Harmful Chemicals in Marine Fish Consumption
Max Nesins
Marine Biology 115

Abstract
This paper educates the reader to make a wise choice of buying a marine fish. The goal is to find a balance between healthy nutrients and harmful chemicals. The reader will be acquainted with the health benefits of fish consumption, and at the same time get a basic understanding of harmful toxins present in fish. Writing will reveal the process of bioaccumulation as well as potential threats from an overdose of toxins. In the end, the reader will get equipped with valuable knowledge to eliminate consumption of toxins while still getting the best nutrients out of the fish.

Health Benefits
Fish is an abundant source of nutrients which our bodies require on a weekly basis. It is a good way to get the protein regardless of how it is cooked. It contains a full list of vital minerals such as calcium, phosphorus, iron, zinc, iodine, magnesium, and potassium. Also, it is a great source of vitamin B2 (riboflavin) and vitamin D which plays a foundational role in bone development. Interesting thing is that there is one more benefit such as omega-3 fatty acids. We need to understand that there is no way how our bodies are capable to generate this acid naturally. The only way to receive it is to consume it with food. The good news is that it is fairly simple to do because any kind of fish contains them. The highest concentrations of omega-3 acids are in fatty fish. These acids can benefit a person’s cardiovascular system by lowering blood pressure and triglyceride levels as well as reduce the risk of heart attack, abnormal heart rhythms, and strokes. Consumption of a diet list is a decrease in risk of depression, ADHD, Alzheimer’s disease, and diabetes. It may prevent inflammation, reduce the risk of arthritis, and slow growth of plaque in arteries. It helps brains to work properly and plays a crucial role in the infant’s development of nerves and vision during pregnancy. (michigan.gov, 05/26/11, doh.wa.gov, 05/17/19).

Biaccumulation in Action
The big problem is that the synthetic compounds are persistent which implies that they are truly steady and don’t separate after some time. Since they don’t split down and leave, these synthetic compounds are a big issue when humans consume them. It holds even more value when we keep in mind that they are bioaccumulative and will build up in the human’s body just like in fish. As a consequence, toxins became part of the environment embedded in the natural food chain. If the person rarely eats fish and the chemical concentration is relatively low, then there is a certain probability that the body can dispose of some of the toxins. On the other hand, if a person consumes a decent amount of fish with a high concentration of chemicals, the body is going to be challenged to free the body. The good news is that 1980s, there was a study which declared that the percentage of chemical concentration was on 15-30 higher per decade than it is today. This implies that the regular fish that the person eats today has on 50% less synthetic compounds when contrasted with a similar fish eaten by the people of that time.” Fish retain contaminants from water, soil, and the nourishment they eat. Some of those contaminants are PCBs, DDT, dioxins, and mercury. All of them are persistent and part of the food chain. Probably the most known toxin today is mercury. It is stored in fish muscle or so-called fillfet. Other chemicals such as PCBs or dioxins are sometimes seen in the fat of the fish. PCBs are synthetic compounds which were once utilized in pressure containers and other electrical capacitors and transformers. It is not rare that in the bigger animals are found abnormal amounts of chemicals. For instance, one dolphin had 40 times more dangerous chemicals than the safe limit. Finally, DDT is a white, pesticide with no smell or taste, once generally used insects that carry diseases. (peta.org, 05/17/19, scripps.ucsd.edu. 02/03/19)

So then the reasonable inquiry emerges, how do contaminants get into fish? It all starts with toxic chemicals which end up in water supplies in various ways. Some come as an industrial waste discharged in the process of burning coal and other petroleum. Others as agricultural practices, or urban practices such as throwing products containing chemicals in the trash or washing down the sewer instead of proper recycling. As it all adds up, precipitations wash down synthetic compounds from the land and air into water stores. Once chemicals are in the water, they drew and settle into the sediment. There are many bacteria which live in the sediment and can convert the inorganic synthetic substances into a natural compound. The bacteria are good prey for plankton as well as other small creatures which are eaten by little fish, and then even by bigger fish. Eating smaller prey rewards predators with an additional dose of toxins which collects and stores in their bodies in the process of bioaccumulation. The strongest individuals of prey fish accumulate the chemicals over times higher chemical concentration than initially entered in water. Once chemicals are in fish, it is very likely that harmful chemicals will be transported in the human body after fish consumption. (michigan.gov, 05/26/11, doh.wa.gov, 05/17/19).

Chemicals
Besides the vast abundance of healthy nutrients in fish, consumers need to be educated that there is a serious threat to their present health if they consume fish without caution. Fish is a marine animal which is heavily consumed by several billion people worldwide. In some cultures, people eat fish every day while some have it about once a week. That is very important to make sure that people eat good quality food. The concerns around fish are not in regards to fish itself but in regards to chemicals which accumulate in the body of fish throughout their lifecycle. The difficulty is that the average consumer will not be able to tell a difference between a good fish and fish full of chemicals without special lab equipment.

In general, individuals around the globe devour 40 pounds of fish every year. In the countries bordering with the sea, this number tends to be even higher due to cultural identity. Regardless of the location, 40 pounds of contaminated fish every year, is enough to store a sufficient amount of toxins to have a high chance of developing disease or disability. The counter-argument which always comes is that there are many people who abundantly eat fish all their life long and there are no side effects. While that may be true, it does not grant safety to everyone. As mentioned before, toxins don’t leave the body but accumulate at an increased number. Definitely, not every person will become ill. There are always exclusions from the rule as few people might be okay after consumption of a toxic fish. But the general rule states that there is a high chance of getting sick from excess chemical build up in the body. It is impossible to know for sure who will get ill and who will be lucky. Hence, it is a wise choice to be aware of what fish people are buying. Two main factors which determine the final result is the dosage of toxins in the body and person’s DNA. Having an agreement that the damage to the health is done regardless of consumers will, it is a smart idea to be informed of potential health risks. Each toxin specializes in its own area of damage but some of them cross apply harms to the body. Such an example is mercury and PCBs which in excess amounts cause damage to the nervous system, immune system, and the brain. It adversely affects damaging adult’s health, those chemicals harm developing life in the mother’s womb which afterward may cause slower development and difficulties in learning new material. It may take more than half a decade for a childbearing mother’s organism to clean itself from PCB’s and 6-12 months to decrease the mercury levels. The mercury by itself can create damage to the cardiovascular system which in turn will cause even bigger problems. The other major chemical, PCBs stimulates additional list of problems. According to the research of the University of Illinois, people who eat more than 24 pounds of fish over the year, have issues with learning and remembering information which was given just half an hour ago. Other research indicates that this chemical stimulates the development of cancer in the liver and biliary tract. People should count it dangerous since it works as a stimulus for an assortment of sexual issues like barrenness. The DDT toxin is believed to cause cancer and diabetes while toxaphene primarily targets destruction of the immune system. The last chemical is selenium which human bodies indeed require to properly function but in big amounts, it damages the mild nerve, causes fatigue, hair loss, and is a common cause for increased nervousness. (peta.org, 05/17/19, doh.wa.gov, 05/17/19; michigan.gov, 05/26/11, oehha.ca.gov, 05/30/19)

Cut away the fat along the back
The worst part of eating fish is to remove all fat as quickly and easily as possible. It not only tastes much better, but it is also filled with harmful compounds which has several negative health effects. Some of the most dangerous compounds include PCBs, DDT, dioxins, and mercury. It is important to remove all the excess fat from the fish to ensure the healthiest form of eating fish. Following these steps will help to remove all the excess fat from the fish:

1. Cut off the head and tail of the fish.
2. Remove the skin from the fish.
3. Lay the fish on its side.
4. Make a cut from the top of the fish to the bottom of the fish.
5. Remove all the fat from the cut area.
6. Rinse the fish with clean water.

This picture explains the process of bioaccumulation. Source: (michigan.gov)

Work Cited

Consume Fish Wisely. (2019, May). Retrieved from https://www.michigan.gov/mdhhs/0,5885,7-26_114_58871_714794-.aspx


Source
For Adults
This picture visualizes general serving sizes for adults and children. Source: (oehha.ca.gov)

For Children
This picture shows the best way of cooking – on the grill. Source: (michigan.gov)

Safety Precautions
Once it is clear that the person may receive benefits and harms from the same fish, it is important to identify actions which will minimize harms and maximize benefit. There are several pieces of advice which every consumer needs to know and practice in their daily life. If it all starts with the right choice which fish to purchase. The rule of thumb is to stay away from fish which have either one of these characteristics: big, old, or fish that feeds at the bottom sediments. As older is the fish, as more toxins it absorbs or eats throughout its lifecycle. The same principle applies to its size, as bigger is the fish, as more toxic it collects by eating others. The problem with the sediment fish is that they feed upon the animals which consume chemical particles in the sediments, and therefore collect more and more toxins, storing them in the bodies. The best advice is not to buy relatively young, small sized fish that does not live at the bottom of the water body. The following advice relates to cooking. There is no harm that can be done when cooking fish with bare hands. Chemicals from fish will not be able to retain in humans skin. Every chemical such besides mercury residues in fat, skin, and inner organs of the fish. That is why the consumer can get rid of the majority of the chemicals by removing the skin, inner organs, and visible fat. The effectiveness of this step is up to 50% which makes it essential. Mercury remains in the skinless fillet, making it impossible to remove it with cooking. The only way to solve it is to come back to the first step and choose fish mindfully with the lowest concentration. The healthiest way to cook the fish is to use the grill so all fats full of chemicals will drip down and not seal toxins inside the fish as it’s the case with frying. An important note is to not add dripping fat to the food because the consumer’s goal is to get rid of it. The last cooking procedure is to fully cook the fish avoiding the risk of any living parasites entering your body. The last section will touch the base of how much should each person consume? At this point, it will depend on a person’s weight, age, sex, fish species, and the type of cooking. (doh.wa.gov, 05/17/19; oehha.ca.gov, 02/10/19; michigan.gov, 05/26/11).