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Seafood may contain illness-causing bacteria, parasites and viruses. These micro-organisms may come from the environment (in soil or water), and are considered to be naturally present in fish, shellfish and water. Other sources include water pollution (sewage and dirty water), contamination by food handlers or the environment during processing or after production (post-processing contamination), during transportation, storage or at retail














































before the product is served. Contamination may occur directly from unsanitary equipment or processing, from food handlers poor hygiene, or from poor temperature control during either transportation or after cooking. Consumption of raw or undercooked seafood may result in many types of illness due to one of a number of micro-organisms that may be present. Cooking seafood (for example, oysters) eliminates most naturally occurring micro-organisms.

Sources of Fish and Shellfish Pathogens

| | Pathogen Name | | Primary Habitat | Transmission Sources | Seafoods Involved | Illness (note: gastroenteritis → vomiting, diarrhea, cramps) | |
|---|--|---|---|---|--|---|--------------------|
| V i r u s e s | | | | | | | |
| | Astrovirus | |  |  | all bivalves | gastroenteritis (mainly in children) | |
| | Enterovirus (polio, coxsackie, echo. entero) | |  |  | all bivalves | asymptomatic, muscle pain, meningitis, CNS | |
| | Hepatitis A virus | |  |  | all bivalves | viral hepatitis : liver damage, jaundice, and gastroenteritis | |
| | Hepatitis E virus | |  |  | all bivalves | self-limiting liver disease | |
| | Norovirus, Sapovirus | |  |  | all bivalves, significantly oysters | gastroenteritis | |
| | Parvoviridae | |  |  | all bivalves | gastroenteritis | |
| P a r a s i t e s | | | | | | | |
| | Roundworms - <i>Anisakis simplex</i> - <i>Pseudoterranova decipiens</i> | |  |  | raw fish | sudden onset vomiting, abdominal pain, diarrhea | |
| | Tapeworms - <i>Diphyllobothrium</i> spp. | |  |  | raw fish | vomiting, abdominal pain, diarrhea, anaemia | |
| | Trematodes - liver, lung & blood flukes | |  |  | raw seafood – crabs & molluscs | acute abdominal pain, diarrhea and liver, lung &/or heart damage | |
| | <i>Clonorchis</i> , <i>Opisthorchis</i> (liver flukes), <i>Paragonimus</i> ,(lung flukes) <i>Heterophyes</i> , <i>Metagonimus</i> (blood flukes) | | | | | | |
| Pictogram Key: | | | | | | | |
|  | Natural Water (fresh, estuarine or ocean) |  | Fish |  | Fish Processing Factory |  | Soil & Environment |
|  | Contaminated Water (sewage) |  | Shellfish |  | Food Handler (unwashed hands/ feces) |  | Restaurant |

Concerns with Bivalve Molluscs: records from past years demonstrate the majority of illnesses are due to the consumption of bivalve molluscs (oysters, clams, mussels). The eating of raw or under-cooked bivalves can be a particularly serious problem for persons with jaundice or persons with liver conditions at risk for serious illness such as cirrhosis, haemochromatosis, and chronic alcohol use.

Sources of Fish and Shellfish Pathogens

| | Pathogen Name | Primary Habitat | Transmission Sources | Seafoods Involved | Illness (note: gastroenteritis → vomiting, diarrhea, cramps) |
|-----------------|--------------------------------------|---|---|---|---|
| Bacteria | <i>Aeromonas hydrophila</i> |  |  | raw or undercooked shellfish – oysters | gastroenteritis |
| | <i>Bacillus cereus</i> |   |    | raw & cooked seafood (poor temp control) | gastroenteritis |
| | <i>Clostridium botulinum</i> |   |   | smoked, salted & fermented seafood | botulism |
| | <i>Escherichia coli</i> (pathogenic) |   |    | raw & undercooked seafood | gastroenteritis |
| | <i>Clostridium perfringens</i> |  |    | raw & cooked seafood (poor temp control) | gastroenteritis |
| | <i>Listeria monocytogenes</i> |  |   | raw & smoked fish | meningitis, bacteremia, febrile gastroenteritis |
| | <i>Plesiomonas shigelloides</i> |  |   | raw or undercooked seafoods | gastroenteritis |
| | <i>Salmonella</i> spp. |   |    | raw & undercooked seafood – esp. shrimp | gastroenteritis |
| | <i>Shigella</i> |   |  | shellfish- clams, shrimps | gastroenteritis |
| | <i>Staphylococcus aureus</i> |  |    | cooked seafood (poor temp control) | gastroenteritis |
| | <i>Vibrio parahaemolyticus</i> |  |   | raw or undercooked shellfish – esp. oysters (poor temp control) | gastroenteritis |
| | <i>Vibrio vulnificus</i> |  |  | raw oysters | wound infections, septicemia (esp. in vulnerable groups) |
| | <i>Vibrio cholerae</i> |  |  | shellfish, shrimp, crab | gastroenteritis, septicemia. range: self-limiting to severe diarrhea. |

Pictogram Key:

| | | | | | | | |
|---|---|---|-----------|---|--------------------------------------|---|--------------------|
|  | Natural Water (fresh, estuarine or ocean) |  | Fish |  | Fish Processing Factory |  | Soil & Environment |
|  | Contaminated Water (sewage) |  | Shellfish |  | Food Handler (unwashed hands/ feces) |  | Restaurant |

Available Controls: bacteria and viruses associated with fish products are usually destroyed when seafoods are cooked to an internal temperature of 90°C for 90 sec. However, these microorganisms can cause illness when present in seafoods consumed without cooking, or in re-contaminated cooked foods. Prevent cross-contamination of these products through good sanitation, personal hygiene, and seafood handling practices. Other "Fish Notes" are available that address these issues in more detail.

References:

1. Carter, M.J. 2005. J Appl Micro 98:1354-1380
2. Huss, H. 1997. Food Control 8(2):91-98
3. Lee et al, 2008. Ch14 Bacterial pathogens in seafood in *Improving Seafood Products for the Consumer*. CRC Press.
4. Lees, D. 2000. Int. J Food Micro 59:81-116

Updated March 2010