Microbiological quality of different varieties of Ready to Eat Foods retailed in Cairo area

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Abstract: One hundred and thirty five different predefined / reference strains of mold, yeast and foodborne pathogens were recovered by FS kits to check up the reliability of the kits to be used as a rapid test for ready to eat different foods. A total of one hundred sixty five samples of ready to eat foods (meat, carbohydrate, savory, salad, dairy) were collected from Cairo area restaurants and take away shops and were tested microbiologically by the conventional (CM) and FS (RM) methods. Microbiological analysis encompassed the pathogenic food borne bacteria and other microbiological criteria determining food safety and according to Communicable Disease and Public Health CDPH, 2000. The results of FS test were reliable for different varieties of ready to eat foods as a rapid method with the conventional methods for detecting foodborne microorganisms. The microbiological analysis revealed that the worst the quality was due to salad foods 70%, then cheese samples 40%, meat different categories 30%, and carbohydrate foods 15% fit out the CDPH, 2000. The main etiologies were due to the presence and high levels of Enterobacteriaceae members and the pathogens of *Salmonella spp, E. coli O157H7, S. aureus, B. cereus* and *L. monocytogenes*.

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Keywords: microbiologically; Enterobacteriaceae; *Salmonella spp,; E. coli O157H7, S. aureus, B. cereus.*

1. Introduction

Ready to eat food is an any food , including beverage, which is normally consumed in its raw state or any food handled, processed, mixed, cooked or otherwise prepared into a form in which it is normally consumed without further processing (CODEX STAN,1999). Catering, where ready to eat foods handled, is one of the largest industries in Egypt as in allover the whorled become more and more of outlets which are independently owned and operated. The small and medium size enterprise nature of the catering sector is demonstrated by the simple average that less than nine staff is employed per outlet (JHIC, 1998). The guidelines or the microbiological quality of some ready to eat foods at the point of sale reported by the Communicable Disease and Public Health , CDPH 2000 (Gilbert et al., 2000) incorporate many of provisional microbiological guidelines that were practical to use by microbiologists and environmental health officers throughout the United Kingdom. Eating out has increased considerably over recent years with tow thirds of population in 2000 occasionally or regularly using take away to eat out (COI, 2001). In Egypt consumption of ethnic foods (out side the home) continues to increase considerably with more purchases of popular foods and sandwiches. As in England, Sandwiches are a popular food; a fifth (20%) of the total market volume (1,796 million) of sandwiches are purchased from bars or cafes, and chicken sandwiches account for the third (12%) most sandwich filling (Taylor , 2001).

Food safety and suitability are assurance that food will not cause harm to the consumer and is acceptable for human when it is prepared and/or eaten according to its intended use (Codex Stan, 1999). Hence, inadequate cooking or reheating (50%), inappropriate storage (45%), and cross contamination (39%) have been identified as important contributory factors of foodborne outbreaks in England and Wales (Evans et al, 1998).

Although, ready to eat food samples collected for surveillance and monitoring purposes are often multi-component products for which there are no microbiological standards. Interpreting the significance of the types and levels of microorganisms reported when these foods are tested may therefore be difficult.

Again and according to the guidelines for the microbiological quality of some ready to eat foods sampled at the point of sale (CDPH, 2000), provided new guidelines identify five categories of food. The categories, 1 to 5, are based solely on expected aerobic colony counts, from $< 10^3$ cfu/g to not applicable, (NA) in addition to indicator organisms and pathogens.

Rapid methods for detection of pathogenic bacteria and their toxin in foods are considered as important food safety new developments during the last 10 years. Diagnostic kits, like API, enterotube

and Minitek etc., are one of these developments through the miniaturized system (Fung, 2002***)***. Food-system (FS) is a 24 – well microtiter plate miniaturized biochemical system containing desiccated biochemical substrates and culture media for detection and presumptive identification of pathogenic germs from food stuffs. The system provides detection and presumptive identification of: *Salmonella spp., Citrobacter spp., Proteus/ Providence spp., Pseudomonas spp., Staphylococcus aureus, Escherichia coli, Bacillus cereus, Listeria spp.*, yeasts and moulds. FS was used successfully in testing milk and milk products (Zeinab et al, 2009 and Hosny et al, 2010).

In this study, food system (FS) as miniaturized rapid microbiological kits for testing different Gram positive and Gram negative foodborne bacteria and mold & yeast as well in ready to eat foods retailed in Cairo area has been suggested ,in comparison with the conventional methods (CM), for easy and reliable routine work by the public health authorities. Furthermore, the point of microbiological evaluation of the Cairo retailed different ready to eat foods as meat, milk, carbohydrate and salad products is to determining their safety, quality and specifications .

2. Materials and Methods:

Test Strains: The following different strains of pathogenic & non – pathogenic microorganisms were obtained from Central Public Health laboratories (Ministry of Health) and isolates from different dairy products in our Laboratory. They were *Aspergillus* spp *Penicillin spp.* (mold), *Saccharomyces sp* (Yeast) – *Salmonella typhimurium*, Proteus *spp, Providence spp., Pseudomonas spp., Escherichia coli, Staphylococcus aureus, Bacillus cereus* and *Listeria monocytogens*.

Ready to eat food Samples collection:

One hundred and sixty five ready to eat food samples representing different varieties of meat group (60), salad and savor group (30), carbohydrate group (40) and white cheese group samples (35), were collected from different restaurants, street vendors and food shops Cairo market in sterile plastic bags. Samples were transferred to the laboratory in ice box and refrigerated until microbiological analysis.

Ready to eat food sample Preparation:

Each food sample, of meat group (60), salad and savor group (30), carbohydrate group (40) and white cheese group samples (35), as ready to eat foods, was mixed and homogenized in sterile mixer, mortar or flasks and diluted with saline or sodium citrate solutions to make the sufficient dilutions for the microbiological analysis.

Food System Kits: Miniaturized biochemical food-system, kits (micro titer plates) for identification of pathogenic germs were delivered from Liofilchem. Via Scozia-Zona Ind. Le-64026 Roseto D.A. (TE) Italy. **Methods of Analysis:**

Food-System method:

Preparation of the Sample:

An appropriate quantity of the cheese sample (10g) was homogenized in buffered peptone water (90ml) and incubated at 36º C, 24 hrs. Aliquot of 0.2ml of the sample was dispensed into the vial of the physiological solution contained in the kit, and 0.2ml (4 drops) of the sample suspension was transferred into each well of the system. The first wells 1- LDS, 2- H_2S and 3- UR was covered with 2 drops of Vaseline oil and the system was covered with the lid and incubated at 36º C for 18 – 24 hrs.

Presumptive Identification of foodborne Microorganisms by FS:

Salmonella spp. is detected by a change in colour from yellow to red in the well 1- LDS, by the change in colour from yellow to black in well 2- H_2S and by the yellow colour in well 3- UR. *Citrobacter spp.* is detected by the yellow colour of well 1- LDC, by the change in colour from yellow to black in well 2- H_2S and by the yellow colour in well 3- UR. *Proteus / Providence spp.* is detected by the yellow colour of well 1- LDC, by the change in colour from Yellow to red - fuchsia of well 3- UR. Confirmation of *Proteus / Providence spp*. is provided by the change in colour from yellow to brown - black of well 4 - PRO. *Pseudomonas spp.* is detected by the change in colour from yellow to turbid green of well 5- PSE. *Staphylococcus aureus* is revealed by the appearance of a black ring in the button of well 6 - STA. *Escherichia coli* is apparent by the change of red to blue colour in well 7- ESC and by the appearance of a pink- red ring following the addition of kovac's reagent to well 8- IND. *Bacillus cereus* is detected by the change from yellow to turbid green colour in well 9- BCE. *Listeria spp.* is apparent from the change yellow to black colour in well 10- Lis and by the development of bubbles following addition of H_2O_2 reagent to well 11- CAT. Yeasts and moulds are detected by the change from green to yellow colour in well 12- Y/M and observation under the microscope of mycelia strands (hyphae) and chlamydospores.

Methods of conventional microbiological (CM) analysis:

Aerobic colony bacterial count (ACC):

The aerobic colony count (ACC) was carried out as the conventional method *(FDA, 2002)* using plate count agar (Oxoid). After 48 ± 2h incubation at 35± 1Cº colony forming units were accounted and calculated per gram of sample.

Molds and yeasts counts:

Enumeration and counts of yeasts and molds were carried out in the samples using the media of acidified potato dextrose agar (Oxoid). The method recommended by FDA (2002) was followed up. Plates were incubated at 22-25º C for 3-5 days, and colonies of yeasts and molds were accounted and calculated per gram of sample.

Detection of *Listeria monocytogenes:*

Each sample (25g) was homogenized and mixed with 225ml tryptose soy broth (fluka, Switzerland) supplemented with yeast extract and listeria selective enrichment supplement (Oxoid), in 500ml flasks. (Lovett et al, 1987). Flasks incubated at 30º C for 7 day. Every day a plate of oxford agar base (Oxoid) supplemented with listeria supplement was streaked from each of an enrichment flask and incubated at 35º C for 48h as reported by Curtis et al (1989). Suspected colonies were picked up and propagated for further specific morphological, biochemical and serological tests as recommended by FDA (2002).

Detection and Enumeration of *Staphylococcus aureus:*

Enumeration of *S. aureus* in the samples was carried out by spreading 0.l ml of each of sufficient (expected) dilution onto the surface agar media. Baird Parker media (Fluka, Switzerland) supplemented with egg yolk and potassium telurite solution was used for enumeration as the method and media were recommended by APHA (1976) and FDA (2002).

Detection and Enumeration of *Bacillus cereus:*

Bacillus cereus was determined by the surface plating technique onto the manitol egg yolk - polymyxin ager (MYPA, Oxoid 2005). The suspected colonies peacock blue - coloured and surrounded by a zone of precipitation of egg yolk *(Holbrook & Anderson, 1980)* were further tested for specific identification according to FDA (2002).

Determination of Coliform and *Escherichia Coli:*

Coliform group was determined using solid medium method onto plates of violet red bile agar (VRBA) (Difco) according to the method reported by FDA (2002). Plates were incubated 24h at 32- 35º C. A portion of purple red colonies (5/ a plate) per each plate was transferred (loopful) into tubes of MacConkey broth medium (Oxoid,England.) which were incubated at 35º C. Positive acid and gas tubes, after 24 and/or 48h, where further transferred into EC broth which in turn are incubated at 45.5º C for 48h. Positive tubes were streaked onto MacConkey agar (Merck, Germany) according to APHA (1976). Suspected red colonies were tested for IMVIC test ++ - - for typical *E.coli*. Enteropathogenic & enterotoxigenic *E.coli* identification within the (+) IMVIC test isolates were examined using the serological reactions and indicators.

Detection of *Escherichia Coli O157: H7:*

Samples dilutions were spread onto plates of medium Sorbitol Mac Conkey agar (Oxoid, England). After 18-24h at 35º C incubation, sorbitol negative colonies (pale - coloured, typical E. coli 0157: H7) were serologically tested, as outlined by FAD (2002).

Isolation and identification of *Salmonellae*:

Aseptically 25g of each sample was mixed with 225ml of sterile lactose broth and incubated at 35º C for 24h.A 1ml to 10ml mixture was transferred to selenite cystein broth (SC) (Oxoid) and incubated at 35º C for 72h. Plates of *Salmonella & Shigella* ager (SS) were streaked every day and incubated at 35º C for 24h. Lactose negative suspected *Salmonella or Shigella spp*. were biochemically and serologically identified according to FDA (2002) and APHA (1976) using the recent reagent kits.

Isolation and Identification of other Members of Enterobacteriaceae:

The non - lactose ferementers of the gram negative bacilli : *Citrobacter spp, Pseudomonas spp., Proteus / Providencia spp.* were isolated onto MacConkey agar and SS agar as described for *Salmonella* onto TSI agar and the other biochemical Tests (FDA,1992) .

Isolation and identification of *Campylobacter jejuni*:

Twenty five gram of each cheese sample were mixed with 100ml Preston enrichment medium (Bolton et al., 1983), followed by incubation for 18 h at 42 C under microaerophilic conditions (Doyle and Roman, 1982) .Thereafter, the resulting cultures were streaked onto plates of campylobacter blood free selective medium supplemented with cetoperazone (Oxoid, SR 125) .Plates were incubated under microaerophilic condition at 42C for 24 h according to Bolton et al., (1984). Isolation and confirmation of C. jejuni was carried out according to Smibert (1984).

3. **Results and Discussion**

Recovery of the test strains by FS system:

One hundred and thirty five different predefined/ reference strains of mold, yeast and foodborne pathogens were recovered by FS test to check up the reliability of these kits to be used as a rapid test for ready to eat different foods; results are shown in Table (1) and Fig. (1).

For mold and yeast, results of applying FS for mold / yeast with different strains are shown in Table (1), Fig (1). Results reveal a strict and very close conformity (100 %) and reactivity of Y/M (12) of FS with different strains of mold and yeast.

Concerning the Gram negative pathogens, application of FS for G-ve pathogens with pre-

defined different strains are shown in table (1), fig (1). Results reveal that except *E. coli* strains, G-ve pathogens identified by FS showed high identity with the pre-defined strains. Since, *Salmonella spp, Pseudomonas spp* appeared in 80 and 78% of the strains; while *Citrobacter spp* and *Proteus / Providence* were in 100%. Only, *E. coli* showed the lowest reactivity (55%) among G-ve pathogens.

For the Gram positive pathogens: the lowest the reactivity of FS was shown for G+ve pathogens with different strains (table 1, figure 1) . Results reveal that *S. aureus*, the most common G-ve pathogen, appeared in 60% of the strains followed by *B. cereus* and *Listeria spp,* 33% each. This is indicated the unreliability of FS for the later bacteria.

In conclusion FS with pre-defined culture strains emphasizes the recommendations which have been taken through its application with different dairy products. As good as enough, this test would be used as it fulfilled the minimal and general requirements given by. Fung (1992 & 2000). However, the classic methods are still the main, reference and official microbiological assays.

Food system (FS), the rapid method (RM), for testing food borne bacteria in different varieties of ready to eat foods:

A total of one hundred sixty five samples of different varieties of ready to eat foods (uncooked or cooked foods) were collected from Cairo area restaurants, take away shops, street vendor and were tested microbiologically by the conventional (CM) and FS (RM) methods. Microbiological analysis encompassed ACC, indicator bacteria and the pathogenic food borne bacteria and other criteria determining food safety according to the Egyptian Public Health Laboratories, ministry of Health and Communicable Disease and Public Health (CDPH, PHLS, Gilbert et al., 2000).

Meat group, results as shown in table (2) and figure (2) reveal incidence of food borne bacteria in 60 samples of meats foods (cooked and uncooked) as ready to eat foods that categorized according to CDPH,2000. The *Enterobacteriaceae* bacteria, as one of the criteria required by CDPH, 2000 (Table, 6) for ready to eat foods, were found in ~ 21.6% of meat samples by FS or 46.6 % by CM. Also, *E.coli* and *Salmonella* spp were detected in 6.6 % and 3.3 % of the samples by FS and 11.6% and 3.3% by CM, respectively. Foodborne enterotoxic bacteria as *S. aureus* and *B. cereus* were found in meat products in 3.3% and 1.6% by FS and 3.3 and 3.3% by CM, respectively. Also, *Listeria monocytogenes* was detected in 1.6 % of the total meat products by both of FS and CM methods.

Carbohydrate food, results as shown in table (3) and figure (3) reveal the incidence of food borne bacteria in 40 samples of carbohydrate foods as ready to eat foods that categorized according to CDPH,2000 (Table,6). The *Enterobacteriaceae* bacteria, as one of the criteria required by CDPH, 2000 for ready to eat foods , were found in 15% of carbohydrate food samples by FS or 40% by CM. Also, *E.coli* was detected in 5 % and 12.5% of the samples by FS and CM, respectively. Enterotoxin foodborne bacteria as *S. aureus* and *B. cereus* were found in carbohydrate food products in 2.5%, 5% by FS and 5%, 5% by CM, respectively. Meanwhile, *Listeria monocytogenes* and *Salmonella* were not detected in all of the carbohydrate food products by either of FS or CM methods.

Salad and savory, results as shown in table (4) and figure (4) reveal the incidence of food borne bacteria in 30 samples of salad foods as ready to eat foods that categorized according to CDPH, 2000 (Table, 6). The *Enterobacteriaceae* bacteria, as one of the criteria required by CDPH, 2000 for ready to eat foods , were found in 23% of salad and savory food samples by FS or 70% by CM. Also, *E.coli* was detected in 20 % and 40% of the samples by FS and CM, respectively. Enterotoxin foodborne bacteria as *S. aureus* and *B. cereus* were found in salad food products in 6.6%, 3.3% by FS and similarly by CM, 6.6%, and 3.3%, respectively. Meanwhile, *Listeria monocytogenes* has been detected in 6.6% by either of FS or CM. However, *Salmonella* spp was not detected in all of the salad food products by either of FS or CM methods.

Dairy products, results as shown in table (5) and figure (5) reveal the incidence of food borne bacteria in 35 samples of white soft cheese as ready to eat foods that categorized according to CDPH,2000 (Table, 6) . The *Enterobacteriaceae* bacteria, as one of the criteria required by CDPH, 2000 for ready to eat foods, were found in 14.2% of cheese samples by FS or 74.2% by CM. Also, *E.coli* was detected in 11.4 % and 25.7% of the samples by FS and CM, respectively. The most hazardous Gram negative bacteria the *Salmonella spp* was detected in 2.8% of the samples either by FS or CM. Enterotoxin Gram positive foodborne bacteria as *S. aureus* and *B. cereus* were found in cheese samples in 22.8%, 14.2% by FS and 28.5%, 17.1% by CM, respectively. Meanwhile, *Listeria monocytogenes* was detected in 17.1% by FS and 20% by CM

The obtained results for FS testing different varieties of ready to eat foods as a rapid method with the conventional methods for detecting foodborne microorganisms , were at the lower acceptable level of reliability according to the reports by(Fung 2002) . Moreover, the obtained results for ready to eat foods were in confront with these found by (El Kholy et al. 2008 and Zeinab et al., 2009), who reported the

acceptable reliability of FS test as a rapid microbiological test. Though, FS test is recommended for survey studies but not for testing food poisoning incriminated foods or remains from ready to eat foods.

Ready to eat food quality according to CDPH (2000): The CDPH, 2000 guidelines for the microbiological quality of some ready to eat foods at the point of sale depend on number of provisions. The term aerobic colony count (ACC) has replaced the previous name "aerobic plate count". The test of *Enterobacteriaceae* has replaced the tests for coliforms that traditionally have been used as indicators of hygiene and contamination after processing. The major problems with the Coliform tests are the variability in definition of the term coliforms and the fact that only lactose fermenting organisms are detected (Edwards and Ewing, 1972). Ready to eat foods containing *Salmonella spp, E. coli* O157H7 and verocytotoxin types or other pathogens may not always cause illness but there is good microbiological and epidemiological evidence that small number of pathogens in food have caused illness, however food should be free (Gilbert et al., 2000 and HCAC, 1997). The criteria for E. coli and *Listeria spp*. have been modified. Quantitative levels in the counts of *Listeria spp.* in previous versions of the guidelines (PHLS, 1996) excluded *L. monocytogenes*. This has been changed to include *L. monocytogenes* and hence the term is fully inclusive of all *Listeria spp*. The microbiological criteria for *S. aureus* and *B. cereus* differ for the quantitative levels as lower for the first, but at the same group of pathogens (CDPH, 2000).

Hence, results as shown in Table (2) reveal that 33.3% out of 60 samples of different meat categories fit out the CDPH microbiological guidelines. The main etiologies were due to the presence of the pathogens, *Salmonella spp, E. coli O157H7*, S. *aureus* and *B. cereus*. Also, results as shown in Table (3) reveal that only 15% out of 40 samples of different carbohydrate food categories fit out the CDPH microbiological guidelines. The main etiologies were due to the presence of the pathogens, *E. coli O157H7* and *B. cereus*. Meanwhile, results as shown in Table (4) reveal the worst the microbiological quality that 76.6% out of 30 samples of different salad and savory food categories fit out the CDPH microbiological guidelines. The main etiologies were due to the presence and high levels of *Enterobacteriaceae* members and the pathogens of *E. coli O157H7*, *S. aureus*, *B. cereus* and *L. monocytogenes*. Furthermore, results as shown in Table (5) reveal that 40% out of 35 samples of white soft cheese categories fit out the CDPH microbiological guidelines worse than meat and carbohydrate foods. Also, the main etiologies were due to the presence and high levels of *Enterobacteriaceae* members and the pathogens of *Salmonella spp, E. coli O157H7, S. aureus, B. cereus* and *L. monocytogenes*.

Therefore appropriate control measures during production, adequate hygiene standards and appropriate cooking during final preparation should ensure that the end products are free from viable organisms and that food are of good quality.

Table (1): Food system* for identification and recovery of the test Strains of the concerned microorganisms

Microorganisms	Number of Biochemical wells must be positive for microbial identification / strains												
	No.of strains	**1 LDC**	**2 H_2S**	**3 UR**	**4 PRO**	**5 PSE**	**6 STA**	**7 ESC**	**8 IND**	**9 BCE**	**10 LIS**	**11 CAT**	**12 Y/M**
Salmonella spp	15	14	12	12	-	-	-	-	-	-	-	-	-
Citrobacter spp	4	4	4	4	-	-	-	-	-	-	-	-	-
Proteus/prov. spp	10	10	10	9	10	-	-	-	-	-	-	-	-
Pseudomonas spp	19	-	-	-	-	15	-	-	-	-	-	-	-
E. coli	22	-	-	-	-	-	-	19	12	-	-	-	-
S. aureus	22	-	-	-	-	-	13	-	-	-	-	-	-
B. cereus	6									2			
Listeria spp	12										4	10	
Mold/yeast	25												25
total	135												

*** FS: Liofilchem miniaturized microbial, liofilchem Co., Italy**

Table (2): Foodborne bacteria in meat group as ready to eat foods by rapid method (FS)*[1] and conventional methods (CM), according to CDPH, 2000.

Meat group products/categories	No of samples	Criteria /Foodborne bacteria	% by FS	% or cfu/g by CM	% Fit out CDPH, 2000[*4]
Cooked meat (boiled and spicy) / cat. 3	20	Average .ACC*[3] Coliform[*2] *Proteus* *E. coli* *E.coli O157H7* *L .monocytogenes*	- - 20 10 0 5	$<10^6$ 30 20 10 10 5	45
Fried meat / cat. 2	10	Average .ACC** Coliform [2] *Citrobacter* *S. aureus*	- - 10 10	$<10^5$ 10 10 10	20
Fried beefburger / cat.1	10	Average .ACC** Coliform [2] *E. coli* *S. aureus*	- - 0 10	$<10^4$ 10 10 10	20
un-fried beefburger / cat. 1	10	Average .ACC** Coliform [2] *B. cereus* *Listeria sp* *Pseudomonas* *E. coli*	- - 20 10 20 10	$<10^4$ 50 20 10 30 20	40
Meat poultry / cat.3	10	Average .ACC** *Coliform* [*2] *Salmonella spp* *Pseudomonas* *E. coli*	- - 20 10 10	$<10^6$ 40 20 20 20	30
Total	60	Enterobacteriaceae	21.6	46.6	
total	60		33.3	58.3	33.3

[*1] RM, rapid method by FS: food system from **,** liofilchem Co., Italy
[*2] Coliform or Enterobacteriaceae not set up in FS,
[*3] Aerobic colony count, ACC in cfu/g
[*4] CDPH, Communicable Disease and Public Health, (Gilbert et al, 2000)

Table (3): Foodborne bacteria in carbohydrate ready to eat foods by (FS)[*1] test and conventional methods (CM) , according to CDPH, 2000

Carbohydrate foods/categories	No.of Samples	Criteria/Foodborne bacteria	By FS %	% or cfu/g by CM	% Fit out CDPH, 2000[*4]
Sweet macaroni Boiled /cat. 2	10	Average ACC [*3] *Coliform* [*2] *E.coli* *Pseudomonas*	- - 10	$<10^5$ 20 10 10	10
Macaroni with tomato / cat. 2	10	Average ACC [*2] *Coliform* *E.coli O157H7* *Proteus* *Pseudomonas* *S. aureus*	- - 0 10 10	$<10^5$ 20 10 10 10 10	20
Oven milk meat macaroni / cat. 3	10	Average ACC [*2] *Coliform* *E.coli* *Proteus*	- - 10	$<10^6$ 20 20 20	20

Cooked rice / cat. 1	10	Average ACC [*2] Coliform *E.coli* *B. cereus*	- - 10 20	$<10^4$ 10 10 20	10
Total	40	Enterobacteriaceae	15	25	40
Total	40		17.5	47.5	15

[*1] Rapid method by FS: food system from **,** liofilchem Co., Italy
[*2] Coliform or Enterobacteriaceae not set up in FS,
[*3] Aerobic colony count, ACC in cfu/g
[*4] CDPH, Communicable Disease and Public Health, (Gilbert et al, 2000)

Table (4): foodborne bacteria in salad types as ready to at foods by FS [*1] test and the conventional methods (CM), according to CDPH, 2000.

Savoury & Salad/category	No. of samples	Criteria/Foodborne bacteria	% by FS	% or cfu/g by CM	% Fit outCDPH, 2000[*4]
Vegetable salad Fresh and pickled / cat.5	10	Average ACC[*3] *Coliform* [*2] *E.coli* *E. coli O157H7** *Pseudomonas* *Listeria spp* *B. cereus*	- - 50 - 50 10 10	NA[*5] 100 60 20 60 10 10	60
Potato and others burette / cat. 2	10	Average ACC[*3] *Coliform* *S. aureus* *Listeria spp* *E.coli* *E.coli O157H7*	- - 20 10 10 0	$<10^5$ 80 20 10 40 20	60
Maize with olives / cat. 2	10	Average ACC[*2] *Coliform* *Pseudomonas spp* *E.coli*	- - 10 0	$<10^5$ 30 20 20	30
	30	*Enterobacteriaceae*	23	70	
Total	30		50	90	76.6

[*1] Rapid method by FS: food system from, liofilchem Co., Italy
[*2] Coliform or Enterobacteriaceae not set up in FS,
[*3] Aerobic colony count, ACC in cfu/g
[*4] CDPH, Communicable Disease and Public Health, (Gilbert et al, 2000)
[*5] NA, not applicable

Figure (1): Compatibility of the typical positive reactions for the test strains, according to the supplier instructions.

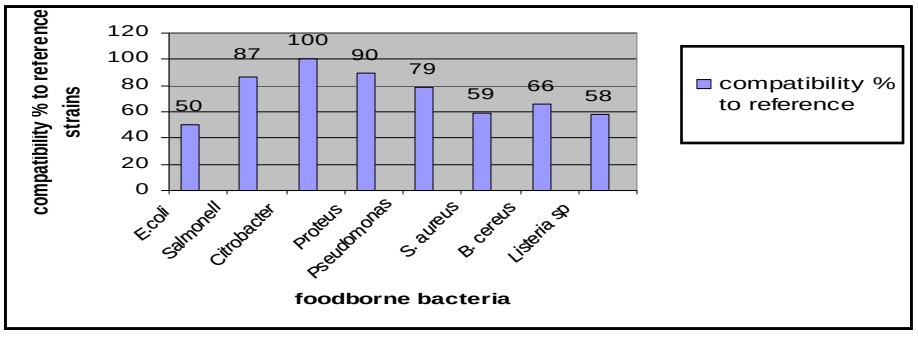
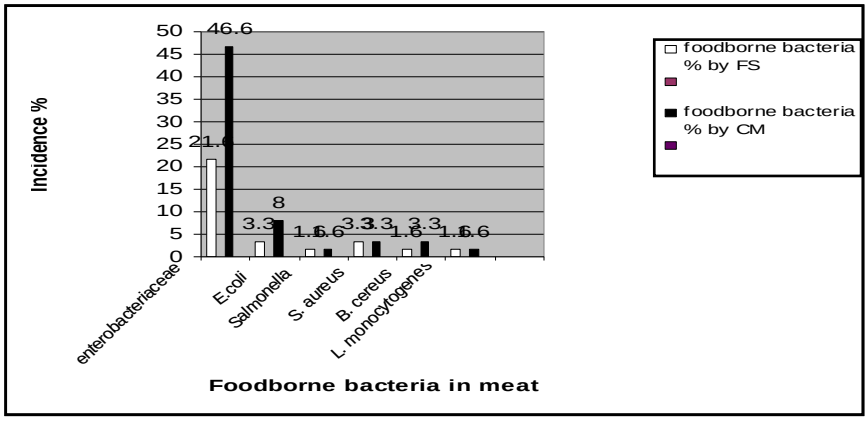


Table (5): Foodborne bacteria in different varieties of white soft cheese, as ready to eat foods by (FS)[*1] test and conventional methods (CM) according to CDPH, 2000.

Cheese varieties/categories	No.of Samples	Foodborne bacteria	% by FS	% or cfu/g by CM	% fit out CDPH 2000[*4]
Domiati /cat.	10	Average ACC[*3]	-	NA	40
		Coliform[*2]	-	50	
		Salmonella	0	0	
		E.coli	10	30	
		S.aureus	20	40	
		B.cereus	10	20	
		Listeria monocytogens	20	20	
Tallaga	10	Average ACC	-	NA	50
		*Coliform***	-	50	
		Salmonella	10	10	
		E.coli	20	30	
		S.aureus	20	20	
		B.cereus	10	10	
		Listeria monocytogens	10	10	
Feta	5	Average ACC	-	NA	20
		*Coliform***	-	20	
		Salmonella	0	0	
		E.coli	0	10	
		S.aureus	20	20	
		B.cereus	20	20	
		Listeria monocytogens	20	20	
Kariesh	10	Average ACC	0	NA	40
		*Coliform***	-	40	
		Salmonella	0	0	
		E.coli	10	20	
		S.aureus	20	20	
		B.cereus	10	10	
		Listeria monocytogens	10	20	
total	35		68.5	94.2	40

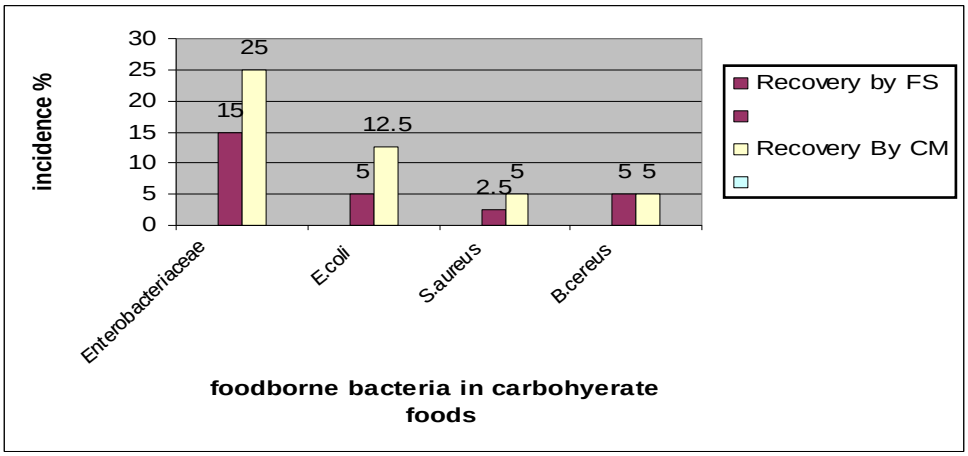
[*1] Rapid method by FS: food system from, liofilchem Co., Italy
[*2] Coliform or Enterobacteriaceae not set up in FS,
[*3] Aerobic colony count, ACC in cfu/g
[*4] CDPH, Communicable Disease and Public Health, (Gilbert et al, 2000)
[*5] NA, not applicable

Figure (2): Foodborne bacteria incidence in meat ready to eat foods by FS* and CM.



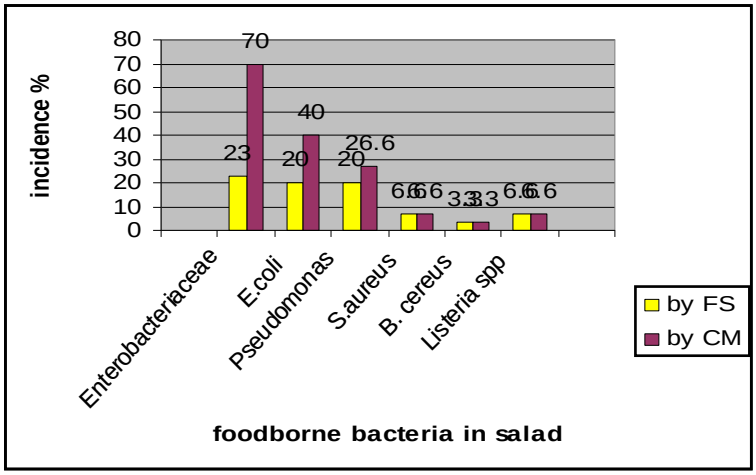
*FS test: food system kits from, liofilchem Co., Italy and CM: conventional methods

Figure (3): Foodborne bacteria incidence in carbohydrate foods as ready to eat foods by FS* and CM.



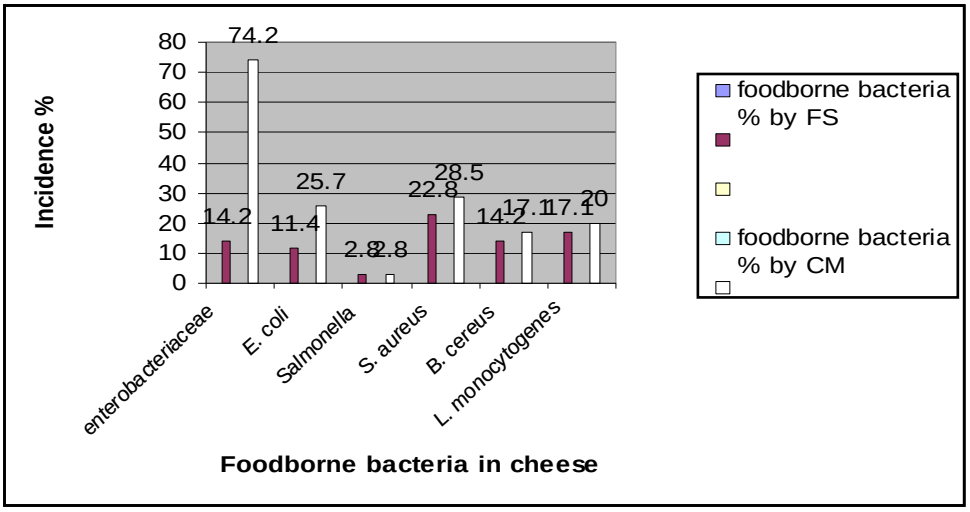
*FS test: food system kits from, liofilchem Co., Italy and CM: conventional methods

Figure (4): Total of foodborne bacteria incidence in salads as ready to eat foods by FS* and CM.



*FS test: food system kits from, liofilchem Co., Italy and CM: conventional methods

Figure (5): Foodborne bacteria incidence in white soft cheese as ready to eat foods by FS* and CM.



*FS test: food system kits from, liofilchem Co., Italy and CM: conventional methods

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