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Microbiological quality of artisanal-ice cream produced in Gaza city – Palestine

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Abstract: This research aimed to investigate the bacteriological quality of artisanal ice cream sold in the local shops in Gaza city, Palestine. A total of 102 random samples of artisanal ice cream were collected from 5 different popular local shops from Gaza city markets were selected. Ice cream ingredients, shops air, plastic cups, and seller's hands were examined microbiologically. All samples were free from Staphylococci, *Salmonella* and *Shigella*. Incidence of pathogenic bacteria such as *E. coli* and fecal coliforms were found in the higher numbers. The percentage failure in complying the standards is distributed as follows; 32.4% with Total Plate Count, 55.9% with coliforms, 55.9% with fecal coliforms, 26.5% with *E. coli*, 5.9% with molds, 2.9% with *O. lactis* and 20.6% with yeasts. Examination of ice cream ingredients showed that primary sources of microbial contamination to ice cream could include water and raw milk whereas secondary sources include flavoring agents, utensils and handling. The results emphasize the need to use good and healthy ice cream ingredients and observing the hygienic conditions of the retail shops including common area, equipment, utensils and food handling.

Keywords: Artisanal Ice Cream, Gaza, Microbiological Quality

1. Introduction

Ice cream is a frozen dairy product made by freezing a pasteurized mixture of milk, cream milk solids other than sugar, emulsifiers, stabilizers, flavoring and coloring agents. Ice cream is produced in two different ways:- industrial large scale methods and traditional methods refers to the manufacturing of open artisanal ice cream. The second kind is generally manufactured in small scale production units and doesn't totally follow the standard procedures of ice cream production. Ice cream can be contaminated with microorganisms if some ingredients have been added after pasteurization or by means of improper sanitation of the equipment and environment many of these psychrophilic microorganisms are including bacteria, fungi, yeast and mold [1].

Contamination of ice cream by pathogenic microorganisms has been correlated with sever outbreaks in a number of countries in Asia, Europe and North America [2-5].

The evaluation of the presence of microorganisms in these products can provide valued information on the quality of the raw ingredients and on the sanitary conditions during processing and packing stages[6].Therefore, the main objective of the present work was to determine the microbiological quality of artisanal ice cream sold in Gaza city.

2. Materials and Methods

2.1. Study Samples

Samples examined in the present investigation included 102 samples of artisan ice cream, 25 samples of each (ice cream with chocolate, nuts, fruit, and fruit flavor). Ice cream ingredients, ice cream shops air, utensils, and seller's hands were examined for the presence of certain pathogenic microorganisms.

The study was carried out over a period of 6 months

starting on June, 2012 to November 2012.

2.2. Sample Collection and Preparation

Ice cream samples were collected randomly from five ice cream shops in Gaza city and transported to the lab. in an ice box within 1 hour of collection. The samples were examined as soon as they reached the lab or were frozen at –18°C till analysis (within no more than 24 hours).

2.3. Bacteriological Analysis

The bacteriological media used throughout this study were prepared[7]. The procedures followed for the detection of different bacteriological parameters was as described in the Standard Methods for Examination of Water and Wastewater [8]and[9]. Aerobic plate count (APC), Isolation of Coliform Group Bacteria, Isolation of *E. coli*, Isolation of *S. aureus*, Isolation of *Salmonella* spp., Isolation of *Shigella* spp.,

2.3.1. Biochemical Tests

The Analytical Profile Index (API) 20 E and Staphylococcus API strips (Bio Merieux) were used as the biochemical systems for identification.

2.4. Isolation of Molds and Yeasts

Wight 25g of ice cream samples in a sterile 225 ml jar and blend at high speed for 1 minute serial dilution will be obtained(10^{-2}, 10^{-3} and 10^{-4})transfer the mixture to the surface of potato dextrose Agar and DRBC Agar[10].

Incubate the plates for 5 days at 25˚C. Count and calculate the number of Molds and yeast[9].

3. Result and Discussion

The data presented in this chapter is a summary of the raw data and the results of statistical analysis of microbiological investigations of ice cream samples collected from five popular shops in Gaza city.

Part of results was found to be applicable with the hypothesis, whilst others were not. Despite this discrepancy, yet there had been other interesting and rather important findings that are hoped to be valuable for other researchers who are interested in this subject.

3.1. Description of the Samples

Twenty four samples were selected from M shop and represent the highest number while from Z shop represent the lowest number (15 samples). Ice cream shops air, ice cream ingredients (water, milk powder, cacao powder, butter, nuts and pistachio) and ice cream cups microbiologically analyzed. Ice cream seller's hands also examined for the presence of different microorganisms.

Ice cream is a fairly complex food containing sugar, emulsifiers and fats. As long as no bacteria or other harmful microorganisms contaminate any of the ingredients after processing, then ice cream while frozen is one of the safer commodities. Depending on the available water, bacterial growth could be rapid in melted ice cream. If melted ice cream were contaminated and allowed to remain at elevated temperatures, freezing temperatures later would not make the product safe (Joshi, 2004).

Table 1. *Ice cream samples.*

Shops	Samples Number	Percent
K	21	20.6
M	24	23.5
Ma	21	20.6
M & A	21	20.6
Z	15	14.7

Information regarding distribution of study sample, as seen in table 1, shows that the major samples collected from M and K, because of these two shops are the most famous in the Gaza city, whilst Z is a small producer and less famous.

3.2. Types of Ice Cream

Thirteen different types of ice cream were selected depend on the sale preferences and availability. As shown in table2, cacao powder, vanilla and strawberry represent the highest number (14.7%) while mulberry, pistachio, banana, melon and kiwi represent the lowest number 2.9%.

Table 2.*Types of Ice cream according to their sale preferences.*

Type	Number	Percent
Cacao powder	15	14.7
Vanilla	15	14.7
Strawberry	15	14.7
Nut	12	11.8
Nescafé	9	8.8
Mango	9	8.8
Caramel	6	5.9
Pineapple	6	5.9
Mulberry (Toot)	3	2.9
Pistachio	3	2.9
Banana	3	2.9
Melon	3	2.9
Kiwi	3	2.9

The study showed in remarkable interest of cacao powder, vanilla and strawberry, data described in table 2, compared with other types such as mulberry and pistachio. According to International Ice cream Association, Washington, D.C., 2006, showed that Vanilla 29%, cacao powder 8.9% and strawberry with 5.3% are most popular ice cream flavors.

3.3. Bacteriological Analysis of Ice Cream

Table 3 showed that *Staphylococci*, *Salmonella* and *Shigella* are absent in all samples. Coliforms were isolated from 57 samples which represent (55.9%) from the total 102 samples. Fecal coliforms were the second one with 45 contaminated samples which represent 44.1% and then TBC 33 (32.3%), *E. coli* 27 (26.5%),yeast 21 (20.6%), mold 6 (5.9%) and the lowest contamination with *O. Lactis* only 3 samples (2.9%).

Table 3.*Microbial Contamination of Ice cream.*

Type	Number	Percent
Staphylococci		
Accepted (not contaminated)	102	100
Refused (contaminated)	0	0
Total	102	100
Salmonella		
Accepted (not contaminated)	102	100
Refused (contaminated)	0	0
Total	102	100
Shigella		
Accepted (not contaminated)	102	100
Refused (contaminated)	0	0
Total	102	100
Coliform		
Accepted (not contaminated)	45	44.1
Refused (contaminated)	57	55.9
Total	102	100
E. coli		
Accepted (not contaminated)	75	73.5
Refused (contaminated)	27	26.5
Total	102	100
Fecal coliform		
Accepted (not contaminated)	57	55.9
Refused (contaminated)	45	44.1
Total	102	100
O. lactis		
Accepted (not contaminated)	99	97.1
Refused (contaminated)	3	2.9
Total	102	100
Mold		
Accepted (not contaminated)	96	94.1
Refused (contaminated)	6	5.9
Total	102	100
Yeast		
Accepted (not contaminated)	81	79.4
Refused (contaminated)	21	20.6
Total	102	100
TBC		
Accepted (not contaminated)	69	67.6
Refused (contaminated)	33	32.4
Total	102	100

A potentially important finding of this study was the common occurrence of microbial contamination of coliform and Fecal coliform. This pioneer study presents the current status ofmicrobial quality of Ice cream being sold in the Gaza city. All analyzed ice cream samples showed negative growth with Staphylococci, *Salmonella* and *Shigella* (table 3), whilst strong positive in Coliform and less positive in other types Fecal coliform, TBC, *E. coli*, yeast, mold, and *O. lactis* the lowest one. Many studies agree that ice cream an excellent medium for the growth of many microorganisms, (Ahmad, 2009, Kanbakan, 2004).

Quality of Ice cream depends on both extrinsic factors that include manufacture procedure and intrinsic factors that include proportion of ingredients used. Ice cream, a milk based product is a good medium for microbial growth due to high nutrient value. Primary sources of microbial contamination to ice cream include water and raw milk whereas secondary sources include flavoring agents, utensils and handling. Although freezing and hardening steps in production can estimate most of the microbial hazards, but still numerous health hazards are persistent due to various conditions (Mohammad, 2011)

In Nepal, it was reported that 61.1%, 68.1% and 22.2% of 44 samples exceeded the standard value of mesophillic aerobic count, total coliform count and staphylococcal count respectively (Joshi, 2004).Warke et al. (2000) reported on the incidence of pathogenic psychrotrophs in 30 ice cream samples sold in some retail outlets in Mumbai, India, they found *S. aureus* in all (100%). El-Sharefet al. (2006) found that *S. aureus* isolated at a lower rate (38%) than the above mentioned study, such a rate is still very high when compared with reports from developed countries. In agreement with our results, Wilson et al. (1997) conducted a microbiological survey of unopened ice cream, ice cream in use and ice cream scoop water (n = 91), did not detect *S. aureus* in any sample.

Yaman *et al*., (2006).Studied a total of 73ice cream samples collected in 2004 in Kars, Turkey and reported that 4.1 % of the samples had unacceptable hygienic quality according to the criterion (10^5 cfu/g) recommended in Turkish Food Codex (TFC).

Masud reported that 46 % of the samples (n=50) were contaminated with *E. coli* and various incidence rates of 3.33 %, 22 % and 70 % were also reported by other researchers in different areas of Turkey (Masud, 1989).

Other study Graceleah *et al*, (1999) show all of the nineice cream samples from the three big scale manufacturers were negative for fecal coliforms, coliforms, coagulase positive *Staphylococcus* spp. and *Salmonella* spp. (Graceleah, 1999).

Our results are in coordination with Bahareem*et al*, 2007 which showed that the total bacterial count was >/=1.5x105 cfu/g in 26 (32.5%) samples (Bahareem*et al*.,2007) . In other study, 50 samples of Ice cream produced by 30 different small-scale traditionalice cream manufacturers in Kazeroon were studied for Total Bacterial Count (TBC), by the Iranian National Standard Center, show poor contaminated with TBC (Ghasemi, 2009).

Regarding to *E. coli* contamination, international guidelines for the microbiological quality of processed and ready to eat foods consider unsatisfactory for human consumption those containing $\geq 10^4$ CFU/g of coliforms or $\geq 10^2$ CFU/g of *E. coli*. A total of 49 dessert samples were collected from 35 restaurants in Guadalajara, and the same number of desserts from 33 restaurants in Houston. All the samples tested negative for non–*E. coli* enteropathogens. The *E. coli* infection was unlikely to kill anyone but some bacteria in the *E. coli* family produced toxins which could make people extremely ill (Vigil *et al* , 2009).

Yeast is a single-cell fungi that exists just about everywhere in nature. There is yeast in the air, in soil, plants and in the food that we eat. Yeast commonly finds its way into our food and drinks through the use of baker's yeast and the fermentation process. One of the main causes of yeast contamination is water; containing chlorine kills both bad and good bacteria in the gut. It is better to use filtered water.

Better to use also distilled water with something else mixed with it rather than plain. Other sources can be sweeteners, syrup, even cacao powder. Ref needed.

The results obtained in our study related to mold contamination is homogenous with previous data, the same locations contaminated with yeast are also contaminated with mold. In another study, 60 % of the samples contained the yeast and mold between 10^4 and 10^5 cfu/ml. The counts of yeast and mold in the samples suggest the need for the control of adequate heat treatment of ice cream and appropriate storage conditions in catering premises (Yaman *et al*., 2006).

3.4 Microbial Analysis of Ice Cream Shops Air

The microbiological analysis of 100 L^3 ice cream shops air showed that large numbers of microorganisms were present. As shown in table 4 bacterial count of 100 L^3 were 20 CFU in store M air, while in the other shops stores, it was too numerous to count.

M shop air was free from molds but the other shops air samples were contaminated.

K and M&A shops air were highly contaminated by molds spores and the numbers were too numerous to count while K and Z shops air were moderately contaminated and their molds number were 50 and 70 respectively.

The shops air analysis showed that M shop air were also free from yeast but other shops air were contaminated by yeast.

Belong to molds, M air was clear but the other air sample sources were contaminated. Also the yeast analysis was clear in M but others were contaminated. M shop is the only store containing ventilation system and that illustrates the good results for the microbiological analysis of M shop air.

Table 4. *Microbial analysis of shops air.*

Shops	Bact. Count	Molds	Yeast
M	20	Clear	Clear
K	T.N.T.C	T.N.T.C	3
Ma	T.N.T.C	50	7
M & A	T.N.T.C	T.N.T.C	21
Z	T.N.T.C	70	20

T.N.T.C: too numerous to count.

3.5. Microbial Analysis of Ice Cream Seller's Hands

According to the workers hands examination shown at table 5, the results indicated that all the ice cream seller's hands were contaminated by different levels of bacteria, molds and yeasts. Ma ice cream seller's hands were free from molds and yeasts while highly contaminated with bacteria. Meanwhile, Z ice cream seller's hands were contaminated with countable degree of molds and yeasts and M&A ice cream seller's hands were contaminated with high numbers of molds and yeasts. These microorganisms my transported from seller's hands to ice cream.

Table 5. *Microbial analysis of Ice cream seller's hands.*

Shops	Bact. Count	Molds	Yeast
M	T.N.T.C	100	20
K	T.N.T.C	170	85
Ma	T.N.T.C	Clear	Clear
M & A	T.N.T.C	T.N.T.C	T.N.T.C
Z	T.N.T.C	45	7

T.N.T.C: too numerous to count.

3.6 Microbial Analysis of Ice Cream Ingredients

Microbial analysis of M & Aice cream samples ingredients results were showed at table 6.The results indicated that water was free of *E. coli, Salmonella* spp*., Shigella* spp*.,* molds and yeast while it contaminated by *S. aureus* and coliform. Milk powder was contaminated with molds and bacteria but it free of coliform*, E. coli, Salmonella* spp*., Shigell*a spp., *S. aureus* and yeasts. Cacao powder of ice cream was free from coliform, *Salmonella*, *Shigella, E. coli,* yeast and Mold but it contaminated by *S. aureus* and other bacteria.

Also we observed that butter ingredient was free from all containments and nut was contaminated by bacteria and free from others.

Regarding to pistachio, which contaminated with bacteria, coliform and molds but free from yeasts*, E .coli, Salmonella* spp. and *Shigell*a spp. According to the microbial analysis of cups with different size it noted that they were free of all types of contamination.

Table 6. *Microbial analysis of M&Aice cream samples ingredients.*

Test	Water	Milk powder	Cacao powder	Butter	Nut	Pistachio
Total count	$8*10^5$	$1.2*10^2$	20	-ve	20	$2*10^2$
Coliform	$6*10^2$	-ve	-ve	-ve	-ve	80
E. coli	-ve	-ve	-ve	-ve	-ve	-ve
Salmonella spp.	-ve	-ve	-ve	-ve	-ve	-ve
Shigella spp.	-ve	-ve	-ve	-ve	-ve	-ve
S. aureus	90	-ve	30	-ve	-ve	-ve
Yeast	-ve	-ve	-ve	-ve	-ve	-ve
Molds	-ve	$1.2*10^2$	-ve	-ve	-ve	50

Table 7 showed the microbial analysis of M ice cream samples ingredients. The results indicated that water was free from *E. coli*, *Salmonella* spp*., Shigella* spp*.,* and molds while it contaminated by *S. aureus*, coliform, other bacterial types and yeast. Milk powder, cacao powder and butter ingredients were not applicable to do.

Pistachio and nut were free from *E .coli, Salmonella* spp., *Shigell*a spp., coliform, *S. aureus,* and yeasts but it contaminated with different bacteria and molds.

Table 7. *Microbial analysis of M ice cream samples ingredients.*

Test	Water	Milk powder	Cacao powder	Butter	Nut	Pistachio
Total count	$1.5*10^2$	N.A	N.A	N.A	40	70
Coliform	$4*10^2$	N.A	N.A	N.A	-ve	-ve
E. coli	-ve	N.A	N.A	N.A	-ve	-ve
Salmonella spp.	-ve	N.A	N.A	N.A	-ve	-ve
Shigella spp.	-ve	N.A	N.A	N.A	-ve	-ve
S. aureus	10	N.A	N.A	N.A	-ve	-ve
Yeast	20	N.A	N.A	N.A	-ve	-ve
Molds	-ve	N.A	N.A	N.A	20	40

N.A: not applicable.

Table 8 showed the microbial analysis of K ice cream samples ingredients. The results indicated that water was free from coliform, *E. coli*, *Salmonella* spp., *S. aureus*, *Shigella* spp., yeast and molds while it was contaminated with other bacteria. Milk powder was contaminated with bacteria and free from other contaminants. Pistachio and nut were free from other contaminants meanwhile cacao powder and butter ingredients were not applicable to do.

Table 8.*Microbial analysis of K ice cream samples ingredients.*

Test	Water	Milk powder	Cacao powder	Butter	Nut	Pistachio
Total count	$3*10^2$	$1*10^2$	N.A	N.A	-ve	-ve
Coliform	-ve	-ve	N.A	N.A	-ve	-ve
E. coli	-ve	-ve	N.A	N.A	-ve	-ve
Salmonella spp.	-ve	-ve	N.A	N.A	-ve	-ve
Shigella spp.	-ve	-ve	N.A	N.A	-ve	-ve
S. aureus	-ve	30	N.A	N.A	-ve	-ve
Yeast	-ve	-ve	N.A	N.A	-ve	-ve
Molds	-ve	-ve	N.A	N.A	-ve	-ve

N.A: not applicable.

Table 9showed the microbial analysis of Ma ice cream samples ingredients. The results indicated that water was free from all contaminants while milk powder, butter, nut, and cups of all size were not applicable to do. Cacao powder was free from all contaminants except bacteria. Pistachio was contaminated with coliform, other bacteria and molds but free from other contaminants.

Table 9. *Microbial analysis of Ma ice cream samples ingredients.*

Test	Water	Milk powder	Cacao powder	Butter	Nut	Pistachio
Total count	-ve	N.A	30	N.A	N.A	90
Coliform	-ve	N.A	-ve	N.A	N.A	20
E. coli	-ve	N.A	-ve	N.A	N.A	-ve
Salmonella spp.	-ve	N.A	-ve	N.A	N.A	-ve
Shigella spp.	-ve	N.A	-ve	N.A	N.A	-ve
S. aureus	-ve	N.A	-ve	N.A	N.A	-ve
Yeast	-ve	N.A	-ve	N.A	N.A	-ve
Molds	-ve	N.A	-ve	N.A	N.A	10

N.A: not applicable.

Table 10 showed the microbial analysis of Z ice cream samples ingredients. The results indicated that water was contaminated with bacteria, coliform and *S. aureus*. Milk powder was free from all contaminants except the bacteria. Cacao powder, nuts and pistachio were not applicable.

Butter was free from all contaminants meanwhile cups (all sizes) were contaminated by different types of bacteria.

Table 10.*Microbial analysis of Z ice cream samples ingredients.*

Test	Water	Milk powder	Cacao powder	Butter	Nut	Pistachio
Total count	$20*10^2$	10	N.A	-ve	N.A	N.A
Coliform	60	-ve	N.A	-ve	N.A	N.A
E. coli	-ve	-ve	N.A	-ve	N.A	N.A
Salmonella spp.	-ve	-ve	N.A	-ve	N.A	N.A
Shigella spp.	-ve	-ve	N.A	-ve	N.A	N.A
S. aureus	20	-ve	N.A	-ve	N.A	N.A
Yeast	-ve	-ve	N.A	-ve	N.A	N.A
Molds	-ve	-ve	N.A	-ve	N.A	N.A

N.A: not applicable**.**

Tables from 6 to 10 showed the results of ice cream ingredients analysis. Water, milk powder, cacao powder, butter, nut and pistachio were microbiologically examined for the presence of specific microorganisms. Ice cream contains over 50% water from milk or other ingredients and air is incorporated into the product resulting in finely-distributed air cells protected by a layer of fat globules(The dairy council, 2014). The microbiological quality of water in the Gaza city is very poor (Abou Elkhair & Altartory 2012) and the bad microbiological quality of water may reflected on the ice cream quality.

Total bacterial (especially *S. aureus*) and coliforms were isolated fromall shops except Ma water which mean that water could be the source of bacteria isolated from ice cream. Regarding to molds, variable numbers were counted in 100 ml water and may also constitute the source of molds isolated from ice cream samples.

All ingredients meet the microbiological standards of food except water.

Further studies must be done to track the source of microorganisms contaminating ice cream.

Table 11.*Microbial analysis of Ice cream cups.*

Shop	M &A			M			K			Ma			Z		
Cup sizeTest	L.	M.	XL	L.	M.	XL	L.	M.	XL	L.	M.	XL	L.	M.	XL
Total count	-ve	-ve	-ve	-ve	+ve	+ve	-ve	-ve	+ve	N.A	N.A	N.A	+ve	+ve	+ve
Coliform	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve	N.A	N.A	N.A	-ve	-ve	-ve
E. coli	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve	N.A	N.A	N.A	-ve	-ve	-ve
Salm. spp.	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve	N.A	N.A	N.A	-ve	-ve	-ve
Shig. spp.	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve	N.A	N.A	N.A	-ve	-ve	-ve
S. aureus	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve	+ve	N.A	N.A	N.A	-ve	-ve	+ve
Yeast	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve	N.A	N.A	N.A	-ve	-ve	-ve
Molds	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve	N.A	N.A	N.A	-ve	-ve	-ve

According to the microbial analysis of M&A cups with different size, it noted that they were free of all types of contamination. M cups with different size were free from all types of microbial contaminants except bacteria. K cups of all sizes were free from all contaminants.

Ma cups were un available for analysis.

Z shop cups were contaminated by bacteria and *S. aureus* was detected and isolated from the cups. Ma cups were unavailable for analysis.

The researcher suggests negligence such as poor sanitation during the preparation and/or storage of these products. These include the observed dirty premises and utensils used, the use of bare hands in preparing the products (personal communication with the handlers). The presence of coliform bacteria, notably fecal coliforms, indicates the presence of fecal contamination in the food. This suggests the possibility that other intestinal pathogens such as enteropathogenic *E. coli*, Hepatitis A virus and *Entamoebahistolytica* may also be present in the food. These microorganisms are transmitted via the fecal-oral route.

4. Conclusion

In the present study, the quality characteristics of artisanalice cream produced in Gaza city was assessed to determine the compliance of artisanal ice cream and to determine types of microorganism present in the ice cream sold in most famous and preferable markets in Gaza city.

We can conclude the following facts regarding the quality of artisanalice cream produced in Gaza city:

- This study considers one of the pioneer studies in the Gaza strip, Palestine.
- Cacao powder, vanilla and strawberry are most preferences types of Ice cream in the Gaza city.
- The results suggest negligence such as poor sanitation during the preparation/or storage of Ice cream.
- All samples were absolutely free from contamination with Staphylococci, *Salmonella* and *Shigella*.
- Incidence of pathogenic bacteria such as *E. coli* and fecal coliform were found in the higher numbers.

- Yeast and mold contamination are less frequent in all samples taken in the current study.
- Neither season of year, flavor of product, nor type of laboratory, under the conditions of the study, seemed to influence the number of coliforms in ice cream.
- The results of the study show that all the samples from small-scale manufacturers failed to conform to the standards set by FDA.
- Primary sources of microbial contamination to ice cream could include water and raw milk whereas secondary sources include flavoring agents, utensils and handling.

Recommendations

The following recommendations were considered as an outcome of this study.

- More interest in ice cream research is recommended to be practiced in food technology and health services.
- Ingredients, such as milk, cream and ice cream mix must obtained from licensed and trusted sources and stored at proper temperature.
- Discard the defrosted products and do not re-freeze any meltedice cream for sale.
- Drain off and discard the leftover of soft ice cream daily.
- Maintain all equipment and utensils in clean and good condition.
- Increase hygienic practices during all preparation and handling processes.

For consumers we can advise the following:

- They should also observe some key points to avoid the exposure to microbiological hazards, through
- Storeice cream products in freezer after purchasing.
- Observe the hygienic conditions of the retail shops including common area, equipment, utensils and food handling.
- Do not eat too muchice cream and take a balanced diet.

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