



## Issues in Aquaculture

# Farmed salmon, PCBs, Activists, and the Media

***FRAMED SALMON:*** Updated to provide commentary on the well-publicized January 9, 2004 *Science* (Vol. 303) study of PCB levels in farmed and wild salmon



A report commissioned by Positive Aquaculture Awareness

## Foreword

The salmon farming industry is being subjected to a host of allegations related to environmental sustainability and human health and nutrition. One of the most serious charges is that farmed salmon contain dangerous levels of PCBs (polychlorinated biphenyls), an industrial compound that is widespread in the environment. Greenspirit Strategies Ltd. was asked by Positive Aquaculture Awareness (PAA) to investigate this claim and to report back to them. As you will see from the following report (which we have updated to comment on the most recent reporting of the January 9, 2004 Science study<sup>1</sup>), we found surprising evidence of contrived misinformation and irresponsible journalism. It seems clear that these findings form part of the larger effort by activists to damage the reputation of the salmon aquaculture industry by using food-scare tactics that have no basis in scientific fact.

The latest effort by activists to misinform the public began only a few days ago, when groups such as the David Suzuki Foundation and the Coastal Alliance for Aquaculture Reform broke a reporting embargo on a study published in the January 9, 2004 edition of Science entitled “Global Assessment of Organic Contaminants in Farmed Salmon.”

By breaking the embargo, the activists hoped to spin the results of the study before the real facts became available to the public. They hoped to scare the public away from farmed salmon by alleging the fish contained dangerous levels of PCBs. We predicted as much in the first edition of this report (see **What’s coming next from the activists?**)

In the first few hours after the embargo was broken, the North American media reported the activists’ allegations almost verbatim. Little scrutiny was given to the activists’ claims and to the conclusions of the study’s authors.

But as the hours progressed, and as more information about the study became available, some journalists began to question the activists’ take on the study. Terence Corcoran, writing in the January 10<sup>th</sup> edition of the National Post headlined his story “Safe Salmon, Sick Science.” Editorials in the Vancouver Sun and Globe & Mail also questioned the claim that farmed salmon was unsafe.

As more and more experts and government authorities (including the US Food and Drug Administration and the Canadian Food Inspection Agency) step forward to vouch for the safety and high nutritional value of farmed salmon, and as scientists begin to critique the conclusions of the study, the activists’ spin is beginning to wear thin.

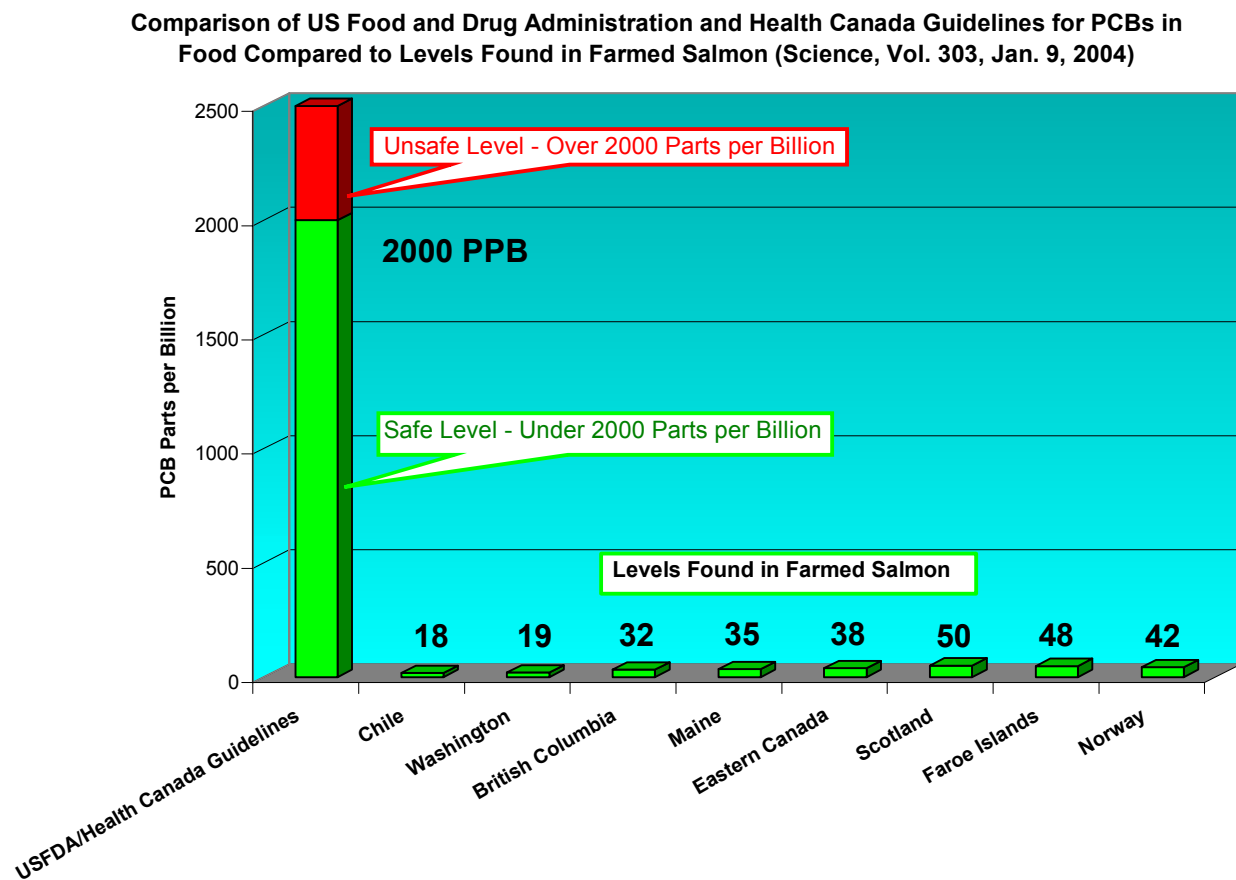
---

<sup>1</sup> Hites, Ronald A. et al, 2004. Global Assessment of Organic Contaminants in Farmed Salmon. Science 303 (January 9, 2004) pp. 226-229.

## What the experts are saying

Many experts are now saying what the Science study actually proves is not that farmed salmon is unsafe, but the very opposite: that levels of PCBs in farmed salmon fall well below safety guidelines set by regulatory authorities like the US Food and Drug Administration and the Canadian Food Inspection Agency). (See the *appendix* for a full compilation of expert criticism of the Science study)

The graph below demonstrates how minute the levels of PCBs in farmed salmon found in the Science study actually are. For example, the levels of PCBs found in farmed salmon in British Columbia are roughly 1/100<sup>th</sup> of the 2000 parts per billion (ppb) allowable limit set by the Food and Drug Administration and the Canadian Food Inspection Agency.

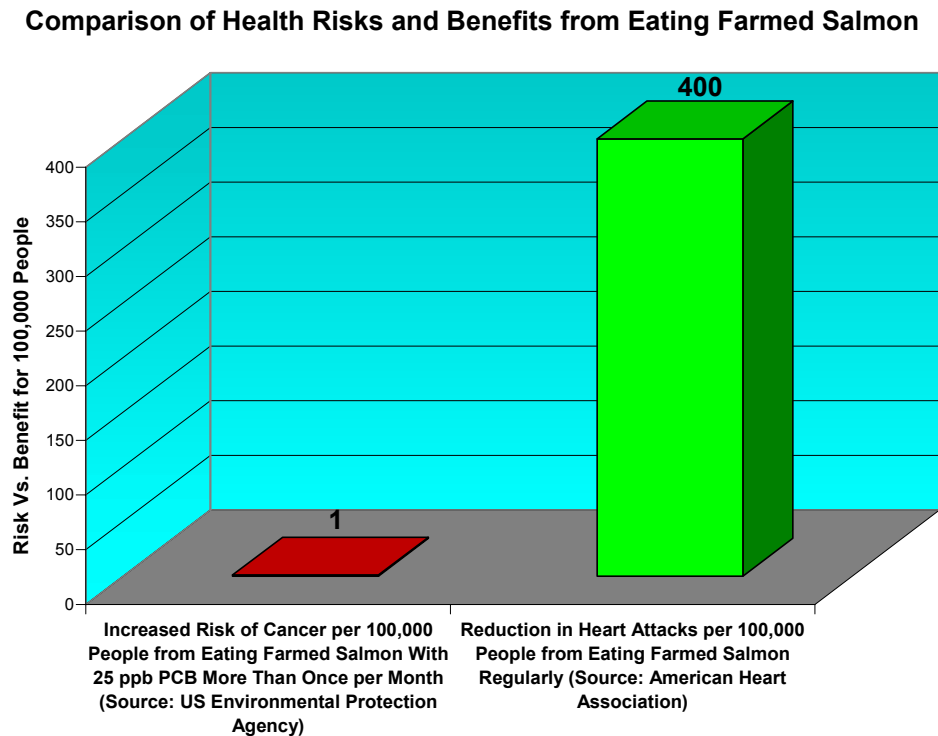


## Benefits vs. Risks

Commenting to the Associated Press on the conclusion of the Science study, Eric Rimm, a specialist on nutrition and chronic disease at the Harvard School of Public Health said the study "will likely over-alarm people in this country."

Rimm said, "To alarm people away from fish because of some potential, at this point undocumented, risk of long-term cancer — that does worry me."

As the graph below shows, the benefits of eating farmed salmon far outweigh any risks.



Charles Santerre, a food toxicologist at Purdue University, told ABC News on January 9<sup>th</sup> that the Science study was flawed because it failed to take into account the nutritional benefits of eating salmon. He said any slightly elevated risk of cancer pales in comparison with the advantages of consuming salmon rich with omega-3 fatty acids, a proven ingredient in preventing heart disease.

Santerre made clear that an increase in farmed salmon consumption is a worthwhile trade-off in the fight against heart disease, the No.1 killer in America. He said "I would calculate 6,000 people getting cancer over their lifetime, that's an approximation, versus potentially saving the lives of 100,000 individuals every year."

### ***Farmed salmon: setting the record straight***

The activists and the media continue to spread these false claims (reporting on the Science study being the latest example) even though clear statements countering them have been issued by the National Cancer Institute, the National Academy of Sciences, the American Council on Science and Health, the American Heart Association, the World Health Organization and the National Fisheries Institute.

While it can be expected that activists will continue to spread misinformation to bolster their otherwise irresponsible campaign against salmon farming, it is disconcerting to find that so many major media outlets seem willing to accept this misinformation without question, even when real experts and scientists advise media that they are being used to spread false allegations.

The public discourse, with the help of inaccurate media reporting, has shifted from farmed salmon to, in effect, *framed* salmon – a discourse based not on scientific accuracy but on interest-based politics.

We hope this report will help to set the record straight, to highlight the importance of scientific fact and to re-affirm the positive benefits of growing and eating all species of both farmed and wild salmon.

### **Acknowledgements**

This project would not have occurred without the guidance and support of Laurie Jensen, President, Positive Aquaculture Awareness, as well as her colleagues at PAA. PAA volunteers work tirelessly to ensure the voices of the aquaculture communities, employees and suppliers are heard in the public debate.

Charles R. Santerre, Ph.D. Associate Professor Foods and Nutrition, Purdue University was kind enough to read this report while still in draft form, and to make valuable comments on its contents.

Numerous industry and government officials have expressed support for this initiative and others like it – and for that we are thankful.

And finally, my colleagues at Greenspirit Strategies Ltd., Tom Tevlin, President, and Trevor Figueiredo, Senior V-P, put in long hours to ensure the record was a balanced and accurate one.

**Patrick Moore, Ph.D.**  
**Chairman and Chief Scientist**  
**Greenspirit Strategies Ltd.**



## **Introduction**

This report details the false allegations, bad science and overt misrepresentations surrounding activists' claims that there are dangerous levels of polychlorinated biphenyls (PCBs) in farmed salmon.

The report also provides a detailed critique and analysis of the significant breakdown in media objectivity that characterized much of the reporting on the PCB-farmed salmon story in North American print and electronic media.

Further, the report demonstrates how numerous media organizations succumbed, perhaps unwittingly, to the scare tactics and environmental rhetoric of activist groups by failing to apply the generally accepted tenets of factual, investigative reporting.

In a sense, this report does what many journalists should have done in the first place: it traces the origins of the story, identifies its sources and then submits those sources to a full and thorough fact-checking, thereby placing them in the context of scientific analysis.

Our aim is to provide the public with 'the real story' – based on fully sourced scientific information – behind the relationship between PCBs and farmed salmon and, to the extent possible, to undo the damage caused to one of the world's most sustainable and nutritious foods.

## **The Beginnings of a False Story**

Media reports falsely alleging that farmed salmon contain inordinately high levels of PCBs have been circulating for some time.

A good example of the tone taken in many of these reports is provided by a July 30, 2003 story in the Washington Post, which begins this way:

A sharp rise in the consumption of farmed salmon may be posing a health threat to millions of Americans because of high levels of PCBs that have been found in limited samples of the popular fish, according to a study released yesterday.

The Post story went on to claim (incorrectly) that “farmed salmon . . . contained concentrations of PCBs that were 16 times higher than those found in wild salmon.”

Similar mid-summer reports appeared in the New York Times, the Seattle Post-Intelligencer, the Seattle Times, the Chicago Tribune, the Oregonian, Reuters, the San Francisco Chronicle, CNN and other news outlets both in the US and Canada.

All of these stories, and others that appeared even earlier, can be traced back to one of two flawed, unscientific studies.

The first was written by Michael Easton and others and published in May 2001 in the journal Chemosphere<sup>2</sup> with financial support from the *David Suzuki Foundation*. The paper warned against the consumption of farmed salmon, suggesting it was high in levels of PCB contaminants.

The second report was released in July 2003 by the Environmental Working Group<sup>3</sup>, an organization known for food scare stories and lack of scientific credibility. It too alleged there were high levels of PCBs in farmed salmon.

These two ‘studies’ fed what can only be described as a hunger for bad news on the part of journalists who failed to carry out one of the more basic steps in accurate reporting – close scrutiny of the source material.

### **The Easton (*et al.*) study**

The Easton study was funded entirely by the *David Suzuki Foundation*, an organization heavily involved in the anti-fish farming movement. Perhaps this helps to explain why the study has many scientific and methodological flaws, as outlined below.

These flaws were carefully outlined in a letter to the editor of *Chemosphere* by food and nutrition expert, Dr. Charles Santerre, an Associate Professor in the Department of Foods and Nutrition at Purdue University.

Among Dr. Santerre’s many concerns with the study were the following:

#### 1. Unrepresentative sample size

The sample size of only 8 fish (4 farmed, 4 wild) and 5 feeds was so small as to be entirely unrepresentative of the number of farmed or wild salmon harvested each year. Dr. Santerre notes that the authors themselves admit, “that the number of samples was not even adequate for a statistical analysis.” He further states, “samples were collected from a grocery store with no documentation of their point of origin or prior handling.”

#### 2. Making the numbers look bigger than they are

The authors used a measurement of *parts per trillion* (ppt) rather than the typically agreed standard of *parts per million* (ppm). Using the ppt measurement rather than ppm, allowed the authors to claim PCB concentrations in farmed salmon of 50,000 ppt – a number that appears alarmingly large to the layman reader or the less than resourceful journalist. Dr. Santerre points out that 50,000 ppt amounts to 0.05 ppm, noting that “most regulatory bodies do not even consider concentrations of PCB less than 0.05 ppm because they are inconsequential from a health perspective.”

Dr. Santerre also indicates the authors failed to provide any “point of reference” from which to compare the 50,000 ppt (or 0.050 ppm). For example, the US Food and Drug Administration’s limit for fish entering interstate commerce is 2 ppm (2,000,000 ppt) – 40 times higher than

<sup>2</sup> Easton, M. D. L. et al, 2002. Preliminary examination of contaminant loadings in farmed salmon, wild salmon, and commercial salmon feed. *Chemosphere* 46 (2002) pp. 1053-1074

<sup>3</sup> See: <http://www.ewg.org/reports/farmedPCBs/index.php>



Easton found in his study. He also notes “our State regulatory body has measured levels of PCBs in wild fish as high as 400,000,000 ppt.” Yet the implication of Easton’s study was that people should switch from eating farmed salmon, “a generally low contaminant species, in favor of eating a more heavily contaminated fish.”

### 3. Flawed assumption: farmed-raised fish are more contaminated than are wild fish

Dr. Santerre disputes the flawed assumption, referenced in the Easton study, that wild fish are safer than are farmed-raised fish because of lower PCB levels. He notes that the opposite is often true: “Our laboratory has demonstrated that farm-raised fish generally are much lower in contaminants because they are fed commercial feed rather than having to obtain their food in other manners.” Two studies conducted by Dr. Santerre on this matter are cited below (Santerre, C.R., P.B. Bush, *et al*<sup>4</sup> and Santerre, C.R., R. Ingram *et al*<sup>5</sup>).

And numerous other scientific studies have backed up Dr. Santerre’s results (more about this later). For example, one study by the American environmental group Circumpolar Conservation Union<sup>6</sup> showed that PCB levels in wild Alaskan Copper River sockeye salmon ranged from 67,000 ppt to 791,000 ppt – much higher than Easton’s reported 50,000 ppt in farmed salmon.

It is important to remember in reading these numbers that regulatory agencies in Canada and the US have examined both farmed and wild salmon, and determined both to be safe and highly nutritious.

### 4. Inflated measurement of TEQ and TDI values

Dr. Santerre’s review found that the tolerable daily intake (TDI) for selected PCB congeners was not presented in the conventional manner and that toxic equivalent (TEQ) measurements were “based upon lipid concentration instead of based upon fresh weight of the fish tissue, thereby inflating the value.” (Lipid, or fat, content is approximately 10% of fish weight; therefore by using lipid concentration the TDI and TEQ numbers would be inflated by about 10 times)

Dr. Santerre recalculated these values based on EPA fish consumption data. His findings are clear:

For a 75 kg man consuming 16.7 g fish per day (actually the EPA normally uses 10 g fish per day), the TDI is 0.252 pg/kg body weight-day which is well below the WHO recommended intake maximum and well below the values indicated by the authors of 6.80 pg/kg body weight-day (lipid).

### 5. Little mention of higher mercury levels found in wild fish

Beyond its fundamentally flawed methodology, the Easton study was also disingenuous in another way: whenever data contradicted the authors’ conclusions, they simply left those data

<sup>4</sup> Santerre, C.R., P.B. Bush, D. Xu, G.W. Lewis, J.T. Davis, R.M. Grodner, R. Ingram, C.I. Wei, and J. Hinshaw. 2001. Metal residues in farm-raised channel catfish, rainbow trout and red swamp crayfish from the southern U.S. *J. Food Sci.* 66(2): 270-273

<sup>5</sup> Santerre, C.R., R. Ingram, G.W. Lewis, J.T. Davis, L.G. Lane, R.M. Grodner, C.I. Wei, P.B. Bush, D. Xu, J. Shelton, E.G. Alley and J.M. Hinshaw. 2000. Organochlorines, organophosphates and pyrethroids in channel catfish, rainbow trout and red swamp crayfish from aquaculture facilities. *J. Food Sci.* 65(2): 231-235

<sup>6</sup> Circumpolar Conservation Union. Persistent Organic Pollutants (POPs) in Alaska: What Does Science Tell Us. October 2000.

out. For example, Dr. Santerre asks why the authors do *not* make clear the fact that wild fish contained twice the levels of mercury as farmed fish. Instead, the authors limit themselves to making allegations in connection with higher levels of PCBs in the farmed fish.

Dr. Santerre notes, again, how the authors chose measurement values that suited their agenda and assisted in misrepresenting the data: “Why was the mercury content reported in (parts per million) rather than (parts per trillion) as used for the PCB concentration?”

### **Selling an erroneous story**

When the Easton study was published in May 2001, the Suzuki Foundation – funders of a study which now validated their publicly stated anti-salmon aquaculture agenda – were quick to put it in front of the media.

Their web site commentary and ‘sky-is-falling’ news release were alarming. Under the heading “International science journal publishes landmark study on wild and farmed salmon,” the foundation alleged:

Dr. Easton’s study shows that the contaminants, known as persistent organic pollutants, are especially dangerous for children, nursing mothers and pregnant women or women considering pregnancy. The samples studied showed that farmed salmon contained much higher levels of pollutants, including 10 times more Polychlorinated Biphenyls (PCBs) than wild fish.

And the media were quick to headline the story, as in this May 2002 report from the Canadian Broadcasting Corporation:

As little as one meal a week of BC 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.

No mention of unrepresentative sample size, or skewed numbers, or inflated measurement values, or erroneous assumptions, or activist sponsorship – in their rush for the story, the CBC and other media left the real facts behind.

They chose, instead, to sell fear.

### **Environmental Working Group (EWG) study**

On July 30, 2003 the Environmental Working Group (EWG) released what they claimed were “results of the most extensive tests to date of cancer-causing polychlorinated biphenyl (PCB) levels in farmed salmon consumed in the United States.” The EWG concluded, “seven of 10 fish were so contaminated with PCBs that they raise the cancer-risk concerns, relative to health standards of the US Environmental Protection Agency (EPA).”

But a closer look at the many flaws of the EWG report shows that is simply not the case.

We outline those flaws below:

### 1. Unrepresentative sample size

The EWG sampled a grand total of 10 fish from local grocery stores. As with the Easton study, such a small sample size is statistically insignificant and is not necessarily representative of the millions of farmed salmon purchased annually by consumers.

The notion that EWG would refer to this collection of 10 fish as “the most extensive tests to date” would be laughable if it were not so misleading to consumers seeking healthy food choices.

### 2. Misleading results

Even if the sample size were representative, the EWG’s findings of an average PCB level of 27 ppb in the sample of farmed fish is 98.5 per cent below the tolerance level of 2,000 ppb (2.0 ppm) set by the US Food and Drug Administration (FDA). It is important to note that the FDA has issued a statement confirming these safety levels after specifically examining this issue.

Terry Troxell, Director, FDA Office of Plant and Dairy Foods and Beverages states that “Part of our equation is looking at the overall picture, the positives in nutrition versus the trace levels of PCBs that may be remaining in our environment.”

Since the FDA tolerance levels fail to set off alarm bells in the case of the EWG’s 10 fish, the EWG moves on to the Environmental Protection Agency (EPA) and its set of standards. The EPA recommendation for fish containing between 24-48 ppb is that people should restrict themselves to one fish meal per month.

The EPA standard is an unusually conservative one. EPA sets the standard at a level where they feel certain that virtually no increased risk occurs over a 70-year lifespan. They don’t take into account that eating foods like salmon might be the very reason that you live to be 70. It is a question of balancing the real positives with the theoretical negatives. Whereas the FDA does consider the balance between nutritional benefit and possible risk the EPA makes no such consideration, even though in the case of salmon the positives win hands-down.

### 3. Conclusion runs counter to leading scientific findings

The EWG conclusion that farmed fish raises “cancer-risk concerns” runs completely counter to a host of prestigious scientific evidence on this issue, including the statements of the National Cancer Institute, the National Academy of Sciences, the American Council on Science and Health, the American Heart Association, the World Health Organization and the National Fisheries Institute, to name but a few.

As Sheldon Jones, Director, Arizona Department of Agriculture noted, “EWG’s approach is more alarmist politics and it lacks sound scientific health or risk assessment information.”

John Connelly, President, National Fisheries Institute, was even more blunt in his assessment of EWG’s work. In a letter<sup>7</sup> to the Wall Street Journal critical of the paper’s EWG coverage,

---

<sup>7</sup> "Eat all the fish you want and stop worrying," John Connelly, Wall Street Journal, September 22, 2003.

Connelly wrote: “You should be embarrassed to repeat the allegation of ‘high PCBs’ in farmed salmon.”

#### 4. Lack of comparative data

Presenting data in a vacuum, without points of comparison, is a typical scare-tactic, and it’s one the EWG has used on a number of occasions. We’ve shown how in many cases PCB levels in wild salmon are actually much higher (but still safe by government standards) than levels in farmed salmon.

For example, recent scientific studies, including one by the American environmental group Circumpolar Conservation Union<sup>8</sup> show that PCB levels in wild Alaskan Copper River sockeye salmon ranged from 67 ppb to 791 ppb. This compares to average levels of 27 ppb found in farmed salmon by the EWG.

And according to the Seattle Times:

Studies conducted in Puget Sound during the past decade by the state Department of Fish and Wildlife have tested 111 of the Sound's prized chinook. These tests found the Puget Sound wild chinook averaged PCB levels of 45 parts per billion, a higher level than detected in most of the 10 farmed fish sampled by the Environmental Working Group . . . But state officials say there is currently no need for dietary restrictions on Puget Sound salmon.<sup>9</sup>

The full details of this in-depth government study can be found here:  
<http://www.wa.gov/wdfw/fish/psamp/toxiccontaminants.htm><sup>10</sup>

While it is not clear where the Seattle Times obtained the figure of 45 ppb for wild Puget Sound Chinook, a review of the actual publication shows that the PCB levels were even higher than this.<sup>11</sup> And unlike the Easton and EWG reports the Department of Fish and Wildlife study had sample sizes large enough to be statistically valid. The study reports that for 34 wild Chinook salmon caught in the ocean PCB levels averaged 74.2 ppb or about three times the level found in farmed salmon in the EWG report. A sample of 144 Chinook caught in rivers had average PCB levels of 49.1 ppb, or about twice the level found in farmed salmon by the EWG.

The results of both the Circumpolar Working Group on wild Alaskan salmon and the Washington State Department of Fish and Wildlife for wild Puget Sound salmon were reported four years before the claims by Easton and the EWG. But despite such readily available, statistically valid science, Easton and EWG advised consumers to choose wild fish over farmed, raising the specter of cancer in both cases. In fact, both wild and farmed

<sup>8</sup> Circumpolar Conservation Union. Persistent Organic Pollutants (POPs) in Alaska: What Does Science Tell Us. October 2000.

<sup>9</sup> "What's safe PCB level in salmon? Study renews debate," Seattle Times, July 30, 2003

<sup>10</sup> Toxic Contaminants in Marine and Anadromous Fishes From Puget Sound, Washington: Results of the Puget Sound Ambient Monitoring Program Fish Component, 1989-1999 James West, Sandra O'Neill, Greg Lippert and Stephen Quinnell

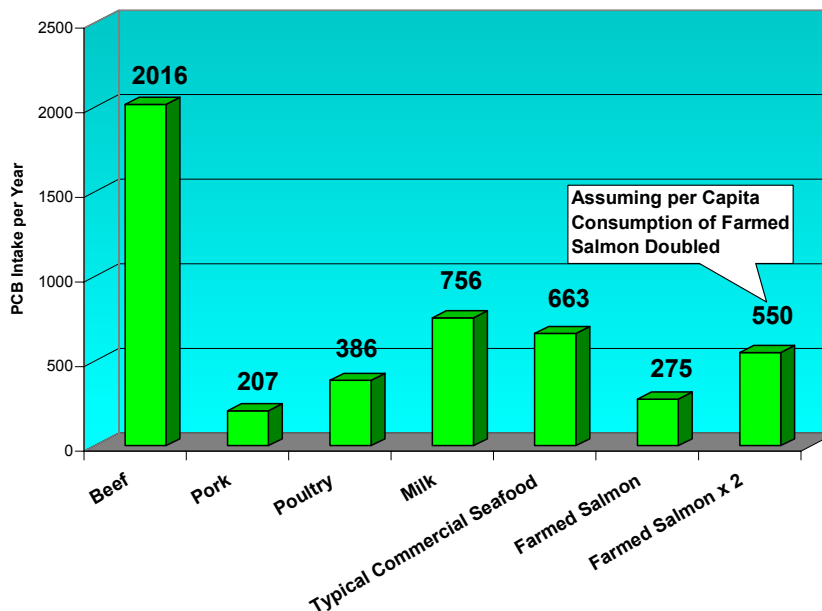
<sup>11</sup> O'Neill et al. 1998. Spatial Trends in the Concentration of Polychlorinated Biphenyls (PCBs) in Chinook (*Oncorhynchus tshawytscha*) and Coho Salmon (*O. kisutch*) in Puget Sound and Factors Affecting PCB Accumulation: Results from the Puget Sound Ambient Monitoring Program. Pages 312-328 in E. R. Strickland, editor. Puget Sound Research '98 Proceedings. Puget Sound Water Quality Action Team, Seattle, WA.

salmon are highly nutritious foods that fall well within government-sanctioned consumer guidelines.

More importantly, through their failure to present points of comparison, both EWG and Easton end up pushing consumers away from healthy, nutritious salmon and toward other, less beneficial forms of protein.

But do other foods result in lower exposure to PCBs levels farmed salmon? Let's take a look:

Annual Per Capita Intake of PCBs by Food (Based on Environmental Working Group Report, July 30, 2003)

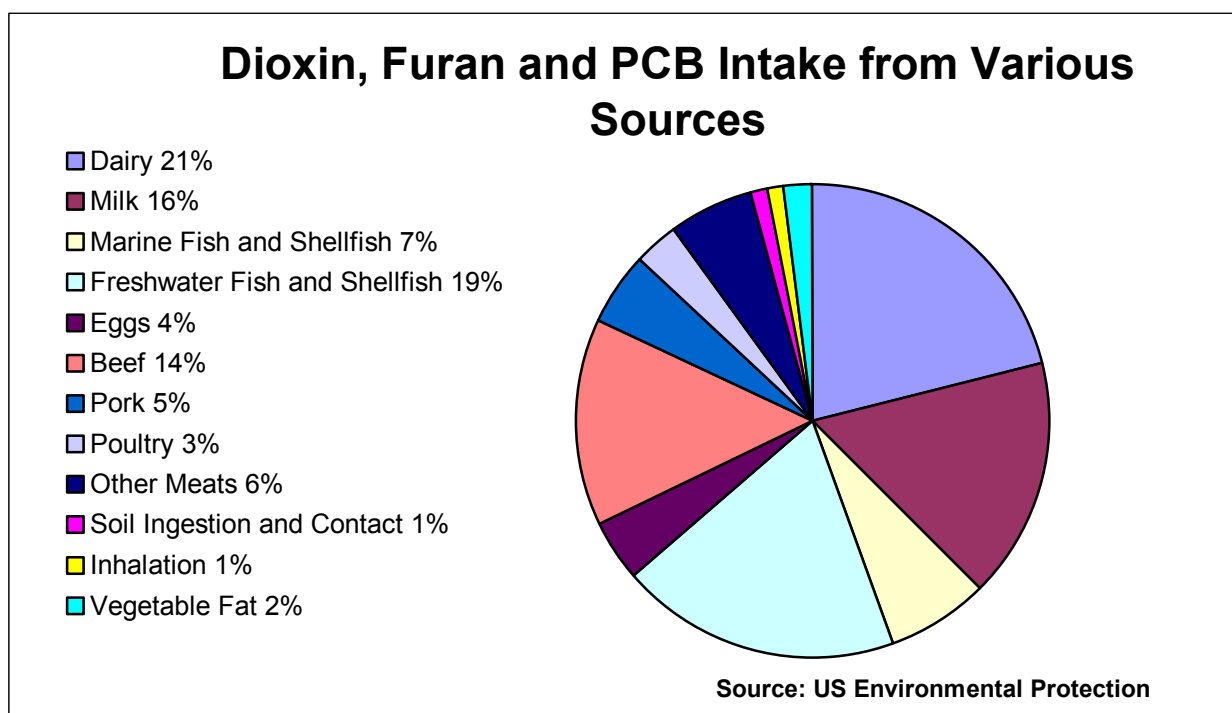


This graph compiled by Salmon of the Americas represents the total per capita intake of PCBs from consuming various foods based on PCB levels referenced in the EWG report. Note that even if salmon intake were to double, PCB loads for farmed salmon would still be much lower than existing loads for beef (the higher level of PCB intake for beef is largely due to the much higher per capita consumption of beef).

These data clearly undermine EWG's suggestion that farmed salmon is dangerous to eat in comparison with other foods. In fact, regulatory authorities have approved all the foods mentioned above. These foods have such low levels of PCBs that health concerns remain insignificant compared to the benefits of eating them.

The failure of Easton et al, the EWG, and activist groups to view food contaminants in an objective light is made clear in the following chart. It shows the average intake for a US adult of the fat-soluble dioxins, furans and dioxin-like PCBs.<sup>12</sup>

<sup>12</sup> Proceedings of the National Forum on Contaminants in Fish. American Fisheries Society and US Environmental Protection Agency. October 20-22, 2002.  
See: <http://www.epa.gov/waterscience/fish/forum/2002.htm>



The chart clearly indicates that milk and other dairy products account for fully 37% of intake of these substances while marine fish and shellfish are only responsible for 7% of intake (again it must be emphasized that these levels are considered safe by health authorities and that they have fallen dramatically over the past two decades).

#### 5. A history of fear mongering – and still no scientists on staff!

EWG is an organization with a long history of fear mongering. From baby foods to apples, EWG's main goal – without any scientific basis for the claim – is to convince consumers that the modern world they live in and the nutritious foods they eat are contaminated and will damage their health.

As Dennis T. Avery, a senior fellow at the Hudson Institute writes:

The EWG is a multi-million-dollar “public interest watchdog” dedicated to making you afraid of nearly everything in your modern world: fruits, vegetables, baby food, drinking water, toys, swimming pool chlorine, utility poles, cotton clothes, etc. The EWG says that eating one non-organic apple or peach can cause “dizziness, nausea or blurred vision” in a child, but offers no evidence. The EWG makes up its own “danger indexes” despite the fact that it has no scientists on its staff.<sup>13</sup>

Without one scientist on staff, without any form of peer-review, without having published the PCB ‘study’ in any peer-reviewed scientific journal, the EWG can hardly claim to conduct scientific research. And yet the organization – funded by agenda driven charitable foundations – has done just that.

After evaluating the evidence, the Seattle Times -- one of the few media critical of the EWG report – wrote:

<sup>13</sup> "Farm fresh salmon," Editorial, Seattle Times, July 31, 2003

Over the years, the Environmental Working Group has obsessed over fresh apples, pears, peaches, spinach, strawberries, celery, lettuce and canned tuna. Now, fresh salmon. Think twice before taking dietary advice from these folks.<sup>14</sup>

### **Media fall for EWG report - hook, line and sinker**

Despite both the advice of the *Seattle Times* and critical analysis from North American toxicologists, aquaculture specialists and food and nutrition experts, most media still reported the story as the EWG wanted it reported – without any scrutiny.

As we described in *The Beginnings of a False Story*, reporting on this story through media outlets in regions across North America was more than just shoddy; it was both substantively and persistently flawed.

Even after several experts responded to the EWG report with detailed critiques, the media continued to report on the EWG claims as if they were backed by reputable science.

On September 3, 2003, the Netscape news service posted a story that began:

If You Love Salmon, This Will Scare You

Packed with omega-3 fatty acids, salmon is one of the healthiest foods you can eat. Or is it? The Environmental Working Group has issued a scary report indicating that farm-raised salmon--but not the kind that is fished out of streams and rivers--is contaminated with high levels of cancer-causing chemicals called polychlorinated biphenyls, more commonly known as PCBs, report Reuters and The New York Times.

The Netscape story repeated the false allegations of the EWG, and in fact, amplified those false allegations by describing PCBs as “cancer-causing chemicals.” Rather than claiming “high levels of cancer causing chemicals” it would have been accurate to state there were “very low levels of substances that have never been shown to cause cancer in humans”. But this is not the stuff of headlines.

As a matter of scientific fact, PCBs have never been shown to cause cancer in humans – even at levels much higher than those reported by the EWG.

Again, other than in the *Seattle Times*, there was no media challenge of the EWG’s biased assumption, no media critique of its lack of scientific methodology or lack of peer-review, no media reference to its history of scare-tactics.

Once again, consumers were misled.

### **What are PCBs, anyway?**

PCBs, polychlorinated biphenyls, are long-lived compounds, used mainly as industrial insulators in electrical transformers. Even though the production of PCBs was halted in the 1980s, most of them are still in use in original equipment. The US FDA states that human consumption of PCBs has declined by 90 per cent in the past 30 years. In other words there is a diminishing concern

<sup>14</sup> [http://www.cgfi.org/materials/articles/2003/aug\\_6\\_03.htm](http://www.cgfi.org/materials/articles/2003/aug_6_03.htm) at Center for Global Food Issues

about PCBs, which were never linked to serious health effects in the first place. This is hardly worth national headlines aimed at scaring people into fearing their most nutritious foods.

## PCBs and Cancer

It's important to repeat that there is no definitive scientific proof linking PCBs with cancer in humans. There have been some studies linking very high levels of PCB intake with elevated levels of cancer in laboratory animals, but to suggest the findings of these studies can be applied equally to humans is scientifically indefensible. Even the laboratory tests gave contradictory results (see below).

On this point, Dr. Elizabeth M. Whelan, President, American Council on Science and Health is very clear. In a letter critical of the New York Times reporting of the EWG allegations, Whelan writes:

First, there is absolutely no evidence that exposure to PCBs poses a risk of human cancer. Even workers who were occupationally exposed to PCBs at high levels over many years manifest no increased cancer rates. (See ACSH's 1997 booklet on PCBs, at <http://www.acsh.org/publications/reports/pcupdate.html>, which was adapted from a paper published in a peer-reviewed scientific journal--*Ecotoxicology and Environmental Safety* 38, 71-84 [1997]. A newer version is now in peer review and will be published later this year.)

You state that PCBs are a 'probable human carcinogens.' However, you well know that this is based on 'regulatory science' at EPA—derived exclusively from animal studies--and does not take human exposure data and physiology into account.

There is no scientific basis to the assumption that low-level exposure to chemicals, which at high levels cause cancer in laboratory rodents, poses a human cancer risk. I know you are familiar with the ACSH Holiday dinner menu (<http://www.acsh.org/publications/booklets/menu02.html>). This demonstrates that natural foods contain substantial numbers of chemicals--which, again, at high dose cause cancer in laboratory animals--with no negative health consequences for humans.<sup>15</sup>

Dr. Whelan's comments, based on research and delivered with scientific authority, never saw the light of day in the coverage of the EWG claims; rather Netscape's news service opted in stead for erroneous references to "cancer-causing chemicals".

And Dr. Whelan is not alone. In a December 2000 editorial by Dr. Whelan in the Wall Street Journal, Susan Sieber, a scientist and director of communications at the National Cancer Institute confirms there is no known link between trace amounts of PCBs (like those referenced in the EWG report) in fish and human cancer.<sup>16</sup>

Dr. Bruce Ames, a biochemist who is director of environmental health science at the University of California at Berkeley, and Dr. Stephen Safe, a toxicologist at Texas A&M University, have been skeptical of a link between PCBs and human cancer for some time.

Both have noted that PCB's are very weak estrogens present in tiny amounts in the body. They have pointed out that studies in which laboratory animals were given high doses led to

<sup>15</sup> Letter from Dr. Elizabeth Whelan to Marian Burros, New York Times, August 1, 2003.

<sup>16</sup> "Who says PCBs cause cancer?" Dr. Elizabeth M. Whelan, Wall Street Journal, December 12, 2000.



contradictory results: in some the compounds were found to have caused breast cancer, in others they protected against it.

Moreover, both Ames and Safe suggest plants have so many naturally occurring estrogens and anti-estrogens that they would likely overwhelm any conceivable effects of very low levels of environmental chemicals such as PCBs.<sup>17</sup>

In all matters concerning toxicology it is important to remember, “the poison is in the dose”. Toxicologists generally agree that there are threshold levels, below which there is no discernable risk. So even chemicals, both natural and synthetic, that do cause cancers at very high dose levels will not necessarily have any negative effects at low levels such as are found in our food supply.

### **Modern chemical testing**

Dennis T. Avery points out that modern chemical testing can detect a part per trillion – equivalent to one second in 31,000 years. Never before have we had the power to detect such minute amounts of substance.

Human consumption of PCBs has declined by 90 per cent in the past 30 years. As a result our exposure to PCBs in the food chain – in everything from catfish to cows - is much less a concern now than in the recent past.

Twenty years ago these trace amounts would have been undetectable using the latest technology available. Today, levels thousands of times lower than these can be detected easily.

It is this ability to detect trace amounts that activists like EWG thrive on. EWG staff knows that all they have to do to attract media attention is to find an insignificant amount of PCB or other contaminants, and write a press release.

No scientific proof or evidence of any kind linking trace amounts of PCBs with human cancer or any other health impact is required.

### **But why does farmed salmon sometimes contain trace amounts of PCBs?**

It's not as if PCBs are being brewed in a lab somewhere and then being injected into farmed salmon – although that's the image many activists would like you to believe.

Trace amounts of PCBs can be found in farmed salmon for the same reason they can be found in wild salmon, in beef, in chicken and in many other foods: they've accumulated in small amounts in the food chain.

Farmed salmon are usually fed fishmeal derived from sustainable anchovy and mackerel fisheries. Anchovies and mackerel may ingest trace amounts of PCBs in their natural environment and these can then find their way into farmed salmon through the feed.

---

<sup>17</sup> "Study Discounts DDT Role in Breast Cancer," New York Times, October 30, 1997

See also: "Ranking Possible Cancer Hazards from Rodent Carcinogens, Using the Human Exposure/Rodent Potency Index (HERP)" at <http://potency.berkeley.edu/pdfs/herp.pdf>

In fact it is virtually inevitable that all wild and farmed fish will contain trace amounts of PCBs and other chemicals that are in the food chain.

### **A disservice to the public**

The journalists who wrote the uncritical stories covering the Easton and EWG reports did an enormous disservice to the general public in Canada, the United States, and around the world wherever the media reported.

Their stories have only succeeded in alarming the public, telling them that it's perhaps best to stay away from farmed salmon when this is one of the healthiest food choices they could make.

And this is perhaps the greatest tragedy of the whole episode: pushing consumers away from a healthy, nutritious product that's available year-round and is rich in Omega-3 fatty acids, a *proven* ingredient in preventing heart disease.

The American Heart Association calculates that about 250,000 Americans die from sudden cardiac arrest each year. They state that a modest increase in daily consumption of the beneficial fats found in salmon and other fish could dramatically reduce this toll.<sup>18</sup>

A recent, but still preliminary, study published by researchers at Tufts University in Boston shows a relationship between fish consumption and reduced risk of Alzheimer disease. The study was conducted from 1993 through 2000, of a stratified random sample from a geographically defined community. A total of 815 residents, aged 65 to 94 years, who were initially unaffected by Alzheimer disease, completed a dietary questionnaire on average 2.3 years before clinical evaluation of incident disease. A total of 131 sample participants developed Alzheimer disease. Participants who consumed fish once per week or more had 60% less risk of Alzheimer disease compared with those who rarely or never ate fish (relative risk, 0.4; 95% confidence interval, 0.2-0.9) in a model adjusted for age and other risk factors.<sup>19</sup>

Anyone who has experienced a family member or friend suffer through this disease knows how important it is to reduce its incidence. Salmon, both farmed and wild, contain among the highest levels of the omega-3 fatty acids thought responsible for this significant reduction in risk.

Ironically, in pushing consumers away from "PCB-tainted farmed fish" environmentalists and journalists have succeeded in doing far more harm than good. They are actually encouraging people to adopt less healthy eating habits.

### **What's coming next from the activists?**

In the months to come, the general public (through media) may once again be subjected to false allegations regarding high levels of PCBs in farmed salmon.

---

<sup>18</sup> Personal communication, Dr Charles Santerre, Dec. 11. 2003.

<sup>19</sup> Consumption of Fish and n-3 Fatty Acids and Risk of Incident Alzheimer Disease Morris et al. *Archives of Neurology*.2003; 60: 940-946.

As an October 28, 2003 article in the Vancouver Sun reports, the information will come from a soon to be released study funded by the Pew Charitable Trusts, a charitable foundation that has taken a position against salmon farming.<sup>20</sup>

The \$2.5 million Pew study is different from those conducted by Easton or EWG because it based on a significant sample size of 700. This means it will likely produce information that is statistically valid.

Dr. Santerre believes the study is actually good news for farmed salmon and, as quoted in the Sun, “will show farmed salmon is comfortably within North American government limits for the presence of toxins such as polychlorinated biphenyls or PCBs.”

But Santerre believes “environmentalists will attempt to use the report in a manner that supports the opposite conclusion.”

Again, activists may be expected to make claims about PCBs being found in farmed salmon, without reference to points of comparison showing how favourable eating farmed salmon really is.

Reaction to the eventual release of this study will be a true test of media objectivity and commitment to thorough reporting.

It will also be a time for consumers to remain at their most vigilant.

## **Recommendations**

Below we provide recommendations for each of the acting parties in the PCB-farmed salmon story. We believe the implementation of these recommendations would go a long way towards mitigating the gross misrepresentations of truth outlined in this paper.

We note the organization Salmon of the Americas (SOTA) recently called on the U.S. Food and Drug Administration to reconcile polychlorinated biphenyl (PCB) and other contaminant intake guidelines with other food agencies to avoid future confusion over food safety.

We applaud SOTA for this initiative, and in particular for delivering the strong message that conflicting claims of food safety are sending mixed messages to consumers about food, and farmed salmon in particular, which could result in consumers being driven from consumption of a food product that is beneficial to their health.

Other constituencies have a strong role to play in better representing the factual record on salmon aquaculture. Implementation of the following recommendations would raise the level of discourse on one of the most important issues of public health and nutrition by subjecting it to a full and thorough scientific inquiry.

---

<sup>20</sup> "Salmon farming faces 'bombshell' report: Professor tells conference that negative spin will be placed on foundation's findings," The Vancouver Sun, October 28, 2003

### ***For the media***

The media in North America -- particularly journalists who cover health and nutrition -- need better information on the scientific facts underlying these issues.

Such inquiry is not always easy, particularly in the race to get the story out first. But neither is such inquiry all that hard. Most of the data gathered for this report were easily accessible on the Internet and in public libraries for anyone who cared to look.

Journalists must question the biases and agendas of the activist groups -- and the foundations that provide their financing -- when these groups publish misleading claims. When such claims amount to misinformation they are never in the public's best interests.

Instead of merely quoting verbatim from press releases, journalists need to do a more thorough job of investigating sources. And they need to better develop their own credible sources such as nutrition and toxicology experts, so questionable information can be verified using reliable, scientific knowledge.

### ***For the food industry***

The food industry needs to react more quickly and more aggressively to erroneous information reported by the media and activist groups.

The longer this information remains unchallenged, the more it takes on the quality of "fact" and the more it gets repeated by other media outlets.

It's important for the food industry to immediately counter misinformation with clear, scientific analysis. When reported information is accurate, it's important the industry acknowledge this too.

As we have done in "*What's coming next from the activists?*" when possible, the food industry must take a proactive stance instead of only reacting to what has already happened. The industry must prepare the public and the media *in advance* of upcoming scare campaigns and news releases from the activist groups.

### ***For activists***

If activists continue to use erroneous information, they will eventually lose credibility in the eyes of the public.

The onus is now on the activists to improve their credibility by:

- Admitting to their errors and correcting this information publicly
- Replacing unscientific information with accurate, scientific data from credible, independent sources
- Moving from a problems-oriented to a solutions-oriented focus. Activists must direct their significant resources toward the research and development of practical, positive solutions to environmental and health and nutrition issues rather than simply alleging crises at every turn

### ***For charitable foundations***

Charitable foundations have long funded the activist agenda. But foundations have also funded more positive, scientific work. It's this scientific work that interested foundations must place at the forefront of their giving.

If foundations wish to make a true mark on the public discourse regarding environmental and health and nutrition issues, they must do so by funding credible, scientific studies that will add to the public dialogue rather than take away from it.

Charitable foundations should develop a new list of science-based criteria that if met would make particular projects or studies eligible for funding. The Easton and EWG studies critiqued in this paper, for example, would never have met the rigorous demands of such criteria.

Had such criteria been in place when the Easton and EWG studies were developed, both studies would have been taken back to the drawing board. Consequently, both studies would have become far more scientific and their results far more accurate – and the public would have been far better served.

Scientists and the foundations that fund their research must also be exceedingly cautious with regards to ensuring the line between science and political advocacy remains clearly drawn and is not crossed.

Scientists must stick to recording and reporting the scientific facts; they should leave policy decisions to the policy makers and advocacy to the advocates. To engage in both science and political advocacy, as has been the case with the Science study, leads to a confusion of the definite with the subjective and a resulting loss of credibility both for the scientists involved and the data they have worked so hard to prepare.

### ***For consumers***

Consumers have busy lives and they cannot be expected to personally analyze and verify all the information presented to them -- that remains the job of the media and of experts.

But consumers can better educate themselves on health and nutrition issues by reading a variety of source material and questioning the biases not only of industry but also of the media and of activists.

When consumers do find inaccuracies, they should report them. A short letter to the editor from a well-informed citizen can do much to enhance the public discourse on these types of issues.

### **Conclusion**

The aim of this paper has been to go behind the PCB-farmed salmon story, to question the key sources of this story by submitting them to a thorough scientific inquiry.

As we have shown, both the Easton and EWG reports -- the key sources upon which the rhetoric of activists relied – used methodologies and procedures that were anything but scientific.

Yet their findings were reported by many in the media as if they were the most accurate, most credible of studies. They were not. The public was misled because journalists failed to do their job.

Journalists primarily, but consumers too, must do a better job at separating the fact from the fiction.

As long as activists continue to promote an agenda bolstered by less than scientific inquiry, a healthy dose of skepticism is required from all of us.

## Appendix

Below is a compilation of expert criticism of the January 9, 2004 study published in Science and entitled "Global Assessment of Organic Contaminants in Farmed Salmon." Comments have been compiled from various North American media outlets by the Canadian Aquaculture Industry Alliance.

*Officials at the Canadian Food Inspection Agency, Department of Fisheries & Oceans & Food and Drug Administration disputed the study's recommendations*

*'In Canada, the fish is safe,' said Glenn McGregor, seafood inspector for the CFIA. 'Health Canada has been trying to promote fish as a healthy alternative for protein, certainly not trying to restrict its intake.'*

**- As quoted in The Globe and Mail, January 9, 2004**

*'One thing that's very clear is that these amounts are well within CFIA standards, which are internationally accepted standards,' said Mark Burgham, policy director of sustainable aquaculture for the Department of Fisheries and Oceans.*

**- As quoted in the Vancouver Province, January 9, 2004**

"We certainly don't think there's a public health concern here,' said Dr. Terry Troxell, director of the agency's office of plant and dairy foods and beverages. 'Our advice to consumers is not to alter their consumption of farmed or wild salmon.'

**- As quoted in The New York Times, January 9, 2004**

'We've looked at all the data and our advice to consumers is not to alter their consumption of farmed or wild salmon,' said Terry Troxell, director of the FDA Centre for Food Safety and Nutrition.

'Salmon is an excellent source of Omega 3 fatty acids, vitamins and proteins,' he said. 'These [contaminant] levels are extremely low and are not of public health concern to us.'

**- As quoted on ABC News, January 9, 2004**

*The Food and Drug Administration said the levels of pollutants found in salmon are too low for serious concern. The agency urged Americans not to let the new research, reported Thursday in the journal Science, frighten them into a diet change.*

**- As quoted by The Associated Press, January 9, 2004**

*The study 'will likely over-alarm people in this country,' said Eric Rimm of the Harvard School of Public Health, a specialist on nutrition and chronic disease. 'To alarm people away from fish because of some potential, at this point undocumented, risk of long-term cancer-that does worry me.'*

**- As quoted by The Associated Press, January 9, 2004**

*Eric Rimm of the Harvard School of Public Health in Cambridge, Mass., points out numbers alone may suggest farmed salmon's benefits still outweigh any risk. One in two Americans die every year from cardiovascular disease, while the risk of developing cancer from contaminants remains uncertain and undocumented.*

**- As quoted by Los Angeles Times, January 9, 2004**

*PCB's have not been proved to cause cancer in people, and industry workers who were exposed to higher levels did not have a higher cancer rate, said Dr. Michael Gallo of the Cancer Institute at the Robert Wood Johnson Medical School.*

**- As quoted in The New York Times, January 9, 2004**

*Echoing many of the criticisms held by other researchers in the fields of nutrition and toxicology, Mike Gallo of Rutgers University told Intrafish yesterday that while the study was comprehensive in its approach, its conclusions were faulty.*

*'PCBs are in all salmon. The difference between 5 ppb [parts per billion] and 30 ppb is meaningless. If you use the EPA's mathematical model...there is no difference,' Gallo said, referring to the differing PCB levels that the study's authors found in wild and farmed salmon.*

*Gallo, who said he helped to craft the EPA's cancer risk assessment model used by the authors, remarked that it was inappropriate for the scientists to discount the U.S. Food and Drug Administration's guidance on contaminants in fish. The FDA has never issued a public health advisory on farmed salmon and yesterday reiterated its position that the product is safe to several news outlets.*

*'As a professor of public health, I would never tell anyone to limit their intake of salmon,' Gallo said.*

**- As quoted on Intrafish, January 9, 2004**



*'No one is really sure how important these interactions are in the real world,' said Dr. Mark E. Hahn, a toxicologist at the Woods Hole Oceanographic Institution who has spent 20 years working on PCB's and dioxins, with no industry support.*

*But, Dr. Hahn said, if someone decides not to eat farmed salmon, then what? 'What risk are you substituting?' he asked. 'What else are you going to eat?'*

*'I love salmon, and I eat it a couple of times a month,' he said.*

*He read the Science paper carefully, he said, and 'I'm not going to change my eating habits.'*

**- As quoted in The New York Times, January 9, 2004**

*Phil Guzelian, M.D., Professor of Medicine, Head, Section of Medical Toxicology, University of Colorado Health Sciences Centre, says the report is largely a confirmation of previously accumulated knowledge regarding trace amounts of chlorinated chemicals detectable in fish, in this case, in salmon. The data show quite convincingly, as has been known for some time, that regardless of whether the salmon are farm bred or caught wild, the amounts of these chemicals are small indeed, being about 100 times lower than the safe amounts recommended by the US FDA's health-based risk assessments.*

*In view of the lack of an evidence-based determination that these chlorinated chemicals at such low doses are toxic to humans at all, the Hites et al. 2003 report provides reassurance to the public to consider, without misgivings, the reported health benefits of including salmon in the diet.*

*'The nutritional benefits of salmon are pretty amazing,' said Charles Santerre, a professor of food and nutrition at Purdue University in West Lafayette, Ind., 'I strongly believe that all the data we have today suggests that everyone should be eating more farmed salmon.'*

**- As quoted on ABC News, January 9, 2004**

*Charles Santerre, a food toxicologist at Purdue University, called the study flawed because it failed to take into account the nutritional benefits of eating salmon. He said any slightly elevated risk of cancer pales in comparison with the advantages of consuming salmon rich with omega-3 fatty acids, which help prevent heart attacks.*

*Even an increase in farmed salmon consumption, he said, is a worthwhile trade-off in the fight against heart disease, American's No. 1 killer. 'I would calculate 6,000 people getting cancer over their lifetime, that's an approximation, versus potentially saving the lives of 100,000 individuals every year.'*

*Furthermore, Santerre said, the levels of contaminants detected in the study show salmon to be perfectly safe, as is recognized by the FDA.*

**- As quoted in The Los Angeles Times, January 9, 2004**

*A University of Guelph expert dismisses as overblown an American study alleging eating Canadian-farmed Atlantic salmon is a health hazard from elevated toxins.*

*"In actual fact, no, there really isn't significant cause for concern," aquaculture professor Richard Moccia, who oversees the university's aquaculture centre, said recently.*

*Moccia cited several reasons why consumers can feel confident in eating farmed Atlantic salmon.*

*He stressed the levels of contaminants "are well within acceptable guidelines" set out by Health Canada, the U.S. Food and Drug Administration (FDA) and the Canadian Food Inspection Agency (CFIA).*

*Moccia added the risk from these compounds must be weighted against the healthy aspects of eating fish, such as the presence of beneficial dietary fatty acids.*

*Further, Moccia said the chemical residues come from the fish food, rather than the water in which these farmed Atlantic salmon swim. That's significant, he said, because it means improvements to fish food can be made.*

**- As quoted in the Guelph Mercury, January 12, 2004**