

## The Science Behind What's in Farmed Salmon

### Consumption warnings

#### Salmon health alert

Farmed salmon should not be eaten no more than three times a year due to the toxin levels. But Dr Jeffery Foran, an American toxicologist involved in the study, said neither he nor his family would eat farmed salmon again after what he discovered. There are also health concerns over feeding the fish chemicals which colour their flesh pink.”

<http://www.dailymail.co.uk/health/article-205547/Salmon-health-alert.html>

#### Consumption advisories for salmon based on risk of cancer and noncancer health effects.

The most stringent recommendation, for farmed salmon from northern Europe, was at most one meal every 5 months in order to not exceed an elevated risk of cancer of more than 1 in 100,000. Farmed salmon from North and South America triggered advisories of between 0.4 and one meal per month.

<http://www.ncbi.nlm.nih.gov/pubmed/16198332>

#### Quantitative Analysis of the Benefits and Risks of Consuming Farmed and Wild Salmon

This study found wild salmon have significantly lower contaminant concentrations than farmed salmon from any region. Young children, women of child-bearing age, pregnant women, and nursing mothers not at significant risk for sudden cardiac death associated with CHD but concerned with health impairments such as reduction in IQ and other cognitive and behavioral effects, can minimize contaminant exposure by choosing the least contaminated wild salmon.

<http://jn.nutrition.org/content/135/11/2639.full>

#### Farmed salmon high in PCBs: study

As little as one meal a week of B.C. farmed salmon could pose health hazards, according to a Vancouver geneticist. Michael Easton says he found elevated levels of PCBs in salmon raised in pens along Canada's west coast. Easton is blaming the feed used to fatten the fish and promote their rapid growth. He says it's laced with PCBs.”

[http://www.cbc.ca/news/story/2002/05/17/salmon\\_020517.html](http://www.cbc.ca/news/story/2002/05/17/salmon_020517.html)

#### Preliminary examination of contaminant loadings in farmed salmon, wild salmon and commercial salmon feed

This analysis indicated a safety concern for individuals who on a regular weekly basis consume farmed salmon produced from contaminated feed.

<http://www.sciencedirect.com/science/article/pii/S0045653501001369>

## Scientific Literature

### **Global Assessment of Organic Contaminants in Farmed Salmon**

“Risk analysis indicates that consumption of farmed Atlantic salmon may pose health risks that detract from the beneficial effects of fish consumption.”

<http://www.sciencemag.org/content/303/5655/226.short>

### **DNA damage induced by ethoxyquin in human peripheral lymphocytes.**

Fish oil used in farmed salmon feed goes rancid and so Ethoxyquin is used to preserve the oil. Ethoxyquin has been found to cause DNA damage in humans.

<http://www.ncbi.nlm.nih.gov/pubmed/16266792>

### **Carry-over of dietary organochlorine pesticides, PCDD/Fs, PCBs, and brominated flame retardants to Atlantic salmon (*Salmo salar* L.) fillets**

This study examined how much of the toxins in farmed salmon feed ends up in the salmon fillets people eat. The result showed toxins transfer from the feed to salmon 5-10 times higher than in terrestrial meat products (meaning cows and pigs). Uptake of toxaphene among the highest.

<http://www.ncbi.nlm.nih.gov/pubmed/21284993>

### **Risk-based consumption advice for farmed Atlantic and wild Pacific salmon contaminated with dioxins and dioxin-like compounds.**

Consumption of farmed salmon at relatively low frequencies results in elevated exposure to dioxins and dioxin-like compounds with commensurate elevation in estimates of health risk.

<http://www.ncbi.nlm.nih.gov/pubmed/15866762?dopt=Abstract>

Just 2 servings of 200 grams recommended serving size of Norwegian farmed salmon from 2012 can exceed the tolerable weekly intake (TWI) for adults (60 kg) and greatly exceeds the tolerable intake for children. From EFSA "The CONTAM Panel considered new scientific information regarding the toxicity of these forms of mercury and established a TWI for inorganic mercury of 4 µg/kg body weight (bw) and a TWI for methylmercury of 1.3 µg/kg bw (lower than JECFA's TWI of 1.6 µg/kg bw). Average exposure to methylmercury in food is unlikely to exceed the TWI, but the likelihood of reaching such a level increases for high and frequent fish consumers. This group may include pregnant women, resulting in exposure of the fetus at a critical period in brain development."

<http://www.efsa.europa.eu/en/topics/topic/metals.htm>

### **EU Clears Use of Some Animal Proteins in Fish Feed**

“The European Union (EU) has officially ended a long-standing ban on using certain processed animal proteins (PAPs) in fish feed... Stringent controls including species-specific processing and species-of-origin testing will ensure that only poultry and

porcine PAPs enter the feed chain. Ruminant PAPs remain prohibited. The use of PAPs in feed was banned in 1997 for cattle, and extended to all animals in 2001 in an effort to control the bovine spongiform encephalopathy (BSE) outbreak in Europe.”

<http://www.rendermagazine.com/articles/2013-issues/april-2013/eu-clears-use>

### **Levels of synthetic antioxidants (ethoxyquin, butylated hydroxytoluene and butylated hydroxyanisole) in fish feed and commercially farmed fish**

The highest levels of BHT, EQ and BHA were found in farmed Atlantic salmon fillets, (also tested halibut, cod and rainbow trout)

<http://www.ncbi.nlm.nih.gov/pubmed/20931417>

### **Changes in concentrations of perfluorinated compounds, polybrominated diphenyl ethers, and polychlorinated biphenyls in Norwegian breast-milk during twelve months of lactation.**

During twelve months of nursing the levels of toxins in their milk dropped 15-95% suggesting the toxic load was transferred to the infant.

<http://www.ncbi.nlm.nih.gov/pubmed/21090747>

### **Chronic consumption of farmed salmon containing persistent organic pollutants causes insulin resistance and obesity in mice**

This study found that mice that ate farmed salmon regularly gained weight and were at elevated risk of diabetes. The results are consistent with a growing body of [research](#) on people, linking POPs exposure to type 2 diabetes. Mice fed contaminated salmon gained twice as much weight and developed more severe insulin resistance measures than mice that ate no salmon but the same amount of fat.

<http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0025170>

### **Intake of Farmed Atlantic Salmon Fed Soybean Oil Increases Insulin Resistance and Hepatic Lipid Accumulation in Mice**

As fish oils become scarce and vegetable oils are used to replace them, this study examined the affect of this on consumers. The authors conclude the effects they saw may be a matter for concern that warrants further investigation

### **Accumulation and distribution of polychlorinated dibenzo-p-dioxin, dibenzofuran, and polychlorinated biphenyl congeners in Atlantic salmon (*Salmo salar*).**

This study looked whether specific toxins were transferred from salmon feed, into farmed salmon. Biomagnification of all the PCBs was observed. “Differences in the behavior of PCDD/F and PCB congeners resulted in a selective enrichment of the most toxic congeners in salmon.”

<http://www.ncbi.nlm.nih.gov/pubmed/15230320>

## Popular Literature

### **Norwegian farmed salmon production raises global concern**

Senior scientist with the Norwegian National Institute of Nutrition and Seafood Research warns that farm salmon food has been dangerously contaminated with cadmium. Norway recommended that the EU increase the maximum allowable level of cadmium in farm salmon feed.

<http://environmentalchemistry.com/yogi/environmental/200605norwegiansalmon.html>

### **Understanding the Debate over POPs in Norwegian Farmed Salmon**

<http://barentsobserver.com/en/nature/2013/06/understanding-debate-over-pops-norwegian-farmed-salmon-24-06>

**The salmon struggle: A fish by any other color is just not natural** “Wild salmon derive their color from the krill they eat in the ocean. With their artificial diet, farmed salmon are normally a dull gray color. A lawsuit filed last month seeks justice for consumers who unwittingly purchased artificially colored fish. In a creepy, science fiction-like exploitation of advanced technology, pharmaceutical giant Hoffman-La Roche, which manufactures the dyes, provides salmon manufacturers with swatches of pink hues arranged in a fan formation, much like one would find at a paint store. They call it the "SalmoFan." Dye for the selected shade is then added to the salmon's processed food pellets.”

<http://www.seattlepi.com/news/article/The-salmon-struggle-A-fish-by-any-other-color-is-1115339.php>

### **Infected salmon declared fit for human consumption by Canadian Food Inspection Agency**

“For the first time, Canada’s food safety regulator is allowing Nova Scotia salmon infected with a flu-like virus to be processed for supermarkets and restaurants.”

[http://www.thestar.com/news/canada/2013/02/01/infected\\_salmon\\_declared\\_fit\\_for\\_human\\_consumption\\_by\\_canadian\\_food\\_inspection\\_agency.html](http://www.thestar.com/news/canada/2013/02/01/infected_salmon_declared_fit_for_human_consumption_by_canadian_food_inspection_agency.html)

**The Risks of Eating Farmed Salmon** (Organic Consumers Association) “Eating more than one meal of farm-raised salmon per month (depending on where it is from) may increase one’s risk of developing cancer in the future due to the increased levels of chemicals and antibiotics.”

[http://www.organicconsumers.org/articles/article\\_16668.cfm](http://www.organicconsumers.org/articles/article_16668.cfm)

## **Bloggers on farmed salmon**

### **Mercola on farmed salmon**

**Salmon Confidential—How a Canadian Government Cover-Up Threatens Your Health, and the Entire Ecosystem**

<http://articles.mercola.com/sites/articles/archive/2013/04/13/salmon-confidential.aspx>

**Eat Your Salmon** - there is one type of salmon, incidentally the same one you will most likely see in conventional grocery stores, that I will not eat...farmed salmon.

<http://naturemoms.com/blog/2007/07/01/benefits-of-wild-salmon>

**Paint samples, counterfeit and salmon** “What if I told you that farm-raised salmon is naturally a grayish white-fleshed fish? But, wait. When you buy it at the grocer it has that attractive pink color, sometimes even darker than that of the wild-caught cousin.”

<http://www.motherfitness.com/paint-samples-counterfeit-and-salmon>

**How about some antibiotics, pesticides, PCB's, and artificial color with that salmon?**

<http://fanaticcook.blogspot.ca/2005/02/salmofantm.html>

**Is something fishy going on?** “About midnight, I was itching inside and out, as if every blood vessel were dilated. At first I didn't connect my itching to the salmon dinner... It was a Boston fish broker who provided the first clue. He told me the name of two red food dyes used to color the flesh of farmed salmon--canthaxanthin (pronounced can tha zan thin) and its cousin astaxanthin (pronounced as ta zan thin). With these two words, I did an Internet search that yielded hundreds of pages of information.”

[http://www.motherlindas.com/is\\_something\\_fishy\\_going\\_on.htm](http://www.motherlindas.com/is_something_fishy_going_on.htm)

**True Color? Synthetic Colors in Farmed Salmon** “And there is concern about the safety of canthaxanthin, another carotenoid pigment additive used in salmon feed. As Marion Burros wrote this spring in the New York Times (May 28, 2003), "European Union officials are reducing the permissible levels of canthaxanthin in fish and poultry from 80 parts per million per kilogram of feed—the levels permitted in this country—to 25 parts per million because there is some concern that high levels may cause retinal damage. In Canada the permissible level is 30 parts per million.”

<http://chetday.com/farmraisedsalmon.htm>

**Farm Raised Fish Not so Safe** Farmed salmon contains higher levels of many other persistent pollutants. An influential study published last year showed that PCBs are just one family in a complex mixture of persistent pollutants that appear to concentrate in farmed salmon. The Canadian scientists found that farmed salmon tissue contained

significantly higher levels of 151 out of the 158 chemical contaminants that were detected in both farmed and wild salmon samples (Easton et al. 2002). In addition to 110 different PCBs, these chemicals included brominated flame retardants, organochlorine pesticides like DDT and dieldrin, and carcinogenic combustion byproducts called polynuclear aromatic hydrocarbons (PAHs). While PCBs may dominate human health risks from farmed salmon, many other contaminants contribute to the overall health concerns associated with these fish.

<http://nutritionresearchcenter.org/healthnews/farm-raised-fish-not-so-safe>

### **Movies on dangers of farmed salmon**

Everybody Loves Wild Salmon Don't They?:

[http://www.youtube.com/watch?v=es7y\\_iBumBc](http://www.youtube.com/watch?v=es7y_iBumBc)

Salmon Confidential: [www.salmonconfidential.ca](http://www.salmonconfidential.ca)

Salmon Wars: : <http://www.youtube.com/watch?v=Rfxzvlzazz0>

Farmed Salmon Exposed: <http://www.youtube.com/playlist?list=PLE2BB141685AF50A8>

Alexandra Morton's Salmon Fight

<http://www.nytimes.com/video/2008/11/04/science/1194831199078/alexandra-morton-s-salmon-fight.html>

Alexandra's Echo <http://www.youtube.com/watch?v=xsBB5kzXLJE>