Egyptian Pasteurized Processed and Spread Cheeses: An Overview

Abou-Donia, S.A
Dairy Sci. and Technol. Dept., Fac. of Agric., Alex. Univ., Alexa., 21545, Egypt.

ABSTRACT

Pasteurized cheese and spread cheeses are applied to the products that have been heated and packed into selected containers. The processed cheese industry was recently originated in Egypt, and then research work began science fifty years ago. The overview describes selecting and blending of cheese, milk ingredients replacers, emulsifying agents, animal or plant origin ingredients, different additives to cheese, filling and packaging of cheese. The microbiology and consumer safety, the chemistry and the nutritional value of processed cheese are also considered.

Key words: Egyptian processed cheese, pasteurized cheese, spread cheese, cheese blends, cheese emulsifiers.

INTRODUCTION

The term process or processed cheese is applied to those products that have been heated and packed into selected containers. World War I (1914-1918) stimulated wide interest in processing cheese to avoid spoilage and permit distant shipment.

Processing cheese has advantages beyond the increased keeping time of the product. Of primary importance, also is the fact that any pathogenic microorganisms that may be present are destroyed during heating (Foster *et al*. 1961).

According to the Federal Security Agency, Food and Drug Administration, USA (1951), the definitions and standards have been established for several types of heated processed cheese:

1- Pasteurized process cheese: Except for the emulsifying agent, salt, acid and cream, cheese contribute practically all of the milk solids in this product. The limit moisture content is identical for the corresponding variety of natural cheese.

2- Pasteurized process cheese spread: The moisture content of this product is greater than 44% but not more than 60%.

The processed cheese industry was recently originated in Egypt after the Egyptian Revolution in 1952, then the research work regarding science and technology of the Egyptian pasteurized processed and spread cheeses started. It was first investigated by Hofi (1957), and subsequently by El-Sadek & Zaki (1958) and Nassib (1965). Recently, Abd El-Salam *et al*. (2005) reviewed the studies on processed cheese in Egypt.

The processed cheese is known among the Egyptian consumers as *Gebnah Matbukha* (cooked cheese), and also *Gebnah Muthallathat* (triangular cheese) referring to the most popular shape of processed cheese packages.

Selecting and blending of cheese

Cheeses with different degrees of flavour developments are mixed in proportions that will yield the desired characteristics in the final products. One or more variety of cheese may be included:

Ras cheese

Processed cheese using immature and 6 month old Ras cheese (1:1) was manufactured by Abou-Donia & Salam (1982) and Abou-Donia *et al*. (1983). Ras cheese was also used by Shehata *et al*. (1982) and Magdoub *et al*. (1984a &b) as 60% current + 40% ripened. Addition of direct acidified Ras cheese gave unchanged spread during storage (Abdel Baky *et al*., 1987). Ripened Ras cheese was also utilized by El-Sayed *et al*. (1997).

Cheddar cheese

Cheddar cheese was used in manufacturing processed cheese by Guirguis *et al*. (1985). Cheese spread blend containing full fat Cheddar cheese 75% green curd + 25% full fat Cheddar cheese + 0.2% pectin was gained the highest scores for organoleptic properties and can be economically suitable to produce low fat cheese spread of good quality from the view point of physical and organoleptic properties (Abd Rabo, *et al*. 2004c).

Mozzarella cheese

The addition of low-fat-Mozzarella cheese improved the outer appearance and flavour of resultant processed cheese spread (Awad *et al*. 2003a).

Milk ingredients replacers other than cheese: Replacing of cheese blend partially with other milk ingredients was very well investigated by several authors as follows:

Whey proteins: Adding denaturated whey protein and coprecipitate at ratios 10, 20, 30% to mixture used in manufacture of low fat processed cheese gave a good organoleptic score, also, gave good texture, toughness, hysteresis and elasticity (Salem *et al*. 1987). Good quality processed cheese spread can be made with 40% whey protein concentrate (El-Neshawy, 1988, Abd El-Salam *et al*., 1996, 1997, 1998, Al-Khamy *et al*. 1997).

The succinylated denaturated whey protein was used in processed cheese making, the resultant cheese had a better spreadability than that of control (Fayed & Metwally, 1999). Karish cheese was substituted with whey protein precipitated by heating of salted whey at pH 4.6 for the manufacture of low fat processed cheese spread. The most acceptable treatment was that made with replacing 60% of Karish cheese with whey protein (Kebbary *et al*., 2001).

Skim milk powder: The skim milk powder was successfully used in the manufacturing of processed cheese (Shehata *et al*., 1982, & Magdoub *et al*. 1984a). Replacement 40% of skim milk powder with retentate gave spread of acceptable properties and composition (Gouda & El-Shibiny, 1987).

Preparing of cheese base using a coagulum reconstituted skim milk by ultrafiltration/ diafiltration at 75% for manufacturing processed cheese met the Egyptian statutory regulations (Tamine *et al*., 1989, 1990).

Butter milk: Cultrured butter milk was used for the manufacture of processed cheese (Abou-Donia & Salam 1982, Abou Donia *et al*., 1983). The sensory evaluation indicated that butter milk curd could be used to replace casein in the manufacture of processed cheese of spread type analogues up to 60%.

Increasing the levels of butter milk curd up to 80 and 100% produced cheese analogues with unacceptable flavour and texture, especially when cheese stored at temperature above 20°C. (Abou-El-Nour & Bucheim, 2002).

Rennet caseins: Replacement of up to 40% rennet casein with total milk protein resulted in processed cheese of satisfactory meltability, firmness, sliceability, texture and organoleptic properties (Abou-El-Nour *et al*. 1996, 1998). Three commercial rennet casein samples were used in the manufacture of processed cheese analogues. The sources of casein had high significant effect on the free fat content, firmness, and resistance to cutting and meltability of processed cheese analogues. (Abou-El-Nour, 2003).

Cheese curd slurry

Mature Cheddar cheese used for the manufacture of processed cheese spread was successfully replaced by accelerated ripened cheese curd slurry at levels of 25, 50, 70 and 100% (El-Neshawy *et al*., 1987, 1988).

Replacement slurry at 15 or 20% gave a product with good flavour, consistency and outer appearance when fresh or after 3 months at both storage treatments (Abdel-Hamid *et al*., 2002).

Calcium caseinate

Using calcium caseinate gave poor spreadability in the resultant spread (Gouda *et al*. 1985).

Enzyme treated cheese base

Processed cheese can be successfully made by replacing partially Cheddar cheese up to 75% with enzyme treated cheese base. (Dawood *et al*., 1989).

Phosphocaseinate

Native phosphocaseinate can be used successfully in the manufacture of processed cheese spread analogues at the rate of 30-40% replacement of the rennet casein. (Abou-El-Nour *et al*. 2001b).

Whole milk concentrate

The total costs for manufacturing processed cheese spreads was reduced by 13.4 and 25.61% when hard cheese in the base were replaced by total milk proteins at the levels of 25 and 50%, respectively than the control spread (Hussein, *et al*., 2005).

Emulsifying agents or salts

To obtain the desired smoothness in the final product, certain chemicals may be added to help dissolve the protein and emulsify the fat the chemicals include the following:

Phosphate salts: Disodium phosphate (Na2 HPO4) can be used successfully in manufacturing processed cheese. (Abou-Donia & Salam, 1982, Abou-Donia *et al*. 1983).

JOHA salts: Both of JOHA No and JOHA S9S salts were successfully used in the manufacture of processed cheese. (Magdoub *et al*., 1984a). The use of JOHA HBS, JOHA, S221, JOHA S197, JOHA RK2 and JOHA PZ 14 in the manufacture of spread-type processed cheese analogues from rennet casein gave variable pH, free oil, firmness, resistance to cutting and stability to final product (Abou-El-Nour *et al*., 2001a).

Potassium salts: The microstructure of processed spreads with potassium citrate + potassium acetate in different ratios showed a well emulsified small size fat globules spreads in the matrix, indicating that, it always better to use a mixture of salts rather than emulsifying salts. Potassium acetate acts as emulsifier and preservative in the same time (Abd Rabo *et al*. 2004a, 2005).

Sodium salts: Tetra sodium pyrophosphate, penta sodium tripolyphosphate and sodium hexameta phosphate were used in formulating emulsifying salts in making spreadable processed cheese. The spreads contained low bacterial counts and spore formers, and were free from moulds & yeasts. The microstructure of cheese spreads showed marked improvement in the emulsification of fat. (Abd Rabo *et al*. 2004b).

Adding of animal or plant origin ingredients

The addition of animal or plant origin ingredients to process cheese mixture was very well studied by several investigations as follows:

Animal origin ingredients: Shrimp, Replacement of Ras cheese with shrimps (10, 20, 30, 40 and 50%) improved the organoleptic properties of the cheese spread, while it had a slight effect on their chemical compositon, elasticity and meltability (Abeid *et al*., 2001).

Plant origin ingriedients

Faba bean flour: Adding to cheese mixture, faba bean flour at 0, 1.8, 3 or 5.4% gave processed cheese with acceptable organoleptic properties, but slight browning occurred in cheese made with the higher inclusions of faba bean flour (Abou-Donia & Salam, 1982).

Gossypol free cotton seed flour: Adding to cheese mixture, cotton seed flour at 1.8, 3 or 5.4% gave processed cheese with acceptable organoleptic properties, the only undesirable effect being a slight brown colour in cheeses containing higher amounts of cotton seed flour (Abou-Donia *et al*., 1983).

Soya bean flour: Accepted processed cheese was obtained by replacement of hard cheese with soya bean flour at the rates of 25, 50, 75 and 100% respectively (Ghaleb *et al*., 1985, El-Neshawy *et al*., 1988).

Peanut curd: Replacement 50% of the curd with peanut curd improved the organoleptic properties of fresh and stored cheeses. (Guirrguis *et al*., 1985).

Chick pea flour: Replacement of the curd with chick pea flour gave good organoleptic quality processed cheese. (El-Neshawy *et al*., 1988).

Corn germ protein: Mixture of corn germ protein/acid casein 15% gave the most acceptable processed cheese spread, but excess corn germ protein in processed blends resulted in stronger gel and gave inferior rheological and organoleptic properties (Fayed, 1996).

Potato puree: Addition of potato puree in the blend of processed cheese up to 30% improved the body and texture as well as enhanced the flavour and gave a better organoleptic quality. The total costs also saved 18% than that of control (Awad, 2003).

Different flavouring additives to cheese

Flavouring with vegetable, fruits and cheese flavours:

Hot pepper, Low fat processed cheese treatments flavoured with hot pepper were more acceptable than those flavoured with hot green pepper (Kebbary *et al*., 2001).

Fruit pulp of guava, mango and banana: Flavoured processed cheese spreads with fruit pulp of guava, mango and banana was studied. Cheese spreads with banana pulp exhibited higher pH value than that with guava or mango flavours (Awad *et al*., 2003b).

Cheese flavours

Adding of different levels of Cheddar or Swiss cheese flavours in the blend affected the free fatty acid content in the resultant processed cheese (El-Bagoury and Helal, 1987).

Fortification with iron

Ferrous gluconate at levels of 40 and 80 mg Fe/kg and ferrous citrate at levels of 40 mg Fe/kg could be used to produce an appealing iron fortified processed cheese (El-Sayed *et al*., 1997).

Fat replacers

The fat replacers, protein based fat replacers, and carbohydrate based fat replacers were used to replace 50% and 100% of butter in the blend of the cheese spread, they gave the cheese spread good quality (Kebary *et al*., 1998).

Massoud *et al*. (2005) used Jerusalem artichokes (J, A) (*Helianthus tuberosus*) as a source of fruline and oligo fructose as fat replacer in processed spread Cheddar cheese. Processed cheese was prepared by blending natural cheddar cheese with (JA) using different concentrations. The cheese product showed lower fat content and higher moisture content when increasing J, A concentration. Replacing 35% cream and 50% Cheddar cheese with J.A. paste had no effect in organoleptic properties.

Filling and packaging of cheese

After heating at not less than 66°C (150°F.) for at least 30 seconds the mixture of cheese and other ingredients with agitation until it becomes a smooth plastic mass, the hot mass is caused to flow into glass, plastic or foil lined cartons of convenient size that then are sealed to exclude air. Salam *et al*. (1992) concluded that the best processed cheese package was the small polystyrene containers sealed with brightly coloured laminated foil.

El-Shibiny *et al*. (1996) packed processed cheese in glass jars and three locally made polymeric laminated materials and an imported polyamide sheets and stored them for three months at refrigerator (5-8°C) and room temperature (25-30°C). Unnoticeable change during cold storage regarding chemical composition, microbiological state, sensory evaluation and oiling off, while on counter act picture observed regarding storage at room temperature. The previous results pointed out that the effect of storage temperature on processed cheese quality was more important than type of package.

Metwally *et al*. (1996) observed that the internees of glass as well as its availability in Egypt highly recommend to use for packaging processed cheese.

Microbiology and consumer safety of cheese

El-Sadek & Zaki (1958) examined microbiologically 8 locally produced, and 3 imported processed cheese samples; the total count ranged from 3.6 X 103 to 2.3 X 106 cfu/gm. The dominant organism was *Bacillus* spp. & moulds.

Few bacteria other than aerobic (*Bacillus* spp), and anaerobic (*Clostridium* spp) spore formers survive the heat treatment given processed cheese mixtures. Although molds are killed during processing, they may recontaminate the product during packaging and will grow if oxygen is available. (Foster *et al*., 1961)

Nassib (1965) isolated heat resistant bacteria from local and imported processed cheese samples, also the dominant organism was *Bacillus* spp.

Al-Ashmawy *et al*. (1977) examined microbiologically 40 locally processed cheese samples. The dominant organisms was *Bacillus* spp. and moulds.

Shehata *et al*. (1982) and Magdoub *et al*. (1984a) reported that increasing quantity of Ras cheese in the blend of processed cheese tended to increase total bacterial and anaerobic spore formers count.

Mahfouz *et al*. (1986) collected randomly 62 processed cheese samples from Cairo market microbiologically analyzed. Generally the results suggest that all the examined samples of reasonable quality. Also all samples contained molds.

Abeid (1996) reported that addition of 5% starter of *Lactobacillus casei* improved the organoleptic properties of resultant processed cheese.

Sadek, (2005) studied the antibacterial activity of some strains of lactic acid bacteria against *Clostridium perfringenes* isolated from processed cheese using spot-on-the lawn and agar diffusion methods. Results revealed descending inhibition potential from *Pedicoccus acidilactis* followed by *Lactobacillus plantarum*, *Lb. rhamnosus* and *Lactococcus lactis*, while *Enterococcus faecium* was the least.

Chemistry of cheese

Gross chemical composition: Various factors affect the chemical composition of processed cheese namely, blending of cheese, milk ingredients replacers, emulsifiers salts added and animal or plant origin ingredients to cheese mixture.

Ho *et al*. (1957) analyzed random samples of processed cheese collected from Cairo markets, the results revealed that moisture content ranged between 32.5 to 39.2%, fat 21.5 to 31.5%, ash 4.2 to 7.24% and NaCl 0.91 to 3.35%.

Mahfouz *et al*. (1986) collected Randomly and analyzed 62 samples of processed cheese from Cairo markets, the results revealed that they are widely varied in their chemical analysis as follows; fat 19.70-60% /D.M. lactose 2.09-28.35% /D.M.

Hamed *et al*. (1997) and Khader *et al*. (1997) analyzed processed cheese samples from Cairo markets, they observed a great variation in their chemical composition. Also Abou-El Nour (2001) obtained similar results.

Biogenic amines: Abd Alla *et al*. (1996) examined 24 processed cheese samples collected from Cairo markets for its contents from biogenic amines. Results revealed the presence of histamine, tyramine, putrescence and cadaverine in 45.5, 36.4, 27.3 and 27.3 of the samples respectively.

El-Sonbaty *et al*. (1998) detected spermine, putrescine and cadaverine in processed cheese of one year old.

Nutritional quality of cheese

El-Sonbaty *et al*. (1998) analyzed 8 brands of local processed cheese for their content from, amino acids, fatty acids, minerals and vitamins. The results were as follows:

Total amino acids: Essential amino acids were higher than that of reference-protein which suggested by FAO and WHO.

Fatty acids: Palmitic acid was the major saturated fatty acid, while oleic acid was the predominant unsaturated fatty acid.

Minerals: Cheese brands varied in their contents of Ca, P, Na, K, Mg, Fe, Cu, Zn, and Mn.

Vitamins: There were no differences among vitamins, B_1, B_6 and nicotinic acid.

REFERENCES

Abd Alla, E.A.M, El-Shafei, Ibrahim, G.A. & Sharaf, O.M. **1996**. Changes in microflora and biogenic amines of some market processed cheese during storage. Egyptian Journal of Dairy Science, **24**: 217-226.

Abdel Baky, A.A., El-Neshawy, A.A. & Farahat, S.M. **1987**. The use of Ras cheese made by direct acidification in the manufacture of processed cheese spread. Egyptian Journal of Dairy Science, **15**: 273-285.

Abdel-Hamid, L. Zammar, O.A. & Hagrass, A.E. **2002**. Utilization of ripened curd slurry in processed Cheddar cheese spread making. Egyptian Journal of Dairy Science, **30**: 283-296.

Abd El-Salam, M.H., Al-Khamy, A.F., El-Garawany, G.A., Hamed, A. & Khader, A. **1996**. Composition and rheological properties of processed cheese spread as affected by the level of added whey protein concentrates and emulsifying salts. Egyptian Journal of Dairy Science, **24**: 309-322.

Abd El-Salam, M.H., Khader, A., Hamed, A., Al-Khamy, A.F. & El-Garawany, G.A. **1997**. Effect of whey protein concentrate, emulsifying salts and storage on the apparent viscosity of processed cheese spreads. Egyptian Journal of Dairy Science, **25**: 281-288.

Abd El-Salam M.H, Khader, A., Hamed, A., Al-Khamy, A.F. & El-Garawany, G.A. **1998**. Whiteness of processed cheese spreads as affected by added whey protein concentrate and emulsifying salt. Egyptian Journal of Dairy Science. **26**: 151-159.

Abd El-Salam, M.H., El-Shibiny, S. & Ahmed, N.S. **2005**. studies on processed cheese in Egypt. A review. Egyptian Journal of Dairy Science. **33**: 129-141.

Abd Rabo, F.H., Abd El Fattah A.M., El-Sayed, M.M. & Mohamed, A.G. **2004a**. Potassium emulsifying salts for improvement of nutritive and dietary value of processed cheese. Proc. 9th Egyptian Conf. for Dairy Sci. & Technol. Cairo, Egypt P. 78.

Abd Rabo, F.H., Abd El Fattah, A.M. El-Sayed, M.M. & Mohamed, A.G. **2004b**. Effect of some formulated emulsifying on processed cheese properties. Proc. 9th Egyptian Conf. for Dairy Sci. & Technol, Cairo, Egypt P. 79.

Abd Rabo, F.H., El-Aasser, M.A., Zedan, M.A. & Mahmoud, M. **2004c**. Characterization of low fat processed Cheddar cheese prepared from a mixture of buffalo and cow's milk. Proc. 9th Egyptian Conf. for Dairy Sci. & Technol, Cairo, Egypt P. 80.

Abd Rabo, F.H., Abd El-Fattah, A.M., El-Sayed, M.M. & Mohamed, A.G. **2005**. Improvement

of nutritional value of processed cheese by using modified emulsifying salts. Egyptian Journal of Dairy Science, **33**: 85-103.

Abeid, A.M. **1996**. Improving the quality of processed fresh Ras cheese using lactic acid cultures. Egyptian Journal of Dairy Science, **24**: 37-46.

Abeid, A.M., El-Aassar, M.A. & El-Sonbaty, A.H. **2001**. The use of shrimps in processed cheese spread. Egyptian Journal of Dairy Science. **29**: 127-137.

Abou-Donia, S.A. & Salam, A.A. **1982**. Enrichment of processed cheese with faba bean flour. News Letter Faba bean Information service. **4**: 55-56.

Abou-Donia, S.A., Salam, A.E. & El-Sayed, K.M. **1983**. Enrichment of processed cheese with cotton seed flour. Indian Journal of Dairy Science **36**: 119-120.

Abou El-Nour, A.M. **2001**. Physicochemical and rheological properties of processed cheese spreads in the Egyptian and German market. Egyptian Journal of Dairy Science. **29**: 119-126.

Abou El-Nour, A.M. **2003**. Rennet Casein: Properties and application in processed cheese analogues. Egyptian Journal of Dairy Science. **31**: 345-360.

Abou-El-Nour, A.M. & Buchheim, W. **2002**. Using rennet casein and butter milk curd in the manufacture of processed cheese analogue. Egyptian Journal of Dairy Science. **30**: 315-324.

Abou-El-Nour, A.M., Schenrer, G.J., Omar, M.M. & Buchheim, W. **1996**. Physico-chemical and rheological properties of block-type processed cheese analogue made from rennet casein and total milk protein. Milchwissenschaft. **15**: 684-687.

Abou El-Nour, A.M., Scheurer, G.J. & Buchheim, W. **1998**. Use of rennet casein and milk protein concentrates in the production of spread-type processed cheese analogue. Milchwissenschaft. **53**: 685-690.

Abou-El-Nour, A.M., Mohammed, A.A., El-Safty, M.S., El-Zayat, A.I., & Buchheim, W. **2001a**. Optimization of spread-type processed cheese analogue manufacture 1. Effect of type of emulsifying salts. Proc. 8th Egyptian Conf. for Dairy Sci. & Technol, Cairo, Egypt. P. 53.

Abou-El-Nour, A.M., Buchheim, W. & Abd El-Salam. **2001b**. The use of novel milk protein preparations in the manufacture of processed cheese analogues. Egyptian Journal of Dairy Science. **29**: 313-323.

Al-Ashmawy, A.M., Mohamed, S.M. & Moursy, A.W. **1977**. Microbiological evaluation of processed cheese. Assiut Veterinary Medical Journal. **4**: 179-189.

Al-Khamy, A.F., El-Garawany, G.A., Khader, A., Hamed, A. & Abd El-Salam, M.H. **1997**. The use of whey protein concentrates in processed cheese spreads Egyptian Journal of Dairy Science. **25**: 99-112.

Awad, R.A. **2003**. Impact of potato puree as a cheese base replacement in the manufacture of processed cheese. Egyptian Journal of Dairy Science. **31**: 375-387.

Awad, R.A., Abd El-Hamid, L.B., Haggras, A.E. & El-Zammar, O.A. **2003a**. Rheological and sensory properties of low-fat processed cheese spread with low fat Mozzarella cheese in the base blend. Egyptian Journal of Dairy Science **31**: 361-373.

Awad, A.A., El-Sinabrawy, Osman, Sh. G., & Saad, S. A. **2003b**. Chemical composition of flavoured processed cheese spreads with different fruit flavours. Egyptian Journal of Dairy Science. **31**: 335-344.

Dawood, A.H., Abdou, S.M., Tamime, A.Y., Abd El-Hady, S.M. & Younis, A.F. **1989**. 1-Chemical composition, keeping quality and sensory evaluation of processed cheese. Proc. 4th Conf. for Dairy Sci. & Technol, Cairo, Egypt. P. 44.

El-Bagoury, E.H. & Helal, F.R. **1987**. Fatty acids composition of processed cheese as improved by modified cheese flavours. Egyptian Journal of Food Science. **15**: 219-223.

El-Neshawy, A.A., Abdel Baky, A.A. & Farahat, S.M. **1987**. Cheese curd in the manufacture of processed cheese spread. Egyptian Journal of Dairy Science. **15**: 287-297.

El-Neshawy, A.A., Farahat, S.M. & Wahba, H.A. **1988**. Production of processed cheese food inriched with vegetable and whey proteins. Food Chemistry. **4**: 245-255.

El-Sadek, G.M. & Zaki, S. **1958**. The microflora of processed cheese. Annals Agric. Sci., Ain Shams Univ. **3**: 12-23.

El-Sayed, M.M., Abd-Rabou, N.S., Sayed, A.F. & El-Samragy, Y.A. **1997**. Iron fortification of processed Ras cheese. Egyptian Journal of Dairy science **25**: 289-298.

El-Shibiny, S., Metwally, M.M., El-Etriby, H.M., El-Dieb, S.M. & Assem, F.M. **1996**. Changes in processed cheese during storage as affected by the packaging materials. Egyptian Journal of Dairy Science. **24**: 197-206.

El-Sonbaty, A.H., Badawi, R.M. & Kebary, K.M.K. **1998**. Nutritional quality of Egyptian processed cheese. Egyptian Journal of Dairy Science. **26**: 139-150.

Fayed, H.H. **1996**. Use of mixtures of casein and corn germ protein in manufacture of processed cheese spread. Zagazig Journal of Agricultural Research. **23**-559-570.

Fayed, H.H. & Metwally, S.A.M. **1999**. The use of chemically modified denaturated whey proteins in processed cheese manufacture. Egyptian Journal of Dairy science. **27**: 167-178.

Federal Security Agency, Food and Dairy Drug Administration, USA. **1951**. Definitions and standards for food title 21, part 19, cheese, processed cheeses, cheese foods, cheese spreads, and related foods.

Foster, E.M., Nelson, F.E., Speck, M.L., Doetsch, R.N. & Olson, J.C. **1961**. Dairy microbiology. Prentice Hall. Inc. pp. 406-407.

Ghaleb, H.M., Elhami, M. & Rashed, M.A. **1983**. Soya as a competent replacer in processed cheese production. Journal of Agricultural Research. Tanta University **9**: 694-708.

Gouda, A., El-Shabrawy, S.A., El-Zayat, A. & El-Bagoury, E. **1985**. Use of calcium caseinate in the processed spreads making. Egyptian Journal of Dairy Science. **13**: 115-119.

Gouda, A. & El-Shibiny, S. **1987**. The use of ultrafiltrated skim milk in the manufacture of processed cheese spread. Egyptian Journal of Dairy Science and Technology. **15**: 255-262.

Guirguis, A.H., Adel Baky, A.A., El-Neshawy, A.A. & El-Shafy, N.M. **1985**. Peanut curd in the manufacture of processed cheese like spread. Dairy International **50**: 37, 40-41.

Hamed, A., Khader, A., Al-Khamy, A.F., El-Garawany, G.A., & Abd El-Salam, M.H. **1997**. Effect of storage on the composition, rheological properties and organoleptic quality of commercial processed cheeses. Egyptian Journal of Dairy Science. **25**: 113-122.

Hofi, A.A. **1957**. Analytical study on processed cheese in the Egyptian market. Annals Agricultural Science, Ain Shams Univ., **2**: 1-7.

Hussein, G., A.M., Fathi, Fatma, A. & Mohamed, A.G. **2005**. Quality and acceptability of processed cheese spreads made from total milk proteins and casein Co-precipitate. Egyptian Journal of Dairy Science. **33**: 261-277.

Kebbary, K.M., Abeid, A.M., & Badawi, R.M. **1998**. Impact of fat replacers on properties of low fat processed cheese spread. Proceedings 7th Egypt Conf. Dairy Sci & Techno pp. 383-401.

Kebbary, K.M.M., Hussein, S.A. & Badawi, R.M. **2001**. The use of whey protein in flavoured low fat processed cheese spread proceedings of 8th Egypt Conf. Dairy Sci. & Technol. Cairo. Egypt.

Khader, A, Hamed, A., Al-Khamy, A.F., El-Garawany, G.A., & Abd El-Salam, M.H. **1997**. Chemical composition and some properties of market processed cheese. Egyptian Journal of Dairy Science. **25**: 269-279.

Magdoub, M.N.I, Shehata, A.E., Gouda, A.& Hofi, A.A. **1984a**. The chemical, microbiological and sensory properties of processed Ras cheese spread. Egyptian Journal of Dairy Science. **12**: 37-46.

Magdoub, M.N.I, Shehata, A.E., Gouda, A.& Hofi, A.A. **1984b**. The chemical, microbiological and sensory properties of processed Ras cheese. Dairy Industry International. **49**: 23, 25, 27, 31.

Mahfouz, M.B., El-Dien, H.F., El-Shibiny, S., Haggag, H.F.& Magdoub, M.N. **1986**. Chemical and microbiological quality of market processed cheese. Egyptian Journal of Dairy Science. **14**: 33-41.

Massoud, M.I., Zeyada, N.N. & Abdel Gafar, M. **2005**. Studies on the development of low calories dairy food products using fruline and stevia sweetener. Alexandria Journal of Agricultrual Research **50**(3): 47-56.

Metwally, M.M., El-Shibiny, S., El-Dieb, S.M. & Asem, F.M. **1996**. Effect of packaging materials on keeping quality of processed cheese. Egyptian Journal of Dairy Science. **24**: 1-12.

Nassib, T.A. **1965**. The Microflora of Process Cheese, with Particular Stress on the Heat Resistance of Certain Isolates. M.Sc. Thesis,

Dairy Science, Fac. of Agric. Alex. Univ. Alex. Egypt.

Sadek, Z.I. **2005**. Clostridium perfringens in feta and processed cheese and its behaviour with lactic acid bacteria. Egyptian Journal of Dairy Science. **33**: 187-200.

Salam, A.E., Kamal, N.M., Zeidan, A., & Abd El-Salam, G.C. **1992**. Selection of packaging materials and their effect on processed cheese properties during storage. Proceeding 5th Egyptian Conference of Dairy Science and Technology, Cairo, Egypt. PP. 188-204.

Salem, S.A., Salam, A.E. & Gooda, Effat. **1987**. Improvement of chemical, rheological and organoleptic properties for local-low fat processed cheese. Egyptian Journal of Dairy Science. **15**: 263-271.

Shehala, A.E., Magdoub, M.M.I., Gouda, A. & Hofi, A.A. **1982**. The chemical, microbiological and sensory properties of processed Ras cheese food. Egyptian Journal of Dairy Science. **10**: 225-235.

Tamime, A.Y., Davies, G. & Younis, M.F. **1989**. The production of cheese base from reconstituted skim milk powder for the manufacture of processed cheese. Proceedings 4th Egyptian Conf. Dairy Sci & Technol P. 35.

Tamime, A.Y., Younis, M.F., Davies, G. & Bradbury, I. **1990**. The quality of processed cheese made from reconstituted skim milk powder cheese base. Egyptian Journal of Dairy Science, **18**: 115-131.

الجبن المصرى المعامل (المطبوخ) والمفرود: نظرة شاملة

أ.د. سمير أحمد أبو دنيا

قسم علوم وتكنولوجيا الألبان – كلية الزراعة – جامعة الإسكندرية

الجبن المبستر المعامل (المطبوخ) والمفرود هو الناتج عن المعاملة الحرارية للجبن الجاف والتى يتبعها التعبئة فى عبوات خاصة.

ولقد أدخلت صناعة الجبن المطبوخ إلى مصر حديثا منذ حوالى خمسين عاماً. ويتضمن المقال اختيار الجبن للطبخ، المواد اللبنية البديلة للجبن، مواد الاستحلاب، الإضافات ذات الأصول الحيوانية والنباتية، المواد المضافة للجبن، تعبئة وتغليف الجبن المطبوخ. كذلك تم استعراض ميكروبيولوجيا وكيمياء والقيمة التغذوية للجبن المطبوخ.