

## Artigo Técnico

# ADEQUACY OF CREAMY REQUEIJÃO CHEESE TO THE STANDARDS OF IDENTITY AND QUALITY AND THE LABELING STANDARDS

## Adequação de requeijão cremoso aos padrões de identidade e qualidade e às normas de rotulagem

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### SUMÁRIO

O requeijão cremoso é um tipo de queijo fundido cremoso, obtido por fusão de uma massa de coalhada dessorada e lavada obtida por coagulação ácida e/ou enzimática do leite com adição de creme de leite e/ou manteiga e/ou gordura anidra de leite ou butter oil. Este trabalho objetiva avaliar a adequação de requeijões produzidos por micro e pequenas empresas da região do Sul de Minas Gerais, às normas da legislação de alimentos, visando identificar possíveis problemas. Foram realizadas análises de composição-química dos três lotes, e os resultados dos teores de gordura no extrato seco e teores de umidade, comparados com os requisitos estabelecidos no Regulamento Técnico de Identidade e Qualidade de Requeijão. Foi avaliada também a adequação dos rótulos dos produtos em relação ao disposto na legislação brasileira vigente sobre rotulagem de alimentos. Foi verificado que todos os requeijões cremosos analisados apresentaram irregularidades em relação ao Regulamento Técnico de Identidade e Qualidade de requeijão e normas referentes à rotulagem de alimentos. Desta forma fica evidente a necessidade de ações visando à melhoria da qualidade dos requeijões analisados e a adequação destes à legislação.

**Palavras-chave:** queijo processado; legislação; composição química.

### ABSTRACT

The creamy Requeijão cheese is a type of creamy Requeijão cheese, obtained from the fusion of a washed drained curd obtained through acid and /or enzymatic coagulation of milk with the addition of cheese cream and/or butter and/or anhydrous milk fat or butter oil. This study evaluates the adequacy of creamy Requeijão cheeses produced by micro and small companies in the southern region of Minas Gerais, according to the standards of food legislation, to identify possible problems. The chemical composition on the three batches was analyzed, and the results of fat in dry matter

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and moisture, compared to the requirements of the Technical Regulation for Identification and Quality of Requeijão cheese. The adequacy of the labeling of products according to the provisions in the current Brazilian Legislation on food labeling was also evaluated. It was observed that all creamy Requeijão cheeses analyzed showed irregularities regarding the Technical Regulation for Identification and Quality of Requeijão cheese and the standards for food labeling. Thus it is evident the need for actions to improve the quality of the creamy Requeijão cheeses analyzed and to be in accordance to the legislation.

**Keywords:** processed cheese; legislation; chemical composition.

## 1 INTRODUCTION

The processed cheese came from German and Swiss efforts to find a way to export cheese to countries with hot climates. In 1911, Gerber and Stettler were able to solubilize the calcium paracaseinate of raw material by means of heat, using sodium citrate as melting agent, thus obtaining what is called processed cheese (VAN DENDER, 2006).

So, at this time, the processed cheeses were created, which are a balanced mixture of different types of cheese, with or without addition of water, butter, or cream, and flavorings that allow them to be offered in several versions. From the mixture of several ingredients, there is the possibility of manufacturing various types and flavors.

In Brazil, the processed cheeses use soft cheese or cheddar as basis which provide a variety of products that do not require refrigeration. In general there are two types of cheese: processed cheese in blocks and processed creamy Requeijão cheese. They are sold in slices, chunks, in glasses (when spreadable) or pre-prepared versions for fondue. They are intended for raw consumption (servings), hot sandwiches or preparations of food.

Creamy Requeijão cheese is a kind of processed creamy cheese, obtained by fusion of a mass of drained and washed curd obtained by acid and / or enzymatic coagulation of milk with added cream and / or butter and/or anhydrous milk fat or butter oil. (BRASIL, 1996).

Originally, the creamy Requeijão cheese was made from skim milk which was considered whey, and regarded as waste. Usually this was done in farms located near the small railway station in the State of Minas Gerais, where the cream was shipped to butter processing plants, usually located in city centers.

Nowadays, the creamy Requeijão cheese is made from skim or whole milk, raw or pasteurized, with or without the addition of dairy cultures, which makes it a very popular product and commercially important.

The composition of a typical creamy Requeijão cheese consists of 58-60% water, 24-27% fat, 9-11% protein, 1.2% carbohydrates and 1-1.5% NaCl (ABIA, 1998).

The moisture and fat contents are the main

factors influencing the texture of the creamy Requeijão cheese, as the reduced fat content promotes an increase in the dry degreased extract (ESD) with consequent increase in the firmness of the product. Thus, it becomes necessary to dissolve the ESD so equilibrium in the texture of cheese may occur (VAN DENDER, 2006).

Several factors may contribute to changes in the cheeses' moisture, such as coagulation temperature, amount of rennet, the cutting of the curd, mixing process, salting and ripening conditions (FURTADO, 1990).

Factors such as fat and water content of the creamy Requeijão cheese are set by the Technical Rules of Identity and Quality of Cheese, while factors related to the product package fit the resolutions created by the Agência Nacional de Vigilância Sanitária (ANVISA) (National Health Surveillance Agency), which are DRC 259/02 (TECHNICAL REGULATIONS FOR LABELING PACKED FOOD) (ANVISA, 2002), DRC 359 (TECHNICAL REGULATION FOR NUTRITIONAL LABELING OF PACKED FOODS PORTIONS) (ANVISA, 2003a), and RDC 360 (TECHNICAL REGULATIONS FOR NUTRITIONAL LABELLING OF PACKAGED FOODS) (ANVISA, 2003b).

With the development of means of transportation, also of storage and distribution conditions, the cheese has achieved status of main product in the national dairy industry, acclaimed by the consumer market.

However the medium and small dairy industries can face the lack of competitiveness in the market, mainly due to lack of consumer confidence regarding information on the labels of the products produced by these companies and the adequacy of them under the food legislation (BASTOS, 2010).

Therefore, it is necessary for food manufacturers to ensure consumer access to useful and reliable information about the product they are buying. To gain customer confidence, manufacturers must meet the legal requirements for food technical regulations (YOSHIZAWA et al., 2003).

The physical-chemical analysis of cheese, such as analysis of fat, protein, moisture, among others, are important assessment sources for the quality standard of the product, indicating whether or not it is appropriate for food legislation and the evaluation of the adequacy of the information contained on the labels.

Given the above, this study aims at determining the adequacy of creamy Requeijão cheese from different trademarks to the technical regulation for the attachment of identity and quality of creamy cheeses and at assessing the appropriateness of these labels to the requirements in Brazilian legislation for food labeling.

## 2 MATERIAL AND METHODS

### 2.1 Material

#### 2.1.1 Survey of creamy Requeijão cheese producers (dairy industries)

A survey was conducted in order to identify dairy producers in the southern region of Minas Gerais, registered at the Instituto Mineiro de Agropecuária – IMA (Minas Gerais Institute of Agriculture) and at the Serviço de Inspeção Federal – SIF (Federal Inspection Service), who produce creamy Requeijão cheese. Among these dairy industries, just five brands were available for consumers in Lavras – MG, in local stores, and were collected for analyses.

#### 2.1.2 Collection and sample preparation

Five brands of creamy Requeijão cheeses were acquired in markets of Lavras/MG, and for each brand, three different lots were purchased, and these lots have the same manufacturing date.

The samples were then transported to the dairy laboratory in the Department of Food Science and refrigerated in a refrigerator with temperature between 4 and 7°C. Each brand of creamy Requeijão cheese was identified by a letter, from A to E.

### 2.2 Methods

#### 2.2.1 Composition of creamy curd

The physical and chemical analyses were performed at the Laboratory of Physical and Chemical Analysis in the Dairy Sector at Food Science Department – DCA – UFLA. Analyses were conducted according to the methodologies described below.

##### 2.2.1.1 Moisture

The moisture content was obtained by the gravimetric method and calculated by difference (100% – percentage of total dry extract), according to Brasil (2006).

##### 2.2.1.2 Total Protein

The total nitrogen content of the creamy Requeijão cheese was determined using the Micro Kjeldahl method, comprising the steps of digestion, distillation and titration, as described by Brasil

(2006). The factor 6.38 was used to estimate the total protein content.

##### 2.2.1.3 Ashes

The ash content of the creamy Requeijão cheese was determined in order to calculate the content of total carbohydrates, using methods described by Brasil (2006), which is based on the elimination of organic matter at a temperature of 550°C, resulting in steady mineral residue (ash).

##### 2.2.1.4 Carbohydrates

Carbohydrates were calculated by difference, according to the following formula: Carbohydrate = 100 - (protein + ash + moisture + fat).

##### 2.2.1.5 Salt

The salt content of the creamy Requeijão cheese was determined by the modified Volhard's method as described by Kosikowski; Mistry (1992), by titration of excess silver nitrate added, with a solution of potassium thiocyanate.

##### 2.2.1.6 Fat

The total fat content of cheese samples was determined by Butirometric method for cheese, using centrifuge, Gerber type, as described by Brasil (2006).

The fat contents in dry extract (GES) were calculated by dividing the fat content of cheese by their content of total dry extract.

##### 2.2.1.7 Energy Value

The energy value was calculated following the method described by Osborne; Voogt (1978), as follows: 1g of fat, when fully metabolized, generates 9 kcal, while 1g carbohydrate and 1g protein, when fully metabolized, produce 4 kcal.

#### 2.2.2 Analysis of results

The results for the chemical composition of samples of creamy Requeijão cheese produced by companies in the southern region of Minas Gerais were compared to the identity and quality standards established in the Technical Regulations for attachment of identity and quality of Requeijão cheese (BRASIL, 1997).

Another evaluation conducted during the development of this work was the appropriateness of the labels of samples of creamy Requeijão cheese to food labeling standards: RDC 259 (ANVISA, 2002); RDC 360/03 (ANVISA, 2003b), the RDC 359/03 (ANVISA, 2003a). This evaluation was performed by analysis of each of the labels to each resolution. That is, each label was analyzed based on the determinations and requirements established in each resolution, and then observed whether this label was in compliance or not with the legislation.

The nutritional information stated on the packaging labels was also analyzed. Thus, the values obtained experimentally were compared to the amounts of nutrients stated on the packaging labels of the samples, and they were approved or not. For each sample, the portion (in grams) stated on the packaging was calculated taking into account the variability of 20% allowed by the RDC 360/03 (ANVISA, 2003b).

### 3 RESULTS AND DISCUSSION

#### 3.1 Appropriateness of creamy Requeijão cheese to Technical Regulations for Identity and Quality

The Technical Regulation for Identity and Quality of Requeijão cheese (BRASIL, 1997) establishes the identity and minimum quality requirements that must be complied by the cheese for human consumption and refers to the creamy Requeijão cheese for the national and international trade. In this regulation, the description of creamy Requeijão cheese is established, its definition, classification, designation (trade name), composition (compulsory ingredients and optional ingredients), sensory requirements, physicochemical requirements form of product packaging, additives and adjuvant allowed in development process, contaminants, hygiene, labeling, weights, measurements and sampling.

This regulation defines Requeijão cheese as the product obtained by the fusion curd mass, cooked or not, drained and washed obtained by acid and/or enzymatic coagulation of milk optionally with added cream and/or butter and / or anhydrous milk fat or butter oil. The product may have condiments, spices and/or other food substances added to.

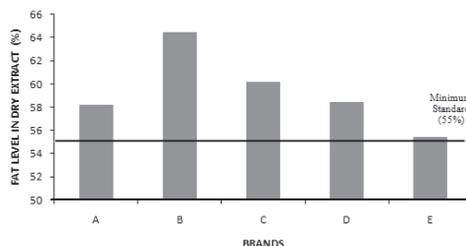
The Requeijão cheese is classified into three categories: cheese, creamy Requeijão cheese and butter cheese. The cheese under analyses in the present study is in accordance with the Technical Regulation for Identity and Quality of Requeijão cheese (BRASIL, 1997), which ranks as creamy Requeijão cheese, one that is obtained from the fusion of a curd mass drained and washed, obtained by acid and/or enzymatic coagulating of milk with added cream and/or butter and/or anhydrous milk fat and/or butter oil.

Regarding the designation (trade name), all analyzed brands were in accordance to the Technical Regulations for Identity and Quality of Requeijão cheese (BRASIL, 1997), this name being "creamy Requeijão cheese". For packaging, allowed additives, all five brands met the law's requirement The Regulation determines the conditions of storage and sale of cheese, and this should be kept at a temperature below 10°C. All brands are in accordance to the rules regarding the conditions of preservation and marketing.

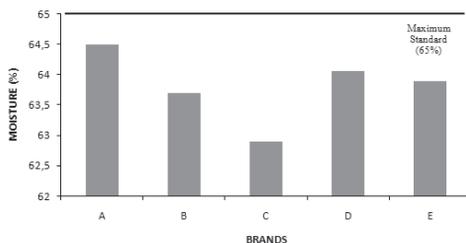
In relation to physical and chemical requirements, the creamy Requeijão cheese must be at least 55 g/100g

fat on dry extract and maximum moisture at 65g/100g (BRASIL, 1997).

As it can be seen in Figures 1 and 2, the fat content in dry extract of all samples of creamy Requeijão cheese is greater than the minimum value of 55g/100g and moisture content of the creamy Requeijão cheese does not reach the maximum value of 65g/100g. Therefore, all samples are in accordance with the physicochemical requirements established by the legislation regarding fat content on dry extract and moisture, which characterize creamy Requeijão cheese product in relation to these aspects.



**Figure 1** – Graph showing the fat level in the dry extract from the five creamy Requeijão cheese brands in comparison to the minimum standard established by the legislation.



**Figure 2** – Graph showing the moisture on the five creamy Requeijão cheese brands in comparison to the maximum standard established by the legislation.

#### 3.2 Adequacy of the labels of creamy Requeijão cheese to the provisions of Brazilian legislation

The RDC 259/02 modified by the RDC 123/04, are resolutions related to the General Labeling of Packaged Foods and Beverages. This resolution is applicable to all food that is produced, marketed and packaged without the presence of the consumer and ready to be offered. Therefore, the labels of all food products sold must comply with RDC 259/02 (ANVISA, 2002).

Of all five labels analyzed, none was fully compliant with the technical regulation. Only the label of the brand E presented the information about country of origin, while none of the other brands indicate that on the label.

The brands A and B were those that were in accordance to the legislation regarding the color of the letters in contrast to the color of the packaging and the information being easily readable, which facilitates the reading by the consumer. The legislation requires that the additives are presented after the list of ingredients, and in both brands, one of the ingredients is listed among the additives. In addition to this disagreement there is one other, related information on the conservation of the product after opening, which does not state the minimum temperature for storage.

As the creamy Requeijão cheese is a product that requires special conditions for its conservation, the legislation states that a legible notification should be included on the label, indicating the necessary precautions to keep the product's normal characteristics after opening. These precautions are the minimum and maximum temperatures of storage, and for how long this product should be stored after opened when stored in the indicated temperature. The brand A does not state the minimum temperature and these information are not highlighted on the label. Since the brand B declares the maximum and minimum temperature, how long the product should be stored after opening, and these characters are highlighted on the product label.

The information required on the labels of creamy Requeijão cheeses brands C, D and E are illegible making it difficult for the consumer to read and may induce to misunderstanding.

Brand D is faulty on the list of ingredients. The legislation requires it to be in descending order of ingredients proportion in the product, however on the label of this brand, this list appears in ascending order, since their additives first appear in the list.

Brand C presents the required information, in very small size, which makes the reading difficult and also has information such as date of manufacture, batch and expiry date on a non-visible and easy to be erased. The company's address appears in very small characters, which is difficult to read.

### **3.3 Reliability of nutrition information declared on the labels of creamy Requeijão cheeses**

It is possible to see in Table 1 the nutritional information stated on the label of each brand of creamy Requeijão cheese, and also the amount of each nutrient obtained by means of physical-chemical analysis and calculated per serving of 30g of creamy Requeijão cheese. Besides this information, these tables also report the percentage of variance between the values

of nutritional information declared on the label of each sample with the values of nutritional information obtained through laboratory analysis.

As can be seen in Table 1, only the brand A did not present variation over 20% compared to the levels of constituents declared on labels and those obtained experimentally. The other four brands tested showed disagreement between the values declared on the label, and the values obtained through laboratorial analysis, for at least one of the constituents analyzed.

The RDC nº 360 (ANVISA, 2003b), establishes maximum variation of 20% for in nutrient content declared on the labels of food products. Thus, it can be stated that the according to this resolution, only brand A has proved to be in accordance to what is declared in the Nutrition Facts label for all constituents, while brands B, C, D and E are not adequate with the legislation, because they present a variation between the levels declared on the label and the levels obtained by physical-chemical analysis above 20% in at least one of the constituents (Table 1).

Brands B, C, D and E were analyzed and showed wide variation between the protein and sodium contents determined in the laboratory and the contents declared on the label. It is observed that the levels of sodium obtained experimentally were much higher in the creamy Requeijão cheese of brands B, D and E, reaching a variation of 511% for the product of brand E.

According to WHO (World Health Organization, 2006), the maximum recommended intake of sodium per day is 2g (2000mg), an amount present in about 5 g of salt. For brands B, C, D and E, approximately four (4) tablespoons of creamy Requeijão cheese consumed per day reaches the recommended daily intake of sodium. In addition to this, in the brands B, D and E, the variation between the stated value and the value obtained by analysis is exceptionally high, ranging from 222 to 511%. It is extremely necessary to decrease the levels of sodium in these foods, because of the importance of controlling the intake of sodium for many Brazilians.

This excess in the amount of sodium in the product can be deliberately caused by the manufacturer in order to produce better conservation for the food, since the salt acts on the preservation of food before the appearance of undesirable microorganisms. If the high sodium content is not deliberate, we need greater awareness of the company employees in order to severely meet the amount of ingredients for making creamy Requeijão cheese, obtaining a final product with higher quality.

While 30g (one tablespoon) of creamy Requeijão cheese from the brands B, C, D and E showed approximately 480 mg sodium on analysis, this same measure of some foods has much lower levels of sodium: grilled beef (17.3 mg sodium), roasted chicken breast (17mg sodium), whole cow's milk (20

mg sodium), fried chicken eggs (50mg sodium); cola soft drinks (2.1 mg sodium) (TACO, 2011).

To achieve the maximum daily intake of sodium recommended by WHO, it takes approximately 120g of creamy Requeijão cheese from the brands B, C, D and E. Meanwhile, for the foods mentioned above, the approximate amounts are: 3.4kg of grilled beef; 3.5kg of roasted chicken breast; 3.0kg of whole cow's milk; 1.2kg of fried chicken egg; 28.5kg of cola soft drink.

Based upon these values, to match the sodium contained in only 30g (one tablespoon) of creamy Requeijão cheese from the brands B, C, D and E, we would have to intake approximately 832g of grilled beef or 847g of roasted chicken breast or 720g of whole cow's milk or 288g of fried chicken egg or 6.85 kg of cola soft drink.

Most US and Brazilians citizens consume too much sodium (GALLANI; FERREIRA, 2007;

FRIEDEN; BRISS, 2010), which is associated with high blood pressure and increased risk of heart attack and stroke (SMITH-SPANGLER et al., 2010; USDA, 2010). Sarno et al. (2008) conducted a study and indicate that the amount of sodium available for consumption in Brazilian households is more than two-fold higher than maximum recommended ingestion levels. The potential savings due to reduction in sodium by reducing hypertension and related cardiovascular disease has been reported to be significant, regarding societal well-being (quality of life) and savings in billions of dollars in medical costs (PALAR; STURM, 2009; BIBBINS-DOMINGO et al., 2010; SMITH-SPANGLER et al., 2010).

In a study conducted in the United States in 2011, Agarwal et al. (2011) analyzed the sodium content in cheddar cheese, mozzarella cheese and processed cheeses, and compared to the declared content in the

**Table 1** – Values declared on the level and measured by analysis referring to the nutritional composition of the five creamy Requeijão cheese brands.

		Energy value	Carbohydrates	Proteins	Fat	Dietary fiber	Sodium
Brand A	Declared quantity*	79 kcal = 327 kJ	1,0 g	3,0 g	7,0 g	0 g	130 mg
	Obtained quantity**	70,279 kcal	0,9138 g	2,706 g	6,2 g	0 g	134,1 mg
	Variation (%)	11,03	8,62	9,8	11,42	0	3,15
Brand B	Declared quantity*	96 kcal = 403 kJ	1,0 g	4,0 g	8,0 g	0 g	150 mg
	Obtained quantity**	74,895 kcal	1,04 g	2,61 g	6,7 g	0 g	483 mg
	Variation (%)	21,98	4,4	34,8	16,26	0	222
Brand C	Declared quantity*	75 kcal = 318 kJ	0 g	3,7 g	6,9 g	0 g	330 mg
	Obtained quantity**	78,567 kcal	0 g	3,89 g	6,99	0 g	486 mg
	Variation (%)	4,75	0	5,24	5,24	0	47,3
Brand D	Declared quantity*	74 kcal = 311 kJ	1,2 g	3,1 g	6,3 g	ud	135 mg
	Obtained quantity**	72,606 kcal	1,199 g	2,33 g	6,49 g	0 g	468 mg
	Variation (%)	1,88	0,05	24,78	3,14	-	246
Brand E	Declared quantity*	73 kcal = 307 kJ	0 g	3,3 g	6,6 g	0 g	76 mg
	Obtained quantity**	67,48 kcal	0 g	2,69 g	6,3 g	0 g	465 mg
	Variation (%)	7,60	0	18,58	4,54	0	511

ud – undeclared

Variation values in bold indicate non-compliance with legislation

\*amount of each nutrient declared on the label of creamy Requeijão cheese per serving of 30g.

\*\* amount of each nutrient obtained through analysis and calculated per serving of 30g.

packaging. A large variation between the declared content and the analyzed content was found. However, sodium levels obtained in this study were, for the vast majority of products, lower than the levels stated on the packaging.

Another study, also conducted in the United States, carried out by Moshfegh et al. (2012), shows that the cheese (natural and processed), in a ranking of 10 foods analyzed, is the 7th food responsible for total sodium intake by the U.S. population.

Thus, both facts make clear that all producers in the Brazilian dairy industry should control with greater precision the amount of sodium added to their products, since in a countries, like the United States, where daily sodium intake is highly recommended, milk products are at relatively low levels.

Although variations in fat content were not greater than 20% presented for any brand analyzed, there must be some special attention to this constituent. Brands A, D and E are characterized, according to the Technical Regulation of Identity and Quality of Cheeses, as a fat cheese, while brands B and C, as extra fat cheese or double cream. According to the FDA (Food and Drug Administration, 2011), an U.S. government agency that controls, among other products, food, health experts recommend that you keep your intake of this nutrient to as low as possible while consuming a nutritionally adequate diet. However, in the food industry, the fat can be used as a food ingredient, providing taste, consistency and stability stable, which cause some industries to add an excessive amount of this constituent in their products.

Some alternatives to reduce the fat content in dairy products are being studied. According Johshon et al. (2009), more than half of adult Americans are willing to buy a cheese with low fat content, if it is similar to the same type of cheese with regular fat content. Based on tests with consumers, a cheddar cheese was developed with 8.5% fat (50% reduction in fat content), reaching a satisfactory sensorial acceptance.

Besides the reduction in lipid content, studies are also developed to reduce the sodium content, especially in cheeses, whether natural or processed. The best current is the substitution of sodium salts for mixtures of sodium / potassium. However, this substitution for potassium salt is still under analyses, due to the appearance of metallic, bitter and off-flavors materials in addition to points which encompass the product safety (JOHSHON et al., 2009).

A study showed a development of a low-sodium Minas fresh cheese, replacing sodium chloride by potassium chloride. Gomes et al. (2011) manufactured four treatments of low-sodium cheese, with partial replacement of NaCl by KCl at 0, 25, 50 e 75% (wt/wt), respectively. The partial substitution of NaCl by KCl decreased up to 51.8% the sodium concentration of the cheeses produced. The consumer test indicated that it is possible to manufacture a low-sodium Minas

fresh cheese that is acceptable to consumers by partial substitution of NaCl by KCl at 25% (wt/wt) in the salting step.

Recently, it was verified that the substitution of sodium chloride for potassium lactate did not influence the physicochemical and microbiological stability of the Prato cheese added with *Lactobacillus rhamnosus* and fibers during the stability of the product (CICHOSKI et al., 2008).

Several studies have shown that it is possible to substitute NaCl with KCl during processing, without affecting the sensory, rheological and stability of the final product. There are reports of manufacturing technologies for Cheddar cheese (ANJAN; MARTH, 1993; LINDSAY et al., 1982; SCHROEDER et al.; 1998), Cottage cheese (WYATT, 1983), Feta cheese (ALY, 1995), Kefalograviera cheese (KATSIARI et al., 1997, 1998, 2001), Fynbo type cheese (ZORRILLA; RUBIOLLO, 1997; 1999), White cheese (KARAGOZLU et al., 2008), and Halloumi cheese (AYYSHAH; SHAH, 2010, 2011a, 2011b) showing the concern in decreasing the consumption of sodium content in cheese.

Other study, in Korea, 2006, showed that the local population rarely bought low sodium foods. However, their intention to buy low sodium foods increased up to 40% in condition that sodium information is given on the food label. Therefore, it is clear the importance that indicating the correct nutrients amount in the foods packing, by the fact that the consumer is increasingly relying on these information in the act of buying the product (CHANG, 2006).

In order to be considered as a product with low sodium content, cheese must not contain more than 140 mg of sodium per 50g (FDA, 2012), that is, it must contain up to 0.7% salt. The salt content of the product normally present in processed cheeses varies from 325 to 798mg per 50g of cheese. However, processed cheeses with reduced sodium content may contain from 244 to 600mg per 50g of cheese (FDA, 2012).

Comparing the sodium content that a cheese must fulfill to be considered a low sodium cheese (FDA, 2012) to the sodium content found in the five brands analyzed in this study, it was observed that the reduction in the sodium concentration should be at approximately 37.3% for brand A, 82.6% for brand B, 82.7% for brand C and 82% for brand D and E. This proves the high sodium content found in the five brands analyzed and the relative distance from being considered a low sodium product.

Many studies have been developed, since some time ago, showing that the reduction in sodium content in cheese is possible. Lindsay et al. (1982) demonstrated that reduction of salt in moisture from 4.9 to 3.5% in cheddar cheese did not significantly affect the flavor and texture of the product. Schroeder et al. (1988) reported non-detectable differences in cheddar with reduced concentration of salt (from 4.1% to 3.1%). Wyatt (1983) observed that a reduction of

35% in the amount of NaCl (from 1 to 0.65%) did not influence the evaluation by consumers.

With an increase in consumption and more frequent use of cheeses in culinary dishes, in addition to traditional use of table cheese, it is interesting to develop technologies for the production of cheese with low sodium content with an aim to meet the needs of some segments of the population. In fact, the development of cheese with low sodium content represents a contribution to the dairy industry, in addition to being a technological option that adds values (PERRY, 2004; WALTER et al., 2008).

The protein contents obtained from products of the brands B and D are also not in accordance to the standard, with brand B reaching up to 34% variation compared to the value declared on the label. The creamy Requeijão cheese brand B showed the highest non-compliance, since its levels of energy, protein and sodium, present more than 20% variation when comparing analytically obtained values to values declared on the label.

In the processing of creamy Requeijão cheese, as for other cheeses, an important step in its production flowchart is the syneresis stage, since the serum must be removed as much as possible to obtain a higher quality product, especially in terms of their lifetime. The high protein content in some brands may be based on the incomplete removal of serum during manufacturing. A portion of the milk proteins is found in the serum (known as soluble proteins or whey protein). If the syneresis does not occur in an efficient way, the protein product may increase.

Throughout the production chain of creamy Requeijão cheese, it is necessary to pay attention to the correct addition of ingredients. One reason that generates high discrepancy between the amounts declared on the label and experimentally obtained values is the analytical capabilities of the staff in adding a proper amount of an ingredient, or even failures in the pumps and flow controllers that do not properly regulate the amount intended by the manufacturer of creamy Requeijão cheese. A further correction of these points or even in the data declared on the label would create a more competitive brand in the market, since consumers feel safe when they buy food that fits into existing food legislation.

The calculation of the nutritional value from food composition tables based on raw materials or ingredients of the product may be primarily responsible for the discrepancy between nutrient data obtained in the laboratory and the one declared by the manufacturer on the label (BASTOS, 2010). The recommendation is that severe physical and chemical analyzes on the product must be conducted when the product is still in the industry, and, after this, the correct preparation of the nutritional labels on food labels.

Resolution RDC Nº. 360 (ANVISA, 2003b), also establishes that it is mandatory to declare nutrition

information on the amount of energy value of the product and the amount of carbohydrates, protein, total fat, saturated fat, trans fat, dietary fiber and sodium. On the labels of brands A, B, C and E, all of these mandatory constituents were declared but it presented no other optional constituent. The label of brand D does not show values of trans fat or dietary fiber.

The RDC 359 (ANVISA, 2003a) from December 2003 establishes that the portion of cheese is equal to 30g and the "home measure" that corresponds to the portion is a "spoon". All analyzed brands were in accordance with this resolution regarding portion and "home measure", which creates trust for the consumer when using this product both for direct consumption and as an ingredient in the production of another product.

#### 4 CONCLUSIONS

Regarding the adequacy of creamy Requeijão cheeses to the Technical Regulation of Identity and Quality, all brands of creamy Requeijão cheese analyzed fit the physical and chemical requirements corresponding to the values of fat on dry extract and moisture. However, regarding the sodium content in the product, obtained amounts were higher than the permitted by such technical regulation, so there is a strong need for change in the sodium concentration in the product, since it is an extremely dangerous mineral to human health when ingested in large quantities.

Regarding the provisions in Brazilian legislation related to food labeling, the labels of the five brands of creamy Requeijão cheese analyzed showed irregularities in at least one aspect, and all samples showed some non-compliance of the nutrition information stated on the label of the creamy Requeijão cheese, showing the need for greater control by the dairy industry, for the correct adjustment to the current legislation and creating a better security both for the company and for the consumer.

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