

# Farmed Salmon 'Likely' Passed Virus to Wild Pacific Salmon

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✓ Fact Checked

## STORY AT-A-GLANCE

- › Piscine orthoreovirus (PRV) is a viral infection that likely spread to wild Pacific salmon from fish farms in the 1980s. It has caused substantial losses to the Norwegian farming industry, where it has been detected in 95% of farmed salmon
- › PRV may have contributed to the declining numbers and diversity of wild Pacific salmon, which have been dropping for 30 years. Pacific salmon body size is also substantially smaller than fish from before 1990
- › Farmed salmon are fed pellets made from highly polluted eel and fatty fish from the Baltic Sea and manufacturers add a pesticide to lengthen the shelf life
- › Wild-caught salmon is high in omega-3 fat, essential for good brain health and helps lower all-cause mortality. Seek out wild-caught Alaskan salmon with the Marine Stewardship Council (MSC) logo, indicating it came from a responsible fishery using sustainable practices

Salmon is often used as an example of a health-conscious food choice, but the health value depends greatly on the source. While wild salmon is nutritious, there are significant problems with farm-raised salmon. One of these is the high rate of infection on salmon farms.<sup>1</sup>

Data released in May 2021 support the theory that piscine orthoreovirus (PRV) spread from fish farms to wild Pacific salmon in 1989, which may have endangered several salmon species to the point of near extinction.<sup>2</sup>

PRV is known to cause Heart and Skeletal Muscle Inflammation (HSMI) in salmon. The disease is causing substantial losses to the Norwegian farming industry, where it is spreading from farmed salmon to wild salmon. In one study<sup>3</sup> it was detected in 95% of farmed Atlantic salmon and up to 45% of wild salmon that were exposed to the salmon farms.

Even in regions farthest from salmon farms, researchers detected PRV in 5% of the wild salmon. The virus was discovered in 2010 and, according to researchers, “is now considered ubiquitous in marine farmed Atlantic salmon (*Salmo salar*) in Norway and British Columbia (BC), Canada.”<sup>4</sup>

## **Farmed Salmon ‘Likely’ Transmitting Virus to Wild Salmon**

Farmed salmon are kept in large, netted enclosures where water is freely exchanged with the surrounding ocean. Researchers have long suspected that PRV was transferred from farmed salmon to wild Pacific salmon. They also believed the infection rates in **aquacultures** were influencing rates in wild salmon and posing a significant risk to wild salmon survival and reproduction.<sup>5</sup>

A study published in *Science Advances*<sup>6</sup> in May 2021 used genomic sequencing from strains isolated between 1988 to 2018. Based on their analysis they estimated that at least one strain of PRV was introduced into the Pacific in 1989. This introduction was potentially from the importation of eggs from an Icelandic farm.

Many of the Atlantic salmon farms in the northeast Pacific are along salmon migration routes, increasing the risk that wild salmon are near farmed salmon. However, the risk is not only from proximity to farms, but also from farmed salmon that escape into the wild.<sup>7</sup>

In fact, farmed salmon that escape from ocean net pens are so common that more than one-third of “wild-caught” salmon from the Faroe Islands, tucked between Iceland and Norway in the North Atlantic Ocean, are escaped farmed fish.<sup>8</sup>

Back in the Pacific, one research team analyzed the prevalence of PRV after the escape of 253,000 Atlantic salmon from a farm in Washington state,<sup>9</sup> finding it was close to 100%. Not only that, the PRV strain was "very similar to the PRV strain reported in farmed Atlantic salmon from the source hatchery in Iceland that was used to stock commercial aquaculture sites in Washington state."

Other studies have found PRV is nearly ubiquitous in salmon farmed in British Columbia, Canada.<sup>10</sup> Espen Rimstad, a fish virologist from Norwegian University of Life Sciences, spoke with a reporter from The Scientist. He was not part of the study, but commented that the study is:<sup>11</sup>

*"... describing something which has ... been suspected before: that PRV on the west coast of Canada and the United States [comes from] Atlantic salmon farming, and it arrived there approximately in the 1980s."*

## **Virus in Pacific Salmon May Contribute to Declining Population**

The population of Pacific salmon has been declining for nearly 30 years. Researchers have sought to identify the potential reasons in the hope that the population could be reestablished. According to The Scientist,<sup>12</sup> likely triggers have included overfishing, habitat destruction and climate change.

How much diseases, including PRV, have played a role in this has not yet been established. Gideon Mordecai from the University of British Columbia and lead researcher in the current study, spoke with The Scientist, saying:<sup>13</sup>

*"There are all sorts of reasons why there've been declines in salmon populations over the last few decades. I'm not saying viruses rule the world and do everything. But it's one thing which we are in control of since we're the ones doing the farming."*

The number and diversity of salmon in Northern British Columbia have declined nearly 70% over the past 100 years. Data from a recent study<sup>14</sup> published in the Journal of Applied Ecology compared current wild adult sockeye salmon scales against 100-year-

old scales. Using modern genetic tools, they reconstructed historical diversity and number for comparison. Michael Price, lead author, said in a press release:<sup>15</sup>

*"Our study provides a rare example of the extent of erosion of within-species biodiversity over the last century of human influence. That loss in abundance and diversity from wild populations has weakened the adaptive potential for salmon to survive and thrive in an increasingly variable environment influenced by climate change."*

Another research study<sup>16</sup> looked at the decline in body size of Pacific salmon based on 60 years of measurements and 12.5 million fish across Alaska. Declining size is associated with climate change and competition. Salmon that matured before 1990 were substantially larger than salmon that matured after 2010.

However, as a reporter from The Seattle Times<sup>17</sup> points out, the environmental impact of declining **wild salmon** is not just about fish. David Montgomery, geomorphologist at the University of Washington, notes that "fully one-third of the nitrogen" supply to old growth trees in Washington were supplied by the fish that swam up the river or were dragged onto the forest floor by bears and eagles.

Historically, adult salmon runs numbered between 10 and 16 million fish each year in the Northwest. Currently it is less than 5% of historic populations and 15 species of salmon and steelhead stock are listed as endangered species. This has led to a domino effect in the ecosystem since more than 135 other fish and wildlife benefit from wild salmon and steelhead.

## **Health Challenges With Farmed Salmon**

A growing interest in eating healthier food has driven up consumer demand for fish, including salmon. In fact, according to the Food and Agriculture Organization of the United Nations (FAO),<sup>18</sup> fish have become so popular that global demand jumped 122% from 1990 to 2018.

In 2017, the National Fisheries Institute (NFI) reported that seafood consumption in the U.S. was trending upward with salmon hitting the No. 2 spot, recording 2.18 pounds consumed annually per person.<sup>19</sup> By 2021 the same report found consumption of salmon had risen.<sup>20</sup> It was again in the No. 2 spot, just behind shrimp, with 3.1 pounds consumed annually per person.

As mentioned, [salmon's human health value depends greatly on its source](#). Wild-caught Alaskan salmon is a great source of omega-3 fats. But farmed salmon has more in common with junk food than with healthy food<sup>21</sup> – and, unfortunately, farm-raised salmon makes up more than 90% of salmon sold in U.S. supermarkets and served in restaurants.<sup>22</sup>

Not only that, testing showed that 43% of the salmon sold as wild-caught in your grocer or in restaurants was mislabeled<sup>23</sup> – often meaning the salmon was farm-raised and not wild-caught.

A key part of the problem lies with the diet of farmed salmon. In the wild, salmon eat marine life, including zooplankton, algae and other fish, which makes their meat rich with natural, omega-3 fats. Farmed salmon, on the other hand, eat a fish version of processed food pellets they wouldn't ordinarily eat in the wild, composed of plants, fishmeal and grain products like soybeans, with plant-derived oils partially replacing the natural omega-3s.<sup>24</sup>

Sometimes, the pellets might even contain chicken feathers, poultry litter, genetically modified yeast, chicken fat and dyes.<sup>25</sup> The dyes are to help the farmed salmon look more like their wild, pink cousins, as the pellets the farmed salmon eat are gray, which makes them gray, too, without the dyes.

In Nicolas Daniel's documentary "Fillet-Oh-Fish," he visits fish farms and factories around the world. You can watch the documentary at "[Why Farmed Salmon Are a Toxic 'Junk Food'](#)." On the farm, aquaculturists have attempted to simulate salmon's wild diet by putting eel and other fatty fish from the Baltic Sea in their pellets.

The problem is the Baltic is highly polluted and Sweden's food industry is required to warn consumers about the potential toxicity of eating fish from the Baltic.<sup>26</sup> Another

problem with fish food is the manufacturing process. When fatty fish are prepared and cooked to produce fish pellets, the protein meal and oil are separated. The oil has high levels of dioxins and PCBs.

According to the documentary, ethoxyquin is added to the protein powder as an antioxidant, which is one of the best-kept secrets in the fish food industry, and maybe one of the most toxic. Ethoxyquin was developed as a pesticide by Monsanto in the 1950s.<sup>27</sup>

Farmed salmon also have **higher levels of contaminants** than fish living in the wild,<sup>28</sup> as many toxins readily accumulate in fat. While some salmon farms may claim that farmed salmon contain fewer toxins than oily wild fish because of the special feed they get these days,<sup>29</sup> research shows that pollutants tested in salmon feed have included dioxins, PCBs, chlorinated pesticides and other drugs and chemicals.

One study<sup>30</sup> tested 700 salmon samples collected from around the world and PCB concentrations in farmed salmon are, on average, eight times higher than in wild salmon.

When the Environmental Working Group<sup>31</sup> tested farmed salmon purchased at U.S. grocery stores, they found it had on average 16 times more PCBs than wild salmon, four times more PCBs than beef and 3.4 times more PCBs than other types of seafood.

## **Omega-3 Fats Are Important to Good Health**

The nutritional content in farmed salmon is also seriously different from wild caught salmon. The farmed variety of fish has 52% more fat and 38% more calories than wild-caught salmon.<sup>32</sup> Additionally, farmed salmon have radically skewed ratios of omega-3 to **omega-6 fats**.

One-half a fillet of wild Atlantic salmon<sup>33</sup> has approximately 3,996 milligrams (mg) of omega-3 and 341 mg of omega-6. However, one-half a fillet of farmed salmon<sup>34</sup> in the Atlantic contains 4,961 mg of omega-3 and an astounding 1,944 mg of omega 6, which is over 5.5 times more than the omega-6 in wild salmon.

**Omega-3 fats** are important for many reasons. Humans evolved on a diet of a ratio of omega-6 to omega-3 fats of close to 1-to-1.<sup>35</sup> However, most western diets have a ratio 15-to-1 to 16.7-to-1.<sup>36</sup> The shift in fat ratio began during the industrial revolution when people began eating more omega-6 fats driven by the introduction of vegetable oils and cereal grains.

One study<sup>37</sup> published in January 2021 evaluated 100 individuals' omega-3 index and compared that against their COVID-19 outcomes. They found the risk of death from COVID in people who had lower levels of omega-3 fatty acids was at least as predictive as being 10 years older.

In addition, maintaining your omega-3 index within optimal levels can reduce your potential risk of all-cause mortality, cardiovascular disease and coronary heart disease, according to data published in 2018.<sup>38</sup> A second study<sup>39</sup> in 2020 explored the hypothesis that omega-3 fats in fish oil had a protective effect on cardiovascular health.

The researchers found that fish oil reduced the risk of all-cause mortality by 13% and the risk of cardiovascular disease mortality by 16%. A lesser-known benefit is in Type 1 diabetes.

One study<sup>40</sup> published in 2020 showed adults who tested positive for a marker for Type 1 diabetes could significantly reduce their risk of onset by eating omega-3 rich fatty fish. For a further discussion of the benefits of omega-3, see "[Lower Omega-3 Levels Correspond to COVID Deaths.](#)"

## **Choose Wild-Caught Over Farm-Raised Salmon**

Martin Krkosek, an ecologist at the University of Toronto, was not involved in the featured study analyzing the evolution of PRV in wild salmon. But, he believes other pathogens have taken the same route between farmed salmon and wild salmon. He told *The Scientist*:<sup>41</sup>

*"PRV is just the tip of the iceberg. It's one of dozens, if not hundreds, of species of viral and bacterial pathogens that we think are being passed back and forth*

*[between farmed and wild salmon.]”*

There are many reasons to avoid eating farmed fish. As I discussed in “[The High Cost of Salmon Farming](#),” toxic drugs and chemicals used in fish farming pollute the water and the fish, there is a significant environmental impact on wild fish and the marketing claims used by multinational farm companies are false and misleading.

I only recommend eating safer seafood choices such as wild-caught Alaskan salmon, [sardines](#), mackerel, anchovies and herring. These species have a low risk of contamination and yet are high in healthy omega-3 fats without the problems posed by fish farming.

You'll want to seek out sustainably harvested wild caught fish as well. Look for the Marine Stewardship Council (MSC) logo that features the letters MSC and a blue check mark in the shape of a fish. The logo ensures the seafood came from a responsible fishery that used sustainable fishing practices to minimize environmental impact.<sup>42</sup>

## Sources and References

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