

## Best Practices for Producing Smoked Fish

Control Points (★Critical Control Points)		Monitoring Step	Monitoring Frequency	Critical Limits	Corrective Action
Receiving	<b>Lot Identity</b>	Obtain and retain purchase documentation to enable traceability of product throughout the process. Assign lot identity to enable traceability of product throughout the process.	Upon receipt of fish.	Accurate and complete documentation (e.g., purchase documentation, identifying lots, etc.) obtained and retained (i.e., for at least one full calendar year).	Reject fish unless required documentation is received. Discontinue use of supplier if documentation cannot be provided.
	<b>Storage Temperature</b>	Measure and record storage temperature to ensure critical limits are met.	At least daily.	If fresh product, fish temperature must be maintained between 0°C and 4°C. If frozen product, fish must be -18°C or colder.	Discard product when fish temperature exceeds 4°C. Adjust cooler/freezer temperature and re-ice fish as required.
Storing (Freezer & Cooler)	<b>Appropriate Product Storage</b>	Confirm processed and unprocessed fish are stored separately from each other to prevent cross-contamination. Confirm that no chemicals or cleaners are in storage unit.	At least daily.	No contact between processed, partially processed, and unprocessed fish products. No chemicals or cleaners in storage unit.	Discard if product appears contaminated. Remove chemicals or cleaners from storage unit.
	<b>Product Inspection</b>	Conduct sensory evaluation (e.g., smell, appearance, etc.) of incoming fish. Confirm unprocessed fish meets required storage temperature.	At least daily.	No processing of tainted, decomposed, or unwholesome fish. If fresh product, fish temperature must be maintained between 0°C and 4°C. If frozen product, fish must be -18°C or colder.	Adjust cooler/freezer temperature and re-ice fish as required. Discard tainted, decomposed, or unwholesome fish.
	<b>Rotation of Stock</b>	Confirm stock (processed and unprocessed) is rotated on a first in/first out basis (FIFO) to minimize storage time.	At least weekly.	Use non-frozen dressed fish for production within 5 days. Rotation system is followed.	Review and adjust procedures. Discard tainted, decomposed, or unwholesome fish.
Thawing	<b>Thawing frozen product</b>	Defrost frozen fish in a sanitary manner so as to preserve the wholesomeness of the fish. Confirm removal of all packaging materials.	For each batch.	Regardless of thawing method (e.g., air, continuous water-overflow tank, spray system, microwave tunnel), fish temperature must be maintained between 0°C and 4°C. Packaging materials removed and discarded.	Review and adjust procedures. Remove all packaging materials. Discard tainted, decomposed, or unwholesome fish.

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<b>Cutting</b>	<b>Fish Preparation</b>	Eviscerate fish in an area that is separate from other processing operations.  Wash fish thoroughly with a vigorous potable water spray or a continuous water-flow system to maintain fish wholesomeness.	For each batch.	Minimal disturbance of the intestinal tract contents.  Fish washed thoroughly with potable water.	Review and adjust procedures. Re-wash fish. Use potable water. Discard tainted, decomposed, or unwholesome fish.
	<b>Production Flow</b>	Confirm production time.	Ongoing.	Thawed fish should be eviscerated within a maximum of 2 hours from start to finish. Eviscerated/finished product should be brined within 30 minutes. Fish temperature must be maintained between 0°C and 4°C.	Review and adjust procedures. Place 'backed-up' product in cooler. Discard tainted, decomposed, or unwholesome fish.
<b>Brining</b>	<b>★Brining</b>	Confirm required brine strength. Confirm containers used are acceptable. Confirm brines are pre-chilled prior to use. Confirm fresh brine is used for each batch. Ensure brining process occurs in cooler. Brining procedures lasting longer than 4 hours are done in a refrigerated environment at less than 4°C. Confirm fish are batched by size, species, thickness.	For each batch.	All brines exceed 15% salt content. 3.5% WPS (water phase salt) achieved. <sup>1</sup> Brining to occur in cooler: <ul style="list-style-type: none"> <li>• for brining times longer than 4 hours, temperature of brines not to exceed 4°C.</li> <li>• for brining times less than 4 hours, temperature of brines not to exceed 15°C.</li> </ul> New brine required for each batch. Each batch to contain same species, similar thickness and uniform sized fish. Ensure that no salts or curing agents containing nitrates are being used.	Review and adjust procedures. Discard batch if brining critical limits not met. Discard tainted, decomposed, or unwholesome fish.
	<b>Ingredients</b>	Confirm ingredients are labelled and properly stored. Confirm ingredients are food grade. Confirm additives are approved for use on fish. <sup>2</sup>	Monthly.	Minimize potential for contamination through improperly stored ingredients. Use only food grade ingredients. Use only additives permitted for use on fish as per the CFIA list. <sup>2</sup>	Discard ingredients exposed to contamination. Discard ingredients not properly labelled. Discard ingredients that are not food grade. Discard additives that are not permitted for use on fish.

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Hot Smoking	★Cooking Time/ Temperature	Measure and record internal temperature to ensure critical limits are met.	For each batch.	Internal temperature of product (at thickest portion) must reach minimum temperature for required time in order to inactivate bacterial pathogens. <sup>1</sup>  For example: minimum 63°C for 30 min (or equivalent) to achieve control for <i>C. botulinum</i> and <i>Listeria monocytogenes</i> .	Reprocess to critical limit.  Discard tainted, decomposed, or unwholesome fish.
	★Cooling Time	Confirm batch is rapidly cooled after smoking process is complete.	For each batch.	Smoked fish cooled to: <ul style="list-style-type: none"> <li>• less than 10°C within 3 hrs after cooking <u>AND</u> less than 3°C within 12 hrs after cooking.<sup>3</sup></li> <li><u>OR</u></li> <li>• less than 20°C within 2 hrs after cooking <u>AND</u> less than 3°C within 4 hrs after cooking.<sup>4</sup></li> </ul>	Review and adjust procedures.  Discard batch if critical limits not met.  Discard tainted, decomposed, or unwholesome fish.
	Lot and Batch Identity	Maintain identity of each batch made from a specific lot to enable traceability of product throughout the process.	For each batch.	Each batch is uniquely identified (e.g., by date, batch number, etc.).	Review and adjust procedures.
	IF Product Testing	Consult with accredited lab to ensure correct sampling procedure.  Collect and submit representative sample for lab analysis depending on product (e.g., <i>Listeria</i> spp., <i>Staphylococcus</i> spp., etc.). <sup>5</sup>	At least annually or as directed.	Within acceptable guidelines. <sup>5</sup>	If bacteriological guidelines are exceeded, inform applicable Regional Health Authority or the Food Protection Branch with the Ministry of Agriculture.  Hold and segregate affected product.  Initiate recall of any suspect product.  Review and adjust procedures (including sanitation program) and re-sample.

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<b>Cold Smoking</b> (NOTE: for cold-smoking, temperature is a critical control point at most steps – see the processing temperature and time control step for details)	<b>★Product Freezing</b>	Confirm product is frozen to ensure parasite destruction. <sup>6</sup>  Measure and record time and temperature to ensure critical freezing limits have been met.	For each batch.  Minimum frozen storage requirements for fish intended for cold smoking: <sup>6</sup> <ul style="list-style-type: none"> <li>• Stored at –35°C for 15 hours</li> </ul> <u>OR</u> <ul style="list-style-type: none"> <li>• Stored at –20°C for 7 days</li> </ul> <u>OR</u> <ul style="list-style-type: none"> <li>• Stored at –35°C until solid <u>AND</u> then stored at –20°C for a minimum of 24 hours</li> </ul>	Freeze either before or after cold smoking process to the minimum frozen storage requirements.  Discard batch if critical limits not met.  Discard tainted, decomposed, or unwholesome fish.	
	<b>★Processing Time and Temperature</b>	Measure and record time and temperature throughout entire Cold Smoking Process (e.g., thawing, brining, cooling) to minimize pathogen growth and toxin formation. <sup>7</sup>	For each batch	Within acceptable guidelines. <sup>7</sup>	Discard batch if critical limits not met.  Discard tainted, decomposed, or unwholesome fish.  Review and adjust procedures.
	<b>★Cooling Time</b>	Confirm batch is rapidly cooled after smoking process is complete. <sup>3,4</sup>	For each batch.	Smoked fish cooled to: <ul style="list-style-type: none"> <li>• less than 10°C within 3 hrs after cooking <u>AND</u> less than 3°C within 12 hrs after cooking.<sup>3</sup></li> </ul> <u>OR</u> <ul style="list-style-type: none"> <li>• less than 20°C within 2 hrs after cooking <u>AND</u> less than 3°C within 4 hrs after cooking.<sup>4</sup></li> </ul>	Discard batch if critical limits not met.  Discard tainted, decomposed, or unwholesome fish.  Review and adjust procedures.
	<b>Lot and Batch Identity</b>	Maintain identity of each batch made from a specific lot to enable traceability of product throughout the process.	For each batch.	Each batch is uniquely identified (e.g., by date, batch number, etc.).	Review and adjust procedures.

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	<b>IF Product Testing</b>	Consult with accredited lab to ensure correct sampling procedure. Collect and submit representative sample for lab analysis depending on product (e.g., for water phase salt, water activity, pH, <i>Listeria</i> spp., <i>Staphylococcus</i> spp., etc.). <sup>5</sup>	At least annually or as directed.	Within acceptable guidelines. <sup>5</sup>	If bacteriological guidelines are exceeded, inform applicable Regional Health Authority or the Food Protection Branch with the Ministry of Agriculture. Hold and segregate affected product. Initiate recall of any suspect product. Review and adjust procedures (including sanitation program) and re-sample. Discard tainted, decomposed, or unwholesome fish.
<b>Packaging</b>	<b>★Packaging</b>	Confirm packaging material is approved by the Canadian Food Inspection Agency. Smoked fish products contained in oxygen permeable packaging must comply with <i>Food and Drugs Act</i> Regulation B.21.025). <sup>8</sup>	For each batch.	Use only approved packaging materials. <sup>8</sup> Vacuum packed smoked fish must: <ul style="list-style-type: none"> <li>• be labelled “Keep Frozen Prior to Use” if sold <u>frozen</u></li> </ul> <b>OR</b> <ul style="list-style-type: none"> <li>• be labelled “Keep Refrigerated”, packed in oxygen permeable packaging, and indicate validated durable life (displayed as a “best before date”) if sold <u>unfrozen</u></li> </ul>	Discard improperly packaged fish product. Discard tainted, decomposed, or unwholesome fish. Review and adjust procedures.
<b>Storage &amp; Shipping</b>	<b>★Product Temperature</b>	Measure and record storage and shipping temperature to ensure critical limits are met. <sup>8</sup>	Ongoing.	<ul style="list-style-type: none"> <li>• Unfrozen (e.g., refrigerated smoked fish) fish product temperature must not exceed 3°C (for cold-smoked) and 4°C (for hot-smoked).</li> <li>• Frozen fish product temperature must be -18°C or colder while in transit or stored within a facility.</li> </ul>	Adjust cooler/freezer temperature as required. Discard tainted, decomposed, or unwholesome fish. Review and adjust procedures.

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### References:

1. Food and Drug Administration (2011). "Fish and Fisheries Products Hazards and Controls Guidance " Fourth Edition. Retrieved May 13, 2013, from <http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/Seafood/ucm2018426.htm>.  
Ch. 13 – Clostridium botulinum toxin formation. Consult pg. 260 (WPS); pg. 265 (hot-smoking temperature);  
Appendix 4 - Bacterial pathogen growth and inactivation
2. Guide to Additives Permitted in Fish and Fish Products. Canadian Food Inspection Agency. Accessed May 13, 2013.  
<http://www.inspection.gc.ca/english/fssa/fispoi/product/additi/guidee.shtml>
3. Seafood Network Information Centre. Chapter 7: Smoked Fish and Fishery Products. Retrieved May 13, 2013 from  
<http://seafood.ucdavis.edu/haccp/compendium/chapt07.htm>
4. Canadian Retail Food Code. 2004. Section 3.3.6 Cooling. Retrieved May 13, 2013 from [www.cfis.agr.ca/english/regcode/frfsrc-amendmts/codeang-2004.pdf](http://www.cfis.agr.ca/english/regcode/frfsrc-amendmts/codeang-2004.pdf) Note: cooling is stated to 4°C. This amended to 3°C for *C. botulinum* control.
5. Canadian Food Inspection Agency. Fish Standards and Methods Manual. Appendix 2 - Bacteriological Guidelines for Fish and Fish Products. Retrieved May 13, 2013 from <http://www.inspection.gc.ca/food/fish-and-seafood/manuals/standards-and-methods/eng/1348608971859/1348609209602?chap=7#s17c7>
6. Food and Drug Administration (2011). "Fish and Fisheries Products Hazards and Controls Guidance " Fourth Edition. Retrieved May 13, 2013, from <http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/Seafood/ucm2018426.htm>.  
Ch. 5 – Parasites.
7. "Fish & Fishery Products Hazards & Controls Guidance", 4<sup>th</sup> Edition, Appendix 4, page 417.  
<http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/Seafood/ucm2018426.htm>
8. Canadian Food Inspection Agency (1993). "Smoked Fish Storage Conditions. Industry Bulletin"  
<http://www.inspection.gc.ca/food/retail-food/information-bulletins/smoked-fish/eng/1331662809395/1331662880980>