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SEAFOOD HEALTH BENEFITS

According to recent results from the European Food Safety Authority, seafood has many health benefits:

- Seafood is an excellent source of energy and protein, containing all essential amino acids humans need;
- Seafood contributes to the intake of essential nutrients, such as iodine, selenium, calcium, and vitamins A and D, which have well established health benefits;
- Seafood is a valuable source of minerals and trace elements such as zinc, phosphorus, iron and copper, which are required by the body for a variety of functions;
- Seafood provides n-3 long-chain polyunsaturated fatty acids, which in contrast to other nutrients are obtained mainly from seafood. These include omega-3 fatty acids required for normal growth, to support immunity, and which can improve cardiovascular and brain health;
- In the general adult population, consumption of seafood, particularly fatty fish, lowers the risk of mortality from coronary heart disease;
- Consumption of about one to two servings of seafood per week and up to three to four servings of seafood per week during pregnancy has been associated with better functional outcomes of neurodevelopment in children compared to no consumption of seafood during pregnancy. However, during pregnancy, consumption of seafood species with a high mercury content (e.g. tuna, swordfish) should be limited and replaced with species low in methylmercury (e.g. sardines, anchovies, mackerel, trout);
- Seafood is a component of dietary patterns associated with good health.

Most European food-based dietary guidelines recommend two servings of seafood per week. This ensures the provision of key nutrients, especially omega-3, but also vitamin D, iodine and selenium.
ENVIRONMENTAL HAZARDS AND CHEMICALS
Problems related to chemical contamination of the environment are nearly all caused by humans. The dumping of hundreds of millions of tonnes of waste material from industrial processing, sludge from sewage treatment plants, agricultural drainage and raw untreated sewage into the ocean contributes to the contamination of coastal marine and freshwater environments. Various chemicals find their way from the aquatic environment into fish and other aquatic organisms. Other chemical contaminants affecting seafood include marine biotoxins, which are produced naturally in the ocean and coastal waters, mainly by toxic microalgae. Toxins from marine microalgae can be transferred along food webs and can accumulate in seafood.

SEAFOOD HEALTH RISKS
Although the consumption of seafood (following official recommendations) has many health benefits for humans, like other food types, it can also pose a potential health risk. Seafood health risks can arise from environmental contamination, and can be introduced directly by human activities, including mishandling food during preparation.

In Europe, all seafood intended for human consumption must comply with general health requirements ensuring that all seafood for sale is of good standard. Legislation has restricted contaminants that may end up in seafood from various stages in the production process or from contamination in the marine environment. Each EU country carries out a range of seafood monitoring programmes to ensure that all seafood products available in the market are of the highest quality regarding food safety standards.

In recent years, new seafood health risks have started to emerge. This ECsafeSEAFOOD guide informs consumers about these new risks, what plans are in place to manage them, and what they can do to prevent or minimise them.
Emerging chemical contaminants that ECsafeSEAFOOD has carried out research on include:

- Pharmaceuticals (PhACs) (e.g. the anti-inflammatory drug diclofenac, the sedative diazepam, the antibiotic azithromycin);
- Personal care products (e.g. galaxolide, a synthetic musk/fragrance used in cosmetics, and UV filters found in sunscreen);
- Toxic element species (e.g. inorganic arsenic, organic mercury, cadmium) – elements which occur naturally but become concentrated as a result of human activities such as mining and industrial processes;
- Polycyclic aromatic hydrocarbons (PAHs) – a group of chemicals that are released from burning coal, oil, gasoline, rubbish, tobacco, wood, or other organic substances;
- Brominated flame retardants (BFRs) – man-made chemicals used commonly in plastics, textiles and electrical equipment;
- Perfluorinated compounds (PFCs) – a large group of manufactured compounds that are widely used to make everyday products more resistant to stains, grease and water. They are also used in the aerospace, automotive, building and construction, and electronics industries;
- Plasticizers (e.g. bisphenol A (BPA), phthalates, Polychlorinated biphenyls (PCBs)) – substances which are added to a material to increase its flexibility, usually a plastic;
- Marine biotoxins (e.g. azaspiracids (AZA), okadaic acid (OA), tetrodotoxin (TTX)) – substances produced naturally by marine microorganisms, usually during harmful algal bloom events.

Currently, seafood is regularly controlled by efficient monitoring programmes for some environmental contaminants defined under European legislation (Regulation 1881/2006 and Directive 2006/113/EC) that provide data for management and risk assessment purposes. This includes PAHs, dioxins, PCBs, heavy metals (mercury, cadmium, lead) and radionuclides. However, little information is available for contaminants without maximum limits set by authorities. These are considered as priority contaminants, including BFRs, PFCs, pharmaceutical and personal care products, organochlorine pesticides, organotin compounds, phthalates, arsenic and mercury speciation, and marine biotoxins.

**What can you do?**

To reduce your exposure to environmental contaminants, consider the following advice:

- A healthy diet is a balanced diet. Eat a variety of fish, including one portion of fatty fish per week.
- Follow the recommended guidelines of eating two servings of seafood per week (EFSA 2014).
- Do not avoid fish all together, as the benefits outweigh any possible risks. Other food sources may also contain environmental contaminants, and often at a higher level than in seafood.

To help prevent the contamination of seafood by the above environmental contaminants, consumers could consider using personal care products that do not contain those contaminants. Even by making a small change in everyday life, it is possible to achieve big results in helping to protect the ocean and its sealife, and ultimately our health. Some practical examples of how you can help are at www.seachangeproject.eu.

- Use eco-friendly cleaning products.
- Dispose of chemicals properly.
- Avoid foods treated with synthetically manufactured pesticides.
- Do not discharge sewage from boats into coastal waters.
- Dispose of unused medicines responsibly by returning them to your local pharmacy.
MICROPLASTICS

More than 80% of the waste that ends up in our world’s oceans is generated on land. One of the main contributors to this waste is plastic. Plastic does not biodegrade easily and stays in our environment for a very long time, causing a serious problem. Nowadays many plastic recycling initiatives reduce the amount of plastic that ends up in the environment, ultimately keeping it out of the ocean. However, there is a certain type of plastic whose damaging effects to sealife are not yet fully understood: microplastics.

Microplastics:
- are small plastic particles (generally smaller than 5 mm)
- come from a variety of sources including personal care products like toothpaste, cleaning agents and industrial processes.
- have been found in seafood (such as fish, shrimp, and some shellfish), non-seafood products (e.g. honey, beer and table salt) and even in the air we breathe.

There is concern that these microplastics can accumulate up the marine food chain, and the risk is that humans may eventually ingest these microplastics when they eat (sea)food contaminated with microplastics.

At the moment, researchers do not fully understand the fate and toxicity of microplastics in humans, whatever way they have been ingested.

What is being done:
There is no current European Union-wide legislation specific to microplastics as contaminants in food, including seafood. However, there is a broad range of EU policies and legislation with regard to marine litter, covering sources and impacts.

The use of microbeads in cosmetics has already been phased out by many cosmetic companies and there are ongoing developments to ban the production and sales of personal care products containing microbeads completely.

What can you do?

✔ Avoid cosmetics that contain microbeads. Check for polyethylene (PE), polypropylene (PP), polyethylene terephthalate (PET), polymethyl methacrylate (PMMA), polytetrafluoroethylene (PTFE) and nylon.

✔ In general, take actions to stop plastic marine debris. For example, carry a reusable water bottle, refuse plastic drinking straws and use reusable shopping bags over disposable plastic bags.

✔ Spread the word. Talk to your family and friends and see what is happening on a local level to raise awareness of this important challenge.

For more useful tips, check out http://seachangeproject.eu/takeaction
A relatively new emerging biotoxin present in some species of fish in Europe is ciguatoxin, causing ciguatera in humans, resulting in gastrointestinal and neurological problems. During the last decade ciguatera has been reported in the Canary Islands and Madeira, two areas that were previously not affected. In these areas several ciguatera poisonings have been reported since 2008 after consumption of fish, mainly amberjack (Seriola species).

Regional public health authorities in the Canary Islands and Madeira have set up management procedures through local regulations in order to limit the consumption of fish which have a high risk of being contaminated with ciguatoxins and in the Canary Islands a monitoring programme for ciguatoxins has been established. Consumers in these areas should gather information locally on the established restrictions. Ciguatera is a hazard in other tropical areas for several species of fish and shellfish. Seafood may not be safe in countries that do not run monitoring programmes.
EFFECT OF COOKING ON HARMFUL CONTAMINANTS IN SEAFOOD

The ECsafeSEAFOOD project looked into the effect of cooking on the levels of several environmental contaminants in various seafood species. The table below gives you an understanding of what happens with the level of some contaminants in certain types of seafood when you cook them. Despite an increase, there is no need for concern as the levels still do not pose a health risk.

**Seafood Consumption: Effects of Cooking (Steaming)**

Cooking affects environmental contaminant levels of metals, (methylmercury, inorganic arsenic), perfluorinated compounds (PFCs), endocrine disruptors (EDCs: chemicals which can interfere with hormone systems e.g. pharmaceuticals, pesticides, plasticisers and dioxin compounds), brominated flame retardants (BFRs), musks, polycyclic aromatic hydrocarbons (PAHs), UV filters and biotoxins in seafood. Tested species were ranked according to the number of contaminants showing increased levels after cooking by steaming, from the lowest (canned mackerel) to the highest (mussels).

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<tr>
<th>METALS</th>
<th>PFCs</th>
<th>EDCs</th>
<th>BFRs</th>
<th>MUSKS</th>
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<td>Canned Mackerel</td>
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Steam increases the concentration of the specific contaminant level in particular seafood species, however these levels do not represent a potential health risk for consumers.
Although cooking can increase the concentration of certain environmental contaminants in some seafood species, the levels of environmental contaminants after cooking still pose no potential health risk for consumers. However, most marine toxins are not destroyed or deactivated by heat, meaning that cooking does not reduce their health risks for humans. In areas where fishing or gathering shellfish is permitted but where permanent or temporary restrictions exist for several seafood species, consumers should strictly follow the local guidance and never assume that prohibited species can be manipulated or cooked in order to reduce risks of contamination.

In general, seafood is a perishable food item, and as with all other food items consumers must pay attention to its careful handling overall.

**What can you do?**
- Keep it cold, keep it clean, store it quickly, prepare and cook it properly.
- Check the source - make sure the supplier or producer is above board.

**ECsafeSEAFOOD CONCLUSIONS**

Seafood is a high quality, safe and nutritious food. A diet rich in seafood contributes to a healthy life. Although contaminants of emerging concern can be found in seafood, the ECsafeSEAFOOD project research results indicate that the levels are low and do not pose a health risk for consumers, when eaten as part of a balanced diet. To ensure a balanced and healthy diet, consumers should diversify seafood consumption, prioritising species at the lower end of the food chain (e.g. mackerel, sardines) over higher level predatory fish. It is also recommended that consumers select species obtained from sustainable and responsible fishing and farming practices and harvested in areas in which environmental regulation mechanisms are implemented.
FISHCHOICE: New online tool to evaluate benefits and risks of seafood consumption

The ECsafeSEAFOOD project partners have developed an online tool that balances the benefits and risks associated with seafood consumption, taking the exposure to contaminants into consideration. The tool is called FISHCHOICE and is available at: www.fishchoice.eu.

Where to find additional information:

• The European Food Safety Authority (EFSA) has lots of interesting information about food in general, including seafood. See:
  • Scientific advice on nutrition, diet and allergens: efsa.europa.eu/en/science/nutrition

• EC legislation for the minimum labelling information requirements in food include:
  EC Regulation No 1224/2009;
  EC Regulation No 1169/2011;
  EC Regulation No 2283/2015

• EC legislation establishing the limits for contaminant levels in seafood can be found in the following policy document: EC Regulation No 1881/2006

Information for vulnerable groups:


• ECsafeSEAFOOD website (D2.7) Effect of processing seafood on levels and profiles of priority contaminants: http://www.ecsafeseafood.eu/images/ECsafeSEAFOOD/Results/D2.7-Effect_of_processing_seafood_on_levels_and_profiles_of_priority_contaminants_final.pdf


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ECsafeSEAFOOD has been assessing food safety issues related to priority contaminants present in seafood as a result of environmental contamination (including those originating from harmful algal blooms and those associated with marine litter) and evaluating their impact on public health.

Availability of safe and high-quality food is a growing public concern and research plays a very important role in ensuring consumer confidence in this sector. ECsafeSEAFOOD will provide scientific evidence to serve as a basis for further development of common food safety, public health, and environmental policies and measures, by seeking to establish a quantitative link between the contamination of the marine environment and that of seafood.

ECsafeSEAFOOD aims to increase consumer confidence through the provision of clear and practical communication and information, working in close collaboration with food safety authorities.

For more information, please visit the project website, www.ecsafeseafood.eu, or contact the project coordinator, Dr. António Marques, amarques@ipma.pt.

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HOW TO REFERENCE THIS GUIDE

Written permission is not required for the distribution or use of this guide. However, the author requests that reference to the guide, or any of the content therein, is cited as follows:


The ECsafeSEAFOOD project sincerely thanks the below organisations for their contribution to the validation of this document.

This guide is not intended as a comprehensive seafood safety guide. It is designed to provide information to assist decision-making regarding safe seafood consumption. It has been developed based on scientific evidence from the project, as well as the best available evidence at the time of development of this publication.
SAFE SEAFOOD – CONSUMER GUIDE

SOURCES:


• SeaChange (2016) www.seachangeproject.eu/ouroceanourhealth/take-action-checklist


