Occurrence of *Listeria monocytogenes* in traditionally processed fish in informal markets in Accra, Ghana

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INTRODUCTION
• *Listeria monocytogenes* is a pathogenic bacterium
  – Causes a highly fatal disease called *listeriosis*

• The organism is Gram-positive, rod-shaped, and non-spore forming.

• It is *ubiquitous* in nature - found in soil, dust, fresh and salt water, decaying vegetation, silage, slaughter house waste, sewage effluent, and as biofilms on food processing and hospital equipments

• About 2 to 10% of healthy individuals are asymptomatic carriers of the organism
• *L. monocytogenes* is considered the **leading cause of death** among food-borne bacterial pathogens, with a fatality rate of **20-30%**, and up to **75%** in highly immunocompromised individuals

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Illnesses</th>
<th>Deaths</th>
<th>% Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Campylobacter</em> spp.</td>
<td>10,539</td>
<td>99</td>
<td>0.95</td>
</tr>
<tr>
<td><em>Salmonella</em> non-typhoidal</td>
<td>15,608</td>
<td>553</td>
<td>3.54</td>
</tr>
<tr>
<td><em>L. monocytogenes</em></td>
<td>2,298</td>
<td>499</td>
<td>21.71</td>
</tr>
</tbody>
</table>

Table 1: Fatality of *L. monocytogenes* infection (CDC, 2000)
Some clinical manifestations of listeriosis

Septicaemia

Pre-term delivery
Foods frequently contaminated

- Whole milk, skim milk
- Soft cheese
- Processed meats, red meat
- Vacuum packaged beef and poultry products
- Lettuce
- Coleslaw, and
- Fried rice
- Smoked fish
- Salted fish
RATIONALE

- Ghana is a heavy consumer of fish
- Over 80% of fish landings are processed traditionally
- Smoked and salted fish are known to be vehicles for the transmission of *Listeria monocytogenes*
- No data on the occurrence of the pathogen in traditionally processed fish
OBJECTIVE

• To determine the presence and concentration of *Listeria monocytogenes* in
  – Hot-smoked fish (salmon, tuna, herrings)
  – Salted fish (*koobi, momoni, kako*)
  – Sundried sardines
METHODS
Sampling

- Twelve (12) samples of each fish product were purchased from four informal markets in Accra (Madina, Kaneshie, Agbogbloshie and Jamestown markets) for analysis.

- The United States Department of Agriculture (USDA) protocol for *L. monocytogenes* detection and enumeration was used.
**USDA Protocol**

- Sample enrichment in *Listeria* Enrichment broth for 24 hours at 35-37°C

- Secondary enrichment in Fraser broth for 24 hours at 35-37°C

- Plating on selective agar (Oxford) at 35-37°C for up to 48 hours

- Confirmation of presumptive *L. monocytogenes* isolates
Primary Enrichment
LEB, 37°C, 24h

Secondary Enrichment
Fraser, 37°C, 24h

Plating on Oxford or Chromagar, 37°C, 24-28h
• **Prevalence** was determined as the percentage of samples in which the organism was isolated.

• **Concentration** was expressed as the colony forming units of *L. monocytogenes* per gram of fish.

• Plates containing up to 150 colonies were considered useful for enumeration (HPA, 2009).
Overview

• *L. monocytogenes* was isolated in at least one sample of each product

• Counts were generally low

• Load: Smoked fish > salted fish > dried fish
Table 1: Prevalence* of *Listeria monocytogenes* in traditionally processed fish purchased from some informal markets in Accra

<table>
<thead>
<tr>
<th></th>
<th>KA</th>
<th>KO</th>
<th>MO</th>
<th>TU</th>
<th>SA</th>
<th>HR</th>
<th>DR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Madina</td>
<td>100</td>
<td>66.7</td>
<td>66.7</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Kaneshie</td>
<td>33.3</td>
<td>66.7</td>
<td>66.7</td>
<td>100</td>
<td>100</td>
<td>66.7</td>
<td>66.7</td>
</tr>
<tr>
<td>Jamestown</td>
<td>33.3</td>
<td>33.3</td>
<td>66.7</td>
<td>100</td>
<td>100</td>
<td>66.7</td>
<td>33.3</td>
</tr>
<tr>
<td>Agbogbloshie</td>
<td>66.7</td>
<td>33.3</td>
<td>33.3</td>
<td>66.7</td>
<td>100</td>
<td>66.7</td>
<td>33.3</td>
</tr>
</tbody>
</table>

KA-kako     KO-koobi   MO-momoni    TU-tuna
SA-salmon   HR-herrings DR-dried fish  * %
Fig. 1: Prevalence of *Listeria monocytogenes* in traditionally processed fish purchased from some informal markets in Accra

KA-kako  
SA-salmon  
KO-koobi  
HR-herrings  
MO-momoni  
DR-dried fish  
TU-tuna
Fig. 2: Average counts of *L. monocytogenes* in fish samples

**Type of fish**

KA-kako  KO-koobi  MO-momonii  TU-tuna  SA-salmon  HR-herrings  DR-dried fish

Department of Nutrition and Food Science, Univ. of Ghana
Table 2: Average counts* of *Listeria monocytogenes* in traditionally processed fish purchased from some informal markets in Accra

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<tr>
<td>Madina</td>
<td>7</td>
<td>6</td>
<td>3</td>
<td>21</td>
<td>29</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Kaneshie</td>
<td>6</td>
<td>9</td>
<td>5</td>
<td>17</td>
<td>15</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Jamestown</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>12</td>
<td>9</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Agbogloshie</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>10</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>14</td>
<td>16</td>
<td>5</td>
<td>1</td>
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* x10^2 CFU/g
Table 2: Average counts* of *Listeria monocytogenes* in traditionally processed fish purchased from some informal markets in Accra

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CONCLUSIONS

• *Listeria monocytogenes* is found in traditionally processed fish on informal markets in Accra, albeit in low concentrations

• Traditionally processed fish on informal markets *could* be potential vehicles for the transmission of *Listeria monocytogenes* to consumers
THANK YOU