



Omega-3, omega-6 and contaminants in Atlantic salmon

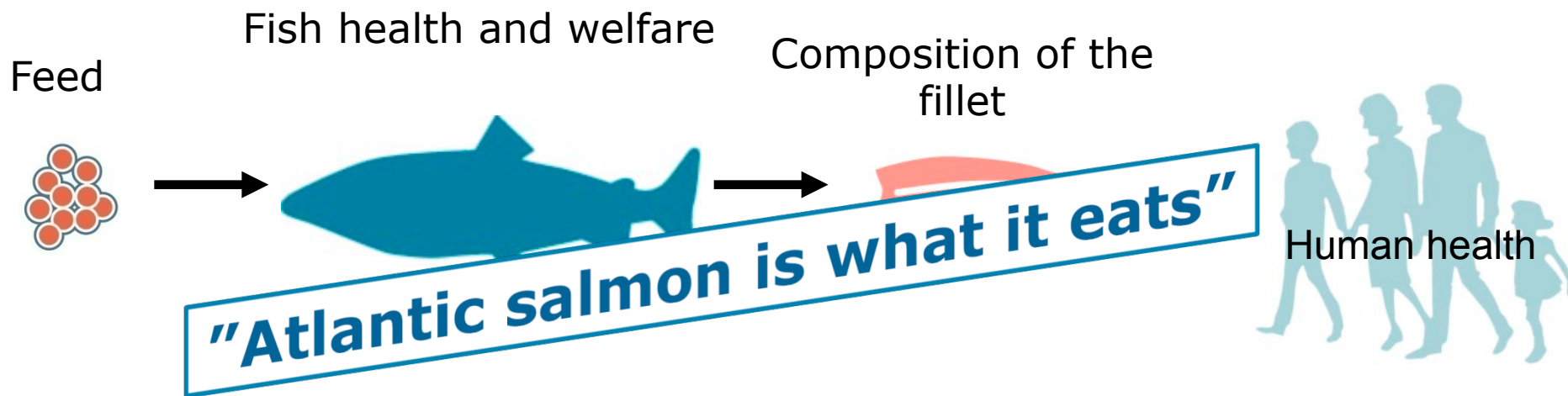
Dr Bente E. Torstensen

*Director of research,
Fish nutrition program, NIFES*

MIC 2013

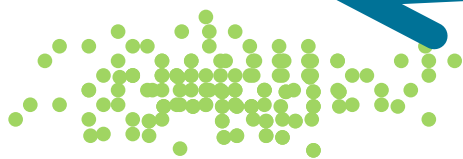


Atlantic salmon is changing due to the diet

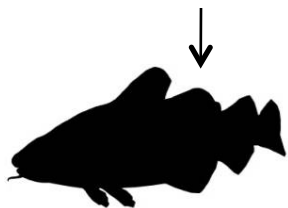


omega-3, omega-6 and marine contaminants

Marine omega-3



Plant plankton



Seafood

EPA and DHA

Plant omega-3



**Alfa-linolenic acid
LNA**

Positive health effects



How much EPA and DHA is required?

Health



Background diet



***Healthy adults and children (2-18 år):
0,25 gram EPA+DHA.***

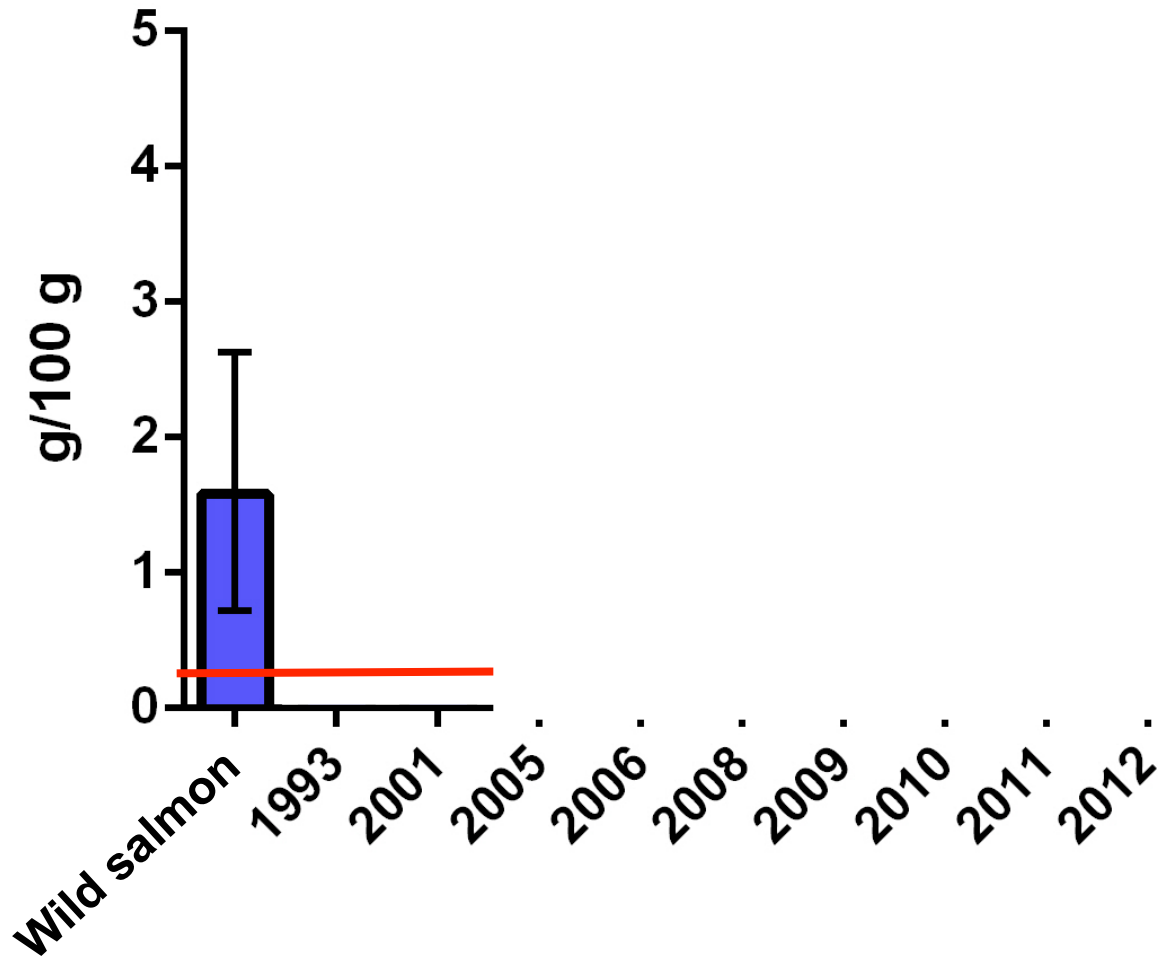
Healthy

Children (6 mnd – 2 years):
0,1 gram (only DHA)

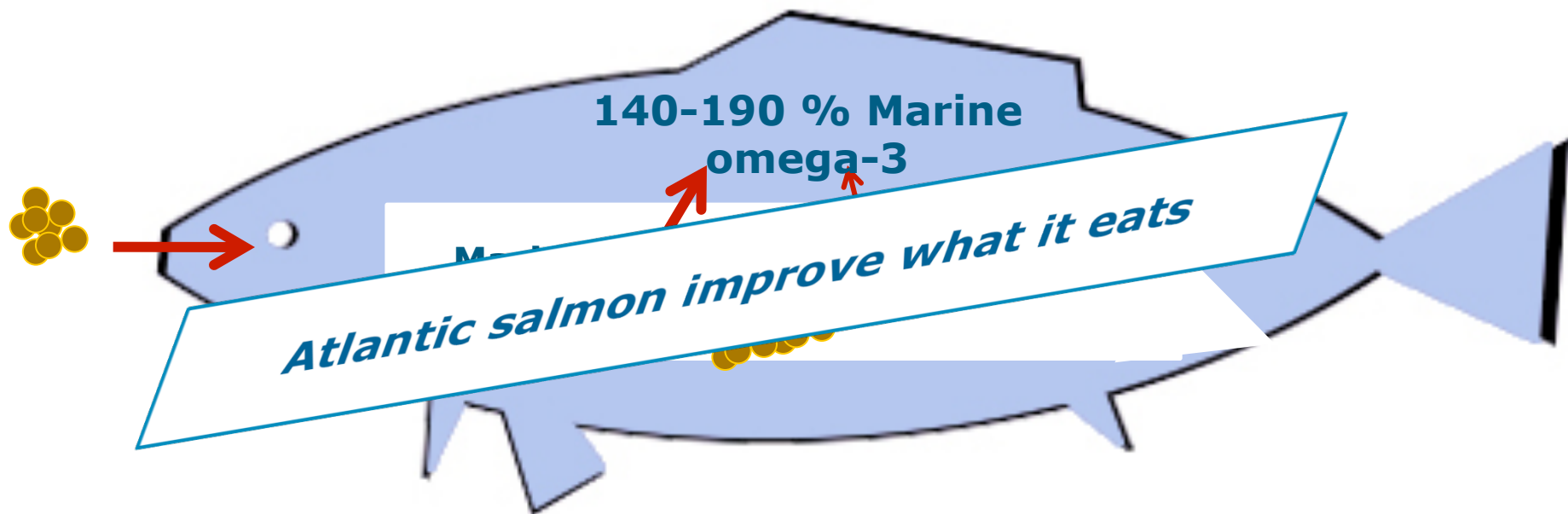
Pregnant and lactating:
0,35-0,45 gram.

**Adult women and men with increased blood pressure and blood
TAG levels:**

To reduce plasma TAG: ca 2-4 g/d
To reduce blood pressure: ca 3 g/d



- 1) Atlantic salmon conserve marine omega-3 in its tissues
- 2) Atlantic salmon **PRODUCE** marine omega-3 from plant omega-3

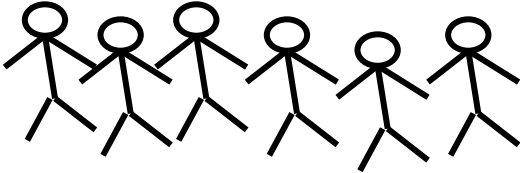


1 kg fish oil with 30% marine omega-3 (300g)



0.05 kg oil with 90% marine omega-3

45 g omega-3

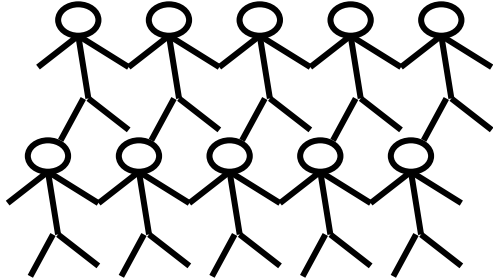


EFSA: 0.250g/day, 1 month



2010 farmed Atlantic salmon fillet

78 g omega-3



96 g omega-3

By products - marine ingredients

Kilde: Ytrestøyl et al, 2011 (Nofima-rapport)

1 kg fish oil with 30% marine omega-3 (300g)

Feed with 0,5% marine omega-3
Calculated using the same model:



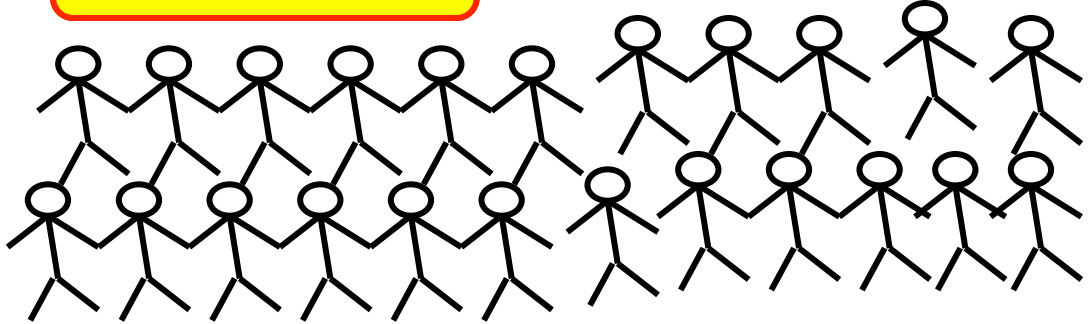
Experimental Atlantic salmon fillet

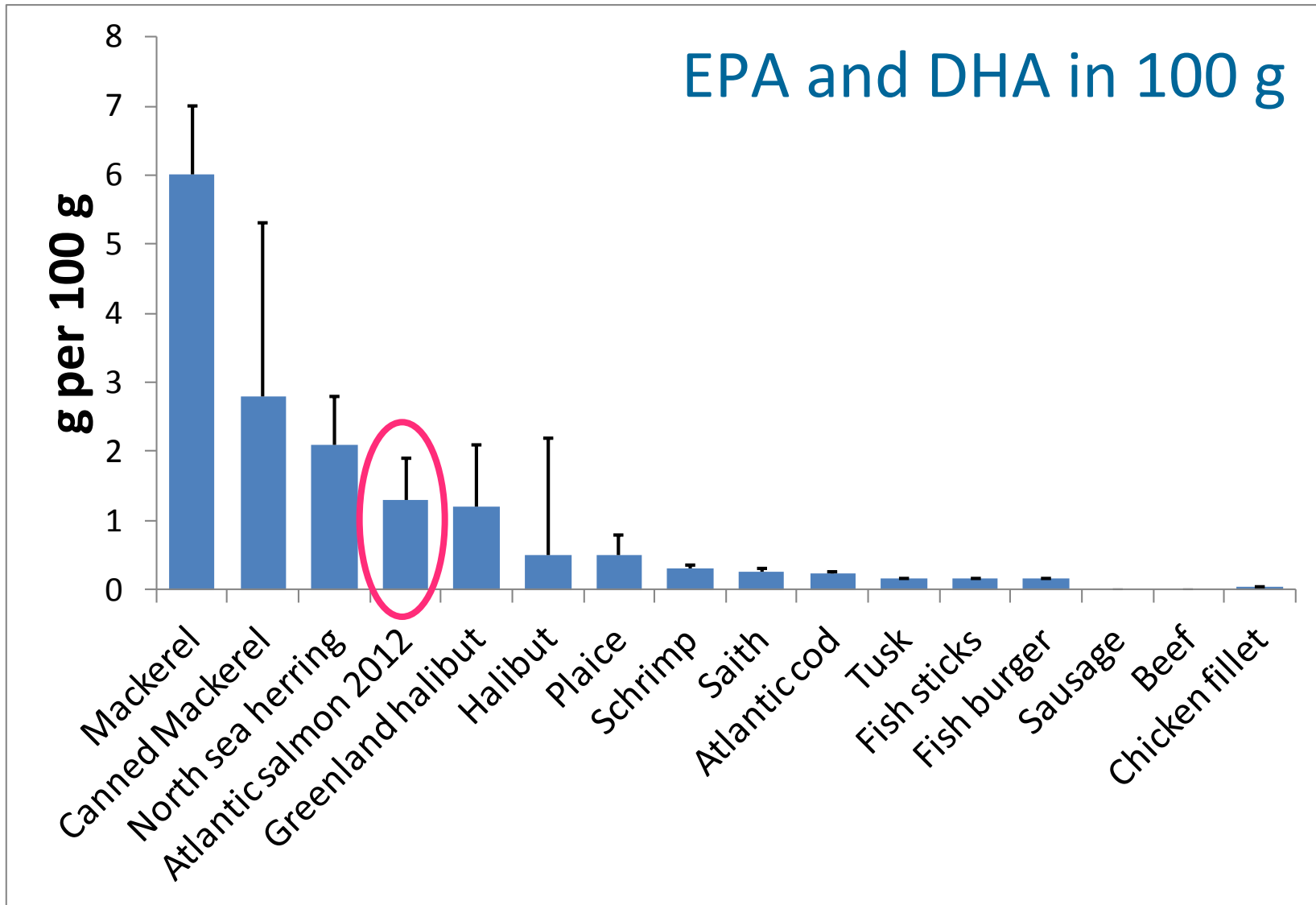
169 g omega-3



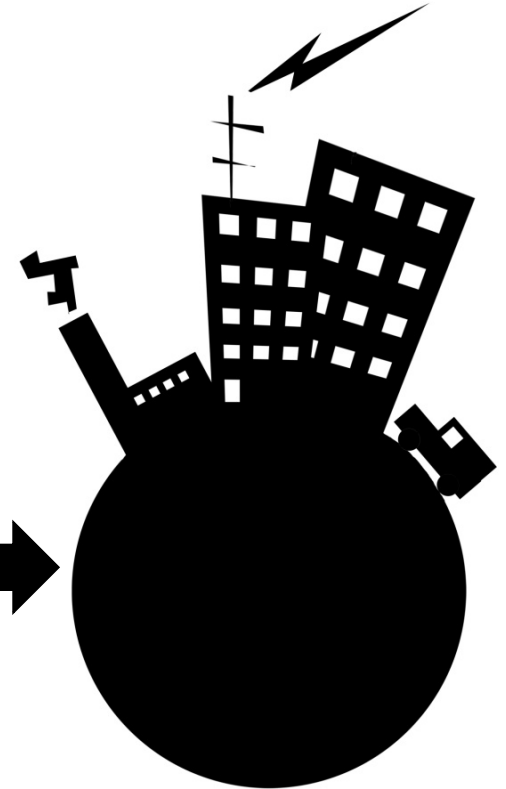
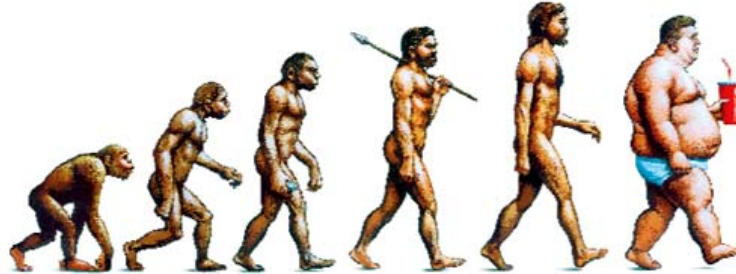
206 g omega-3

By products for marine ingredients





Both society and our diet has changed



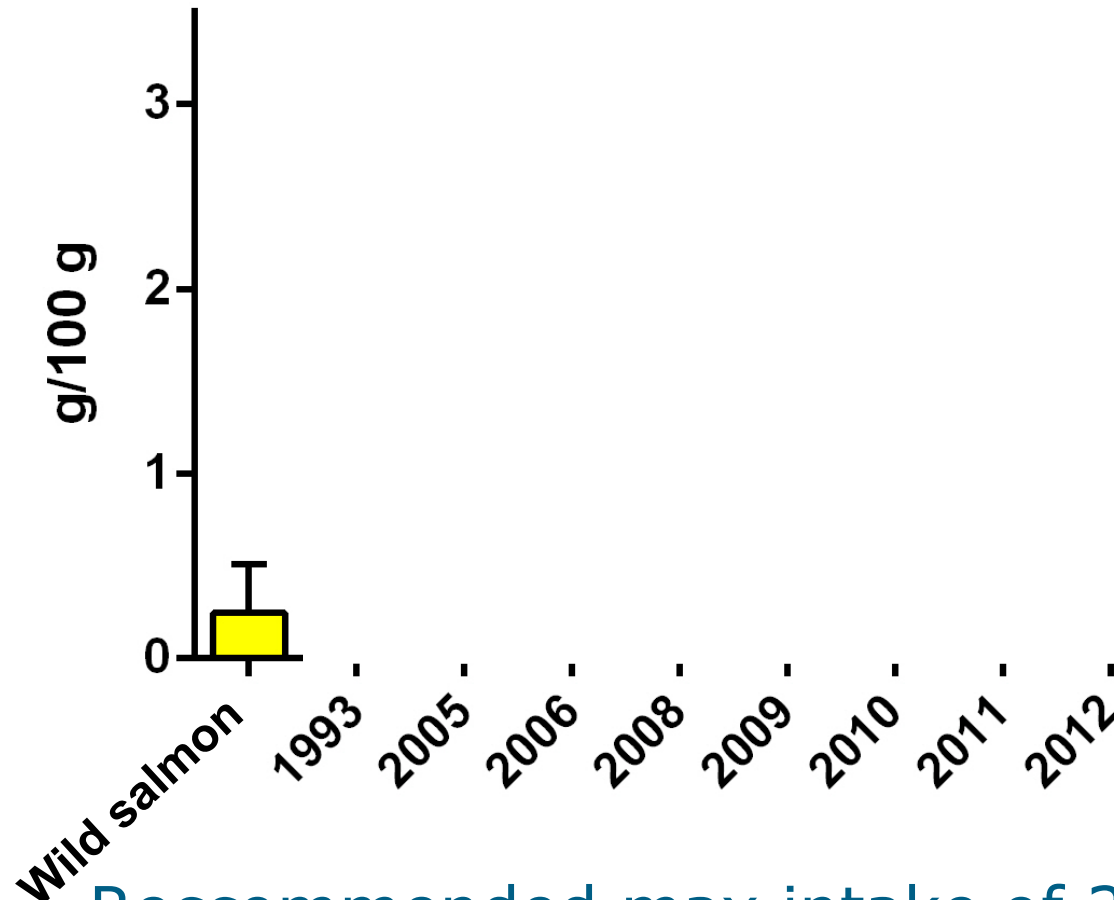
Total
omega-3 omega-6



omega-6

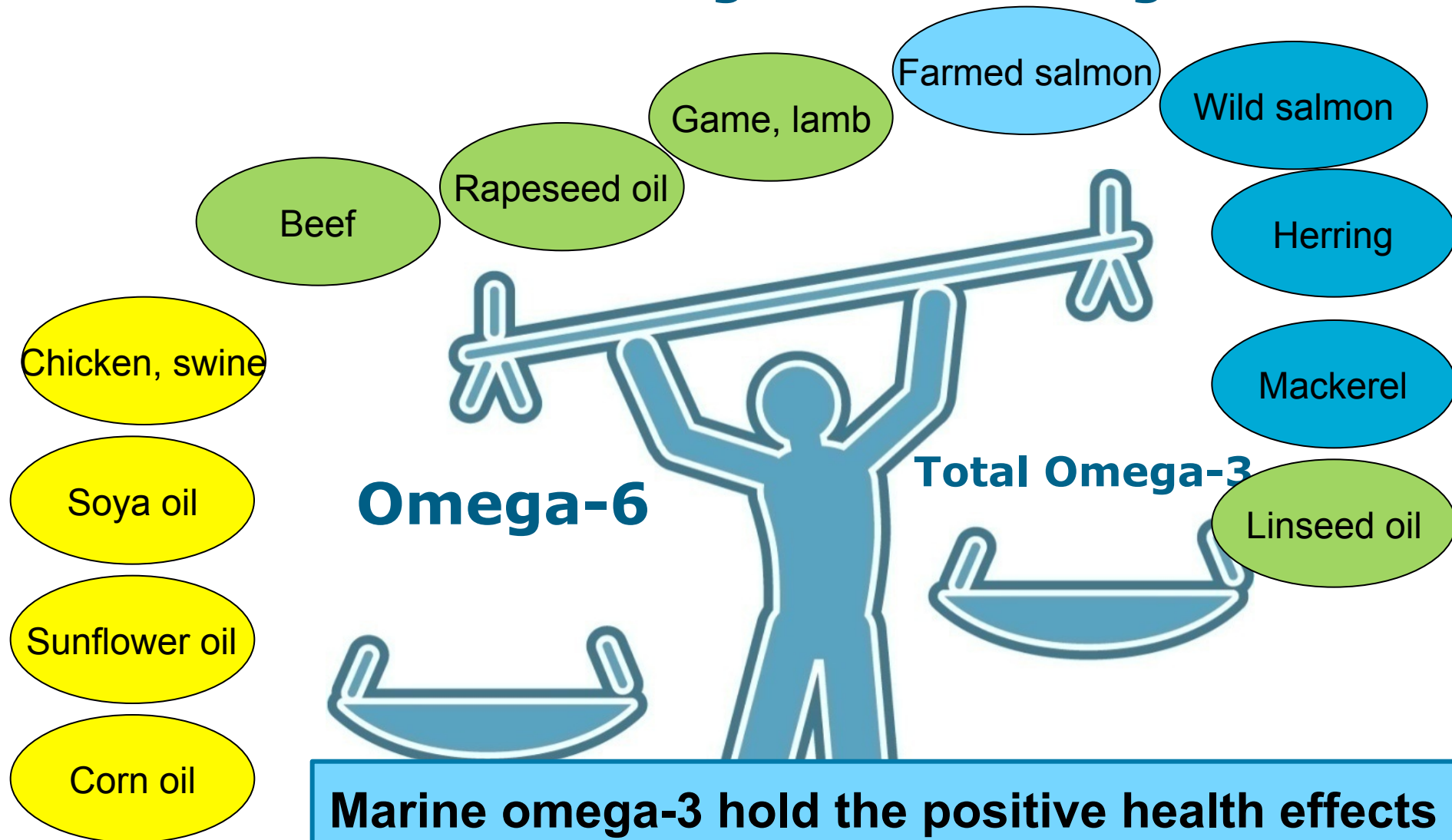
Total
omega-3



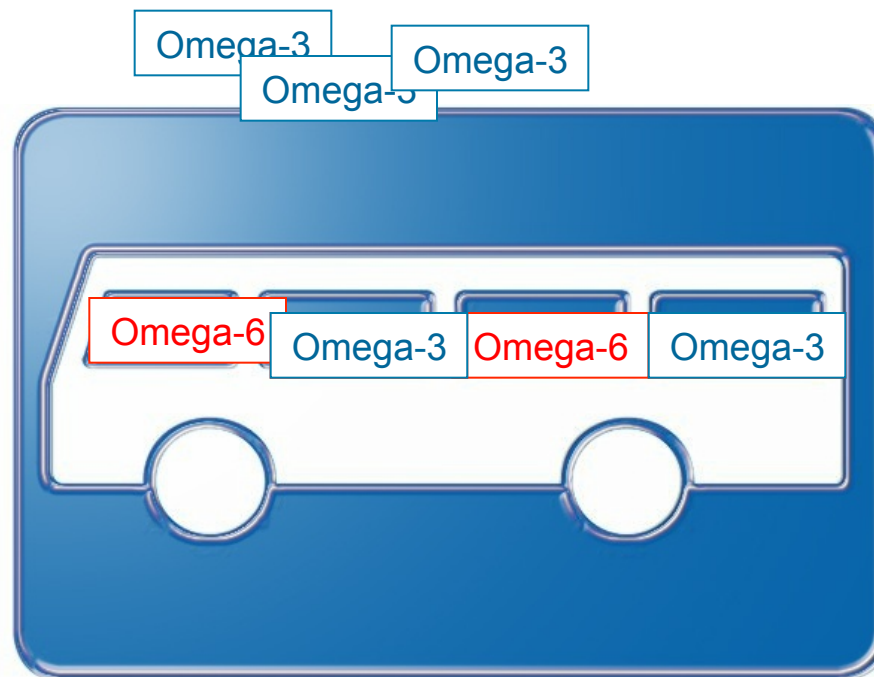


Recommended max intake of 21 g per day
(based on a 2000 kcal diet)

Dietary recommendation: 5 times more omega-6 than omega-3



The content of marine omega-3 in
the tissue
determine the health effects

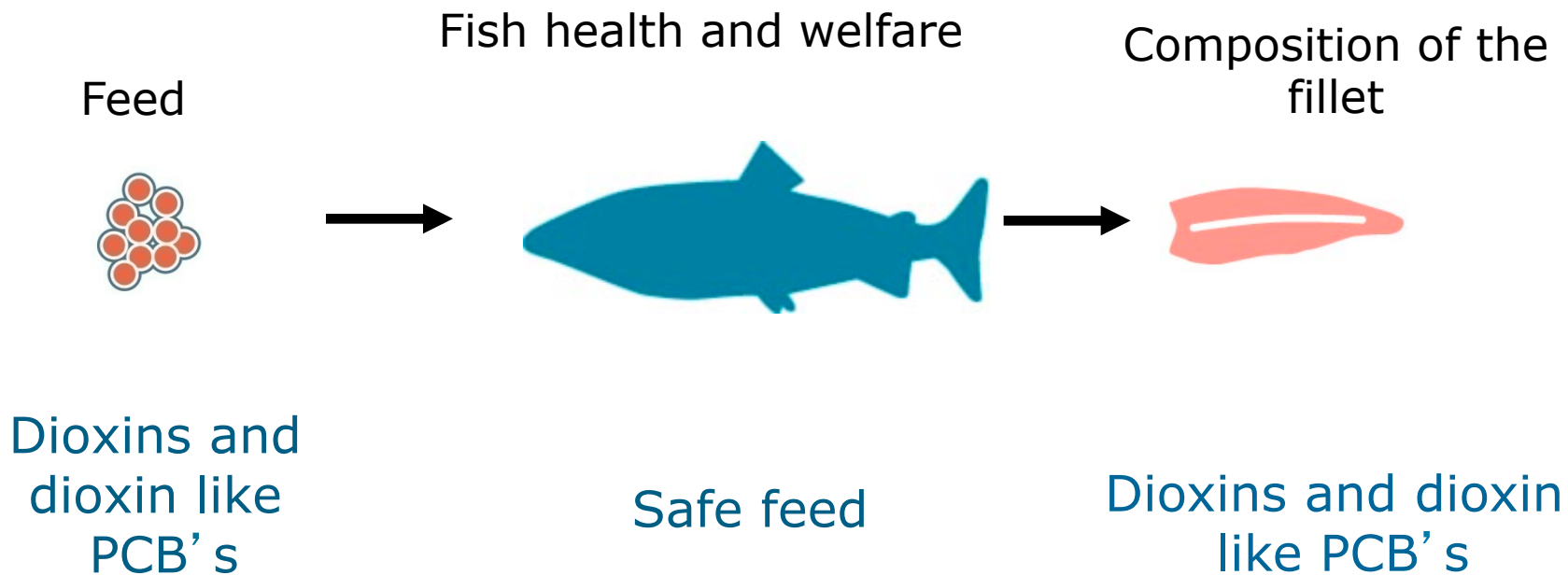


Omega-6 intake affect tissue marine omega-3 content

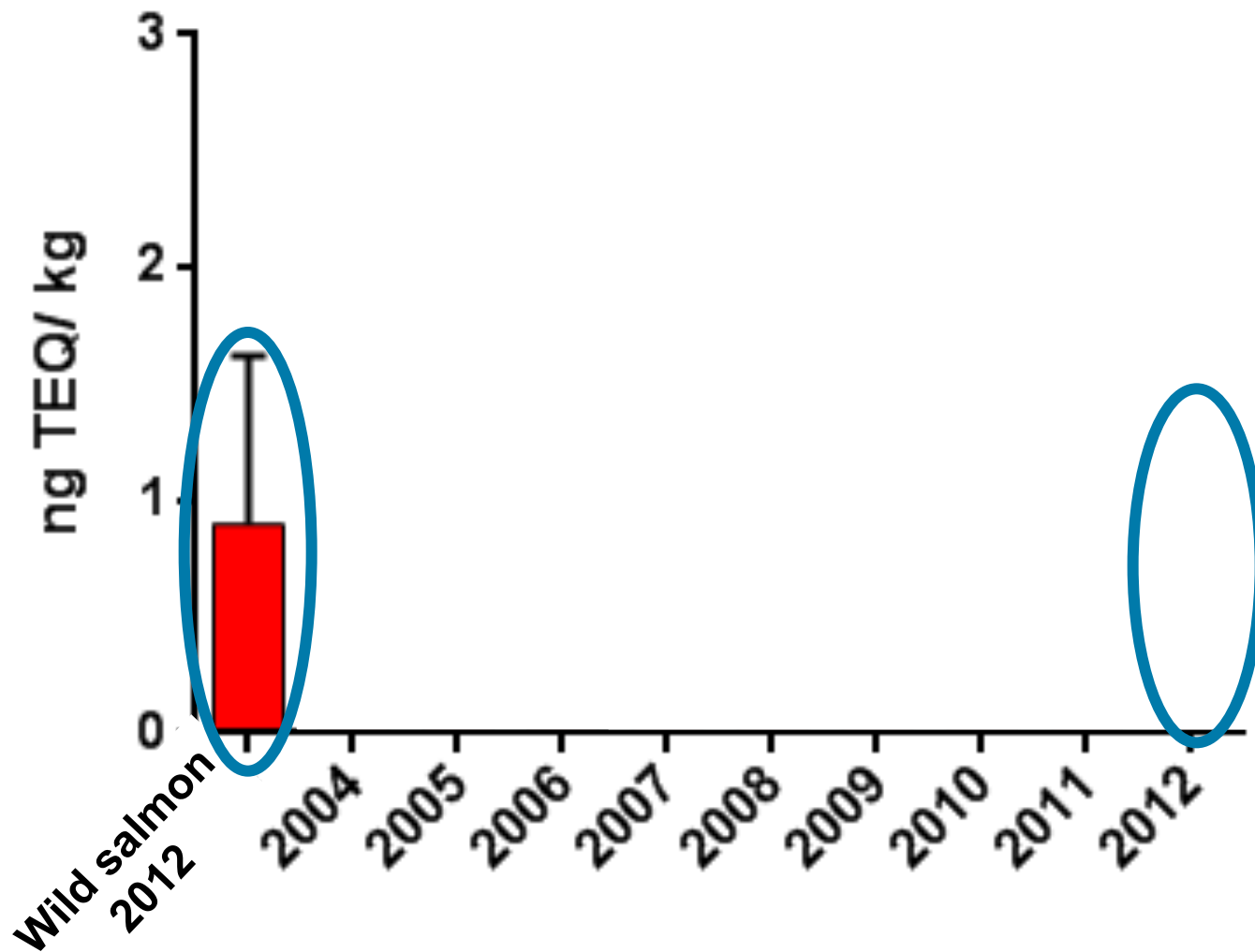
Country	Marine omega-3 intake to achieve the omega-3 index mg/d	Omega-6	Omega-3 index
Philippin			
UK			
USA	2167	+ 8.91	12

The more omega-6 in your diet, the more marine omega-3 is required to obtain the exact same tissue omega-3 content

Marine contaminants

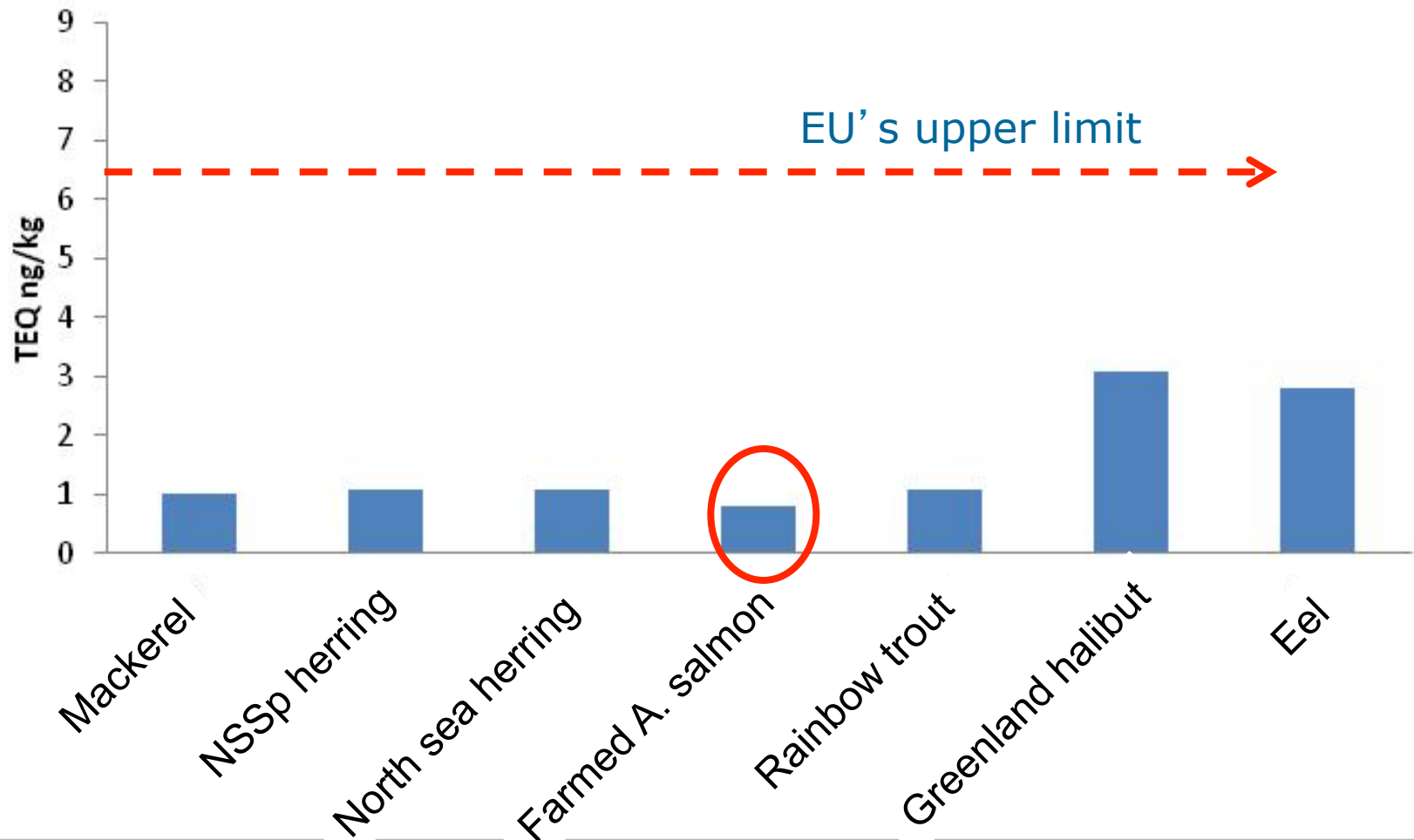


Dioxin and dioxin-like PCB's



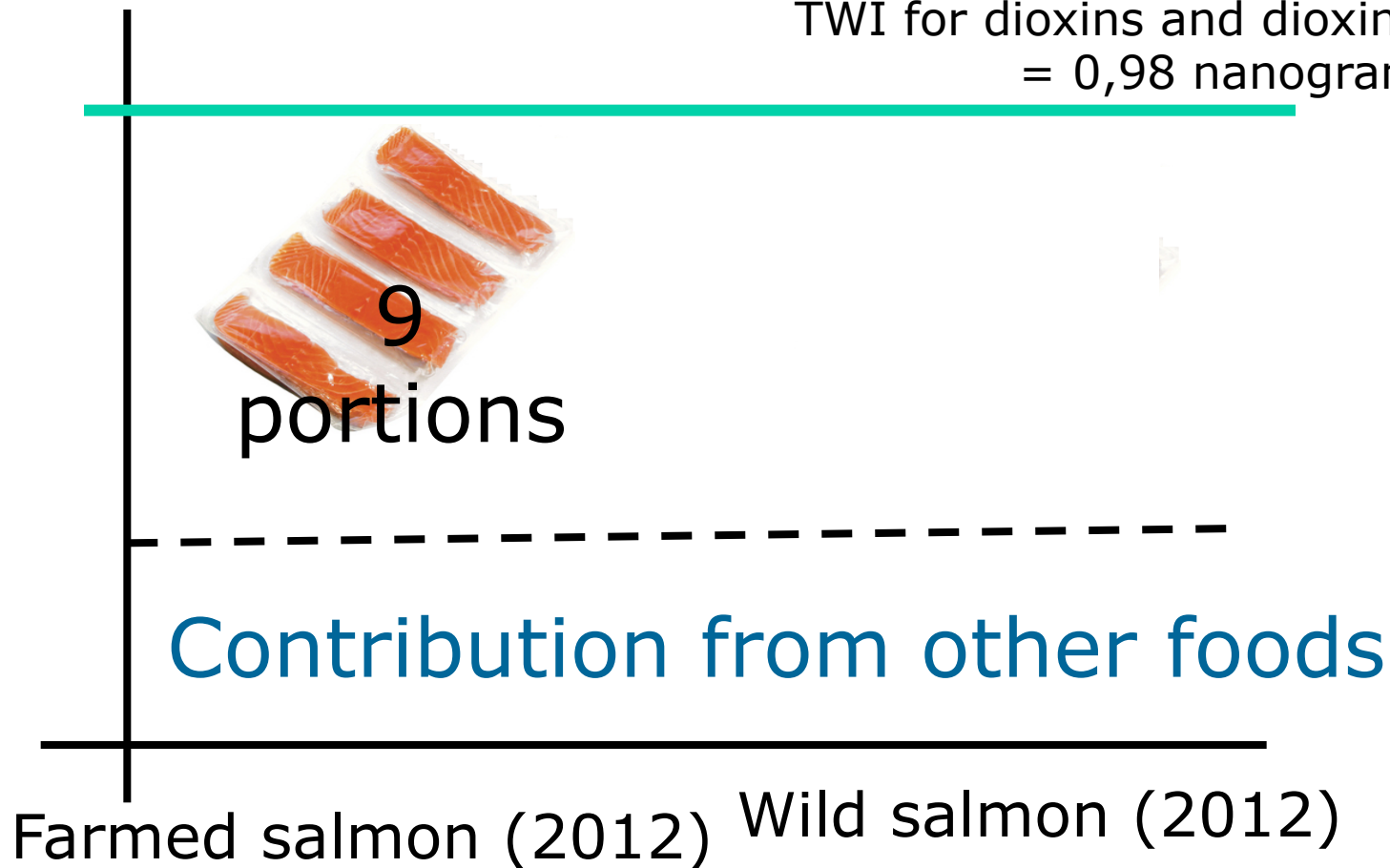
Atlantic salmon compared to other fatty fish

Dioxin and dioxin-like PCB's in fatty fish species
(data from 2006-2011)



Tolerable weekly intake (TWI)

TWI for dioxins and dioxin-like PCB's
= 0,98 nanogram



Farmed salmon is analysed annually for contaminants and other undesirable components

- Illegal substances and drugs



Last update:

Illegal substances: no detections

Drug residues and contaminants: all below upper limits

In accordance with findings since the surveillance started in 2003

per **100 tonn**

- Phosphorous compounds
- Metals (As, Cd, Hg, Pb)

- B3d. Mycotoxins

- B3e. Dyes

- B3f. Other (f.eks. antioxidants, PFAS, PAH)

- Samples are collected at all stages in the production
- Norwegian food authorities collect the samples, NIFES analyse, report and publish the results.

Farmed salmon in development



- A good source of marine omega-3
- Still a limited source of omega-6
- Still contribute to improve the balance between omega-6 and omega-3 in our diet
- Safe food which is carefully monitored

Omega-6 in farmed salmon should not increase further

Thank you



Feed



Fish health and welfare



Composition of the fillet

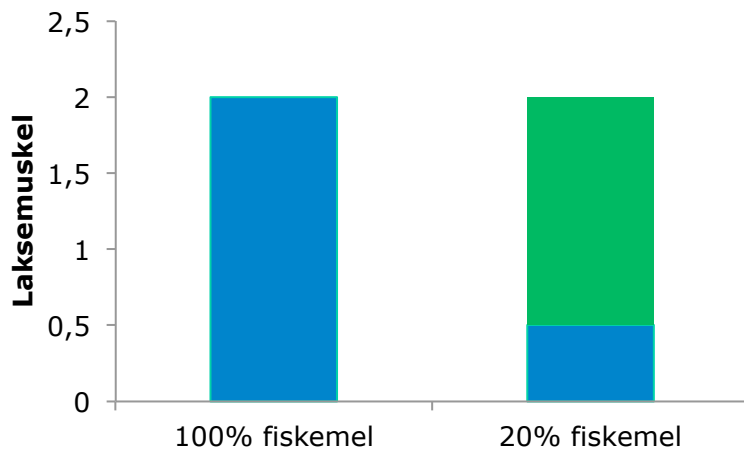


"composition of the fillet DOES NOT reflect the feed"

Protein
= amino acids

Cover the nutrient requirements for essential amino acids

Fish muscle protein composition is determined by the genetic code



Net production of marine protein