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MICROBIOLOGICAL QUALITY CONTROL OF SAMPLE DISHES FROM SOME SCHOOL CAFETERIA (PRIMARY CYCLE) IN THE WILAYA OF CONSTANTINE

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Abstract

In the catering industry, control dishes are samples of the various dishes distributed to consumers. Their sampling is compulsory and is exclusively reserved for the official control service in the event of suspected collective food poisoning. This study was carried out on different samples (control dishes, ready-made meals). The samples were taken at the hygiene laboratory in the wilaya of Constantine, with the aim of checking the microbiological quality of the control dishes by enumerating the various contaminating germs. The analyses revealed that all the dishes were satisfactory. All but two dishes were contaminated with *E.coli and* mesophilic aerobes.

Key words: Controlled dishes- microbiological analysis- quality- counting- control- foodservice.

INTRODUCTION

The ability of a food to meet the nutritional, health, and organoleptic needs of consumers leads to the emergence of an essential component in the food sector: food quality. According to the FAO [1], the availability of healthy and nutritious food is one of the fundamental rights of man and an essential factor for adequate health. The development of food quality focuses on the harmful and beneficial roles of microorganisms. The development of pathogenic microorganisms leads to the alteration of

the commercial quality of food, which causes manufacturing accidents and rejection by the consumer [2].This uncontrolled proliferation is the cause of the spread of disease and the emergence of foodborne illnesses, which have significant human and social costs[2].Among the various population groups worldwide, children represent the most susceptible category for food contamination, poisoning, and collective foodborne illnesses compared to other categories. It is imperative to maintain food hygiene in meals prepared and presented in mass catering, especially in primary school cafeterias. Our work aims to evaluate the hygienic quality of representative samples of different control dishes from some primary school canteens in the wilaya of Constantine distributed for the benefit of student consumers at the hygiene laboratory of the wilaya of Constantine.

MATERIAL AND METHODS

We completed the work at the Constantine Province Hygiene Laboratory. However, for quality control reasons, our research focused on certain control dishes. The food was collected from some primary school canteens in the province of Constantine and between 19.02.2023 and 16.03.2023.

1-Microbiological quality controls

In food hygiene, the analyses to be performed and the microbiological criteria to be applied are defined by European Regulation No. 2073/2005. Microbiological controls allow detecting and identifying microorganisms and determine the best-before date (BBD) or best-optimal use before date (BOUBD) of foodstuffs.

2- Sample collection and sampling

From sample collection to analysis, measures must be taken to qualitatively and quantitatively stabilize the flora present at the time of collection. The ideal conditions for achieving this goal are rapid transportation (car), appropriate temperature (cooler), and sterile containers (properly sealed sterile boxes).Sampling is random, taking seemingly normal foods for quality control. However, rational sampling methods are difficult, particularly in microbiological analysis, when it comes to detecting specific contamination in certain items within a large batch. The choice of samples, the number, and the frequency of sampling depend on many factors and the nature of the elements.

When the samples arrive, the microbiologists at the bacteriology bench record all the information from all the samples (date, time, location, sample type) and record all the analyzed foods in the food logbook. Water samples are recorded in the water logbook. Afterward, all samples to be analyzed are numbered with a marker, using the same numbers in the logbook. Gloves are essential before touching any samples. Sample preparation requires the aseptic opening of closed containers and the homogenization of liquid products.

3 -Preparations for microbiological analysis

3-1 Microbiological Analyses

The following microbiological analyses were performed: *Staphylococcus aureus* (gold), sulfite-reducing anaerobes (Clostridium), aerobic organisms at 30°C (FTAM), *Salmonella*, total coliforms, fecal coliforms, *Enterobacteriaceae* and Yeast and mold.

3-2- Equipment and Reagents

This is the usual equipment used for food microbiological analyses:

- Sampling: glassware: Pasteur pipettes, graduated pipettes (5, 10, and 20 ml), platinum loop, spoon and knife, Petri dishes, and STOMACHER bags.
- Sterilization: Bunsen burner, bleach, autoclave, and cotton.
- Weighing: a PRESICA scale.
- Grinding: a STOMACHER grinder.
- Incubation: several types of incubators at 30°C, 37°C, and 44°C.
- Cooling and heating: Refrigerators: are used for the storage of certain culture media, certain samples, and food preservation in control dishes.
- Other equipment: a water bath is used to maintain the various agar plates at a constant temperature tolerated by the microorganisms. Test tubes, 250 ml bottles of saline solution, a rack, a basket, a tray, and a pipette holder.

-Culture Media and Reagents are: Agar: LIVER MEAT, CHAPMAN, HEKTOEN, OGA, PCA AGAR. Broth: GIOLITTI CONTONI, SELINITE, BLBVB, BCPL, Indole-Free Peptone Water, Human Serum. Reagent: KOVACS, Potassium Tellurite, Iron Aline, Sodium Sulfite Antibiotic.

3-3- Methods

Each food must undergo the various microbiological analyses presented in Table 1.

Table 1: Germs to look for in foods according to the JORA *(2017)*

Foods	Germs to look for
Olive Tajine + meat Vermicelli + meat Pasta + green olives Chakhchoukha + chicken + carrot Lentils Couscous + chicken Canned tomatoes	*Staphylococcus aureus Salmonella* Anaerobic sulphite-reducing Germ aerobic at 30 °C *Escherichia coli*
Cheese	*Salmonella Staphylococcus aureus Escherichia coli*
Yogurt	*Salmonella Staphylococcus aureus Enterobacteriaceae*
Juice	Yeasts and molds
Water	*Escherichia coli*

3-3-1- Sample Preparation and Analysis

Sample preparation requires the aseptic opening of closed containers and homogenization for liquid foods. All analyses are performed using a liquid suspension.

First, all steps for detecting all microorganisms are performed in front of a Bunsen burner in the sterile area in front of a Bunsen burner (sampling,weighing, isolation, inoculation, subculturing) to avoid contamination. A new pipette is used for each sample collection.

Germs to look for while preparing the stock solution

The stock solution consists of the diluted grinding product. For certain foods, a very important step is required: preparing the stock solution (the 10-1 solution) for the main meal, dairy products and canned tomatoes.

Preparation of the stock solution

Near the Bunsen burner, the technique was performed as weighing 25g of the sample using a sterile spoon and knife on a balance, lace the sample in a sterile plastic STOMACHER bag, and grinding 225 ml of physiological water with the sample in the STOMACHER bag. This mixture is placed in a STOMACHER grinder for 1 to 3 minutes. The dilution stock solution (10^{-1}) was made.

Preparation of decimal dilutions

Dilutions are made in test tubes from the stock solution (10^{-1}) to facilitate counting. Successive dilutions are obtained successively by adding 1 ml of the previous solution using a sterile 5 ml graduated pipette (which must be changed after each dilution) into a test tube containing 9 ml of physiological saline. After homogenization, the dilutions 10^{-2},10^{-3}, and $10^{-4}$are ready for use.

3-3-2- Germs to be screened for

The principle of the techniques used is to determine, for each type of food, a group of bacteria to be counted or screened for, based on the risks. For each bacterium in this group, a quantitative or qualitative acceptance criterion is determined whether the food quality is satisfactory or not. Qualitative criteria are defined as the absence or presence of the bacteria in the food. Quantitative criteria are defined as a numerical value for the count.

Staphylococcus aureus

1 ml of the stock solution (10^{-1}) was taken and added to 15 ml of GIOLITTI CONTONI agar supplemented with a potassium tellurite suspension in test tubes. After homogenization and incubation at 37°C (24 to 48 hours), there was a blackening in the tube, the test was positive.

Isolation and inoculation

The isolation was performed on CHAPMAN agar in a Petri dish. A 0.1 ml sample was inoculated in aseptic way into the Petri dish using a Pasteur pipette. The Petri dishes were incubated at 44°C (24 hours).When golden yellow colonies are present, the second step is initiated.

Coagulase Test

A colony was collected with the Pasteur pipette and subcultured into a tube of human serum (or rabbit blood).Read every two hours (for 24h). When the solution coagulates, *Staphylococcus aureus* is present. The colony count is given by the following formula:

Colony count (germ/gram) = colony count * 100

Sulfite-reducing anaerobic

1 ml of stock solution was taken and added to 5 ml of physiological saline in test tubes.

The tubes were heated to 80°C (10 minutes) in a water bath. Afterward, cooling was performed under running tap water. After cooling, quarter drops of iron phosphate and half drops of sodium sulfite were added to the tubes. Discharge with 15 ml of liver meat agar at a temperature of 45°C. Shake well, and stir until the medium solidifies. Finally, incubation was carried out at 37°C (48 hours). The reading was taken after two days. When there are black colonies measuring 5mm in diameter, it means the presence of clostridium. The count is performed using the following formula: **Count (colony/gram) = number of colonies * 101**

Aerobic bacteria at 30°C FTAM

A series of Petri dishes were prepared and numbered as follows: PCA culture medium, physiological saline, and dilution series of 10^{-1}, 10^{-2}, and 10^{-3}.

- Two control dishes: were the PCA agar and 1 ml of physiological saline.

-For the remaining dishes: were the three dilution series 1 ml from each one (10^{-1}, 10^{-2}, 10^{-3}).

Inoculation

The mass inoculation (depth) was performed using PCA agar at 45°C in the 10^{-1}, 10^{-2}, and 10^{-3} plates, with back-and-forth movements for a few seconds for homogenization. The plates were then left to solidify.After solidification, the plates were incubated at 30°C (48 hours).This was performed on the white lentil-shaped colony-counting plates: there are 30 colonies in the 10^{-3} plate = $30.10^3 = 3.10^4$ colonies/gram.

Salmonella

Pre-enrichment

25 g of the product to be analyzed was collected in a sterile STOMACHER bag containing 225 ml of buffered peptone water. The solution was ground in a grinder for a few minutes. In a sterile bottle, the 10^{-1} stock solution was incubated at 37°C (24 hours).

Enrichment

This was performed in a tube containing 10 ml of SELENITE culture medium and 1 ml of the 10^{-1} stock solution. The tubes were incubated at 37°C (24 hours).When the tubes were pink, positive, the secondary step was initiated.

Isolation and Inoculation

A drop was taken with a platinum loop and streaked into Petri dishes on HEKTOEN agar.

The inoculated plates were incubated in an incubator at 37°C 24 hours. When green or blue colonies with a black center are present, it is indicating the presence of Salmonella.

Total Coliforms

There is a collection and preparation of tubes on a rack. The 9 ml tubes of BLBVB culture medium (lactose broth with bile and brilliant green containing a Durban bell) were arranged in the form of three tubes at the beginning, three at the second, and three at the end of the rack. The same was done for the 10^{-1}, 10^{-2}, and 10^{-3} dilution tubes. A sterile 5 ml pipette must be changed for each dilution:

1 ml of 10^{-2} diluent was taken and added to the first three BLBVB tubes.

1 ml of 10^{-3} diluent was taken and added to the three secondary tubes.

1 ml of 10^{-4} diluent was taken and added to the last tubes. The tubes must be degassed before incubation. The tubes were incubated at 37°C (24 to 48 hours).Positive tubes exhibited both: Gas release (greater than 1/10 of the height of the bell) and microbial haze accompanied by a color change. These indicate lactose fermentation under the described operating conditions.

Fecal Coliforms

A few drops from the positive tubes were taken and subcultured into tubes of Indole-Free Peptone Water broth. After that, they were incubated in a 44°C (24 hours).A few drops of KOVACS reagent were added to the incubated tubes to detect the presence of coliforms, which are expressed by the formation of red rings on the surface of the Indole-Free Peptone Water. Enumeration is done according to the MAC GRADY table for foods.

3-3-3- Germs searched for without preparing the stock solution

On the other hand, for the raw product: there are foods that do not require the stock solution (the 10^{-1} solution is the food), which are liquids, so we move directly to the other steps of germ search. These foods are: yogurt, juice and water.

Enterobacteriaceae

This is done with a 5 ml graduated pipette. A few drops of liquid were inoculated in a rato-shaped manner onto HEKTOEN agar in Petri dishes using a rato-shaped Pasteur pipette. The inoculated plates were incubated at 37°C (24 hours).When orange or green colonies are present, the presence of *Enterobacteriaceae*.

Staphylococcus aureus* and *Salmonella

1 ml of liquid was collected and added to 15 ml of GIOLITTI CONTONI with a few drops of potassium tellurite in test tubes. 4 to 5 ml of liquid was collected and added to the 10 ml of SELENITE respectively. The remaining research steps were carried out in the same way as the method described above.

Yeast and Mold

Microbiological analysis used for beverages such as juice and water. Preparation of a series of 10^{-1}, 10^{-2}, and 10^{-3} dilution tubes, a series of poured Petri dishes of OGA agar (mold culture medium), and a series of poured Petri dishes of NUTRIENT agar (yeast culture medium) + 15 g of sucrose were numbered as follows: three dishes of OGA medium at 10^{-1}, 10^{-2} and 10^{-3} dilutions also three other dishes of GN + 15 g of sucrose at 10^{-1}, 10^{-2} and 10^{-3} dilutions.

A volume of 0.2 ml of each dilution was taken and 0.1 ml was added to the OGA agar plate and 0.1 ml to the corresponding NUTRIENT agar plate using a new sterile Pasteur pipette. The dilution was inoculated in a rato manner onto the agar surface of each plate. The plates were incubated in an incubator at 30°C for five days. When filamentous and irregular colonies are present on the OGA agar plates, this indicates the presence of mold. When moist, viscous, and regular white colonies are present on the NUTRIENT agar plates, this indicates the presence of yeast.

Total Coliform

Presentative Test

A series of six BCPL tubes were prepared and numbered: the first two double-strength BCPL tubes and the remaining four single-strength BCPL tubes. Using a sterile 10 ml graduated pipette:
10 ml of analyzed water was taken and added to the two double-strength BCPL tubes.
1 ml of analyzed water was taken and added to the first two single-strength BCPL tubes.
0.1 ml of analyzed water was taken and added to the second two single-strength BCPL tubes.
The tubes must be degassed after sampling. The tubes were incubated at 37°C (48 hours).When there is: lactose fermentation. Gas release (1/10th of the bell jar).A color change to yellow. That is a presence of total coliforms. Counting positive tubes according to the MAC GRADY water table.

Fecal coliform (thermo-tolerant)

Confirmatory test

Positive tubes were subcultured into tubes of indole-free peptone water and incubated at 44°C (24 hours).The KOVACS reagent was added. When red rings appeared on the surface of the indole-free peptone water broth, this indicated the presence of Escherichia coli.Counting positive tubes according to the MAC GRADY water table.

RESULTS

The results were interpreted according to the official journal of the Algerian Republic No. 39 (2017) presented in table 02.

Table 02: Algerian Standardsof microbiological food norms *(JORA, 2017)*

Food categories	Microorganisms metabolites	Sampling plan		Microbio limit (upc/g)	
		N	C	m	M
Prepared meals in which all ingredients are cooked	Aerobic germs at 30°C	5	2	3.10^5	3.10^6
	Escherichia coli	5	2	10	10^2
	Coagulase-positive Staphylococcus	5	2	10^2	10^3
	Sulfite-reducing anaerobes	5	2	50	50.10^2
	Salmonella	5	0	Absence in 25 g	
Raw milk cheese	*Escherichia coli*	5	2	10^4	10^5
	Coagulase-positive Staphylococcus	5	2	10^3	10^4
	Salmonella	5	0	Absence in 25 g	
Yogurt or yogurts and dairy desserts	*Enterobacteriaceae*	5	2	10	10^2
	Coagulase-positive Staphylococcus	5	2	10	10^2
	Salmonella	5	0	Absence in 25 g	
Fruit and vegetable juices	Yeast and mold	5	2	10	10^2
Natural mineral waters and spring waters	Total coliforms	5	0	Absence in 250ml	
	Escherichia coli	5	0	Absence in 250ml	

m: Lower limit.
M: Upper limit.
Interpretation: Satisfactory <m. Unsatisfactory >M. Acceptable (m,M).

1st Culinary dish: Olive Tagine + Meat, Preparation Water.

Table 03: Results of the first dish

Germs to look for	Culinary dish	
	Olive Tajine+Meat	**Preparation water**
Staphylococcusaureus	00germs/g	
Sulfite-reducing anaerobe	00 col/g	
Aerobic germs at 30°C	2.10^2 col/g	
Total coliforms	00 ct/g	00 ct/100ml
Fecal coliform	00ctt /g	00ctt /100ml
Salmonella	Absence	

According to the JORA *(2017)*, the results indicate that the dish is satisfactory and of good microbiological quality. There is a total absence of germs in the main meal except the aerobic germs at 30°C are present in values lower than the standards (2.10^2 col/g). Also the preparation water is satisfactory because the total and fecal coliforms are 00 therefore the *Escherichia coli* is absent.

2ndCulinary dish: Vermicelli + Meat, Cheese

Table 04: Results of the second dish

Germs to look for	Culinary dish	
	Vermicelli+ Meat	**Cheese**
Staphylococcusaureus	00 Germs/ g	00
Aerobic germs at 30°C	$2,5.10^3$col /g	
Sulfite-reducing anaerobe	00 col/g	
Total coliforms	00ct/100ml	00
Fecal coliform	00ctt /100ml	00
Salmonella	Absence	Absence

According to the JORA *(2017)*, the results indicate that the dish is clean, satisfactory and of good microbiological quality, because there is a total absence of germs in cheese and the main meal of the 2nd dish with a presence of aerobic germs at 30°C of value ($2.5.10^3$ col/g) lower than the standards in the main meal.

3rdCulinary dish: Pasta + Olive, Cheese, Yogurt

Tableau 05: Results of the 3rddish

Germs to look for	Culinary dish		
	Pasta + olive	**Cheese**	**yogurt**
Staphylococcusaureus	00 germ/ml	00 germ/ml	00 germ/ml
Aerobic germs at 30°C	2.10^3 col/g		
Sulfite-reducing anaerobe	00 col/g		
Total coliforms	00 ct/g	00 ct/g	
Fecal coliform	00 ctt/g	00 ctt/g	
Salmonella	Absence	Absence	Absence
Enterobacteriaceae			00 nt/ml

According to the JORA *(2017)*, the results indicate that the dish is clean, satisfactory and of good microbiological quality, because there is a total absence of germs in yogurt, cheese and the main meal of the 3rd dish with a presence of aerobic germs at 30°C of value (2.10^3col/g) lower than the standards in the main meal.

4thCulinary dish: Chakhchoukha + Chicken + Carrot, Canned Tomato, Juice

Tableau 06: Results of the 4thdish

	Culinary dish

Germs to look for	Chakhchoukha + Chicken + Carrot	Canned Tomato	Juice
Staphylococcusaureus	00 germ/g	00 germ/g	
Aerobic germs at 30°C	$5,6.10^5$col /g	$6,8.10^5$col /g	
Sulfite-reducing anaerobe	00 col/g	00 col/g	
Total coliforms	00ct/100ml	00ct/100ml	
Fecal coliform	00ctt /100ml	00ctt /100ml	
Salmonella	Absence	Absence	
Yeast and mold			00

According to the JORA *(2017)*, the results indicate that the dish is not clean, unsatisfactory and of poor quality, because there is a presence of aerobic germs at 30°C of value ($5.6.10^5$ col/g) in the main meal also in the canned tomato of value ($6.8.10^5$ col/g) higher than the standards. And total absence of germs in juice in the 4th dish.

5th culinary dish: Lentil, Cheese, Preparation water

Table 07: Results of the 5thdish

Germs to look for	Culinary dish		
	Lentil	**Cheese**	**Preparation water**
Staphylococcusaureus	00germ/g	00germ/g	
Aerobic germs at 30°C	9.10^3col/g		
Sulfite-reducing anaerobe	00 col/g		
Total coliforms	900 ct/100 ml	00 ct/100ml	1100 ct/100ml
Fecal coliform	180 ctt/100ml	00 ctt/100ml	250 ctt/100ml
Salmonella	Absence	Absence	

According to the JORA *(2017)*, the results indicate that the dish is not clean, unsatisfactory and of poor microbiological quality. In the 5thdish there is a presence of aerobic germs at 30°C of value (9.10^3 col/g) and presence of total coliforms of (900 ct/100 ml) and fecal coliforms of value (180 ctt/100 ml) higher than the standards in the main meal. Also in the preparation water there is a presence of total coliforms of value (1100 ct/100 ml) and fecal coliform of value (250 ctt/100 ml) higher than the standards therefore presence of Escherichia coli. In the cheese there is an absence of

germs of value 00.

6th Culinary dish: Couscous + Chicken, Cheese, Yogurt

Table 08: Results of the 6th dish

Germs to look for	Culinary dish		
	Couscous + chicken	**Cheese**	**Yogurt**
Staphylococcus aureus	00 germ/g	00 germ/g	00germ/g
Aerobic germ at 30°C	10^2col/ g		
Sulfite-reducing anaerobe	00 col/g		
Total coliforms	00ct/100ml	00ct/100ml	
Fecal coliform	00ctt /100ml	00ctt /100ml	
Salmonella	Absence	Absence	Absence
Enterobacterieaceae			00 Ent/ml

According to the JORA *(2017)*, the results indicate that the dish is clean, satisfactory and of good microbiological quality, because there is a total absence of germs in the cheese and yogurt. The main meal contains aerobic germs at 30°C with a value (102 col/g) below the standards.

DISCUSSION

Our work shows that most of the dishes are fit for consumption and have good microbiological quality (an absence of germs or a presence with a low value). Except for the 4th and 5th dishes, they are of poor microbiological quality (there is a presence of germs of varying value).

Main Meal

Out of six surface samples taken, we noted the presence of germs in two cases, which corresponds to a contamination percentage. Our results are lower than those found by MEJRHIROU [4]. They noted a contamination percentage of 80%. While that of GARAYOA *and al.* [5] is 40%, lower than that found by MAHMOUH [6] which is 27% and also lower than that of AHOYO *and al.* [7] who revealed a high frequency of contamination of food sold on the campus of the University of Abomey Calavi in Benin (74%) and also lower than the results obtained by MOULOUDI [8] which is 47.92%.The contamination value of the control dish by the aerobic Germ at 30°C in the 4th dish is different from the results of DIOUF [9] who have satisfactory results like our results of the 1st, 2nd, 3rd, 5th, and 6th

dish. The contamination of meals by aerobic Germs at 30°C can testify to a doubtful freshness of the products, or excessively high storage temperatures, the use of heavily soiled raw materials, the lack of means of preserving cooked foods at a temperature greater than or equal to 65°C. The fecal coliform contamination results in the 1st, 2nd, 3rd, 4th, and 6th dishes are satisfactory. However, the results for the 5th dish are 180 ctt/100 ml. The corresponding company must take rigorous hygiene measures regarding, among other things, hand washing, disinfection of sanitary facilities, and better control during post-cooking handling. The *Salmonella* contamination results in our dishes are 100% satisfactory, even if the sulfite-reducing aerobes are also satisfactory in all dishes. This good result can be attributed to proper washing of the food, good mastery of heating and cooling principles, the quality of the raw materials, and also the application of good hygiene practices by the staff. It should be noted, however, that we were unable to observe these various aspects on site. The results for *Staphylococcus aureus* contamination were 100% satisfactory in all dishes. Humans are the main source of food contamination by presumed pathogenic staphylococci, generally considered *Staphylococcus aureus*. They are the reservoir for several species of staphylococci, which they harbor in the nasal passages and throat, especially during colds. They are also present on wounds and burns, on the skin, hair, and in the ears. *Staphylococcus aureus* is pathogenic due to its ability to secrete a heat-stable toxin that exerts both toxic and antigenic properties in the infected person.

Water

The drinking water used in the kitchen in the first and fifth dishes has a lower level of contamination than that of the surfaces, corresponding to a percentage of 47.05%. In the absence of total coliforms in the first dish and the presence of total and fecal coliforms in the fifth dish, the non-compliance of the samples not fit for consumption is caused by the presence of *Escherichia coli,* which is present in the fifth dish. The detection of *Escherichia coli* in water must therefore be considered as reflecting the possible presence of pathogenic microorganisms of fecal or enteric origin [10]. Humans remain the potential source of these two opportunistic pathogens.

Cheese

All cheese samples from the second, third, fifth, and sixth courses were clean, of good quality, and satisfactory, complying with standards. All cheese samples analyzed revealed the absence of *Staphylococcus aureus*; our results are consistent with BECHLEM and BETATACHE [11] who tested negative for this pathogenic bacterium. *Enterobacteriaceae* counts in processed cheeses show that their numbers vary between maximum values of 765 UFC/g. In this study, fecal coliforms were absent in all samples and yielded negative results which is consistent with the results of BECHLEM and BETATACHE [11]. The results of the *Salmonella* test show that this germ is absent in all the cheeses analyzed which specifies that processed cheese must be free of *Salmonella*.

Yogurt

Good-quality yogurt must meet a number of criteria, particularly microbiological criteria. This can be achieved by applying good handling and hygiene rules at all stages of product manufacturing. In the case of our study, microbiological analyses (of the yogurt boxes of the 3rd and 6th dishes revealed the total absence of *Staphylococcus aureus*, *Enterobacteriaceae* and *Salmonella*. This situation is different from that reported by GUEBLI and HAMMADI [12]. This absence may be linked to good mastery of environmental and personnel hygiene rules. These performances are also likely due to the direct validation of the pasteurization scale as well as compliance with the cold chain and finally to regular monitoring carried out during all stages of product manufacturing.

Juice

The sample from the fourth dish was clean and satisfactory because the microbiological analysis results were negative, with an absence of yeasts and molds. Our results are consistent with those of AKKOUCHE and CHIKHAOUI [13]. The presence of yeasts and molds is explained by the ineffectiveness of the heat treatment applied (pasteurization at 75°C/15 min) to eliminate them. This can be explained by the fruit being preserved under favorable conditions, human involvement, and the presence of pasteurization.

CONCLUSION

This study highlighted the importance of microbiological control in school cafeterias. Given the central role of hygiene regulations in mass catering, improvements can be made; protocols and procedures must be written, validated, and regularly evaluated. Preparing meals of good microbiological quality requires compliance with numerous hygiene rules at several levels: raw materials, preparation environment (premises, equipment, storage), and personnel. Various microbiological control analyses were conducted on different types of sample dishes from a primary school canteen at the Food Bacteriology Unit of the Constantine wilaya Hygiene Laboratory. To monitor the microbiological quality of the food, several microbiological analyses were performed, including the enumeration of the following organisms: FTAM, *Escherichia coli*, *Staphylococcus aureus*, sulfite-reducing anaerobes, *Salmonella*, Yeast and Mold, and *Enterobacteriaceae*. Our results revealed that all the dishes analyzed met the standards, and were therefore of good microbiological quality, fit for consumption, and satisfactory, except for the two dishes, the 4th and 5th, which were contaminated with *E. coli* and aerobic germs at 30°C.It is therefore essential that the preparation of meals of good microbiological quality requires compliance with numerous hygiene rules. Finally, we suggest strengthening the measures taken to ensure the quality of school meals.Take steps to educate and train staff in hygiene and food safety: good personal hygiene, training and raising awareness

among staff and restaurant owners and involving veterinarians and hygienists in the design and construction of restaurants.

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