MOLECULAR CHARACTERIZATION OF SOME PATHOGENIC BACTERIA ISOLATED FROM MAYONNAISE

MARWA M.N. EL-GENDI and MANAL M. AMIN
Animal Health Research Institute (Assiut Provincial Lab.) Food Hygiene Department

ABSTRACT
The purpose of this study was to determine the molecular characterization of some pathogenic bacteria isolated from commercial and small producers mayonnaise sold in restaurants and supermarkets in Assiut governorate. In the present study, the samples were analyzed for the presence of Salmonella spp., listeria spp. and staphylococcus aureus and according to microbiological analysis, Salmonella spp., listeria monocytogenes and staph. aureus were detected in 3 of 40 (7.5%), 3 of 40 (7.5%) and 7 of 40 (17.5%) of examined samples of small producers mayonnaise, respectively. The examined samples of commercial mayonnaise were free from salmonella spp. and listeria spp. but staph. aureus could be detected in 2 samples in a percentage of 5%. The presumptive isolates were further confirmed by PCR using specific primers of Salmonella invA isolates, L. monocytogenes 16S rRNA gene and Staph. aureus clfA gene and serotyping of Salmonella. These results indicated that small producers mayonnaise samples may contain pathogenic bacteria and thereby represent a risk to the consumers in regard to foodborne diseases. Thus, it is essential to include the effective hygiene practices as an important safety measure in the production of small producers mayonnaise. Bacterial loads were detected in mayonnaise including hazardous bacteria in spite of a high acidity of the product. This high light the importance of improving production situations and hygienic status in ready to eat foods establishments.

Key words: Mayonnaise, Molecular characterization

INTRODUCTION

Recently, the issue of food contamination has triggered considerable interest in food safety, and the food industry is enforcing an increasing number of stringent regulations concerning acceptable foodborne pathogens. Mayonnaise is probably one of the most widely used sauces or condiments in the world today. It was first produced commercially in the early 1900s, and became popular in America from 1917 to 1927 (Harrison and Cunningham, 1985) and more recently in Japan where sales increased by 21 % a year from 1987 to 1990 (Brabant, 1992). Because of its low pH and high fat content, mayonnaise is relatively resistant to microbial spoilage. Mayonnaise is an oil-in-water emulsion and is traditionally prepared from a mixture of egg yolk, vinegar, oil and spices (especially mustard); it may also include salt, sugar or sweeteners, and other optional ingredients (Depree and Savage, 2001). Pasteurization causes little or no damage to the functional properties and does not affect the formation of stable mayonnaise (Palmer et al., 1969).

Mayonnaise is a relatively microbiologically stable product due to its high fat content and addition of acidic ingredients. Organic acids and other acidic ingredients are toxic to foodborne pathogens, they also contribute to the desirable flavor and, decrease the final pH of product (Fialova et al., 2008). Mayonnaise is widely consumed to such an extent that it form the foundation of one-half of all salad dressings and the basis of many other products (Xiong et al., 2002). Ready-to-eat (RTE) foods by Codex Alimentarius is any food or beverage that is normally consumed in its raw state or otherwise prepared into a form in which it is normally consumed without further processing (Forsythe, 2010). Mayonnaise is ready for consumption without additional preparation and cooking by consumers. Therefore presenting a potential microbiological risks to consumers (Hwang and Tamplin, 2005).

The mayoniasis typically has a low microbial count with no or a very limited contamination with microorganisms (Michles and Koning, 2000). Commercial Mayonnaise, microbiologically, have long shelf life and are extremely safe processed foods. The safety of such products is directly associated with synergistic formulation components of which aqueous phase acetic acid and total formula pH levels are considered the most essential in inactivating foodborne pathogens such as...
Salmonella and Staph. aureus (Erickson and Jenkis, 1991). The ability of pathogenic microorganisms to survive and grow at low temperatures may be important in food-borne infection, particularly when prepared foods are exposed for a long period of time in refrigeration cabinets (George and Levett, 1990). In addition, the pH of mayonnaise increases when it is added to the other foods.

The principal basis of concern is abusive handling of small producers mayonnaise by food handlers. Small producers mayonnaise could be cross-contaminated by contact with utensils, unclean table surface or raw ingredients, such as meats or vegetables. Mishandling of contaminated small producers mayonnaise enhanced the possibility of the presence of pathogenic organisms in the product (Gomez-Lucia et al., 1987).

Salmonella species are found worldwide and are universally recognized as zoonotic agents. Many foods particularly of animal origin and those subjected to sewage pollution, had been identified and must be taken into consideration as a vehicle for transmitting these pathogens to human being. The primary habitat of Salmonella is the intestinal tract of animals and humans. Egg is considered as an important vehicle for Salmonella causing human infection. Additionally, Salmonella species causes illness by means of infection, as they multiply in the small intestine, colonizing and subsequently invading the intestinal tissues, producing an enterotoxin and causing inflammatory reaction and diarrhea (ICMSF, 2006). Salmonella is the second most common of food borne illness. It is responsible for millions of cases of food borne illness a year (HGIC, 2000). The most important serotypes of Salmonella are Salmonella typhimurium and Salmonella enteritidis (Fashae et al., 2010 and Hendriksen et al., 2011).

Listeria monocytogenes is a foodborne pathogen that causes the severe disease listeriosis (Swaminathan and Gerner-Smidt, 2007 and Warriner and Namvar, 2009). Although the prevalence of listeriosis is low (0.52 cases per 100,000 population in the EU in 2014), the severity of the disease makes it one of the most important foodborne pathogens, both economically and with regard to public health (European Food Safety Authority, 2015). There are a variety of symptoms that may arise upon infection, including septicemia, meningitis, and gastroenteritis (Silk et al., 2012). In pregnant women, it may cause spontaneous abortion, premature labor, and neonatal disease (Ferreira et al., 2014). Although L. monocytogenes may survive mild heat treatment at <60 °C, it is relative sensitive to higher temperatures; e.g. D 71 °C<1s in foods (Lado and Yousef, 2007). Thus foods that are consumed without further heat treatment, so-called ready-to-eat foods, are the main sources for listeriosis outbreaks. The main contamination route for L. monocytogenes is through cross-contamination from equipment and machines to food during processing (Ferreira et al., 2014). L. monocytogenes possesses the ability to establish itself in equipment/production environments, and single strains of L. monocytogenes have been found to reoccur in production environments over periods of years (Carpentier and Cerf, 2011 and Ferreira et al., 2014). In addition to being able to survive a wide range of temperatures, Listeria spp. can grow in a variety of salt concentrations, high osmotic pressure, and low pH environments, but succumb to pasteurization (Milillo et al., 2012).

Staphylococcus aureus food poisoning is one of the most common types of food borne diseases worldwide, which caused by an intoxication resulting from the ingestion of food containing Staphylococcal enterotoxins, which is emetic, pyogenic and mitogenic, suppresses immunoglobulin secretion and enhances toxic shock (Stewart et al., 2002). On the other hand (Abeer, 1997) mentioned that Coagulase positive Staphylococcus aureus is considered the most important species of Staphylococci due to its pathogenicity and enterotoxin production which cause food intoxication. S. aureus have been shown to able to grow at low pH values. Nevertheless, in small producers mayonnasie, other factors besides pH should be taken into account when considering the potential risk of the product. Gomez-Lucia et al. (1990) demonstrated that S. aureus may grow at 22°C and sythesize enterotoxins in mayonnaise. Acidification is one of the methods commonly used in the food industry to control growth and survival of spoilage-causing and pathogenic microorganisms. However, it has been reported that microorganisms exposed to a moderately acidic environment may develop cells with increased resistance and longer survival time when transferred to a more acidic condition (Cheng et al., 2003).

The objectives of this study were to determine the molecular characterization of some pathogenic bacteria isolated from commercial and small producer mayonnaise.

MATERIALS AND METHODS

A) Collection of samples:
A total of eighty random samples of commercial and small producers mayonnaise (40 samples of each), were collected from different supermarkets and restaurants at Assiut Governorate. The collected samples were transferred directly to the laboratory in an ice box under complete aseptic conditions. The samples were immediately examined bacteriologically for the detection of Salmonella spp., Listeria spp. and staph. aureus.
B) Isolation of Salmonella (Quinn et al., 2002a): 25 ml of each well mixed mayonnaise sample were thoroughly mixed with 225 ml of sterile buffered peptone water. All samples were incubated at 35 °C for 24 ± 2 h. One hundred microliters from the pre-enriched sample was transferred to 10 ml of Rappaport Vassiliadis (RV) enrichment broth and incubated at 43 °C for 24 h. Loopsfuls from enriched RV broth were separately streaked onto each of xylose lysine deoxycholate (XLD) agar and Salmonella- Shigella (SS) agar plates and incubated at 37 °C for 24 h. Two or three of typical or a typical colonies (colorless with black center on SS standard colonies with black center on XLD) were selected from each selective medium and streaked onto nutrient agar slope which incubated at 37 °C for 24 h for further biochemical and serological identification.

Serological identification of Salmonellae: This part has been done in Serology Department in Animal Health Research Institute, El-Giza, Egypt. Serological identification of Salmonellae was carried out according to Kauffman – White scheme (Kauffman, 1974 and Popoff et al., 2004) for the determination of Somatic (O) and flagellar (H) antigens using Salmonella antiserum (DENKA SEIKEN Co., Japan).

C) Isolation and Identification of Listeria spp. according to the International Organization for Standardization (ISO11290-1, 2017). Briefly, a 25 g mayonnaise sample was aseptically homogenized in 225 ml pre-enrichment half-Fraser broth (CM0895, Oxoid Ltd) supplemented with half-Fraser supplement (SR0166E, Oxoid Ltd) in Stomacher bags (Seward Ltd, West Sussex, UK) for 30 s using a Stomacher circulator (Easy Mix, AES Laboratoire, Bruz, France), followed by incubation at 30°C for 24 h. Then 0.1 ml half-Fraser broth was added to 10 ml Fraser broth containing Fraser supplement and incubated at 37°C for 48 h. At the end of incubation, a loopful of Fraser broth was streaked on chromogenic Listeria agar (ALOA) supplemented with Brillance Listeria Differential Supplement (SR0228E, Oxoid Ltd) and incubated at 35°C for 24 to 48 h. L. monocytogenes appear as green–blue colonies surrounded by an opaque halo. For biochemical identification of L. monocytogenes, five suspected colonies from each plate were streaked on TSA (M290, Oxoid Ltd) supplemented by (0.6%) yeast extract (LP0021) and incubated at 37°C for 18–24 h.

Biochemical confirmation of L. monocytogenes: Suspected colonies were verified by Gram staining, catalase, oxidase, haemolysis and CAMP tests, motility, Methyl Red-Voges Proskauer (MR-VP) reactions, nitrate reduction and the production of acids from rhamnose, xylose and mannitol for the identification as described by ISO11290-1 (2017).

D) Isolation and Identification of Staph aureus according to Bennett and Lancette (2001): All the samples were prepared and enriched on Staphlococci broth for 20h at 35 °C and then inoculated onto Baird Parker Medium (Oxide, Basingstoke, England), and incubated aerobically at 37 °C for 24 h. The isolates were identified using established microbiological methods which included colony morphology, Gram staining and biochemical testing [catalase, coagulase and sugar fermentation (glucose, sucrose, lactose and mannitol)].

Identification and characterization of coagulase positive and negative Staphylococcus Species: the isolates were identified according to (ISO, 2003b).

Coagulase test according to (ISO, 2003b): Five colonies typical and atypical were selected from each plate. The selected colonies inoculated into 5ml Brain Heart Infusion broth. The tubes were incubated at 37°C for 24 hours. From which 0.1 ml was transferred to tubes containing 0.3 ml of sterile citrated rabbit plasma. Inoculated tubes were incubated at 37°C and examined for clot formation after 4 hours.

PCR techniques: DNA extraction. DNA extraction from samples was performed using the QIAamp DNA Mini kit (Qiagen, Germany, GmbH) with modifications from the manufacturer’s recommendations. Briefly, 200 µl of the sample suspension was incubated with 10 µl of proteinase K and 200 µl of lysis buffer at 56°C for 10 min. After incubation, 200 µl of 100% ethanol was added to the lysate. The sample was then washed and centrifuged following the manufacturer’s recommendations. Nucleic acid was eluted with 100 µl of elution buffer.

Oligonucleotide Primer. Primers used were supplied from Metabion (Germany) are listed in table (1 and 2).

PCR amplification. Primers were utilized in a 25-µl reaction containing 12.5 µl of EmeraldAmp Max PCR Master Mix (Takara, Japan), 1 µl of each primer of 20 pmol concentration, 4.5 µl of water, and 6 µl of DNA template. The reaction was performed in an Applied biosystem 2720 thermal cycler.

Analysis of the PCR Products. The products of PCR were separated by electrophoresis on 1.5% agarose gel (Applichem, Germany, GmbH) in 1x TBE buffer at room temperature using gradients of 5V/cm. For gel analysis, 20 µl of the products was loaded in each gel slot, GelPilot 100 bp and 100 bp plus DNA Ladders (Qiagen, Germany, GmbH) and generuler 100 bp ladder (Fermentas, Germany) were used to determine the fragment sizes. The gel was photographed by a gel documentation system (Alpha Innotech, Biometra) and the data was analyzed through computer software.
Table 1: Oligonucleotide primers sequences.

<table>
<thead>
<tr>
<th>Microbial agent</th>
<th>Target gene</th>
<th>Oligonucleotide Sequence (5' – 3' )</th>
<th>Amplified product size (pb)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Staph aureus</em></td>
<td>ClfA</td>
<td>GCAAAATCCAGCACAACAGGAAAAACGA</td>
<td>638</td>
<td>Mason et al., 2001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CTTGATCTCCAGCCATAATGGTGG</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>L. monocytogenes</em></td>
<td>16S Rrna</td>
<td>ggA CCG ggg CTA ATA CCg AAT gAT AA</td>
<td>1200</td>
<td>Kumar et al., 2015</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TTC ATg TAG gCg AgT TgC AgC CTA</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Salmonella</em></td>
<td>invA</td>
<td>GTGAAATTATCGCCAGCTTCCGGCAA</td>
<td>284</td>
<td>Oliveira et al., 2003</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TCATCGACCGCTAAAAGGAAACC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Cycling conditions of the different primers during cPCR.

<table>
<thead>
<tr>
<th>Microbial agent</th>
<th>Gene</th>
<th>Primary denaturation</th>
<th>Secondary denaturation</th>
<th>Annealing</th>
<th>Extension</th>
<th>No. of cycles</th>
<th>Final extension</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Staph aureus</em></td>
<td>ClfA</td>
<td>94˚C</td>
<td>94˚C</td>
<td>55˚C</td>
<td>72˚C</td>
<td>35</td>
<td>72˚C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 min.</td>
<td>30 sec.</td>
<td>40 sec.</td>
<td>45 sec.</td>
<td></td>
<td>10 min.</td>
</tr>
<tr>
<td><em>L. monocytogenes</em></td>
<td>16S Rrna</td>
<td>94˚C</td>
<td>94˚C</td>
<td>60˚C</td>
<td>72˚C</td>
<td>35</td>
<td>72˚C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 min.</td>
<td>30 sec.</td>
<td>40 sec.</td>
<td>1 min.</td>
<td></td>
<td>10 min.</td>
</tr>
<tr>
<td><em>Salmonella</em></td>
<td>invA</td>
<td>94˚C</td>
<td>94˚C</td>
<td>55˚C</td>
<td>72˚C</td>
<td>35</td>
<td>72˚C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 min.</td>
<td>30 sec.</td>
<td>40 sec.</td>
<td>30 sec.</td>
<td></td>
<td>7 min.</td>
</tr>
</tbody>
</table>

RESULTS

Table 3: Incidence of the isolated bacteria from examined samples:

<table>
<thead>
<tr>
<th>Examined samples</th>
<th>No.</th>
<th>%</th>
<th>No.</th>
<th>%</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial mayonnaise</td>
<td>40</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>5%</td>
</tr>
<tr>
<td>Small producers mayonnaise</td>
<td>40</td>
<td>3</td>
<td>7.5%</td>
<td>3</td>
<td>7.5%</td>
<td>7</td>
</tr>
</tbody>
</table>
Fig. 1: PCR result of *Salmonella invA* gene among isolates. Lane L: ladder, lane pos: control positive, lane neg: control negative lane 1, 2, 3 (+ve *Salmonella invA* gene).

Fig. 2: PCR result of *L. monocytogenes* 16S *Rrna* gene among *L. monocytogenes* isolates. Lane L: ladder, lane pos: control positive, lane neg: control negative lane 1, 2, 3 (+ve *L. monocytogenes* 16S *Rrna* gene).

Fig. 3: PCR result of *Staph aureus clfA* gene among Coagulase positive *S. aureus* isolates. Lane L: ladder, lane pos: control positive, lane neg: control negative lane 1 and 3 (+ve *Staph aureus clfA* gene). Lane 2 and 4 (-ve *Staph aureus clfA* gene).
DISCUSSION

Over the past few years, food safety has become very topical subject, eliciting a great deal of public concern elsewhere. As, certain food and their products particularly become contaminated with different microorganisms, likewise, mayonnaise which are palatable, nutritious, healthful and relatively inexpensive food used as appetizer. Poor personal hygiene causes more than 90% of the sanitation problems in food service industry. Also government statistics showed that improper hand washing alone accounts for more than 25% of all food borne illnesses (Weinstein, 1991).

The recorded results in Table 3 & Fig.1 showed that the percentage of salmonella spp. isolated from commercial and small producers mayonnaise were 0 and 7.5 %, respectively. Serological identification of isolated Salmonella in the examined positive small producers mayonnaise showed that the 3 isolates of salmonella spp. were Salmonella typhimurium. Contamination through food often occurs when organisms are introduced into food preparation areas and are allowed to multiply in food, e.g. due to insufficient storage temperatures, inadequate cooking or cross contamination of Ready to Eat food. Even infected food handlers may act as a cause of contamination for foodstuffs (Effimia, 2015). The genus Salmonella constitutes of two species: S. enterica and S. bongori. Salmonellosis in humans is usually described by severe fever, abdominal pain, nausea and sometimes vomiting. Symptoms are often minor and most infections are self-limiting, lasting a few days. Nevertheless, in some patients the infection may be more serious and associated with dehydration or septicemia. Mortality is typically low with less than 1% of reported cases being lethal. The usual reservoir of Salmonella is the intestinal tract of animals from where a variety of foodstuffs of both animal and plant origin may become contaminated with fecal organisms either directly or indirectly. Higher results were documented by Tayfur et al. (2013) who could isolate Salmonella from 26.3% from examined retail mayonnaise-base salads.

The most dangerous mayonnaise-contaminating microorganism is Salmonella. In Rio Grande do Sul (Brazil), homemade mayonnaise accounts for 17% cases of salmonellosis (Capalonga et al., 2014). Changes in pH and temperature can control the growth of Salmonella enteritidis (Keerthirathne et al., 2016), and the model describing the growth of this microorganism in mayonnaise at different temperatures has been proposed (Elia’s et al., 2016).

Food poisoning cases in New south Wales restaurant by Salmonella species Potsdam strain were attributed to shell egg-based Caesar salad dressing mayonnaise, a swab of a cap from a mayonnaise bottle collected and tested positive (Unicomb et al., 2003) Due to its ingredients mayonnaise regarded as source of many bacterial contaminants especially Salmonella spp. The survival of Salmonella spp. and Staph. aureus in mayonnaise is influenced by the pH of the mayonnaise and the choice of the acidulant used in preparation (Radford and Board, 1993).

Salmonella species although associated with eggs they were not isolated from any samples of commercial mayonnaise in this study. In the absence of heat treatment, and using much vinegar represent the main safety factor as it contributes in decreasing pH of the products especially most of mayonnaise samples were prepared from whole eggs which contain the alkaline egg white. Adding garlic (Allium sativum) also can lower bacterial content (Ross et al., 2001). Lemon due to citric acid can play a good role in minimizing Salmonella species in commercial mayonnaise products as suggested by Xiong et al. (2002). In addition, type of vegetable oil used could also affect survival of Salmonella species in mayonnaise as shown by Lock and Board (1996). Howard et al., 2012 said that the chances of outbreaks to occur are even greater, when high risk ingredients, such as raw eggs, are used to prepare a food product. Although improper storage seems to be an important risk factor for the occurrence of salmonellosis outbreaks linked to homemade mayonnaise, it should be highlighted that low cell concentrations of Salmonella can still cause infection (Gog et al., 2012).

The recorded results of the genus Listeria Table 3 & Fig. 2 declared that Listeria spp. could not be detected in the examined commercial mayonnaise and L. monocytogenes isolated from 7.5% of the examined small producers mayonnaise. The presence of L. monocytogenes in small producers mayonnaise indicated that they could be potential sources of listeriosis in humans because these types of foods are commonly eaten raw. There is a need for a more strict control measures in food hygiene and processing of food. The prevalence of Listeria species in small producers mayonnaise may be linked to the presence of the Listeria genus in natural environment, soil and surface water (Nightingale et al., 2004). The genus Listeria contains 10 species, L. monocytogenes, L. ivanovii, L. seeligeri, L. innocua, L. welshimeri, L. grayi, L. marthii, L. rocourtiae, L. fleischmannii and L. welhenstephanensis (Zhang et al., 2007 and Halter et al., 2012), among these species only L. monocytogenes and L. ivanovii are pathogenic (Liu, 2006). L. monocytogenes is an intracellular foodborne pathogen that causes listeriosis and severe infections in humans with high mortality rate, mainly in high risk groups including pregnant women, elderly people, babies, HIV and cancer patients.
The current results illustrated in Table 3 & Fig. 3 showed that Staph. aureus isolates were recovered from 5% (2/40) of commercial mayonnaise samples and 17.5% (7/40) of small producers mayonnaise samples. Similar results (17.4%) were registered (Tayfur et al., 2013) by PCR by using specific primer for (Staph aureus clfA), confirmed the presence of coagulase positive Staph aureus DNA. Staph. aureus is the principle cause of food poisoning and clinical infections in humans and animals (Chiang et al., 2006). Coagulase test was considered a primary test in identification of Staphylococcal spp. but diagnosis of these species needs many biochemical tests to guarantee a consistent results. (Quinn et al., 2002b) also coagulase positive Staphylococci have the same phenotypic characters so coagulase test not considered a single species-specific biochemical test (Sasaki et al., 2010). Staphylococci species isolated are a result of excessive handling during preparation of small scale producers mayonnaise and indicate the poor personal hygiene of food handlers. Staph. aureus is one of the major bacterial agents causing food borne diseases in human worldwide (EFSA, 2010). It is an opportunistic pathogen, which associated with food poisoning and food spoilage (Argudin et al., 2010). The storage at abusive temperature and inappropriate time periods, failure in hygienic practices and cross-contamination/ recontamination appear as the major risk factors for occurrence of foodborne disease outbreaks (Todd et al., 2007).

PCR play a confirmative role in detection of Salmonella spp., L. monocytogenes and Staph. aureus and focus a light on presence of pathogenic types of these isolates in small producers and commercial mayonnaise which consider a public health problem.

Our research showed that small scale producers mayonnaise was contaminated with pathogenic bacteria and confirmed by using PCR technique. This bacterial contamination of mayonnaise may come from the ingredients used in making mayonnaise like yoghurt, carrot, pepper, water, eggs, potato, and breadcrumbs. The eggs could be contaminated from the infected hens or their shells became contaminated from faecal matters from the hen, the lining of the nest or by washing water. Food handlers or food processor during cleaning and breaking of the egg shells, peeling of potatoes or garlic, carrot, or during mixing of yoghurt, vegetable oil, ketchup could be a major source of mayonnaise contamination especially in the recognized bad handling habits and low personal hygiene and sanitation conditions observed in food establishments from where samples were taken. Knives, mixing spoons, food utensils and surfaces which were used for holding different foods e.g meat and chicken could also act as sources of cross contamination as observed during mayonnaise preparation in dusty crowded environments.

CONCLUSION

Control of the safety and spoilage of small producers mayonnaise depends on these steps: There should be usage of cooked, blanched, or pasteurized animal products; vegetables should be washed and ensured that it is clean; usage of organic acids (acetic acid) to help keep pH low, strict hygiene in preparation, mixing, and storing small producers mayonnaise production under proper refrigeration and good hygienic practices represent negligible microbiological health hazards risks to consumers. The results of the present study clearly indicated that microbial quality and safety of small producers mayonnaise was unsatisfactory. The presences of organisms not only indicate poor hygiene but also itself may be pathogenic. The pathogenic bacteria such as Salmonella, listeria and staph. aureus may pass to the mayonnaise which suggests that mayonnaise should be considered as a vehicle for the transmission of potentially pathogenic bacteria.

RECOMMENDATION

1- Raw eggs used in homemade mayonnaise must be forbidden in the food control legislation, because the shells of eggs from the farms are contaminated by faecal matter from the hens and by the lining of the nest.
2- Hygienic situation of ready - to – eat - food establishment should be improved by food handler training and health education and enforcement of food safety laws, by ministry of health and public health inspectors in the localities.
3- The food control health inspector must insure the certain signs of good hygienic standards, such as clean toilets, clean cutlery or crockery, clean walls and floors, clean uniforms and fingernails, short or covered hair, valid medical card.
4- Wash hand basins and soap must be available in the room of food processing to help food handler to clean their hands.
5- Good sanitation in Cafeterias must be enforced by the public health inspector of the locality, because insects are vectors and transmitter of microorganisms.
6- Vegetables and spices must be cleaned with clean water.
7- Eggs used in homemade mayonnaise must be pasteurized as mentioned in the literature review.

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التوصيف الجزيئي لبعض البكتريا الممرضة المعزولة من المايونيز

مروره محمد نبيل الجندي ، مهندس محمد أمين
E-mail: ahmednofel125@yahoo.com Assiut University web-site: www.aun.edu.eg

تم إجراء هذه الدراسة على 80 عينة من المايونيز وتشمل عينة من كل من المايونيز التجاري وصغار المنتجين تم تجميعها من السوق ماركت ومتاجر ممحافظة أسوان، واستمتعت الدراسة على فحص هذه العينات لتواليات ميكروب السالمونيلا، السالمونيلا منوسيتيوجينز، والليكير العنقودي الذهبي حيث تم عزل بكتيريا السالمونيلا، والليكير العنقودي الذهبي من مايونيز صغار المنتجين، حيث كانت نسبة كنهاة 7.5% وعشرة لم تتم عزل أي من السالمونيلا أو الليكير من مايونيز التجارة الصناعي، وكانت نسبة عزل الليكير العنقودي الذهبي من المايونيز التجاري 5% كما تم التوصيف الجزيئي للميكروبات الممرضة من أنواع مختلفة للمايونيز باستخدام تفاعل البلمرة البلازم، وأوصت الدراسة بتطبيق الاتصالات الصحية للجديدة أثناء عملية إعداد وتجهيز مايونيز صغار المنتجين لتفادي تلوثها بيمييروك السالمونيلا والليكير والعنقودي الذهبي.