

# Pathogens of Concern

## and control methods for various product categories

(Including examples of foods that may need to be evaluated for time/temperature control needs for safety)

Product Category (Examples of possible food for evaluation)	Pathogens of Concern	Type of Process Control (Alone and in Combination)
<b>Meats and poultry</b> (fermented sausage)	<i>Clostridium botulinum</i> <sup>5</sup> and <i>Clostridium perfringens</i> , <i>Salmonella</i> spp., <i>enterohemorrhagic Escherichia coli</i> , <i>Campylobacter jejuni</i> , <i>Yersinia enterocolitica</i> , <i>Staphylococcus aureus</i> , <i>Listeria monocytogenes</i>	Time/temperature, pH, aw, preservatives, moisture protein ratio, fermentation, heat processing
<b>Fish and seafood</b> (smoked fish)	<i>Vibrio vulnificus</i> , <i>Vibrio parahaemolyticus</i> , <i>Vibrio cholerae</i> , <i>C. botulinum</i> <sup>5</sup> , <i>L. monocytogenes</i> , <i>Salmonella</i> spp., <i>Shigella</i> spp., <i>S. aureus</i>	Time/temperature, harvest site control, fermentation, pH, aw, water-phase salt, preservatives, drying, salting
<b>Fruits and vegetables</b> (peeled carrots)	<i>Salmonella</i> spp., <i>Shigella</i> spp., <i>enterohemorrhagic E. coli</i> , <i>L. monocytogenes</i> , <i>Bacillus cereus</i> , <i>C. botulinum</i> <sup>5</sup> , <i>Y. enterocolitica</i>	Production control (Good Agriculture Practices), time/temperature, cooking, preservation techniques
<b>Cereal grains and related products</b> (fresh pasta, focaccia bread)	<i>Salmonella</i> spp., <i>S. aureus</i> , <i>B. cereus</i> , <i>C. botulinum</i> <sup>5</sup>	Cooking, aw, pH, preservatives, time/temperature
<b>Fats, oils &amp; salad dressings</b> (garlic-in-oil)	<i>S. aureus</i> <sup>2</sup> , <i>Salmonella</i> spp. <sup>2</sup> , <i>B. cereus</i> <sup>2</sup> , <i>C. botulinum</i> <sup>2</sup>	pH, aw, salt
<b>Butter and margarine</b> (light salted butter)	<i>S. aureus</i> , <i>L. monocytogenes</i> , <i>Y. enterocolitica</i>	Production/raw ingredient quality control, moisture droplet size in the water-in-oil emulsion, water phase salt, aw
<b>Sugars and syrups</b> (light maple syrup)	<i>C. botulinum</i> <sup>3</sup>	aw, acidification (light syrups)
<b>Eggs and egg products</b> (meringue)	<i>Salmonella</i> spp. <sup>4</sup> , <i>L. monocytogenes</i> <sup>4</sup>	Production control, cooking/pasteurization, time/temperature
<b>Milk and milk products</b> (yogurt)	<i>Salmonella</i> spp. <sup>4</sup> , <i>L. monocytogenes</i> <sup>4</sup> , <i>enterohemorrhagic E. coli</i> <sup>4</sup> , <i>S. aureus</i> <sup>4</sup> , <i>B. cereus</i> (cells <sup>4</sup> and spores <sup>5</sup> ), <i>C. botulinum</i> (cells <sup>4</sup> and spores <sup>5</sup> ), <i>Campylobacter jejuni</i> <sup>4</sup>	Production control, time/temperature, cooking/pasteurization, aw, preservatives
<b>Cheese and cheese products</b> (Natural Swiss cheese)	<i>Salmonella</i> spp. <sup>4</sup> , <i>L. monocytogenes</i> <sup>4</sup> , <i>enterohemorrhagic E. coli</i> <sup>4</sup> , <i>S. aureus</i> <sup>4</sup> , <i>Shigella</i> spp. <sup>4</sup> , <i>C. botulinum</i> (cells <sup>4</sup> and spores <sup>5</sup> )	Production control, moisture content, aw, pasteurization, preservatives, pH
<b>Combination products</b> (cheese with vegetable pieces, pumpkin pie, stuffed pastry)	Variable, based on raw materials and processing	Variable, based on raw materials and product

\*Full text available at [www.fda.gov/Food/FoodScienceResearch/SafePracticesforFoodProcesses/ucm094147.htm](http://www.fda.gov/Food/FoodScienceResearch/SafePracticesforFoodProcesses/ucm094147.htm)



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