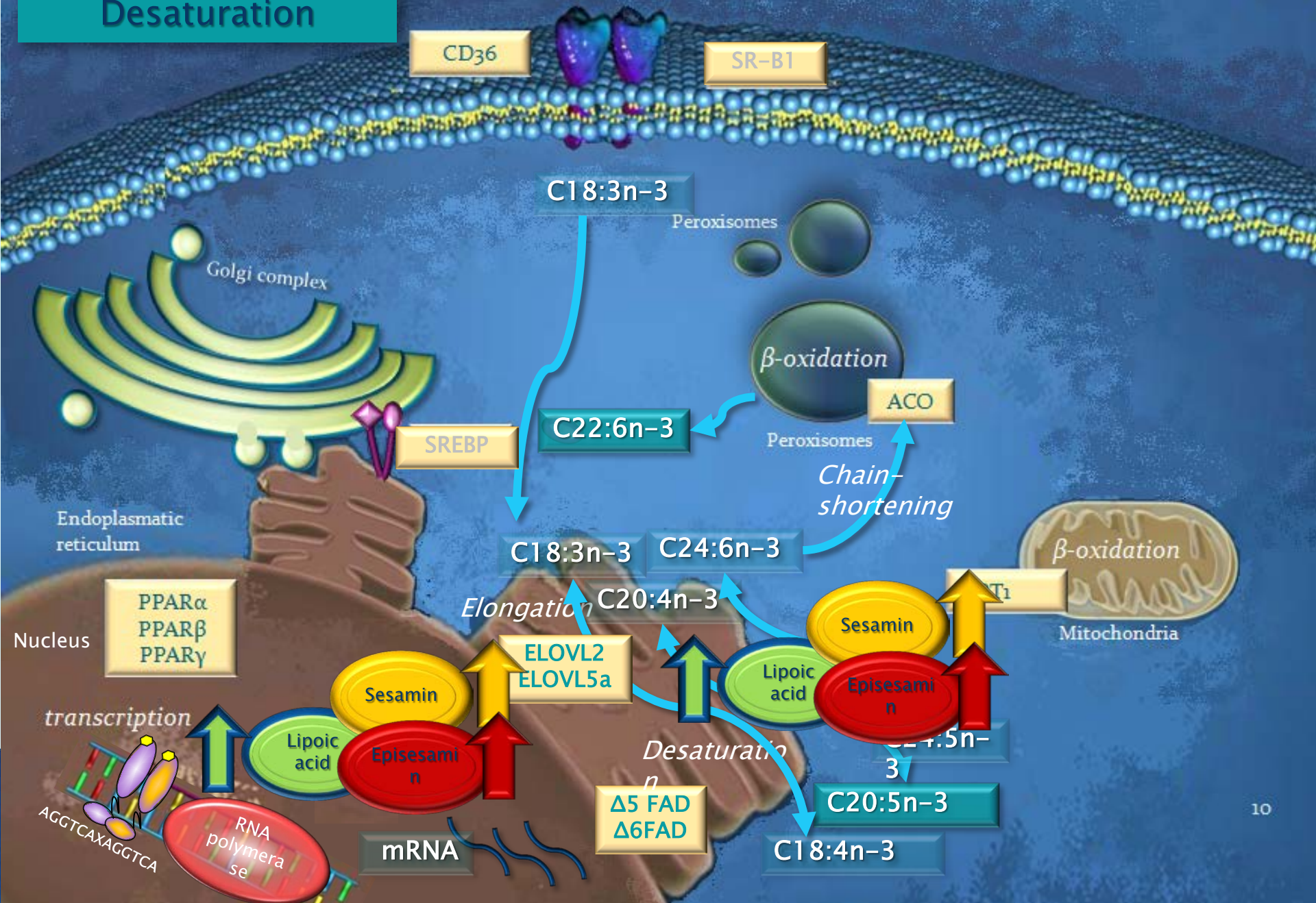
Myosepta,
the white
strings
(collagen
and fat)

Metabolomic profiling in dietary trials in fish tissues and blood /plasma polar and non-polar phase

Human samples in intervention studies will follow



Effect on Elongation and Desaturation



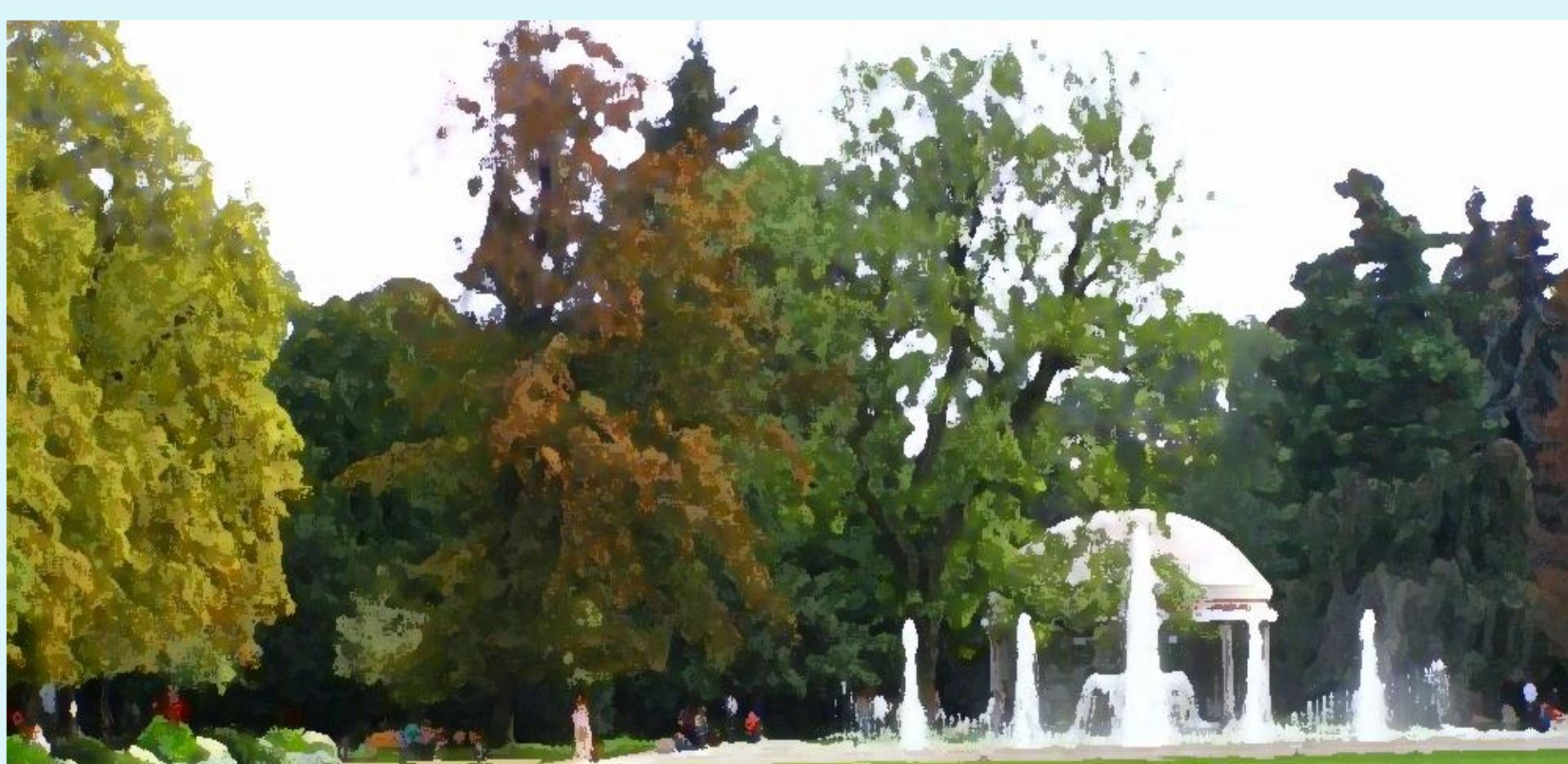
Fatty acid effects on human health

- ▶ To evaluate effects of the carp flesh on the health of patients after cardiac surgery recovering in spa
- ▶ 87 patients – 2 servings (200g) a week for 4 weeks
- ▶ 56 patients – control 4 weeks
- ▶ Equall energy intake



Basic characteristics of the groups (after cardiac surgery)

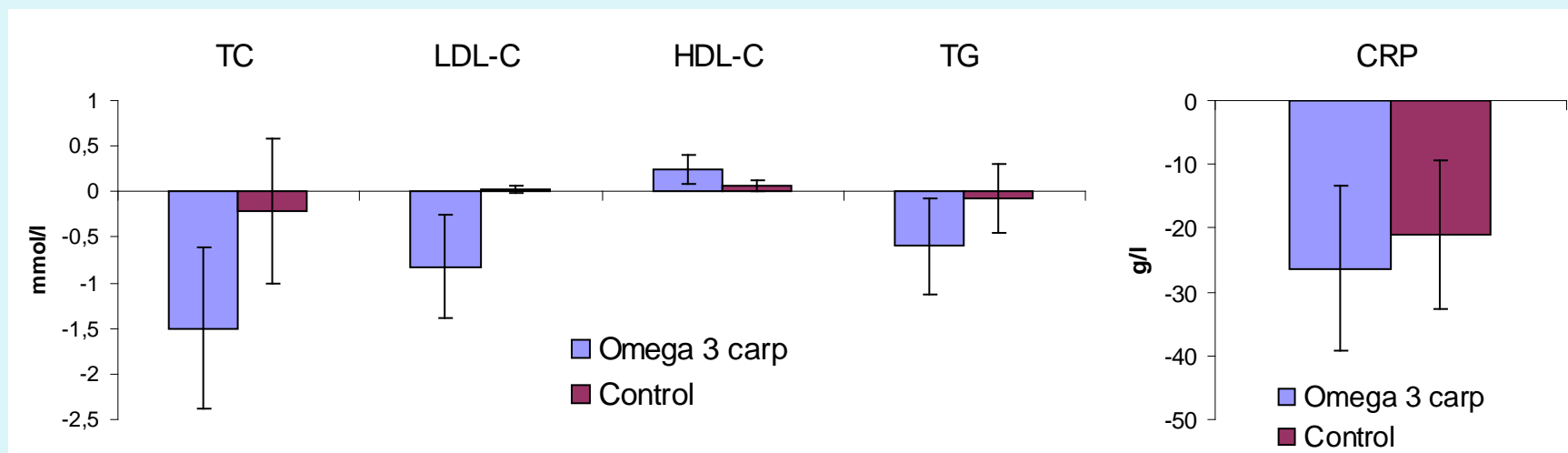
	Treated group	Control group	<i>p</i> -value
N	87	56	
Age	57.9 ± 10.3	57.3 ± 9.5	n.s.
Males/females	64/23	41/15	
Total C (mmol/l)	5.6 ± 0.6	5.4 ± 0.9	n.s.
LDL-C (mmol/l)	3.0 ± 0.8	2.9 ± 0.9	n.s.
HDL-C (mmol/l)	0.9 ± 0.2	0.9 ± 0.2	n.s.
TG (mmol/l)	2.2 ± 0.7	2.1 ± 0.7	n.s.
CRP (g/l)	33.5 ± 15.4	32.8 ± 14.9	n.s.
BMI (kg/m ²)	29.3 ± 4.6	29.1 ± 4.5	n.s.
Glycaemia (mmol/l)	6.7 ± 1.9	6.6 ± 1.9	n.s.



SPA Poděbrady



Changes of the plasma lipids after intervention
(difference; final – baseline values)



$P < 0.001$

$P < 0.01$

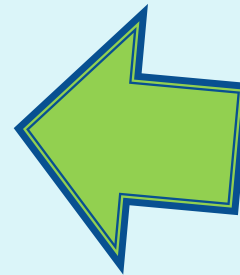
Adámková, V., Kačer, P., Mráz, J., Suchánek, P., Picková, J., Králová-Lesná, I., Skibová, J., Kozák, P., Maratka V., (2011). The consumption of the carp meat and plasma lipids in secondary prevention in the heart ischemic disease patients. *Neuroendocrinology Letters* 32(Suppl.2):17-20.

what next....

omega 3 carp vs regular carp a new study

- ▶ Consumption of omega 3 carp had positive effects on plasma lipid parameters
- ▶ Is it the effect of omega 3 FA only?
 - Replacement of other food
 - Effect of proteins, other N-compounds
 - Other substances?? miRNAs.....

Also freshwater omnivorous fish is important for health benefits!!!

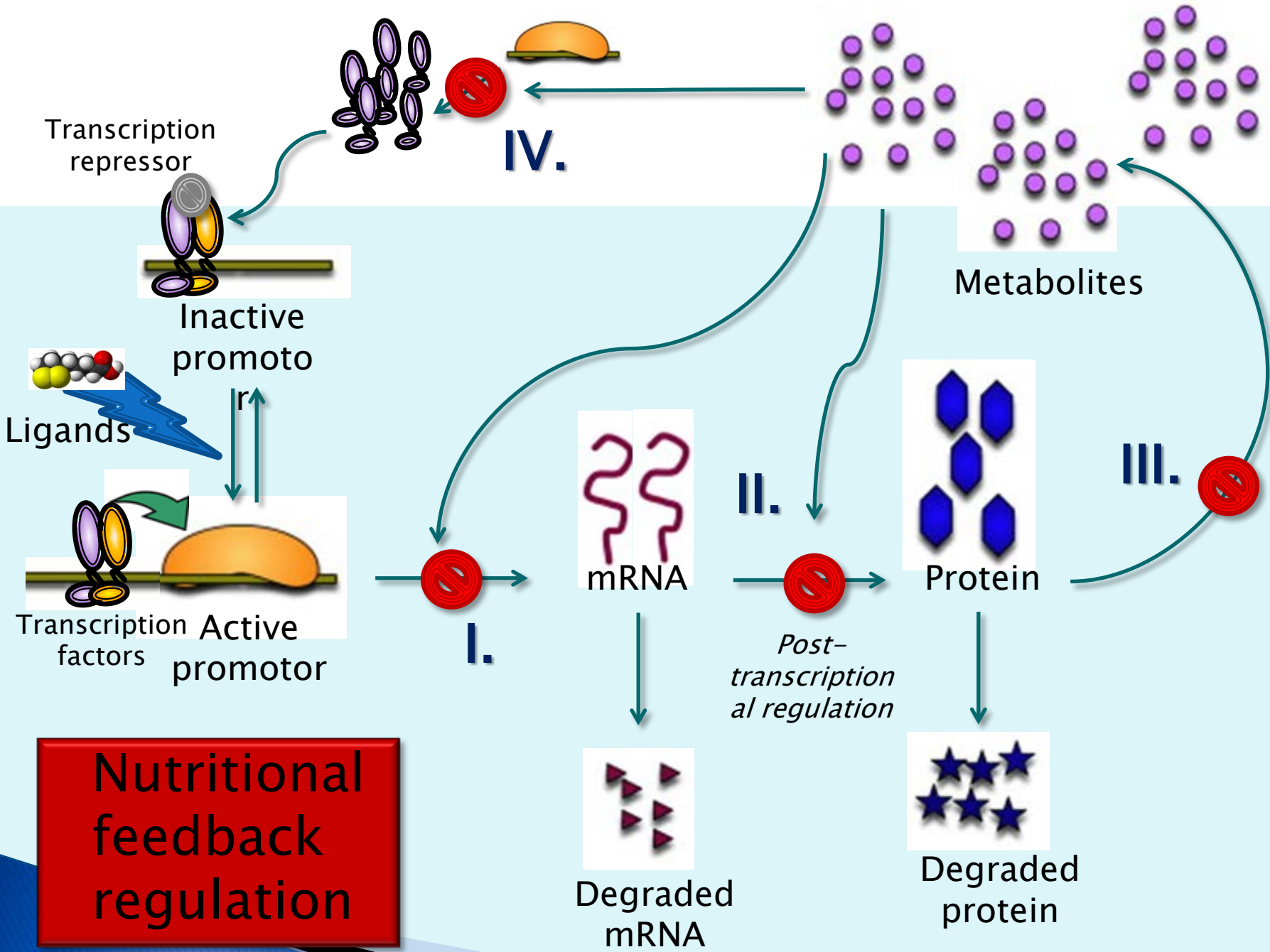


Blood lipids
and cholesterol
lowered

new
recommen
dations ?

A still life painting with a dark, textured background. In the center is a large, rounded copper pot with a lid and a dark metal handle. To its left is a smaller, more ornate copper vessel with a lid and a handle. In the foreground, a large piece of smoked salmon is laid out, showing its characteristic orange-pink color and dark skin. To the right of the salmon is a single, bright yellow lemon. The lighting is dramatic, highlighting the metallic sheen of the copper and the texture of the salmon and lemon.

Thank you for
your attention !



Nutritional feedback regulation

Transcription repressor

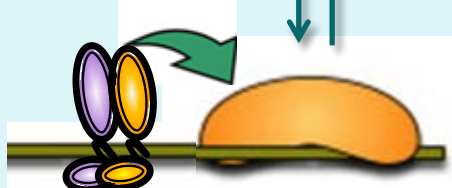


Inactive promoto



Ligands

r



Transcription factors Active promotor

IV.

I.



mRNA

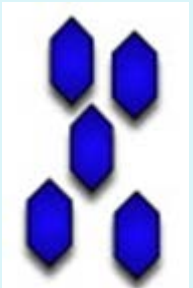


Degraded mRNA

II.



Post-transcriptional regulation



Protein



Degraded protein

III.

Metabolites

