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Standards and labeling of milk fat and spread products in different countries



Chia-Lin Lee ^a, Huei-Lin Liao ^a, Wan-Chen Lee ^a, Chao-Kai Hsu ^a,
Fwu-Chyn Hsueh ^a, Jyh-Quan Pan ^a, Chih-Hsuan Chu ^b, Chieh-Ting Wei ^b,
Ming-Ju Chen ^{c,*}

^a Food and Drug Administration, Ministry of Health and Welfare, Taipei, Taiwan

^b Taiwan Quality Food Association, Taipei, Taiwan

^c Department of Animal Science and Technology, National Taiwan University, Taipei, Taiwan

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ABSTRACT

In the present paper, we provide comprehensive information related to labeling claims and standards of identity of milk fat and spread products. By reviewing the standards and regulations for dairy and non-dairy fat products, Codex Alimentarius and several other countries have clearly specified these products and set the requirements for use of the product name to prevent misleading or confusing the consumers. Generally, for the milkfat products, the fat in the products should be exclusively from milk and/or the products obtained from milk. The milkfat contents of these products should be no less than 10%. Whereas, the blends or blended spreads are mixture of butter and vegetable oils with more than 3% of milkfat of the total fat content. The fat spreads are defined that any milkfat content must be no more than 3% of the total fat content. Although the specification of each fat product might be different, most countries still adopt the labeling system of Codex Alimentarius, including the use of the food names and the “reduced fat” claims. Each of the ingredients used in the food also need to be declared on the label.

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1. Introduction

The fat in milk is primary to provide a source of energy to the new born baby. In cow's milk, more than 98% of fats are triacylglycerols, but monoacylglycerols and diacylglycerols, free fatty acids, phospholipids, sterols, carotenoids, fat-soluble

vitamins and flavor compounds are also found [1]. Milk fat has a unique flavor and texture conferring on a wide variety of dairy products.

The milkfat products could be divided into several categories according to their fat contents, including anhydrous milk fat products, butter, cream and dairy fat spreads. Many blends, mixing butter and vegetable oils, were also developed

* Corresponding author. Department of Animal Science and Technology, National Taiwan University, No. 50 Lane 155 Sec. 3. Keelung Rd., Taipei 106, Taiwan.

E-mail address: cmj@ntu.edu.tw (M.-J. Chen).

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to increase the content of unsaturated fatty acids for improvement of spreadability at low temperatures (Table 1). In Taiwan, most of the milkfat products are imported from other countries, majorly from United States, New Zealand, Japan and some European countries. Many non-dairy creamers, blends and blended spreads are also on the markets. Recently, Taiwan Food and Drug Administration (TFDA) made lots of efforts to modernize the food standards of identity and updates to the standards for dairy products. Understanding the definitions and standards worldwide of the various milk-fat products are important issue not only for assurance of food safety but also for prevention of misleading and mislabeling to dairy products. Clearly labeling regulation and products' standards are necessary to distinguish the dairy and non-dairy fat products to the public. In the present paper, we provide comprehensive information related to labeling claims and standards of identity of milk fat and spread products by reviewing the standards of Codex [2,3], China [4], United States [5], Japan [6,7], European Union [8], New Zealand [9,10] and Taiwan [11,12].

2. Butter

The butter, one of the oldest milk products, is a water-in-oil (W/O) emulsion, generally containing a minimum of 80 g milk fat/100 g and a maximum of 16 g moisture/100 g. The raw materials should be milk and/or products obtained from milk. Nowadays, besides the traditional butter, various butter products (Table 2) such as reduced fat and low fat butters (spreads) have been developed and commercialized to meet the public health concerns and improve the butter qualities.

2.1. Traditional butter

Varieties of the traditional butters (80% milkfat) are made from pasteurized cream under approved conditions following the churning processing to destabilize of the oil-in-water (O/W) milk or cream emulsion. Common salt may or may not be added. Salted butter has 1.6–1.7% salt and can be stored refrigerated for up to 2 months. Under freezer, salted butter can be lasted for 6–9 months. On contrary, unsalted butter can be only stored for up to 2 weeks refrigerated and for up to 5 months under frozen condition.

According to Codex Alimentarius [2], the butter is a fatty product derived exclusively from milk. It is also specified that

butter must contain minimum fat 80% (m/m), maximum water 16% (m/m), and milk solids not-fat (SNF) 2% (m/m). National legislation in many countries, such as Taiwan [11], China [4], Japan [6,7], New Zealand, Australia [9] and European Union [13], adopt the same specifications (Table 2), and mixture of milkfat with fat from other sources is prohibited. A minor difference is found in European Union Council Regulation [13] in unsalted butter. The minimum milkfat content, by weight, is 82%.

Sanitation requirements are regulated in each country. In United States [14], proteolytic count, yeast and mold count and coliform count in butter are no more than 100, 20 and 10 per gram, respectively. In China [4], they also set microbiology requirement in aerobic plate count, *Staphylococcus aureus*, Coliform, Salmonella and molds.

For the quality standards, U.S. government grades butter on the basis of its flavor, body, color and salt content [15]. Grading of butter is first determined on the basis of classifying the flavor characteristics and then rating body, color and salt characteristics. Each parameter is scored accordingly. Flavor is determined organoleptically by smell and taste. Body refers to the textural features of butter as related to its spreadability and mouthfeel. Color refers to the evenness of color and shades of yellow of the butter. Salt is discerned from the degree of salt taste and whether it is completely dissolved. Once these parameters are evaluated, the scores for each sample are added and butter is graded as United States Department of Agriculture (USDA) grade AA, A or B. Grade AA butter possesses a fine and highly pleasing butter flavor. The permitted total disratings in body, color, and salt characteristics are limited. Grade A butter possesses a pleasing and desirable butter flavor with any of following flavors to a slight degree: acid, aged, bitter, coarse, flat, smothered, and storage. The permitted total disratings in body, color, and salt characteristics are also limited. Grade B butter possesses a fairly pleasing butter flavor with any of following flavors to a slight degree: malty, musty, neutralizer, scorched, utensil, weed, and whey. Most butter sold is United States Department of Agriculture (USDA) Grade AA. Grade B butter is used mainly for manufacturing purposes.

2.2. Reduced fat butter (spread)

Besides the traditional butter, the reduced fat butter (spread) was also regulated in certain countries (Table 2). Codex Alimentarius [16] defines dairy fat spreads as products exclusively obtained from milk. The product shall have a fat

Table 1 – The category of milkfat and spreads products.

Milkfat products (fat source: milkfat, milkfat content: $\geq 10\%$)		Blends and blended spreads products (fat source: butter and vegetable oil, milkfat content: $\geq 3\%$)		Fat spreads products (fat source: vegetable oil and/or butter, milkfat content: $<3\%$)	
Milkfat content	Category	Fat content	Category	Fat content	Category
$>99.8\%$	Anhydrous milkfat 1 . Anhydrous milkfat 2 . Butter oil	$\geq 80\%$	Blends	$\geq 80\%$	Margarine (Reduced fat margarine or light margarine)
$\geq 80\%$	Butter (Reduced fat butter or light butter)	10%–80%	Blended fat spreads	10%–80%	Fat spreads
$\geq 10\%$	Cream				

Table 2 – Compositional standards in butter.

Country	Type (sale description)	Milk fat	Definition
Codex [2]	Butter	Minimum 80% m/m of milk fat.	A fatty product derived exclusively from milk and/or products obtained from milk, principally in the form of an emulsion of the type water-in-oil.
Australia [9]	Butter	Minimum 80% m/m of milk fat.	A product derived exclusively from milk and products obtained from milk, principally in the form of an emulsion of the type water-in-oil.
China [4]	Butter	Minimum 80% milk fat	The products with milk fat content of not less than 80.0%, which is made from milk and (or) cream (fermented or non-fermented), with or without addition of other ingredients, food additives and nutrient fortifier.
Europe Union [13]	1. Unsalted butter	82%–90% milk fat	Unsalted butter produced from cream or milk in an approved undertaking of the Community of a minimum butterfat content, by weight, of 82% and a maximum water content, by weight, of 16%.
	2. Salted butter	80%–90% milk fat	Salted butter produced from cream or milk in an approved undertaking of the Community of a minimum butterfat content, by weight, of 80%, a maximum water content, by weight, of 16% and a maximum salt content, by weight, of 2%.
	3. Three quarter fat butter (Reduced fat butter)	60%–62% milk fat	
	4. Half fat butter (Low fat/light butter)	39%–41% milk fat	
	5. Dairy spread X%	Maximum 39% milk fat 41%–60% milk fat 62%–80% milk fat	
Japan [6,7]	Butter	Minimum 80% milk fat	The product which is made by churning and working fat globules obtained from raw milk, cow's milk or special milk. Moisture is no more than 17.0%, and Coliforms should be Negative.
Taiwan [11,24]	Butter	Minimum 80% milk fat	The product in the form of an emulsion of the type water-in-oil containing edible butter made from fat-containing products of dairy derivatives through pasteurization, agitation, and refinement. Moisture, milk solids-not-fat and salt are less than 16.0%, 2% and 2%, respectively.
United States [14]	1. Butter	Minimum 80% milk fat	'Butter' shall be understood to mean the food product usually known as butter, and which is made exclusively from milk or cream, or both, with or without common salt, and with or without additional coloring matter, and containing not less than 80 per centum by weight of milk fat, all tolerances having been allowed for.
	2. Light butter [16]	Maximum 40% milk fat	Salt – Not more than 1.5%

content (g/100 g) no less than 10 and no more than 80. Furthermore, the fat phase shall represent at least two-thirds of the dry matter content of the products. This Alimentarius provides a standard for the spread products that milkfat contents are lower than 80%.

European Union clearly defined the reduced fat butter and other spread products. Council Regulation number 2991/94 [17] provides standards and requirements for the composition of certain spreadable fats, such as butter, blends and spreads regarding the trade, which are allowed to be manufactured and marketed in member countries. The regulation regarding butter products states that these products are in the form of a solid, malleable emulsion, principally of the water-in-oil type, derived solely from milk. The requirements for composition and the authorized name of the products are shown in Table 2. "Three quarter fat butter" is a product with a milkfat content between 60% and 62%. The term "reduced fat" may be used as an additional description. The products with a milkfat content

of 39%–41% are named as "half fat butter". The term "low-fat" or "light" may be used. The spread products with other milkfat contents should be described as "Dairy spread X %".

In United States, USDA regulates an "USDA Specifications for Light Butter" [18] and specifies the ingredients and quantities that are acceptable in a light butter formulation. The light butter requires maximum levels of fat and salt are 40 g/100 g and 1.5 g/100 g, respectively. For the dairy ingredient, the quality of the cream used in the manufacture of the light butter shall meet the requirements of cream acceptable for the manufacture of U.S. Grade AA butter. For non-dairy ingredient, stabilizers and emulsifiers, color and salt could be added and should be approved or meet the requirements of CFR [14] and Food Chemical Codex [19]. The regulation states that the product must not be nutritionally inferior to traditional butter and performance characteristics should be similar. Although the light butter makes a fine spread or dressing, it should not be substituted for regular butter in

baking or frying due to its high moisture content. For the quality requirement of the light butter, United States government [18] regulates flavor, body & texture and color & appearance. Flavor shall possess a pleasing clean dairy flavor. It may possess slight acid, coarse, feed, flat, and definite cooked flavors. A safe and suitable bacterial culture or other ingredients may be added for flavoring. Body and texture should possess a smooth creamy texture. It may be slightly leaky and short bodied. For color and appearance, the product shall have a uniform light to medium yellow color when compared to the USDA Butter Color Standards [15]. It may be waxy in appearance. For microbial requirement, total plant count is not more than 1000 per gram. Coliform and yeast and mold are not more than 10 per gram.

3. Cream and related products

The cream is a concentrated emulsion of milk lipid globules in skimmed milk and is prepared commercially by centrifugal separation of the less-dense lipid phase from skimmed milk. Codex Alimentarius [20] defines cream as “the fluid milk product comparatively rich in fat, in the form of an emulsion of fat-in-skimmed milk, obtained by physical separation from milk”. The cream products are categorized as reconstituted cream, recombined cream and prepared cream according to their types of milk ingredients and preparation methods (Table 3). The milkfat content should be no less than 10%. The raw material could be milk, which may have been subjected to mechanical and physical treatments prior to cream processing. Additionally, butter, milk fat products, milk powders, cream powders, and potable water could be the raw material for cream made by reconstitution or recombination.

Some current regulations and standards for the definition and the milkfat contents in the cream products in different countries are outlined in Table 4. Since not all countries market all classes of cream and use the same names to describe similar products, a uniform international definition or classification system for cream products cannot be found [21]. The cream products could be classified according to the milkfat contents, such as heavy cream (>36%), light cream (18–30%) and half and half (>10.5%) in United States [22], and clotted cream (>55%), double cream (>48%) and half cream (>12%) in United Kingdom [23]. The cream products are also categorized according to their function, e.g. whipping cream and coffee cream/table cream, or by the processing received, e.g. pasteurized cream, ultra-high-temperature (UHT)-treated cream, frozen cream, dried cream and cultured or sour cream [21]. In Taiwan, TFDA regulates cream as a product containing fat physically separated from the milk and processed into a product in the form of an emulsion of the type oil-in-water, staying in fluidity or non-fluidity liquid state if kept above the freezing temperature. The milkfat content should be at least 10%, but less than 80% [24].

4. Anhydrous milkfat and related products

The anhydrous milkfat and related products include anhydrous milkfat, milkfat, anhydrous butter oil and butter oil.

Table 3 – Codex standard for cream and prepared cream [20].

Types	Description
Cream	The fluid milk product comparatively rich in fat, in the form of an emulsion of fat-in-skimmed milk, obtained by physical separation from milk.
Reconstituted cream	Cream obtained by reconstituting milk products with or without the addition of potable water and with the same end product characteristics as Cream
Recombined cream	Cream obtained by recombining milk products with or without the addition of potable water and with the same end product characteristics as cream.
Prepared cream	The milk products obtained by subjecting cream, reconstituted cream and/or recombined cream to suitable treatments and processes to obtain the characteristic properties as specified below.
(1) Prepackaged liquid cream	The fluid milk product obtained by preparing and packaging cream, reconstituted cream and/or recombined cream for direct consumption and/or for direct use as such.
(2) Whipping cream	The fluid cream, reconstituted cream and/or recombined cream that is intended for whipping. When cream is intended for use by the final consumer the cream should have been prepared in a way that facilitates the whipping process.
(3) Cream packed under pressure	The fluid cream, reconstituted cream and/or recombined cream that is packed with a propellant gas in a pressure-propulsion container and which becomes Whipped Cream when removed from that container.
(4) Whipped cream	The fluid cream, reconstituted cream and/or recombined cream into which air or inert gas has been incorporated without reversing the fat-in-skimmed milk emulsion.

According to Codex Alimentarius [2], “the anhydrous milkfat, milkfat, anhydrous butter oil and butter oil are fatty products derived exclusively from milk and/or products obtained from milk by means of processes which result in almost total removal of water and non-fat solids”. All anhydrous milkfat and related products should have acceptable taste and odor for market requirements after heating a sample to 40–45 °C. The texture of products is smooth and fine granules to liquid, depending on temperature.

4.1. Anhydrous milkfat

The anhydrous milkfat is made by removing all of the moisture and nonfat solids from pasteurized cream. The 40%

Table 4 – Compositional standards in cream.

Country	Cream type	Milk fat	Definition	
Codex [20]	Cream	Minimum 10% (w/w) milk fat	The fluid milk product comparatively rich in fat, in the form of an emulsion of fat-in-skimmed milk, obtained by physical separation from milk.	
Australia [10]	Cream	Minimum 350 g/kg of milk fat.	A milk product comparatively rich in fat, in the form of an emulsion of fat-in skim milk, which can be obtained by separation from milk.	
China [4]	Cream	10%–80% milk fat	The products with milk fat content of 10.0%–80.0%, which is made from milk fat-containing part separated from milk, with or without addition of other ingredients, food additives and nutrient fortifier.	
Japan [6,7]	Cream	Minimum 18.0%	the product which is obtained by removal of components other than milk fat from raw milk, cow's milk or special milk.	
Taiwan [12,24]	Cream	10% to 80% milk fat	A product containing fat physically separated from the milk and processed into a product in the form of an emulsion of the type oil-in-water, staying in fluidity or non-fluidity liquid state if kept above the freezing temperature.	
United States [22]	Cream	Minimum 18% milk fat	The liquid milk product high in fat separated from milk, which may have been adjusted by adding thereto: Milk, concentrated milk, dry whole milk, skim milk, concentrated skim milk, or nonfat dry milk.	
		1. Heavy cream (alternatively “Heavy whipping cream”)		Minimum 36% milk fat
		2. Light cream (alternatively “Coffee cream” or “Table cream”)		18%–30% milk fat
		3. Light whipping cream (alternatively “Whipping cream”)		30%–36% milk fat
United Kingdom ^a	Cream	4. Half and half	Minimum 10.5% milk fat	Half-and-half is the food consisting of a mixture of milk and cream which contains not less than 10.5%
			Minimum 10% milk fat	The product obtained from milk in the form of an emulsion of the oil-in water type with a milk fat content of at least 10%.
		1. Clotted cream	Minimum 55% milk fat	Cream which has been produced and separated by the scalding, cooling and skimming of milk or cream;
		2. Double cream	Minimum 48% milk fat	Cream has been whipped. Cream which has been subjected to a process of sterilization by heat treatment in the container in which it is to be supplied to the consumer
		3. Whipping cream	Minimum 35% milk fat	
		4. Whipped cream	Minimum 35% milk fat	
		5. Sterilized cream	Minimum 23% milk fat	
		6. Cream or Single cream	Minimum 18% milk fat	The cream is not sterilized cream
7. Half cream	Minimum 12% milk fat			
8. Sterilized half	Minimum 12% milk fat	The cream is sterilized cream		

^a Guidance on legislation on the protection of definitions and designations in respect of milk and milk products.

milkfat cream is first concentrated to 70–80% milkfat, and then the high-fat cream is processed through a specialized or phase inversion unit. The milkfat is further concentrated by removing residual moisture using vacuum drying. According to Codex Alimentarius [2], the anhydrous milkfat should contain no less than 99.8% (m/m) milkfat and not more than 0.1% (m/m) moisture. The maximum free fatty acids and peroxide value are lower than 0.3% (m/m as oleic acid) and 0.3 (milli-equivalents of oxygen/kg fat), respectively. The copper and iron contents in the anhydrous milkfat products cannot exceed 0.05 mg/kg and 0.2 mg/kg, respectively.

National legislation in many countries, such as China and United States, adopt the same specifications for the anhydrous

milkfat. In China, anhydrous butter oil is defined as “The products with milk fat content are not less than 99.8% (m/m), which is made from milk and (or) butter and cream (fermented or non-fermented), with or without addition of food additives and nutrient fortifier” [4]. In United States, the anhydrous milkfat means “The food product results from the removal of practically all of the moisture and solids-not-fat from pasteurized cream or butter. It contains not less than 99.8% (m/m) fat and not more than 0.1% (m/m) moisture and, when produced from butter, not more than 0.1% other butter constituents, of which the salt shall be not more than 0.05%. An inert gas may be used to flush air-tight containers before, during, and after filling. Carbon dioxide may not be used for this purpose” [5].

When comparing the differences in the anhydrous milkfat specification between Codex Alimentarius and U.S. Code of Federal Regulations (CFR) (Table 5), CFR has more restricted specifications than Codex Alimentarius. Maximum peroxide value in Codex is 0.3 (milli-equivalents of oxygen/kg fat) in the anhydrous milkfat products, while CFR requires 0.1 (milli-equivalents of oxygen/kg fat) [3,5]. CFR also regulated limitation of other butter constituents including salt and salt contents.

4.2. Butter oil

The butter oil is made by the removal of all of the moisture and nonfat solids from butter. It is produced by gently heating butter, disrupting the butter emulsion. The milkfat is then concentrated in separators and vacuum dried to remove residual moisture. Sometimes butter oil is washed with water prior to the final drying stage to remove trace impurities. According to Codex Alimentarius, the butter oil should contain about 99.6% (m/m) milkfat and not more than 0.2% (m/m) moisture, the maximum free fatty acids and peroxide value are lower than 0.3% (m/m as oleic acid) and 0.6 (milli-equivalents of oxygen/kg fat), respectively. The copper and iron contents in the butter oil cannot exceed 0.05 mg/kg and 0.2 mg/kg, respectively [3].

Other countries such as Japan and United States have similar definition and standards for butter oil. In Japan, the butter oil means the product obtained by removal of almost all components other than milk fat from butter or cream [6,7]. It contains not less than 99.3% fat and not more than 0.5% moisture. In US, butter oil means “The food product results from the removal of practically all of the moisture and solids-not-fat from butter. It contains not less than 99.6% fat and not more than 0.3% moisture and not more than 0.1% other butter constituents, of which the salt shall be not more than 0.05%.” [5]. Just like the anhydrous milkfat, US CFR has more restricted requirements than Codex. Maximum peroxide value in Codex is 0.6 (milli-equivalents of oxygen/kg fat), while CFR requires 0.1 (milli-equivalents of oxygen/kg fat) in the butter oil. CFR

also regulated limitation of other butter constituents including salt and salt contents. In European Union, the butter oil defines “a product obtained from milk, cream or butter by processes which eliminate the water and the dry non-fat extract with a minimum content of milk fat of 99.3% of the total weight and a maximum water content of 0.5% of the total weight, including ghee”. To avoid double counting, the “butter oil” relates only to direct production from cream [8].

5. Blends and blended spreads

A mixture of butter and vegetable oils with a high content of unsaturated fatty acids as blends or blended spreads is also on the market due to improvement of spreadability of the milkfat under low temperature and health prospective for high level of saturated fatty acids [21]. The vegetable oils, used in most blended products, are soya bean or rapeseed oil that to replace about 20–30 g/100 g of the milk fat. Other types of oil, which are low in erucic acid and high in oleic acid, such as olive oil, cottonseed oil or rapeseed oil, are also the preferred vegetable oil for the production of the blends and blended spreads [21–23,25,26].

To reduce the possibility of confusing butter, margarine and other spreadable fats, Codex Alimentarius [16] regulates the fat spreads and blended spreads as “plastic or fluid emulsions, principally of water and edible fats and oils. These fat products, containing not less than 10% and not more than 90% fat, intended primarily for use as spreads”. The definition of edible fats and oils is “foodstuffs composed of glycerides of fatty acids. They are of vegetable or animal (including milk) or marine origin. Fats and oils that have been subjected to processes of physical or chemical modification including fractionation, inter-esterification or hydrogenation are included”. This Standard only includes margarine and products applying for similar purposes and excludes products with a fat content of less than 2/3 of the dry matter (excluding salt). Butter and dairy spreads are also not covered by this Standard.

Table 5 – Compositional and quality standards of anhydrous milkfat and related products.

	Codex [3]		CFR [5]	
	Anhydrous milkfat/Anhydrous butter oil	Milkfat/Butter oil	Anhydrous milkfat	Butter oil
Minimum milkfat (% m/m)	99.8	99.6	99.8	99.6
Maximum moisture (% m/m)	0.1	–	0.1	0.3
Maximum free fatty acid (% m/m as oleic acid)	0.3	0.3	0.3	0.3
Maximum peroxide value (milli-equivalents of oxygen/kg fat)	0.3	0.6	0.1	0.1
Maximum other butter constituents including salt (%)	–	–	0.1	0.1
Maximum salt (%)	–	–	0.05	0.05
Maximum Iron (mg/kg)	0.2	0.2	0.2	0.2
Maximum Copper (mg/kg)	0.05	0.05	0.05	0.05
Taste and odor	Acceptable for market requirements after heating a sample to 40–45 °C		The flavor shall be bland and free from rancid, oxidized, or other objectionable flavors.	
Texture	Smooth and fine granules to liquid, depending on temperature			

European Union also regulates that “the spreadable fats (dairy and non-dairy) are products with a fat content of at least 10% but less than 90% by weight and which remain solid at a temperature of 20 °C” [17]. For the non-dairy spreadable fats, there are divided into two categories, blended spreads/blends and fat spreads/vegetable/animal fat product due to the milkfat contents (Table 6).

5.1. Blended spreads/blends (mixed milk fat and vegetable/animal fat product)

According to Codex Alimentarius [16], the blended spreads are in which milkfat is more than 3% of the total fat content and are separated into two categories: ‘Blends’ shall have a fat content no less than 80 g/100 g, and “blended fat spreads” shall have a fat content less than 80 g/100 g (Table 7).

In European Union, Council Regulation No. 2991/94 [17] requires that the blends and blended spreads should be in the form of a solid, malleable emulsion principally of the water-in-oil type, derived from solid and/or liquid vegetable and/or animal fats suitable for human consumption. The fat content in the blends and blended spreads shall be between 10 and 90 g/100 g of the total fat content. The blend and blended spreads could be classified according to the fat contents, e.g. blend (80–90%), three-quarter-fat blend (60–62%) and half-fat blend (39–41%), and blended spread X% (less than 39%, more than 41 and less than 60%, more than 62 and less than 80%).

5.2. Margarine and fat spreads (vegetable/animal fat product)

Conferring to Codex Alimentarius [16], the fat spreads are defined that any milk fat content must be no more than 3% of the total fat content and are divided into two categories: ‘margarine’ shall have a fat content more than 80 g/100 g, and ‘fat spreads’ shall have a fat content less than 80 g/100 g.

In European Union, Council Regulation No. 2991/94 [17] regulated that the margarine and fat spreads should be in the form of a solid, malleable emulsion principally of the water-in-oil type, derived from solid and/or liquid vegetable and/or animal fats suitable for human consumption. The milkfat content in the margarine and fat spreads shall be less than 3 g/100 g of the total fat content. The margarine and fat spreads could be classified according to the fat contents, e.g. margarine (80–90%), three-quarter-fat margarine (60–62%) and half-fat margarine (39–41%), and fat spread X (less than 39%, more than 41 and less than 60%, more than 62 and less than 80%).

In Taiwan, the fatty products are divided into margarine and fat spreads according to their fat contents. Margarine and fat spreads are those fat-containing products in a plastic and liquid state, made from a blend of edible fats, oils, water and legal food additives, modified by the process of emulsification, chilling and kneading, or with the absence of chilling and kneading.

Table 6 – Compositional standards in blends and blended spreads in EUROPEAN UNION [33].

Fat group	Type (sale description)	Definition
Mixed milk fat and vegetable/animal fat product	1. Blend	Products in the form of a solid, malleable emulsion principally of the water-in-oil type, derived from solid and/or liquid vegetable and/or animal fats suitable for human consumption, with a fat content of between 10% and 90%.
	2. Three-quarter-fat blend	The product obtained from a mixture of vegetable and/or animal fats with a fat content of not less than 80% but less than 90%.
	3. Half-fat blend.	The product obtained from a mixture of vegetable and/or animal fats with a fat content of not less than 60% but not more than 62%.
	4. Blended spread X %	The product obtained from a mixture of vegetable and/or animal fats with a fat content of not less than 39% but not more than 41%
		The product obtained from a mixture of vegetable and/or animal fats with the following fat contents: <ul style="list-style-type: none"> – Less than 39%, – More than 41% but less than 60%, – More than 62% but less than 80%.
Vegetable/animal fat product	1. Margarine	Products in the form of a solid, malleable emulsion, principally of the water-in-oil type, derived from solid and/or liquid vegetable and/or animal fats suitable for human consumption, with a milk-fat content of not more than 3% of the fat content.
	2. Three-quarter-fat margarine	The product obtained from vegetable and/or animal fats with a fat content of not less than 80% but less than 90%.
	3. Half-fat margarine	The product obtained from vegetable and/or animal fats with a fat content of not less than 60% but not more than 62%.
	4. Fat spreads X %	The product obtained from vegetable and/or animal fats with a fat content of not less than 39% but not more than 41%.
		The product obtained from vegetable and/or animal fats with the following fat contents: <ul style="list-style-type: none"> – Less than 39%, – More than 41% but less than 60%, – More than 62% but less than 80%.

Table 7 – Labeling regulation for Milkfat products.

	Codex	China	European Union	Japan	United States	Taiwan
Standards	<ol style="list-style-type: none"> 1. <i>The General standard for the Labeling of Prepackaged foods</i> [27] 2. <i>The General Standard for the Use of Dairy terms</i> [35] 3. <i>The Guidelines for the Use of Nutrition and Health Claims</i> [28]. 	<ol style="list-style-type: none"> 1. <i>The General standard for the labeling of prepackaged foods</i> [29] 2. <i>The General standard for the labeling of prepackaged foods for special dietary uses</i> [30] 	<ol style="list-style-type: none"> 1. <i>The new Regulation (EU) No 1169/2011 on the provision of food information to consumers entered into application.</i> [36] 2. <i>The Spreadable fats (dairy and non-dairy): Definition, labeling and sale</i> [33] 	<i>The Food Labeling Standard</i> [31]	<i>The Food labeling</i> [32]	<ol style="list-style-type: none"> 1. Bureau of Standard, Taiwan. <i>Butter. Chinese National Standards 2877, N5085.</i> [11] 2. Bureau of Standard, Taiwan. <i>Cream. Chinese National Standards 2878, N5086.</i> [12] 3. <i>Regulations Governing the Product Names and Labeling of Prepackaged Butter, Cream, Margarine and Related Products.</i> [24]
Anhydrous milkfat products						
Nomenclature	<ol style="list-style-type: none"> 1. 99.8% Milkfat: Anhydrous milkfat, Anhydrous butter oil 2. 99.6% Milkfat: Milkfat, Butter oil, Ghee 	99.8% Milkfat: Anhydrous milkfat	99.3% Milkfat: Butter oil, ghee	99.3% Milkfat: Butter oil	<ol style="list-style-type: none"> 1. 99.8% Milkfat: Anhydrous milkfat 2. 99.6% Milkfat: Butter oil 3. Butter oil and anhydrous butterfat may be declared as “butterfat” (CFR Title Sec. 101.4) 	
Label declaration		Need to indicate the fat content of the product.			Each of the ingredients used in the food shall be declared on the label as required.	
Butter products						
Nomenclature	<ol style="list-style-type: none"> 1. Min. 80% Milkfat: Butter The name “butter” with a suitable qualification shall be used for butter with more than 95% fat 2. Milkfat 10–80%: Dairy fat spreads 	Min. 80% Milk fat: Butter	<ol style="list-style-type: none"> 1. Min. 80% Milkfat: Butter 2. 60%–62% milkfat: Three quarter fat butter 3. 39%–41% milkfat: Half quarter fat butter 4. Maximum 39% milk fat, 41%–60% milk fat, 62%–80% milk fat: Dairy spread X% 	Min. 80% Milkfat: Butter	<ol style="list-style-type: none"> 1. Min. 80% Milkfat: Butter 2. Max. 40% milkfat: Light butter 	Min. 80% Milkfat: Butter

Label declaration	<ol style="list-style-type: none"> If the consumer would be misled by the omission, the milkfat content shall be declared in a manner found acceptable in the country of sale to the final consumer. Dairy fat spreads with reduced fat content may be labeled as "reduced fat". (CAC/GL 23-1997). 	Need to indicate the fat content of the product.	<ol style="list-style-type: none"> The Regulation limits the use of the terms "butter" to products with a fat content of not less than 80%. "Reduced fat" claims: The product has a reduced fat content must be mentioned clearly in the product designation. The Regulation therefore permits the use of nutritional claims which underline that the product has a reduced fat content. 	Content claims – To claim "Reduced X" or "Less X," the relative difference between the previous or standard formulation and the current formulation should be 25% or more.	<ol style="list-style-type: none"> "Reduced X" or "Less X" claim: The label or labeling must state the identity of the reference food and the percentage (or fraction) of the amount of the nutrient in the reference food by which the nutrient in the labeled food differs (Sec. 101.67 Use of nutrient content claims for butter) Each of the ingredients used in the food shall be declared on the label as required. 	The product names and labeling of prepackaged butter shall meet the following definition. Butter: A product in the form of an emulsion of the type water-in-oil containing edible butter made from fat-containing products of dairy derivatives through pasteurization, agitation, and refinement with at least 80% of milkfat.
Cream Nomenclature	<ol style="list-style-type: none"> Min. 10% milk fat: Cream "Prepackaged liquid cream" may be designated as "cream" "Cream packed under pressure" may be designated by another descriptive term that refers to its nature or intended use or as "Whipped Cream". The term "prepared cream" should not apply as a designation. Labeling statements, such as product designation of fermented creams and content claims, may include reference to the terms "Kefir", "Kumys", "Acidophilus" as appropriate, provided that the product has been fermented by the corresponding specific starter culture(s) (<i>the Standard for Fermented Milks</i> (CODEX STAN 243-2003)) 	10–80% milk fat: Cream	Min. 18% milk fat: Cream	Min. 18% milk fat: Cream	Minimum 18% milk fat: Cream Minimum 36% milk fat: Heavy cream, Heavy whipping cream 18%–30% milk fat: Light cream 30%–36% milk fat: Light whipping cream Minimum 10.5% milk fat: half and half Cream, reconstituted cream, dried cream, and plastic cream (sometimes known as concentrated milk fat) may be declared as "cream".	10–80% milk fat: Cream

(continued on next page)

Table 7 – (continued)

	Codex	China	European Union	Japan	United States	Taiwan
Label declaration	<p>1 . If the consumer would be misled by the omission, the milkfat content shall be declared in a manner found acceptable in the country of sale to the final consumer.</p> <p>2 . Creams which have been manufactured by the recombination or reconstitution of dairy ingredients shall be labeled as “Recombined cream” or “Reconstituted cream” or another truthful qualifying term if the consumer would be misled by the absence of such labeling.</p>	Need to indicate the fat content of the product.	<p>“Reduced fat” claims: The product has a reduced fat content must be mentioned clearly in the product designation. The Regulation therefore permits the use of nutritional claims which underline that the product has a reduced fat content.</p>		Each of the ingredients used in the food shall be declared on the label as required.	The product names and labeling of prepackaged cream shall meet the following definition. Cream: A product containing fat physically separated from the milk and processed into a product in the form of an emulsion of the type oil-in-water, staying in fluidity or non-fluidity liquid state if kept above the freezing temperature, and having milkfat content at least 10%, but less than 80%.

6. Labeling

Varieties of the milkfat products and non-dairy fat products are on the market. Codex and certain Countries have legislated clear labeling standards to prevent misleading to the consumer and assure the food safety.

6.1. For milkfat products

For the milkfat products, the fat in the products should be exclusively from milk and/or products obtained from milk. The milkfat contents of these products should be no less than 10% depending on different types of products. The name of the food, providing identity for the products, is most important. According to Codex Alimentarius [27], the name of food should be used if the product name has been established for a food in a Codex standard. Additionally, the milkfat content should be declared on the label if the consumer would be misled by the omission. The label should declare that in a manner found acceptable in the country of sale to the final consumer, either as a percentage by mass, or in grams per serving as quantified in the label provided that the number of servings is stated. Codex Guidelines for the Use of Nutrition Claims [28] also clearly specify the comparative claims. For claim “reduced”, it should be based on a relative difference of at least 25% in the energy value or nutrient content. The use of the word “light” should follow the same criteria as for “reduced” and include an indication of the characteristics which make the food “light”.

National legislation in many countries, such as China, Japan and United States, adopt the same specifications for labeling of the milkfat products. In China, the specific name of the food shall be presented in the prominent place of the label, and shall clearly indicate the true nature of the food. All dairy fat products need to indicate the fat content of the products [29,30]. Recently, Japan developed a new labeling regulation. For content claims, the new Standard harmonizes Japanese food labeling content claim regulations with established Codex standards. The relative difference between the previous or standard formulation and the current formulation should be 25% or more to claim “Reduced X” or “Less X” [31]. In United States, the name of food should be used if now or hereafter specified in or required by any applicable Federal law or regulation [32]. For the comparative claims, the label or labeling must state the identity of the reference food and the percentage (or fraction) of the amount of the nutrient in the reference food by which the nutrient in the labeled food differs, such as “50% less fat than (reference food)”. Accordingly, the ‘reduced’ fat butter could be used with clearly labeling the different percent fat. In European Union, the Regulation limits the use of the terms “butter” to products with a fat content of not less than 80% to avoid any possible confusion [33]. Only if, under the terms of the “Regulation”, the product clearly mentions the reduced fat content in the product designation. Consequently, three quarter fat butter (reduced fat butter), half fat butter (low fat/light butter) and dairy spread X% could be labeled as name of the food. In Taiwan, the products shall be named in accordance with their definitions. The products which meet the standard of butter could be named as “butter”,

and those meet the standard of cream could be labeled as “cream” [24].

6.2. Blends and spreads

The blends or blended spreads are mixture of butter and vegetable oils with a high content of unsaturated fatty acids. To reduce the possibility of confusing the butter, margarine and other spreadable fats, Codex Alimentarius [16] regulates that blended spreads are in which milk fat is more than 3% of the total fat content and are separated into two categories: “Blends” shall have a fat content no less than 80 g/100 g, and “blended fat spreads” shall have a fat content less than 80 g/100 g. Fat spreads are defined as any milk fat content must be no more than 3% of the total fat content and are divided into two categories: “margarine” shall have a fat content more than 80 g/100 g, and “fat spreads” shall have a fat content less than 80 g/100 g. The name of the food should be declared on the label as the above specification. The product should be declared the fat content in the label. If the product contains milkfat, it should be indicated in a manner that is clear and not misleading to the consumer. Each individual fat and/or oil ingredient of a food intended for human consumption shall be declared by its specific common or usual name.

In European Union, the Regulation limits the use of the terms “margarine” to products with a fat content of not less than 80% to avoid any possible confusion [33]. Only if, under the terms of the “Regulation”, the product clearly mentions the reduced fat content in the product designation. Accordingly, three quarter fat margarine (reduced fat margarine), half fat margarine (low fat/light margarine) and fat spread X% could be labeled as name of the food. To assist food businesses understand and comply with legislation that may be complex or difficult to interpret, guidance can be developed at EU. In 2015, EU published a guidance “The Use of the Term ‘Butter’ in the Labelling and Advertising of Fat Spreads”, focusing on how the term ‘butter’ and derived terms are used on the labeling and advertising of some fat spreads. Particularly, fat spreads are need to be correctly labeled and that the word ‘butter’, ‘butter preparation’, and derived terms such as buttery are used appropriately with not misleading consumers.

In United States, when foods characterized on the label as “non-dairy” contain a caseinate ingredient, the caseinate ingredient shall be followed by a parenthetical statement identifying its source. For example, if the manufacturer uses the term “non-dairy” on a creamer that contains sodium caseinate, it shall include a parenthetical term such as “a milk derivative” after the listing of sodium caseinate in the ingredient list [32].

In United Kingdom [34], for a non-dairy product to use a dairy designation, it must be clear to the average consumer that the product is not a dairy product and cannot be confused with a dairy product. The Regulation also bans labels, commercial documents, publicity material or any form of advertising or presentation which claim, imply or suggest, that a non-dairy product is a milk product. The use of comparisons or claims such as “real buttery taste”, “tastes like real cream”, “use as for cream” or terms like “whipping”, “double” etc. normally associated with dairy products should be considered against the provision, in the context of a particular.

In Taiwan, according to the “Regulations Governing the Product Names and Labeling of Prepackaged Butter, Cream, Margarine and Fat Spreads [24]”, the names of non-dairy fatty products shall be labeled as margarine or fat spreads according to their fat contents. Besides, the words that are recognized as vegetable butter shall not appear on the packages. It is violating the rule if the label was against the facts or caused confusion to the consumer.

7. Challenge

By comparing the standards and regulations for dairy and non-dairy fat products, Codex and many countries have clearly specified these products and set the requirements for labeling to prevent misleading and confusing the consumers. However, butter and other milkfat products not only are important nutritionally and functionally to customers, these products are also important economically to the dairy industry in certain countries (US, NZ, EU etc.). The range of milkfat products available has increased rapidly over the last two decades in response to competition from non-dairy fat products. It is also worth to notice that European Union Council Regulation defined more different types of products than other countries due to the diverse range of food and food categories as well as the cultural differences inherent in 28 EU Member States.

The unique challenge worldwide is to evaluate foreign food standards, food safety production systems and requirements to maintain safe food sources for protection of public health. Currently, there do not appear to be well established procedures for determining the safety and quality equivalence of milk fat and spread products among countries. Determining “equivalence” of Taiwan and foreign food production standards, regulations, guidance and practice can be a substantial undertaking. Additionally, the Codex Alimentarius Commission agreed to allow processors to continue to use scientific information, such as emerging research on health and nutrition, in marketing and on labels for products sold in countries that use the international standards. How to meet this requirement from a new standard definition of labeling that includes commercial and consumer communications is still a big challenge for dairy products.

Comparing the dietary hobbies with other countries, butter products are not the mainstream products in Taiwan. However, product names on the market often caused confusion to the consumer or did not conform to their nature. Thus, TFDA published the “Regulations Governing the Product Names and Labeling of Prepackaged Butter, Cream, Margarine and Fat Spreads” recently to define the butter, cream, margarine and fat spreads and their fat contents to ensure that the product purchased by consumer conform to its nature. The further guidance document might be needed to harmonize the understanding and interpretation of food legislation as it relates to the provision of certain food information on fat spreads and provide guidance to food industry to assist in their compliance with Regulation. In particular, the focus will be on how the term ‘butter’ and derived terms (‘buttery’, ‘butterly’, etc.) are used on the labeling and advertising of some fat spreads.

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