

The impact of processing on nutritional benefits of seafood

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This is not the full presentation as presented at the meeting. It has been edited to preserve confidentiality of new research results, prior to their publication in a scientific journal.



Processing and preparation makes food safer, tastier and more shelf-stable

- affect the nutritional quality of foods
 - quantity as well as availability
- content of biological active molecules
 chemical stability (product composition)
 extent of processing (time and temperature)
 environmental factors (storage)
 form of delivery



SEAFOO



Do we need to focus health promoting foods, functional foods and supplements?

New eating habits

New processing and preparing techniques
 processes may destroy key nutrients

Dramatic increase in refined or processed food convenient food



No or limited exercise

Refined food- flour an example

> Our ancestors ate unrefined foods rich in fiber, minerals and vitamins

- From the middle of last century our habits have changed
 - We replaced whole grains by processed grains
 - 100 g white flour contain 0.3 g of fiber
 - 100 g whole wheat flour contain 2.3 g of fiber

During the processing

- 80 % of the vitamins and minerals are lost
- 75 % of the fibers are lost

....abundant on the surfaces of grains, seeds, beans, vegetables and fruits



SEAFOO

Modern seafood processing - up to 60 % of the raw material left as by-products





Oddvar Dahl, Fiskeriforskning

Functional ingredients from byproducts

A new industry?



Seafood consumption is well documented to be beneficial



 Greenland Eskimos, on traditional diet –lower incidence of CHD

 n-3 protects against atherosclerosis and thrombosis

Dyerberg et al., 1978

and the Eskimos consumed

- raw or minimal processed food
- visceral organs (liver kidney heart)
- marine mammals
- fish



Mimicking the Eskimos - administration of marine oils (15 ml) for 10 weeks



				\frown		\frown
Parameter		Control	Seal	Cod liver	Seal+	CL/Whale*
Serum:	Triacylglycerol (TAG)	basal	-	L^*	-	-
	Total cholesterol	ш	-	-	-	-
	HDL cholesterol	ť	-	-	Н*	H***
Coagulation factors:						
	Prothrombin F1 + 2	£	-	-	-	L*
Lipopolysaccharide stimulated(LPS) whole blood:						
Tumorne	crosis factor- α activity TNF α (moncytes)	4 4	-	-	-	L*
Tissue fa	ctor activity (TF) (moncytes)	"	-	-	<u>L</u> *	L*
Thrombo	xane B2 (TXB2)	**	-	-	-	<u>L</u> **

* "Virgin" cold pressed whale oil



- no significative, L lower, H higher, * p< 0.05, ** p< 0.01, *** p< 0.005

Østerud et al., 1995 Lipids, 30 (12): 1111 - 1118.



Effects of marine oil associated with

1. Serum lipids

2. Inflammatory

3. Coagulation



"Virgin" or Cold Pressed Marine Oil ?



Low temperature extraction prohibits

- thermal degradation of antioxidants
- protein degradation
 - minimal release of transition metal ions

thermal activation of chemical reactions

extraction of taste and smell into the oil



Refining needed to improve safety



Detrimental to natural antioxidants

Remove potential beneficial components (Scott and Latshaw, 1991)

> Thermal activation of chemical reactions

 Oxidation, hydrolysis, pyrolysis, polymerization...





Risk of over focusing single aspects?

- > n-3 fatty acids: EPA, 20:5 and DHA, 22:6
- > Minerals; selenium, iodine, calcium, magnesium, zinc
- > Amino acids; lysine and taurine
- > Released peptides, proteins
- Vitamins: A, D, E and K (Ubiuinone CoQ10) niacin, B6, B12



Calcium, selenium, vitamin D, taurine and CoQ10 additional candidates from seafood CHD protection" (Savige, 2001)



THE FATTY ACID COMPOSITION OF THE MARINE OILS

FA (AREAL %)	Cod liver oil	Seal oil	Whale oil
Saturated	15.4	14.3	16.2
Monounsaturated	48.3	49.3	62.3
- 16:1	7.2	10.9	9.5
- 18:1	20.4	21.8	22.1
- 20:1	12.9	11.4	18.5
- 22:1	7.3	5.0	11.8
n - 3	25.9	25.6	12.6
- 20:5 (EPA)	9.8	7.4	3.5
- 20:5 (DPA)	1.1	3.9	2.3
- 22:6 (DHA)	15.0	14.3	6.8



Eskimo advice - for obvious reasons this may not be perceived as an alternative....



"Every day you should eat something from each of the five basic food groups;

- 1. fried blubber
- 2. boiled blubber
- 3. stewed blubber
- 4. baked blubber
- 5. and raw blubber"



BLUBBER, BAKED BLUBBER AND RAW BLUBBER."





The Japanese are world famous for their seafood consumption

• Highest intake of fish and shellfish

• Lowest incidence of IHD

Raw (Sushi) seafood





> Taurine

• Free Sulfonated amino acid



- Taurine reported to reduce of proinflammatory agents
- Japanese have a daily intake of 215,9 +- 187.9 mg Taurine
 - *Kibayashi* et. al; Adv Exp Med Biol, 2000: 483: 137-142
- Reduced cardiovascular risk; beneficial effects of taurine



• Yamori et. al; WHO-CARDIAC Study Hypertension Research , 2001: 24 (4): 453-457



A preventive nutritional factor of cardiovascular diseases or a biological marker of nutrition?







A GALLEGE OF





Female urinary excretion and age adjusted IHD mortality rates





A study of hypolipidemic and antiatherogenic effects of Taurine and n- 3 fatty acids



- > **Design:** Randomized, double-blind, parallel intervention trial
- Subjects: 110 healthy subjects were included in the study
- Intervention:
- > 7 weeks intake of fish pâté (250 grams per week or 36 grams per day)
 - 37 subjects -1 g of n-3 PUFA/day
 - 38 subjects -1 g of n-3 PUFA/day and enriched in 425mg/day Taurine
 - 35 had **no** intervention (control group)



• The level of supplementation is reflecting a diet high in seafood





- A significant enhancement of HDL-cholesterol (6%) in the taurine group "the good"
- Significant reductions in "the bad" LDL-cholesterol (8 %) and reductions in total (4% NS)
- Almost the same rise in serum n-3 fatty acids in the supplemented groups
- Animal model studies support the benefits of moderate dietary supplementation with taurine



More human studies are needed to conclude on these benefits



Processing and preparing;



Frozen preserved diets maintain plasma taurine in cats, the heat processed did not

Amino acid of low molecular weight lost during processing?

taurine may also be used as a marker of "destiny" of "small" water soluble molecules during processing and preparation







How does this apply to seafood?





Contents varies with species, organ and season

COLLEGE (



3rd SEAFOODplus Conference 30-31 May 2006, Tromsø

SEAFOOD

Minimal processed food is higher in taurine

Taurine in fish products (mg/g ww)

SEAFOOD



The overall loss of Taurine from household preparation, varies from 30-40%









Conclusion: Eat seafood

Yes, seafood is good for you

The less you process or prepare seafood the better





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A better life with seafood...



www.seafoodplus.org

