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MICROBIOLOGICAL EVALUATION OF SOME DAIRY PRODUCTS SOLD BY DAIRY SHOPS AND STREET VENDORS IN RURAL AREAS

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SUMMARY

Ninety random samples of Kareish cheese, rice milk and yoghurt were collected as 15 samples of each from dairy shops and street vendors. The results obtained as a mean of total bacterial count, coliform, yeast and mould of dairy shops 3.9 x 10^4, 2 x 10^2 ,1.6 x10^4; 4.4x10^4, 3.5 x10^2, 1.4 x10^3, 1.5 x 10^2 ; 4.5 x 10^3, 0.51 x 10^2, 1.5 x 10^3, 1.2 x 10^3 and street vendors 6.3 x 10^4, 9.6 x 10^2, 4.4 x 10^4, 3.6 x 10^3; 8.7 x 10^4, 4.3 x10^2, 2.2 x 10^3, 7.3 x 10^2 ; 1.9 x 10^4, 2.3 x10^2, 14 x 10^2, 4 x 10^2 respectively. The mean count of *Staphylococcus aureus*, for rice milk and yoghurt were 1.1 x 10^2, 6 x 10^2; 3.4 x 10^2 and 10 x 10^2, respectively. The incidence of *E. coli* for the three products were 6.6%, 33.3%; 13.3%, 26.6%; 13.3% and 20.0%. Incidence of *Staphylococcus areus* enterotoxins both type A and D were 7.7% but C was 23.1%. The isolated moulds were Alternaria sp., Asp. Niger, Caldosporium sp., Asp. flavus and penicillium sp. Salmonella failed to be detected in all examined samples The public health importance as well as hygienic measures to improve the quality of the products were discussed.

INTRODUCTION

Milk is nutritious food for human which plays an important role in human diet allover the world. But at the same time it is a good medium for the growth of a wide range of microorganisms especially pathogens. Presence by low fat content, excellent dietary sources of protein, calcium, phosphorus and soluble vitamins. The main source of pathogenic of such organisms in milk represents a major public health concerns **(Ryser, 1998)**.Kareish cheese is made from naturally fermented raw skimmed milk which considered a traditional method, so it is one of most popular local types of soft cheese in Egypt characterize bacteria in this type of cheese are contaminated raw milk, handlers, dust and utensils **(Robenson, 1990)**.

Dairy desserts also are popular dairy food usually prepared from ingredients that the milk is the base constituent. This type of desserts consumed in Egypt by a wide range of people of all ages and are usually served cooled **(Al-Gendi Marwa, (2004)**.

The use of yoghurt dates back to many centuries and is one of the most unique and universal dairy products due to its symbiotic fermentation involved in its manufacturing. Yoghurt in different farms with appropriate local names is made through out the world and it is being enjoyed every where in the world for its beneficial properties and therapeutic properties **(Tarakci and Kucukoner, 2004)**. In Egypt the traditional name is "Zabady" and can be manufactured by dairy shops and street vendors.

Provision of milk and its products of good hygiene quality is desirable from, consume health point of view, total bacterial count are the most useful indication of microbiological status of dairy products **(Mossel, 1982)**. Also, coliforms are routinely used as indicators for the quality of the food products and their presence indicates careless methods of production and handling of the processed food products and the use of insufficient sanitized equipment **(Banwart, 1998)**. Although most of *E coli* strains are harmless, a limited number of strains are responsible for diarrhea or more serious form of illness **(DeReu *et al.*, 2004)**.

Some pathogens such as *Staphyloccus aureus* can get to the milk from mastitis of lactating animals hence produced milk with the organism in the absence of proper cooling during storage lead to the growth and multiplication of *S. aureus* which may be enterotoxigenic leading to presence and accumulation of enetrotoxins and subsequent food poisoning cases.

Milk also can be contaminated by *S. aureus* from human sources. About 10-20% of human population proved to harbour enterotoxigenic *S. aureus* **(Char *et al.*, 1983)**. Also, Salmonella is regarded as human pathogen and established as one of the most important cause of food poisoning world wide. About 70-80% of people severely ill with salmonella food poisoning may end fatally and historically there have been outbreaks of infection with salmonella associated with the consumption of dairy products **(DeBuyser *et al.*, 2001)**.

Due to the continuous demand for the high quality milk & dairy product, it is extremely necessary not only to increase the production of milk & its products but also to safeguard consumers against health hazard . Therefore this study was planned to evaluate the microbial quality of these dairy products.

MATERIALS AND METHODS

Ninety random samples of Kareish cheese, rice milk and yoghurt (15 each from dairy shops and street vendors) were collected from rural areas. The collected samples were transferred directly to the laboratory in ice box to be examined bacteriologically for:

1. Total aerobic bacterial count **(A.P.H.A., 1992)**.
2. Coliform counts M.P.N. **(A.P.H.A., 1992)**.
3. Isolation and identification of *E. coli* **(Krieg and Holt, 1984)**.
4. *Staph aureus* count and identification **(A.P.H.A., 1992)**.
5. Detection of enterotoxigenicity of *S. aureus* strains **(Oda *et al.*, 1979** and **Shingaki *et al.*, 1981)**.
6. Isolation of Salmonella. **(Varnam and Evans, 1991)**.
7. Total yeasts and moulds counts **(Konemen, 1984)**.
8. Identification of mould isolates **(Samson *et al.*, 1995)**.

RESULTS AND DISCUSSION

The results represented in Tables (1 a&b), revealed that total bacterial count of Kareish cheese samples collected from both dairy shops and street vendors were $3.9 \times 10^4 \pm 0.16 \times 10^4$/g and $6.3 \times 10^4 \pm 0.22 \times 10^4$/g, respectively. These findings lower than that recorded by **Kaldes (1997); Aiad (2002), Abdel Moneium (2004), Abou Dawood *et al.* (2005), El-Bessary (2006)** and **Yilma *et al.* (2007)** but higher than those recorded by **Moustafa Dina (2008)**.

The mean count for rice milk were $4.4 \times 10^4 \pm 0.06 \times 10^4$ and $8.7 \times 10^4 \pm 0.8 \times 10^4$, respectively. These findings higher than that of **AbdelHaleem Amal *et al.* (2001)** and **Al-Gendi Marwa (2004)** but lower than that reported by **El-Shaar Manal (1993)**.

The result represented for yoghurt show that the mean values were $4.5 \times 10^3 \pm 0.16 \times 10^3$ and $1.9 \times 10^4 \pm 0.008 \times 10^4$, respectively, these results lower than that reported by **Taracki and Kucukoner (2004)**.

The total count of bacteria are the most useful indication of microbiological status of dairy products. A high count often indicates contamination of raw material, unsatisfactory sanitation or unsuitable temperature during storage **(Mossel, 1982)**.

Tables (1 a&b) revealed the mean coliform count in Kareish cheese in dairy shops and street vendors were $2 \times 10^2 \pm 0.03 \times 10^2$ /g and $9.6 \times 10^2 \pm 1.1 \times 10^2$/g, while table (2) show that the incidence 20%

and 46.6%, respectively. These results were lower than those of reported by **Aiad (2002), Abdel Moneium (2004), DeReuk *et al.* (2004); El-Leboudy Ahlam and El-Mosalami (2006), Nawar Dalia (2007) and Yilma *et al.*(2007).**

The incidence also were lower than that reported by **Aiad (2002); El-Sebaey (2008)** and **Moustafa Dina (2008).**

Tables (1a&b and 2) revealed that the mean coliform and its incidence in rice milk was 3.5 x $10^2 \pm 0.15 \times 10^2$, 4.3 x $10^2 \pm 0.16 \times 10^2$; 26.6% and 40%, respectively. These results higher than that reported by **El-Shaar Manal (1993)** and **Abdel Haleem Amal *et al.* (2001)** while the incidence of coliform lower than that reported by **Al-Gendi Marwa (2004).**

The mean coliforms count and their incidence recorded in tables (1 a&b and 2) for yoghurt samples were 0.51 x $10^2 \pm 0.03 \times 10^2$/g, 2.3 x $10^2 \pm 0.05 \times 10^2$/g, 26.6% and 40%, respectively. These findings lower than **Aiad (2002)** and **El-Kasas Walaa (2004).**

Coliforms counts are the traditional indicator of possible feacal contamination, microbial quality and reflect the hygienic standards adopted in processing, handling and distribution **Frazier and Westhoff, (1983)** and **Green berg and Hunt (1985).**

Incidence of *E. coli* in the three products (Kareish cheese, rice milk and yoghurt) are recorded in table (2) for both dairy shops and street vendors as 6.6%, 33.3%; 13.3%, 26.6% and 13.3%, 20%, respectively. The findings of Kareish cheese are lower than that recorded by **Dereu *et al.* (2002); Deep Azza (2005)** and **El-Bessary (2006)** while nearly similar results were reported by **Moustafa (2004)** but higher than that recorded by **Moustafa Dina (2008).**

The results of rice milk are nearly similar to that recorded by **Saleh Omayma (1995)** and **AbdelHaleem Amal *et al.* (2001),** while the results of yoghurt are lower than those reported by **Riad Aisha (1996), Eid Aml (1997), Aiad (2002)** and **El-Kasas Walaa (2004),** but higher than **Abdou (1997)** and **Bahout and El-Shawaf (1999).**

Inspection of tables (1b and 2) showed that the mean count of *S. aureus* in kareish cheese obtained from street vendors was 1 x 10^3/g (6.6%). This result was higher than that reported by **Dereu *et al.* (2004)** but lower than that of **Bahout and Moustafa (2006), Zaki Eman (2007)** and **Little *et al.* (2008).**

The same tables (1 a&b and 2) shows the mean count of *S. aureus* and its incidence in rice milk and yoghurt as 1.1 x $10^2 \pm 0.35 \times 10^2$, 6 x $10^2 \pm 1.8 \times 10^2$; 3.4 x $10^2 \pm 1.1 \times 10^2$, 10 x $10^2 \pm 0.15 \times 10^2$; 20%, 13.3%; 20% and 26.6%, respectively. These results lower than that recorded by **Ahmed (1999), Ali Manal (2000)** and **Aiad (2002).**

The presence of *S. aureus* in milk and dairy products even in low numbers regarded as public

health hazard, it has been established that *S. aureus* may lose its viability in food but their enterotoxins still exist causing food poisoning if ingested also presence of *S. aureus* may be due to inadequate heat treatment, unhygienic handling practices faulty storage and transportation **(Erkmen, 1995)**.

Tables (1 a&b and 2) showed the mean count and incidence of yeasts in Kareish cheese in both dairy shops and street vendors as $1.6 \times 10^4 \pm 0.03 \times 10^4$/g, $4.4 \times 10^4 \pm 0.07 \times 10^4$/g, 80% and 86.6%. These results lower than that reported by **Al-Ganzoury (1994), Aman (1994), Aiad (2002)** and **Carrasco *et al.* (2006)** while higher than that recorded by **Abdel Satar *et al.* (1995)**.

Also, Tables (1 a&b and 2) showed the mean count and incidence of yeast and in rice milk as $1.4 \times 10^3 \pm 0.16 \times 10^3$, $2.2 \times 10^3 \pm 0.78 \times 10^3$; 33.3% and 46.6%. These findings are higher than that recorded by **El-Shaar Manal (1993)** and **AbdelHaleem Amal *et al.* (2001)** while lower than that recorded by **El-Essawy *et al.* (1990)** and **Al-Gendi Marwa (2004)**.

The mean count and incidence of yeasts in yoghurt Tables (1 a&b and 2) were $1.5 \times 10^3 \pm 0.36 \times 10^3$/g, $14 \times 10^2 \pm 2.1 \times 10^2$/g, 53.2% and 40%, respectively. These findings lower than that recorded by **Al-Gendi Marwa (2004), Shawer Hadeer (1997), Aiad (2002)** and **El-Kasas Walaa (2004)**.

Yeasts are common contaminant for milk and dairy products which are contributed to food spoilage and even food poisoning **(Pite and Hacking, 1997)**. Yeast however can grow under condition unfavorable to many bacteria and therefore play a significant role in the spoilage of dairy products.

The public health significance of yeasts in food has been considered to be minimal and there are cases of food poisoning where yeasts were suspected to be the cause **(Todd, 1983)**. The allergic reactions of consumers to foods and their contaminants are increasing concern to health authorities and yeasts have been incriminated in this connection **(Taylor, 1980 and Anon, 1984)**.

The results recorded in tables (1b and 2), showed the mean mould counts and their incidence for street vendors in Kareish cheese ($3.6 \times 10^3 \pm 0.65 \times 10^3$ and 13.3%). This finding lower than that observed by **Aiad (2002)** and **Moustafa Dina (2008)**.

Tables (1 a&b) revealed that the mean count of mould in rice milk for both types of samples $1.5 \times 10^2 \pm 0.75 \times 10^2$/g and $7.3 \times 10^2 \pm 0.8 \times 10^2$/g. These findings lower than that recorded by **El-Essawy *et al.* (1990)** and **El-Shaar Manal (2003)** but higher than that of **AbdelHaleem Amal *et al.* (2001)** and **abdel Satar and AbdelHaleem Amal (2001)**.

In Tables (1 a&b) the mean count of mould in

yoghurt as $1.2 \times 10^3 \pm 0.18 \times 10^3$, $4 \times 10^2 \pm 1.2 \times 10^2$. These results lower than that reported by **Shawer Hadeer (1997), El-Kasas Walaa (2004)** but higher than **Saleh Omayma (1995), El-Bagoury and Mosaad (2002), Farag (2002)** and **El-Shaar Manal (2003).**

Table (2) recorded the incidence of mould in rice milk and yoghurt from both dairy shops and street vendors as 13.3% and 20%, these findings lower than **El-Essawy *et al.* (1990); AbdelHaleem Amal *et al.* (2001); Abdel Satar and AbdelHaleem Amal (2001); El-Bagoury and Mosaad (2002), Farag (2002)** and **El-Shaar Manal (2003).**

Moulds are widely distributed as environmental contamination of air, water, dust, soil, etc. and can contaminate dairy products during processing and distribution they are capable of growth on variety of substrates and under diversity of moisture, pH and temperature. They are responsible for food spoilage causing economic losses **(Bullerman, 1979).**

Enterotoxigenic strains of *Staph aureus* produce enterotxoins which are proteins in nature resistant to most proteolytic enzyms, heat stable and not easily inactivated in food during heating **(Ryser, 1998).**

Ingestion of food containing enterotoxins cause staphylococcal food poisoning which is characterized by rapid onset of symptoms during 1-6 hours and may include nausea, vomiting and diarrhea **(Jablonski and Bohach, 1997).**

Table (3) declairs the type of enterotoxins of isolated strains of *Staph. aureus* from the three products. 5 out of 13 isolated strains of *Staph. aureus* were enterotoxigenic which are represented as one for both A and D while the other three strains as C enterotoxins in percentage of 7.7% and 23.1% , respectively. These findings are nearly similar to that of **Sabreen *et al.* (1999); Ali Manal (2000)** and **Zaki Eman (2007).**

Many authors stated that C enterotoxins in the most frequently isolated type while A enterotoxin is mostly encountered in dairy products, **Prekoppova *et al.* (1988)** and **El-Baradie (1993)** who reported that enterotoxin A produced by *Staph. aureus* strains is of human origin. The presence of C and D enterotoxins may be attributed to Staphylococcus mastitis as they are bovine in origin **(Masud *et al.*, 1993).**

El-Zyate (1990); **Ikeda *et al.* (2006)** and **Zaki Eman (2007)** failed to detect enterotoxins from examined samples. In addition, **Pinto *et al.* (2004)** stated that SETRPLA is a simple and essential analytical method for routine purpose and to safe public health.

The results detected in table (4) revealed the types of isolated moulds and its incidence for three products as both Alternaria sp., *Aspergillus niger* arthritis, osteomylitis and eye infections, while others may produce mycotoxins which have carcinogenic effect in human in addition to chronic damage of bone **(Mossel, 1982)**.

Salmonella failed to be detected in examined samples. Similar observations obtained by **Coveney Halen *et al.* (1994); El-Kholy *et al.* (1995); El-Kases Walaa (2004), Bahout and Moustafa (2006)** and **Little *et al.* (2008)**.

From the previous results we confirm that some of examined samples does not agree with the Egyptian Standards for dairy products which must be free form pathogens and their toxins, so to improve the quality of these products we must began at the farm to get healthy raw milk which must be cooled to 4 °C after milking and application of suitable heat treatment during processing.

and Cladosporium sp. (25%), while *Asp. flavus* and penicillium sp. were 16.7% and 8.3% , respectively. These results agreed to those of **Abdel Satar *et al.* (1995); Saleh Omayma (1995), Riad Aisha (1996); Abdelsatar and AbdelHaleem Amal (2001); Aiad (2002); El-Bagoury and Mosaad (2002)** and **Farag (2002)**.

Some members of molds incriminated in some cases of pulmonary and urinary infections,

In conclusion, Handling and distribution should be under strict hygienic conditions, use of good quality raw ingredients, also using of hygienic containers protect the product against contamination after processing until reaches the consumer. Workers and handlers of milk and dairy products should follow the hygienic measures during processing, handling and distribution and must get through educational programs to apply good hygienic measures. Routinely examination of dairy products sold by shops and street vendors to aim the protection of health of consumer.

Table (1a): Statistical analytical results of microbial counts in examined samples obtained from Dairy shops.

	Kareish chase				Rice milk				Yoghurt			
	Dairy shops				Dairy shops				Dairy shops			
	Min	Max	Mean	S.E.	Min	Max	Mean	S.E.	Min	Max	Mean	S.E.
Aerobic plate count	6.5×10^3	15×10^4	3.9×10^4	0.16×10^4	1×10^3	7.8×10^4	4.4×10^4	0.06×10^4	0.1×10^3	10×10^3	4.5×10^3	0.16×10^3
M.P.N. coliform	0.04×10^2	4.6×10^2	2×10^2	0.03×10^2	2.3×10^1	11×10^2	3.5×10^2	0.15×10^2	0.04×10^2	2.1×10^2	0.51×10^2	0.03×10^2
Staph. aureus count	-	-	-	-	1×10^2	20×10^2	1.1×10^2	0.35×10^2	1×10^2	6×10^2	3.4×10^2	1.1×10^2
Yeast counts	$1X\ 10^3$	5.6×10^4	1.6×10^4	0.03×10^4	2×10^2	3×10^3	1.4×10^3	0.16×10^3	9×10^2	30×10^2	1.5×10^3	0.36×10^3
Mould count	-	-	-	-	1×10^2	2×10^2	1.5×10^2	0.75×10^2	3×10^2	20×10^2	1.2×10^3	0.18×10^3

Table (1b): Statistical analytical results of microbial counts in examined samples obtained from Street vendors.

	Kareish chase				Rice milk				Yoghurt			
	Street vendors				Street vendors				Street vendors			
	Min	Max	Mean	S.E.	Min	Max	Mean	S.E.	Min	Max	Mean	S.E.
Aerobic plate count	8.9×10^3	20×10^4	6.3×10^4	0.22×10^4	1.1×10^4	9.7×10^4	8.7×10^4	0.81×10^4	2.3×10^3	5.5×10^4	1.9×10^4	$.0084 \times 10^4$
M.P.N. coliform	2.4×10^2	11×10^2	9.6×10^2	1.15×10^2	2.1×10^1	11×10^2	4.3×10^2	0.16×10^2	0.07×10^2	11×10^2	2.3×10^2	0.05×10^2
Staph. aureus count	1×10^3	1×10^3	1×10^3	0.01×10^3	2×10^2	10×10^2	6×10^2	1.8×10^2	5×10^2	15×10^2	10×10^2	0.15×10^2
Yeast counts	1.2×10^4	8.5×10^4	4.4×10^4	0.07×10^4	1×10^3	4.5×10^3	2.2×10^3	0.78×10^3	4×10^2	23×10^2	14×10^2	2.1×10^2
Mould count	1.5×10^3	5.7×10^3	3.6×10^3	0.65×10^3	1×10^2	20×10^2	7.3×10^2	0.8×10^2	2×10^2	6×10^2	4×10^2	1.25×10^2

Table (2): Incidence of isolated microorganisms

Type of microorganism	Kareish				Rice milk				Yoghurt			
	Dairy shops		Street vendors		Dairy shops		Street vendors		Dairy shops		Street vendors	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Coliforms	3	20	7	46.6	4	26.6	6	40	4	26.6	6	40
E. coli	1	6.6	5	33.3	2	13.3	4	26.6	2	13.3	3	20
Staphylococcus aureus	-	-	1	6.6	3	20	2	13.3	3	20	4	26.6
Yeast	12	80	13	86.6	5	33.3	7	46.6	8	53.3	6	40
Moulds	-	-	2	13.3	2	13.3	3	20	2	13.3	3	20

Table (3): Incidence of enterotoxins produced by isolated *Staph. aureus* strains

Samples	No. of tested isolates	A		C		D	
		No.	%	No.	%	No.	%
Kareish							
Street vendors	1	-	-	1	7.7	-	-
Rice milk							
Dairy shops	3	-	-	-	-	1	7.7
Street vendors	2	-	-	1	7.7	-	-
Yoghurt							
Dairy shops	3	-	-	-	-	-	-
Street vendors	4	1	7.7	1	7.7	-	-
Total	13	1	7.7	3	23.1	1	7.7

Table (4): Identification of isolated mould strains.

Types of mould	Kareish		Rice milk		Yoghurt		Total	
	Dairy shops	Street vendors	Dairy shops	Street vendors	Dairy shops	Street vendors	No.	%
Alternaria spp.	-	2	1	-	-	-	3	25
Asperigllus flavus	-	-	-	-	1	1	2	16.7
Asperihllus niger	-	-	-	1	1	1	3	25
Clasosporium spp.	-	-	1	1	-	1	3	25
Penicillium	-	-	-	1	-	-	1	8.3
Total	-	2	2	3	2	3	12	100

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تقييم ميكروبيولوجي لبعض منتجات الألبان المباعة بواسطة محلات الألبان والباعة الجائلين فى المناطق الشعبية

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الملخص العربى

أجريت هذه الدراسة على (٩٠) عينة من الجبن القريش والأرز باللبن والزبادى بواقع خمسة عشر عينة من كل منهم من محلات بيع الألبان والباعة الجائلين.

وقد تم تسجيل نتائج متوسط العدد الكلى للبكتريا الهوائية والميكروبات القولونية والخمائر والفطريات وكانت النتائج كالتالى من محلات بيع الألبان:-

٣,٩ × ١٠^٤، ٢ × ١٠^٢ ، ١,٦ × ١٠^٤ ؛ ٤,٤ × ١٠^٤ ، ٣,٥ × ١٠^٢ ، ١,٤ × ١٠^٣ ، ١,٥ × ١٠^٢ ؛ ٤,٥ × ١٠^٣ ، ٠,٥١ × ١٠^٢ ، ١,٥ × ١٠^٣ ، ١,٢ × ١٠^٣ على التوالي.

ومن الباعة الجائلين ٦,٣ × ١٠^٤ ، ٩,٦ × ١٠^٢ ، ٤,٤ × ١٠^٤، ٣,٦ × ١٠^٣ ؛ ٨,٧ × ١٠^٤، ٤,٣ × ١٠^٢ ، ٢,٢ × ١٠^٣، ٧,٣ × ١٠^٢ ؛ ١,٩ × ١٠^٤، ٢,٣ × ١٠^٢، ١٤ × ١٠^٢، ٤ × ١٠^٢ على التوالي.

بالنسبة للميكروب العنقودى الذهبى كانت متوسط النتائج بالأرز باللبن والزبادى. ١,١ × ١٠^٢، ٦ × ١٠^٢؛ ٣,٤ × ١٠^٢، ١٠ × ١٠^٢ على التوالى أما الميكروب العصوى القولونى (الايشيرشيا كولاى) كانت نسبة تواجده هى ٦,٦%، ٣٣,٣%؛ ١٣,٣%، ٢٦,٦%؛ ١٣,٣%، ٢٠%.

بالنسبة لأنواع السموم المفرزة بواسطة الميكروب العنقودى الذهبى كانت الأنواع C, D, A بنسبة ٧,٧%، ١%، ٢٣%. أما عن أنواع الفطريات المعزولة فكانت اللترنريا، واسبرجلس نيجر، كلادسبورم، أسبرجيلس فلافس وبنسيليوم. وقد تم مناقشة الأهمية الصحية للميكروبات المعزولة ووضع أهم الأقتراحات للحد من هذه المشكلة.