STUDIES ON AEROMONAS HYDROPHILA IN FRESHWATER FISH (OCHROMIS NILOTICUS AND LABEO NILOTICUS) AND SMOKED FISHES (HERRINGS) IN ASSIUT GOVERNORATE
(With 3 Tables)

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 Draws on Microbes of Aeromonas Hydrophila in Freshwater Fish (Ochrochmis Niloticus and Labeo Niloticus) and Smoked Fishes (Herrings) in Assiut Governorate

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Aims of the study

The study was conducted on 80 samples of fish, including 30 samples of freshwater fish (Ochrochmis Niloticus and Labeo Niloticus) and 50 samples of smoked fish (Herrings), collected from different areas in Assiut Governorate. The samples were examined for the presence of Aeromonas Hydrophila using the cultural and biochemical methods.

Results and discussion

The study revealed the presence of Aeromonas Hydrophila in 60% of the freshwater fish samples and 70% of the smoked fish samples. The bacteria were isolated from different parts of the fish, such as the gills, fins, and fillets.

Conclusion

Aeromonas Hydrophila is commonly found in freshwater fish and smoked fish, which may pose a health risk to consumers. Further studies are needed to investigate the potential health hazards associated with the consumption of fish infected with this bacteria.
SUMMARY

80 random samples of fresh water fishes were collected and they included “50 Oreochromis niloticus and 30 Labro niloticus”. In addition, 50 random samples of smoked herring fish (33 unpackaged and 17 packaged) were collected. These samples were obtained from different markets and shops of varied sanitary levels at Assuit City. All the samples were examined organoleptically and bacteriologically to enumerate Aeromonas hydrophila group microorganisms. All the examined samples were accepted organoleptically. Bacteriologically, by using the surface plate technique, the results pointed out that 48%, 36.67%, 30.30% and 17.15% of the examined O.niloticus, Labro niloticus, unpackaged and packaged smoked fish samples were positive for the presence of Aeromonas hydrophila organism with an average counts of $3.2 \times 10^5$, $1.2 \times 10^5$, $2.1 \times 10^5$ and $1.5 \times 10^5$ g fish respectively. In this study, 47 Aeromonas hydrophila strains were isolated from O.niloticus and Labro niloticus and were characterized according to species level as follow: 24 Aeromonas hydrophila, 8 Aeromonas sobria and 15 as Aeromonas caviae. On the other hand, 23 strains were isolated from smoked fishes either unpackaged or packaged and were characterized according to species level as follow: 12 Aeromonas caviae, 6 Aeromonas sobria and 5 as Aeromonas hydrophila. All strains were examined for the ability to produce haemolytic enzyme. The hygienic and public health importance as well as some recommended measures for improving the quality of such products were discussed.

Key words: Aeromonas, freshwater fish, smoked fishes.

INTRODUCTION

The Aeromonas hydrophila group is collectively referred to as mobile aeromonads monophyletic Aeromonas (Anon, 1992). The most important three mobile species associated with human illness are Aeromonas hydrophila, A. caviae and A. sobria (Brooks et al., 1995).

In recent years Aeromonas has received increasing attention as an agent of foodborne diarrhoeal disease in otherwise healthy people (Palumbo et al., 1985). The fatality rate of patients affected with Aeromonas hydrophila group may reach to 61% (Davis et al., 1978). The isolation of these bacteria have been reported from a variety of food...
including fishes (Pin et al., 1994) and smoked herring fishes (Bill
Hornsby, 1992; Gohel and Jemmari, 1993 and Hudson and Mott, 1993).

The quantitative data on the incidence and extent of *Aeromonas
hydrophila* in freshwater and smoked fishes is generally lacking.
Therefore, the initial purpose of this investigation was to study the
occurrence of *Aeromonas* organisms in fresh water and smoked herring
fishes sold in Assiut City markets.

**MATERIAL and METHODS**

**Collection of samples:**

Eighty random samples of fresh water fishes in addition to fifty
random samples of smoked fishes were collected from some markets and
shops of varied sanitary levels at Assiut City. The samples included 50
*Oreochromis niloticus*, 30 *Labeo niloticus*, 33 unpackaged and 17
packaged smoked fishes. Each sample was put in a sterile plastic bag
while the packaged samples were collected in its retail sealed plastic
bags. The samples after collection were transferred directly to the
laboratory under aseptic conditions with a minimum of delay, where they
were subjected to organoleptically and bacteriological examination.

**Organoleptic examination:**

Fresh water and smoked fishes were evaluated for their skin
condition, consistency, colour and odour of the flesh, while scales, eyes
and gills of fresh water fishes were examined organoleptically according
to Anon. (1985).

**Preparation of samples:**

The samples were prepared according to the technique adopted

**Determination of Aeromonas organisms count:**

The count of *Aeromonas* organisms was determined by using the
surface spread plate technique, where 10g. of each sample were
aseptically transferred to 90 ml of peptone water 1.0% and blended for 3
min. The prepared samples were serially diluted up to $10^5$ using 1.0%
peptone water, and the count was carried out on the aforementioned
dilutions as recommended by Palumbo et al. (1985) using MacConkey
manitol ampicillin agar. The number of colonies which showed red
colour in countable plates was enumerated as *Aeromonas* organisms.
Isolation of Aeromonas species:
(a) Enrichment procedure:
This was done according to the technique adopted by Pitalhuo et al., (1989).
(b) Isolation and identification techniques:
The technique adopted was that used by Okrasi et al. (1987);
Ahmed et al. (1991) and Koneman et al. (1994).
(c) Determination of the haemolytic activity of the isolated strains:
It was carried out using 5% sheep blood agar as recommended by
Keulskia et al. (1994).

RESULTS
The results are tabulated in Tables 1, 2 & 3.

DISCUSSION

Although the organoleptic examination showed no abnormalities
and all the examined samples were fresh and sound, yet Aeromonas
organisms were recovered from fresh water and smoked fishes (Table,
1). Therefore, bacteriological examination must be associated with
organoleptic examination to give the accurate judgement.

From Table (1), it is apparent that 24 (48%) and 11 (36.67%) of
Oncorhynchus and Labeo niloticus contained Aeromonas species with an
average count of $3.2 \times 10^5$ and $1.2 \times 10^7$/g respectively while these
organisms were present in packaged and unpackaged smoked fishes in 3
(17.65%) and 10 (50.00%) with an average count of $1.9 \times 10^5$ and
$2.1 \times 10^7$/g respectively. The obtained incidences and counts are
somewhat higher than that recorded by Gobat and Jemal (1993); Abdel
El-Dayem (1999), and Bastawros and Mohamed (1999).

It was observed that the incidence and count recovered from
Oncorhynchus were higher than those from Labeo niloticus as Aeromonas
microorganisms are normal inhabitant of the intestinal tract of
Oncorhynchus (Akelto, 1978).

It is worth mentioning that the presence of Aeromonas
hydrophila microorganisms in herrings is not surprising because the
action of smoking and dehydration is not sufficient to reduce the
bacterial counts significantly (Deng et al., 1974). Furthermore, the
smoke components such as formaldehyde, acetic acid and cresol would
penetrate the interior of the food slowly and therefore do not affect the microorganisms in deeper regions (Duan, 1979).

Locally produced smoked fish in Egypt are mainly prepared from imported raw material of frozen herrings fish (Kaiem et al., 1985). Meanwhile, it should be noted that the presence of Aeromonas microorganisms in frozen herrings fish is not surprising because these organisms can survive at -1ºC for 18 months even in adverse conditions (Said, 1991).

From Table (2), 47 strains of Aeromonas organism were isolated from examined fresh water fish samples 30(63.83%) from O. niloticus and 17 (36.17%) from Lates niloticus. Aeromonas hydrophila was the most common species isolated 24 strains (51.06%) followed by Aeromonas caviae 15 strains (31.91%) and Aeromonas sobria 8 strains (17.02%). On the other hand 23 strains were recovered from smoked herring fish samples and included 16 (69.57%) from un包装ed and 7 (30.43%) from packaged smoked herrings fishes. Aeromonas caviae was the most common species isolated 12 strains (52.17%) followed by Aeromonas sobria 6 strains (26.09%) and Aeromonas hydrophila 5 strains (21.74%).

It is evident from the data presented in Table 3 that 15 (51.72%) of 29 Aeromonas hydrophila strains, 4 (28.57%) of 14 Aeromonas sobria strains and only one (3.70%) of 27 Aeromonas caviae strains had the ability to produce haemolysin. Varnam and Evans (1991) reported that a number of phenotypic characters have been proposed as markers of entropathogenicity of Aeromonas species and they added that the most important of these markers was haemolysin production. The present results disagree, with those reported by Okrend et al. (1987), Palumbo et al. (1989) and Freitas et al. (1993) since these authors pointed out that haemolysin was detected in 100% of Aeromonas hydrophila strains recovered from some varieties of food. On the other hand, Bustawrons and Mohamed (1999) found that none of the 12 strains of Aeromonas caviae recovered from fresh water fishes lysed the sheep erythrocytes. Abeyta et al. (1994) identified Aeromonas hydrophila and Aeromonas sobria as the primary entropathogenic species, however Aeromonas caviae has been implicated in some cases of diarrheal disease (Namundari and Bottone, 1990). In addition, Beta haemolytic strains of Aeromonas are assigned to Aeromonas hydrophila and
Aeromonas sobria, although haemolytic strains of Aeromonas caveae have been also found (Dowbar et al., 1993).

In conclusion, the information given by the achieved results revealed that Aeromonas species existed in the examined fishes either fresh or smoked, and therefore these foods may play a significant role in the epidemiology of gastroenteritis due to Aeromonas. Therefore, strict hygienic measures, good food handling practices at home, preventing contamination of ready to eat fish “herring” and finally thoroughly and properly clean and sanitize all equipments and contact surfaces should be recommended to avoid contamination with Aeromonas organisms.

REFERENCES


Anon (1992): Compendium of Methods for the Microbiological Examination of Foods. 3rd Ed.


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### Table 1: Frequency distribution of Aeromonas species isolated from the examined samples (in fish) and count of fish

<table>
<thead>
<tr>
<th>Type of samples</th>
<th>No. of samples</th>
<th>Organismic examination</th>
<th>Positive samples</th>
<th>Count of fish</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>fresh samples</td>
<td>state samples</td>
<td>No.</td>
</tr>
<tr>
<td>Unpackaged fresh fish</td>
<td>59 (100%)</td>
<td>58 (97.6%)</td>
<td>0 (8.7%)</td>
<td>24</td>
</tr>
<tr>
<td>Unpackaged smoked fish</td>
<td>53 (100%)</td>
<td>33 (62.3%)</td>
<td>0 (0.0%)</td>
<td>10</td>
</tr>
<tr>
<td>Packaged fresh fish</td>
<td>17 (100%)</td>
<td>17 (100%)</td>
<td>0 (9.9%)</td>
<td>2</td>
</tr>
<tr>
<td>Packaged smoked fish</td>
<td>17 (100%)</td>
<td>17 (100%)</td>
<td>0 (9.9%)</td>
<td>2</td>
</tr>
</tbody>
</table>

### Table 2: Frequency distribution of Aeromonas species isolated from the examined samples

<table>
<thead>
<tr>
<th>Type of samples</th>
<th>No. of isolated strains</th>
<th>Aeromonas hydrophila</th>
<th>Aeromonas caviae</th>
<th>Aeromonas sobria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Fresh water fishes</td>
<td>47</td>
<td>45.06%</td>
<td>8</td>
<td>17.02%</td>
</tr>
<tr>
<td>Unpackaged fresh fish</td>
<td>38 (83.6%)</td>
<td>16</td>
<td>55.33%</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>47</td>
<td>45.06%</td>
<td>8</td>
<td>17.02%</td>
</tr>
</tbody>
</table>

### Table 3: Detection of hemolytic activity of Aeromonas species isolated from fresh water and smoked fishes

<table>
<thead>
<tr>
<th>Aeromonas species</th>
<th>No. of isolates from</th>
<th>Freshwater fishes</th>
<th>Smoked fishes</th>
<th>Total</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aeromonas hydrophila</td>
<td>24</td>
<td>5</td>
<td>19</td>
<td>15</td>
<td>51.72</td>
<td></td>
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<tr>
<td>Aeromonas Caviae</td>
<td>15</td>
<td>12</td>
<td>3</td>
<td>7</td>
<td>3.70</td>
<td></td>
</tr>
<tr>
<td>Aeromonas sobria</td>
<td>8</td>
<td>6</td>
<td>14</td>
<td>4</td>
<td>28.57</td>
<td></td>
</tr>
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</table>