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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, diarrhoea, cramps)
Viruses	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
Parasites	Roundworms - <i>Anisakis simplex</i> - <i>Pseudoterranova decipiens</i>		 raw fish	sudden onset vomiting, abdominal pain, diarrhoea
	Tapeworms - <i>Diphyllobothrium</i> spp.		 raw fish	vomiting, abdominal pain, diarrhoea, anaemia
	Trematodes - liver, lung & blood flukes	 	  raw seafood – crabs & molluscs	acute abdominal pain, diarrhoea and liver, lung &/or heart damage
	<i>Clonorchis, Opisthorchis</i> (liver flukes), <i>Paragonimus</i> ,(lung flukes) <i>Heterophyes, 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

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BC Centre for Disease Control
An agency of the Provincial Health Services Authority

For further information please contact your Fish Safety Officer at 604.707.2458 | fpinfo@bccdc.ca or your local Health Authority

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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, diarrhoea, 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, bacteraemia, 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, septicaemia (esp. in vulnerable groups)		
	<i>Vibrio cholerae</i>		 	shellfish, shrimp, crab	Gastroenteritis, septicaemia. Range: self-limiting to severe diarrhoea.		
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:

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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