

DETECTION OF NITRITES IN DIFFERENT KINDS OF CHEESE AND THEIR EFFECT ON THE BACTERIOLOGICAL STATMENTS

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Abstract

Eighty random samples of cheese (Kariesh, Damietta, Romy and Edam cheese) were collected from different localities in Cairo, Giza and Kalibia Governorates. Samples were examined for nitrites concentrations and total bacterial contamination. Results showed that nitrites concentration ranged from $0.0 : 9.8 \pm 4.6$ mg/kg, while, the total bacterial count ranged from 360 ± 16.33 to 25590 ± 9256.33 C.F.U. There was a negative correlation between nitrites and total bacterial count in Kariesh and Romy cheese. It appears necessary to examine all types of cheese before solding to confirm a good hygienic quality.

INTRODUCTION

Nitrates and nitrites are used as food additives. Nitrates are added to milk for the production of semisolid and mould rippened cheese at levels of 150-200 mg/L potassium nitrate.

Due to the potential risk of formation of carcinogenic N-nitrosocompounds in the consumer's body, several attempts were made to reduce the use of these compounds as food additives (Poulsen, 1980). Peters *et al.* (1994) recorded a relation between the intake of nitrite compounds and risk of leukemia among children up to 10 years age in Los Angeles country. Moreover, Dardir (1996) concluded that prolonged ingestion of sodium nitrite has been shown to be a cause of methemoglobinurea, especially, in infants and also the possible induction of cancer, especially, stomach and oesophageal cancer. Nitrates from food are observed in the intestines, while, about 80% of these are eliminated in the urine. Infants up to the age of one year are more susceptible to the content of nitrates in food. The potential toxicity of nitrates is an immediate negative manifestation of their toxicity (Vondrakova, 1982). Addition of nitrites to cheese is illegal in Egypt, but sodium nitrates is used in certain European cheese (Italy) to prevent spoilage by *clostridium trybuticum* at levels of 100 mg/kg sodium nitrate and 10 mg/kg sodium nitrite (Tompikin, 1983).

Our investigations aimed to determine the levels of nitrites and total bacterial contamination in certain kinds of cheese sold in different market in Cairo, Giza and Kaliobia governorates. Sustained monitoring was performed to indicate the sanitary conditions under which the food was produced or processed and to eliminate the levels of nitrites used as food preservatives added during production and processing of cheese.

MATERIALS AND METHODS

Eighty random samples of cheese (20 each of Damietta, Kariesh, Edam, Romy cheese) were collected from different localities in Cairo, Giza, Kaliobia Governorates. Collected samples were packed in an insulated ice box and forwarded to the laboratory as quickly as possible to be immediately examined or kept in a refrigerator until examined. Each sample from different kinds of cheese was thoroughly mashed in a sterile stomacher bags by stomaching and subjected to the following examinations :

1. Total aerobic bacterial count according to Manual of Food Quality Control (FAO, 1992).
2. Determination of residual nitrites according to AOAC (1990).

Statistical analysis

Mean as well as standard deviation and correlation coefficient were calculated according to method described by Selvin (1996).

RESULTS AND DISCUSSION

Table 1. Levels of nitrites in the examined cheese samples.

Type of cheese	No. of samples	No. of +ve samples	Percentage of +ve samples	Average conc. of nitrites (mg/kg)	Mean \pm S.E.
Kariesh	20	12	60%	0.0 : 11.89	9.8 \pm 4.6
Damietta	20	8	40%	0.0 : 42.41	7.12 \pm 4.2
Romy	20	9	45%	0.0 : 12.29	3.74 \pm 1.57
Edam	20	0	0%	-ve	-ve

Table 2. Total bacterial count of examined cheese samples.

Type of cheese	No. of samples	Average total bacterial count (C.F.U.)	Mean \pm S.E.
Kariesh	20	19×10^3 : 29×10^3	25100 ± 1361.78
Damietta	20	2×10^2 : 5×10^3	1240 ± 420
Romy	20	18×10^2 : 9.5×10^4	25590 ± 9256.33
Edam	20	3×10^2 : 4×10^2	360 ± 16.33

Data expressed as mean \pm S.E.

Table 3. Relation between nitrites and total bacterial counts of examined cheese samples.

Type of cheese	T.B.C.	Nitrite Conc. (mg/kg)	Correlation
Kariesh	25100 ± 1361.78	9.8 ± 4.6	-0.474
Damietta	1240 ± 420	7.12 ± 4.20	+0.344
Romy	25590 ± 9256.33	3.74 ± 1.54	-0.04364
Edam	360 ± 16.33	-	-

The areal monitoring of the occurrence of nitrites content in pooled samples of cheese recorded in Table 1, revealed that Kariesh cheese showed the highest percentage of +ve samples for nitrites (12 +ve samples out of 20 examined samples with a percentage of 60%). Concentration of nitrites in Kariesh cheese ranged from 0.0 : 11.89 mg/kg with a mean of 9.8 ± 4.6 mg/kg. No amount of nitrites could be detected in Edam cheese (0.0%). In Damietta cheese, 8 +ve samples out of 20 examined samples were recorded with a percentage of 40%. Concentration of nitrites ranged from 0.0 : 42.41 mg/kg with a mean of 7.12 ± 4.2 mg/kg. Moreover, the examination of Romy cheese revealed 9 +ve out of 20 examined samples with a percentage of 45%, and nitrites concentration was 0.0 : 12.29 mg/kg with a mean of 3.74 ± 1.57 mg/kg cheese.

Damietta and Kariesh cheese are famous locally produced soft cheese in Egypt in which raw milk is used in their manufacture. Raw milk could be contaminated with nitrites from food of dairy animals resulting in increased content of nitrites in the body, blood and milk of the animals (Wozniak and Wojton, 1996). Addition of potassium and

sodium nitrates used as food preservatives, explain the detection of nitrites in these products (Peluez and Northholt, 1988). Moreover, nitrites content of examined samples of Romy cheese may be attributed to heavily using of nitrites in the manufacture of hard cheese to overcome the growth of butyric acid and fermenting microorganisms during ripening and processing stage (Makiewicz and Hiller, 1989).

Bacteriological examination of cheese tested samples (Table 2) showed that Romy and Kariesh cheese represented the highest total bacterial count "T.B.C." (1800 : 95000 C.F.U.) with a mean of 25590 ± 9256.33 and 19000 : 29000, 25100 ± 1361.78 , respectively. Moreover, Damietta cheese recorded 200 : 5000 C.F.U. with a mean of 1240 ± 420 , while, the T.B.C. in Edam cheese showed the lowest number (300:400 C.F.U.) with a mean of 360 (16.33). Bacterial contamination of cheese may be attributed to the previous contamination of milk by different types of bacteria either before or during process of manufacturing (Ternstrom *et al.*, 1993).

Statistical analysis of results revealed a correlation between nitrites and T.B.C. in different types of cheese as recorded in Table 3, where, Kariesh and Romy cheese showed -ve correlation for each examined sample. Gouda (1988) recorded that nitrites improved the keeping quality of cheese. Damietta cheese showed a +ve correlation between nitrites and T.B.C. Pluta *et al.* (1989) reported that nitrites content are increased with the increasing of the number of coliforme bacteria when the milk used to produce the cheese was heavily contaminated with these bacteria. In such case, the advantages effect of nitrites on each quality was apparent. Edam cheese showed no remarkable contamination of nitrites as they are decreased during the coagulation and pressing stages of cheese. Similar results were reported by Przybylowski *et al.* (1987).

As regards the indicators of nitrites and T.B.C. contamination of the most kinds of cheese, it appears necessary to examine all types of cheese before selling or consuming to confirm the good hygienic quality and safety.

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التعرف على أملاح النيتريت فى أنواع الجبن ومدى تأثيرها على التلوث البكتيرى

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تناول هذا البحث فحص عدد ٨٠ عينة من ٤ أنواع مختلفة من الجبن (قريش، رومى، دومتى وجودة)، جمعت العينات من أماكن عشوائية فى محافظات القاهرة والجيزة والقليوبية. وقد تم فحص هذه العينات لوجود النيتريت بالإضافة الى التلوث البكتيرى. وقد وجد ان نسبة النيتريت تراوحت بين صفر الى 4.6 ± 9.8 جرام نيتريت لكل كيلوجرام جبن. وكانت نتائج التلوث البكتيرى 2509.0 ± 9256.22 . وقد وجدت علاقة عكسية بين نسبة النيتريت والتلوث البكتيرى فى الجبن القريش والرومى مع وجود علاقة طردية بينهما فى حالة الجبن الدمياطى. وكانت فى الجبن الجودة سلبية بالنسبة لوجود النيتريت. لذلك يجب فحص الأنواع المختلفة من الجبن جيداً قبل بيعها واستهلاكها ومناقشة الأهمية الصحية ومدى خطورة وجود النيتريت فى أنواع الجبن المختلفة على صحة الإنسان.