Evaluation Of Microbiological Safety Of Ready-To-Eat Tilapia and Mackerel In Assiut City

Thesis Presented

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Submitted for

Master Degree in Veterinary Medical Sciences

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(Hygiene of Meat, Fish and Their Products and Animal By-products)

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2016

سورة طه : آية ١١٤

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List of Abbreviations

A. caviae	***Aeromonas caviae***
A. hydrophila	***Aeromonas hydrophila***
APHA	**American Public Health Association**
A. sobria	***Aeromonas sobria***
CDC	**Center for Disease Control and Prevention**
EFSA	**European Food Safety Authority**
ELISA	**Enzyme Linked Immunosorbent Assay**
FDA	**Food and Drug Administration**
hr	**hour**
ICMSF	**International Commission of Microbiological Specification for Foods**
L. monocytogenes	***Listeria monocytogenes***
LE	**Lemon extract**
RTE	**Ready-to-eat**
S. aureus	***Staphylococcus aureus***
SE	**Staphylococcal Enterotoxin**
SFP	**Staphylococcal Food Poisoning**

Conclusion and Recommendations

The obtained results of the present study showed that consumption of RTE fish especially grilled fish may be constitute a public health hazard, as it may be associated with food poisoning microorganisms such as *L. monocytogenes*, enterotoxigenic *S. aureus* and *A. hydrophila*.

The examined samples were contaminated with microorganisms because such products may receive more handling during preparation. So, the sanitation level had the major role and significant effect on determination the types of microorganisms existing in the final RTE fish products. Therefore, illness can be prevented by controlling the initial numbers of bacteria present; preventing the small numbers from growing; destroying the bacteria by proper cooking and avoiding post cooking contamination.

Also, the achieved results in this work decleared that lemon extract, cumin extract and thyme extract exhibited inhibitory activity against *L. monocytogenes* and *S. aureus*.

Within the tested antimicrobials, lemon extract was the most potent against *L. monocytogenes*. It had a bactericidal property against it, so it can be used as marinates on fish meat and other meats as well.

Finally, to improve the hygienic status of RTE fish and minimize the puplic health hazards associated with it the following recommendations should be followed:

1. During receiving and storage of raw fish:

1.1. Good quality raw material should be used in the preparation of RTE fish as the finished product substantially affected by the

characteristics of the fresh raw materials so raw materials should be obtained from reliable supplies.

1.2. Proper handling, preparation and refrigeration on storage of received raw fish till cooking.

2. Cooking of fish:

2.1. From the achieved results of this study, it could be concluded that lemon extract was effective on fish meat as antimicrobial and can be used as marinates.

2.2. Complete thawing of frozen fish before cooking should be accomplished**.**

2.3. Preparation and cooking of RTE fish should be carried out inside the restaurant away from the surrounding polluted environment.

2.4. Fish must be well cooked to permit internal temperature lethal to bacteria contaminating their raw material.

3. Holding of cooked fish:

3.1. Cooked fish should not be held at room temperature for more than 2 hours.

3.2. Cross contamination between raw fish containing pathogens and cooked fish should be avoided as possible as we can.

4. Personal sanitation:

4.1. Food handlers should have the necessary knowledge and skills to enable them to handle food hygienically.

4.2. Individuals with diarrhea, pustules on their hands or who are coughing should be excluded from food preparation, so the food

handlers should be healthy and have medical certificate and subjected periodically to thorough medical check.

4.3. Washing hands and utensils, as well as surfaces, using clean cloths or towels after each contact with raw food.

4.4. Eating raw or under cooked fish should be eliminated.

Summary

The present study was carried out to evaluate bacteriologically the prevalence of *Listeria* spp., *S. aureus* and *Aeromonas* spp. in RTE tilapia and mackerel in Assiut city.

A total of 200 random samples of RTE tilapia and mackerel fish from different restaurants in Assiut city represented as 50 grilled tilapia fish, 50 fried tilapia fish and 100 grilled mackerel fish samples.

The bacteriological examination of the grilled tilapia fish revealed that 3 samples were positive for *Listeria* spp. with a percentage 6%; which were identified as 1 (2%) *L. monocytogenes*, 1 (2%) *L. innocua* and 1 (2%) *L. welshimeri*. Also, 3 isolates of enterotoxigenic *S. aureus* with a percentage (33.3%) producing SEC only were identified from 9 (18%) coagulase positive *S. aureus*. The obtained results of *Aeromonas* spp. isolation showed that 6 samples were positive for *Aeromonas* spp. with an incidence 12%; identified as *A. hydrophila* (10%) and *A. sobria* (2%).

Regarding to the bacteriological status of the examined fried tilapia fish samples, this study revealed that the incidence of *Listeria* spp. was 4% represented as *L. innocua* (2%) and *L. grayi* (2%), while *L. monocytogenes* couldn't be isolated in the all examined samples. Also, the prevalence of coagulase positive *S. aureus* was 14% while these strains didn’t show any toxigenic capability. Concerning *Aeromonas* spp., the only isolated species from the examined samples was *A. hydrophila* with a percentage 6%, while other species failed to be recovered.

On the other hand, the investigation of the examined grilled mackerel fish samples revealed that the highest contamination by *Listeria* spp. with a percentage 14% represented as *L. monocytogenes* (4%), *L. innocua*

(6%), *L. welshimeri* (2%), *L. grayi* (1%) and *L. ivanonii* (1%). The achieved results revealed that out of 23 (23%) coagulase positive *S. aureus* strains isolated from the examined grilled mackerel fish samples, 4 strains were enterotoxigenic with an incidence of (17.3%) which produced SEA and SEC. Furthermore, the prevalence of *Aeromonas* spp. was 4% classified as *A. hydrophila* only.

An experimental study was conducted to investigate the antimicrobial activity of lemon exract (LE), cumin extract and thyme extract against the isolated *L. monocytogenes* and *S. aureus* in growth media and in fish meat (food model).

The results of the experimental study revealed that the MIC of Lemon extract was 12.5% for both *L. monocytogenes* and *S. aureus*, while the MLC was only for *L. monocytogenes* at a concentration 25%. Moreover, the MIC of cumin extract was 6.25% for both *L. monocytogenes* and *S. aureus*, while the MLC was only for *S. aureus* at a concentration 25%. Concerning the thyme extract, the MIC was 25% for both *L. monocytogenes* and *S. aureus*, while it had no any cidal properties against it.

When applied in food model, dipping of fish fillet pieces artificially contaminated with *L. monocytogenes* in lemon extract declined the population of *L. monocytogenes* from 2.5 $\log_{10}$ CFU/g cube(control) to undetectable level (treatment) just after dipping. Also, the LE was able to reverse the attachment of *L. monocytogenes* to fish meat fillet.

The public health importance of the isolated microorganisms *Listeria* spp., *S. aureus* and *Aeromonas* spp. as well as methods for protecting consumers were discussed.