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Dairy products introduced illegally by airline passengers into Germany and their zoonotic potential

Illegal von Flugpassagieren nach Deutschland eingeführte Milchprodukte und ihr Zoonosenpotential

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Summary

According to regulation (EC) 206/2009, travellers are not allowed to introduce products of animal origin from third countries into the European Union (EU). Still, customs confiscate, in considerable amounts, dairy products regularly. The present survey focused on n = 227 non-EU dairy product samples confiscated from passengers at two international German airports in 2014. Most samples (83.70 %) were cheeses, cheese preparations, and processed cheeses, arriving moreover with flights starting from Turkey, Egypt, and the Russian Federation. Fresh, brine, and pasta filata-type cheeses were most numerous. Identification was done either by products' labels or via research, consulting persons of the countries of origin when possible. The literature, if existent, shows that many of the products can yield classical food-borne pathogens, e. g. salmonellae and listeriae, and emerging, opportunistic pathogens, e. g. fungi and their mycotoxins, in their countries of origin, which makes surveillance there, and confiscation and subsequent destruction at EU borders necessary.

Keywords: traditional dairy products, food safety, customs, regulation (EC) 206/2009

Zusammenfassung

Nach der EU-Verordnung 206/2009 ist es Reisenden nicht gestattet, Lebensmittel tierischen Ursprungs aus Drittländern in die Europäische Union einzuführen. Dennoch werden vor allem Milchprodukte regelmäßig beim Zoll konfisziert. Die vorliegende Untersuchung bezieht sich auf n = 227 Nicht-EU-Milchprodukte, die über ein Jahr an zwei deutschen internationalen Flughäfen beschlagnahmt wurden. Es zeigte sich, dass 83,70 % der Proben Käse waren, die v. a. mit Flügen aus der Türkei, Ägypten und der Russischen Föderation kamen. Frisch-, Lake- und Pasta-Filata-Käse waren die häufigsten Produkte. Eine Identifizierung erfolgte entweder über die Angaben auf den Etiketten oder durch Recherche, ggf. unter Zuhilfenahme von Personen aus den Ursprungsländern. Soweit vorhanden, zeigte die Literaturrecherche, dass viele der beschlagnahmten Produkte in ihren Ursprungsländern klassische Erreger lebensmittelbedingter Erkrankungen, z. B. Salmonellen und Listerien, oder aufkommende Opportunisten, wie z. B. Pilze und deren Toxine, enthalten können, weswegen die Überwachung dieser Produkte dort sowie die Beschlagnahme und subsequente Unschädlichmachung an den EU-Grenzen notwendig sind.

Schlüsselwörter: traditionelle Milchprodukte, Lebensmittelsicherheit, Zoll, EU-Verordnung 206/2009

Introduction

The airplane has become a standard way to travel larger distances quickly. As could be seen during the recent Ebola outbreak in Western Africa[1], thorough controls at airports are a vital public health issue. In order to avoid the introduction of human and animal diseases, many nations limit the introduction of risk material by flight passengers, among them, foodstuffs of animal origin. To give an example, Brazilian legislation establishes that all animal products, by-products, and genetic material without an international health certificate must be confiscated at the borders and destroyed (Barros de Melo et al., 2014a).

According to regulation (EC) 206/2009, travellers are not allowed to introduce many foodstuffs of animal origin (including dairy products) from third countries into the European Union (EU), in order to avoid the introduction of eradicated animal diseases, e. g. foot-and-mouth disease or African swine fever (Jansen et al., 2015b). However, foodstuffs also yield a zoonotic potential. From 2004 on, the European Food Safety Authority (EFSA) has been issuing national zoonosis reports[2] in which outbreaks of e. g. brucellosis, salmonellosis, and campylobacteriosis were confirmedly associated with dairy products. Regulation (EC) 2073/2005 establishes the microbiological criteria for foodstuffs consumed within the EU that were either produced inside the Community or introduced into it legally. In contrast, the safety of foodstuffs brought into the EU illegally via e. g. passengers' luggage cannot be asserted at the customs level. Other nations may have set other thresholds for microbiological criteria (e. g. Mexico which includes *Vibrio cholerae* as food safety criterion[3]) or frankly do not have a food regulation that responds to a given product (e. g. Ethiopia that does have a food law[4] but does not specify governmental standards for dairy products). Artisanally-crafted foodstuffs (which are typical gifts for people living abroad) pose a particular risk when compared to industrially-produced ones because the latter are usually manufactured applying accepted standardization techniques and hygiene measures. An additional danger are foodstuffs that contain risk material, e. g. raw milk (Barros de Melo et al., 2014a; Hayaloğlu et al., 2008a). This is why regulation (EC) 206/2009 establishes that confiscated foodstuffs must be recorded and destroyed.

Apart from EU tourists returning to their home countries, many flight passengers who are carrying dairy products in their personal luggage are expatriates or visitors of expatriates and do not consider this regulatory background, perhaps because of an insufficient distribution of the information (Jansen et al., 2015a; 2015b). Since traditional foodstuff is considered part of the cultural heritage (Meyer-Rochow, 2008), people living as migrants or residents inside the EU, confiscating typical foodstuffs may become particularly annoying for them. Thus, risk-orientated customs controls frequently detect and confiscate large amounts of dairy products.

Still, the measures taken via regulation (EC) 206/2009 are necessary. Milk and dairy products were the third most frequent carrier foodstuff for zoonotic pathogens in Germany in 2013. The fact that outbreaks of certain Zoonoses in Germany could be associated with illegally-introduced dairy products or consuming them in third countries show the necessity for this measure. By means of an example, a total of 28 cases human brucellosis was reported officially in 2013. More than half of them originated in other countries, especially Turkey, Iraq, Spain, and Egypt. Several cases originated from Iraqi raw milk cheese which was introduced into the country, and by means of visitors to Turkey who consumed raw milk cheeses there (RKI, 2014). Concise data of the risks conveyed by the illegal introduction of dairy products are presented by Barros de Melo et al. (2014b). In their survey on Brazilian airports, they analysed foreign cheeses, acidified milk, liquid milk, and condensed milk (n = 166 in produces total) detecting *Brucella* spp., *Mycobacterium bovis,* and *M. avium* subsp. *paratuberculosis* in coming from other nations of the Americas, Africa, Europe (including EU countries like Portugal, Italy or the Netherlands), and Asia.

Apart from an 'international' set of world-wide known dairy products, hundreds of others take an important role on national or even only local level in many non-EU countries, be it as staple food, be it as side dishes or a delicacy. *Tulum peyniri* (fig. 1) is such a product from Turkey, a cheese traditionally made out of raw ewe milk using its indigenous flora and eventually yoghourt as starter cultures. Rennet and salt are added afterwards, and the mixture is traditionally filled into cleaned goat skins and left to ripen. Industrially-manufactured varieties are made with pasteurized milk and ripened in pierced vats or plastic bags, but their taste is considered less than the traditional one (Hayaloğu et al., 2008a). *Miş* is another product, typically consumed in Egypt and Sudan as a staple food. It is made from raw (Egypt) or heated (Sudan) milk and yoghourt or *qarīş,* a cottage cheese-like product from Egypt made from skimmed milk. It receives intensive pickling using salt, spices, and herbs as well as a portion of already fermented *miş* as another part of the starter cultures. It is stored in airtight clay pots and allowed to ripen for a year, consuming some of it and eventually refilling it, so that there is a constant usage. Industrial *miş* is a homogenized mass while the traditional one contains both chunky pieces of clotted milk and a pasty pickling mixture (Abd-El Salam and Benkerroun, 2006).

String cheeses are very popular in the Circumcircassian region, i. e. the Caucasus and surrounding areas of Russia, Turkey, and Levantine countries. Called *ṫel panir* in Armenian (fig. 1), *tel, çeçil or civil peyniri* (fig. 1) in Turkish or *stroka* resp. *spagetti syr* in Russian, the curd for this basic kind of cheese is treated with hot water (making it a pasta filata-type) and pulled into strings of varying diameter which are afterwards woven into a more compact structure like e. g. a braid. These string cheeses may be further processed by adding colorants or spices, stored in brine or smoked (Hayaloğu et al. 2008b).

Many of the products are available, in their countries of origin, in a hand-crafted and/or an industrially-produced way. Their compositional, sensorial and microbiological quality varies greatly among regions and producers, even with industrial products, and the lack of standardisation along with poor hygiene have been admonished frequently (Bintsis and Pappademas, 2002).

On the occasion of a major project dealing with (il)legally introduced meat products from third countries into the EU, samples of confiscated foodstuffs at two major German airports were obtained, including dairy products.

[1] http://www.bbc.com/news/world-africa-28755033
[2] http://www.efsa.europa.eu/en/zoonosesscdocs/zoonosescomsumrep.htm
[3] http://dof.gob.mx/nota_detalle.php?codigo=5160755&fecha=27/09/2010
[4] https://chilot.files.wordpress.com/2011/02/661.pdf

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The aim of the present paper was to describe the variety of confiscated dairy products and to assert, by a literature study, their risk potential regarding food-borne diseases.

Material and methods

Sample recording

Between January 2014 and January 2015, confiscated dairy products were collected from two major German airports operating also third countries. Samples were obtained either by assisting local customs officers and veterinarians during their regular surveillance duties or receiving the products which they had confiscated previously. The latter samples had been stored at –18 °C.

Products were transported according to regulation (EC) 1069/2009 considered as category 2 material to the authors' institution in Germany maintaining the cold chain at –4 °C, registered on subsequent days and eventually frozen again at –18 °C. Registration included the date of confiscation, the amount of products per confiscation incl. total weight, a picture (fig. 1), and the country of provenance of the passenger from which the products were confiscated. It is important to stress that only the last provenance before entering the EU could be recorded. Thus, a Japanese product from a passenger departing from e. g. Tokyo who travelled to Germany via Kuala Lumpur, New Delhi, and Ankara would be recorded as "Turkish", unless the label stated otherwise, in which case "country of provenance" and "country of origin" were recorded separately.

Two basic types of products were confiscated: on one hand, industrial ones with labels, and on the other, artisanal ones with no labels. Product names of the industrial ones were also recorded in the original language, including a transliteration and a translation when necessary. The linguistic precision which in this degree is rather uncommon for a food safety paper is necessary because many products attended in this survey lack international significance but have an undoubted local importance. It was seen that non-native research papers use rather generic terms (e. g. "Turkish brine cheese") or handmade transliterations (e. g. "roomy" instead of *Rūmī* cheese) which by their high degree of variability hamper research

FIGURE 1: *Examples of confiscated cheeses; upper left: Armenian* tel panir, *upper right: Turkish* çeçil peyniri, *lower left: Turkish* tulum peyniri, *lower right: Russian* syr kolbasa Luhskij. Pictures: W. Jansen, S. Ortaeri.

TABLE 1: *Confiscated dairy products at German international airports: liquid milk, evaporated milk, acidified dairy products, and butters and creams.*

	Liquid milk			Evap. milk	Acidified dairy products			Butters and creams			
Country of provenance, type of product	raw milk	UHT	**total**	SCM*	yoghurt	kefir	**total**	butter	butter preparations	cream	**total**
Armenia											
artisanal	.	.	.	.	.	.	.	1	.	.	**1**
Bahrain											
industrial	.	1	**1**	.	.	.	.	.	.	1	**1**
Brazil											
industrial	.	1	**1**	2	.	.	.	.	.	.	.
Egypt											
artisanal	1	.	**1**	.	.	.	.	1	.		**1**
industrial	.	.	.	.	.	.	.	.	.	3	**3**
Eritrea											
artisanal	.	.	.	.	.	.	.	.	5	.	**5**
Israel											
industrial	.	.	.	.	1	.	**1**	.	.	.	.
Russian Fed.											
artisanal	.	.	.	.	.	.	.	.	.	.	.
industrial	.	.	.	4	.	1	**1**	.	.	.	.
Tunisia											
industrial	.	1	**1**	.	1	.	**1**	.	.	.	.
Turkey											
artisanal	.	.	.	.	.	.	.	12	.	.	**12**
industrial	.	.	.	.	.	.	.	1	.	.	**1**
total	**1**	**3**	**4**	**6**	**2**	**1**	**3**	**15**	**5**	**4**	**24**

SCM = sweetened condensed milk, "." = no sample

considerably. Thus, for the transliteration, official systems were used whenever possible, i. e. DIN 9 (Cyrillic scripts), 3602 (Japanese), 9985 (Armenian), 31635 (Arabic), and 31636 (Hebrew). Dialectal differences (e. g. in Arabic) were not considered[5]. In any case, the original script was presented once to facilitate further research.

Products without labels were identified by online research or questioning persons familiar with these products, e. g. persons coming from these countries and their families, and embassy staff. In some cases, a definite identification was not possible since products could not be tasted. Instead, they were declared as a "type of" a given product.

Dairy products were classified into the basic types 'liquid milk', 'evaporated milk', 'acidified dairy products', 'butters and creams', and 'cheeses'. The latter was the most frequent type of product. However, there is no commonly-accepted way to classify cheeses. Based on the current German cheese regulation (Bundesministerium der Justiz und für Verbraucherschutz, 2013), there is a fundamental distinction between 'cheeses', 'cheese preparations', and 'processed cheeses'. A further differentiation of cheeses according to this system was not possible due to the lack of data regarding the fat-in-dry-matter. Instead, a system regarding the cheese types that were encountered was developed with the categories 'fresh cheeses', 'brine cheeses', 'soft cheeses', 'pasta filata-type cheeses', 'yellow cheeses'. In this way, the categorisation presented here is a system based on the German model.

After analysis, samples were destroyed.

TABLE 2: *Confiscated dairy products at German international airports: cheeses.*

Country of provenance, type of product	Fresh	Brine	Soft	Pasta filata	Yellow	Blue	Hard	Prep. *	Proc. **	total
Armenia										
artisanal	.	1	.	1	.	.	.	.	.	**2**
industrial	.	.	.	1	.	.	.	.	.	**1**
Bahrain										
industrial	.	.	.	.	.	.	.	.	1	**1**
Brazil										
industrial	.	.	.	1	.	.	.	.	.	**1**
Egypt										
artisanal	1	.	.	.	.	.	.	3	.	**4**
industrial	4	9	1	.	12	2	.	3	6	**37**
Eritrea										
artisanal	1	.	.	.	.	.	.	.	.	**1**
Georgia										
artisanal	.	.	1	.	.	.	.	.	.	**1**
Israel										
artisanal	1	.	.	.	.	.	.	.	.	**1**
industrial	1	.	.	.	.	.	.	.	1	**2**
Japan										
industrial	.	.	.	1	.	.	.	.	.	**1**
Jordan										
industrial	.	2	.	1	.	.	.	.	.	**3**
Lebanon										
artisanal	3	.	.	2	.	.	.	2	.	**7**
industrial	.	.	.	1	.	.	.	.	.	**1**
Marocco										
industrial	.	.	.	.	.	.	.	.	1	**1**
Russian Fed.										
artisanal	.	.	2	3	.	.	.	.	.	**5**
industrial	2	3	1	4	1	.	.	.	7	**18**
Tunisia										
industrial	.	.	.	.	.	.	.	.	9	**9**
Turkey										
artisanal	17	1	6	17	.	.	1	2	.	**44**
industrial	8	4	2	25	.	.		3	2	**44**
Turkmenistan										
artisanal	.	1	.	.	.	.	.	.	.	**1**
Uzbekistan										
industrial	.	.	.	1	.	.	.	.	.	**1**
Viet Nam										
industrial	.	1	.	.	.	.	.	.	.	**1**

* = cheese preparations, ** = processed cheeses, "." = no sample

Results

Survey

A total of n = 227 samples was recorded. Of those, most (83.70 %) were cheeses, followed by butters and creams (10.57 %), evaporated milk products (2.64 %), liquid milk (1.76 %), and acidified dairy products (1.32 %). Approx. two thirds (61.67 %) of samples were produced industrially, while the rest did not present any labelling and was therefore considered artisanally-crafted. Each sample included between one and 12 packages of the given product, weighing a total of 10 g to 6.3 kg. Tables 1 and 2 detail sample sizes with regard to country of provenance and types of products. The most represented countries of provenance were Turkey (45.81 % of samples), Egypt (20.26 %), and the Russian Federation (12.33 %). All other countries individually ranged <5 %. Of those n = 49 samples, 55.10 % originated from other Asian, 36.73 % from other African countries, and 8.16 % from the Americas (i. e., Brazil).

Dairy products from some countries were manufactured 100 % industrial (i. e. Bahrain, Brazil, Japan, Jordan, Tunisia, Uzbekistan, and Viet Nam), 100 % artisanal (Eritrea, Georgia, and Turkmenistan). In other countries,

[5] This has mainly linguistic reasons, since Arabic dialects are spoken rather than written. Arabic writing generally reflects all the consonants, but only long vowels, and a differentiation of dialects would have complicated matters even more. Still, many traditional Arabic products are known by their dialect name which may vary according to the region.

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both types of products occurred, with a preference on industrial (Egypt, Israel, and Russian Federation) or artisanal (Armenia and Lebanon) products. Regarding Turkey, both kinds are products were almost equally distributed, with 54.71 % of artisanal ones.

In addition to the data provided in tab. 1, the sweetened condensed milk included one *doce de leite* sample from Brazil, and the Egyptian raw milk was transported in a soft drink plastic bottle. The acidified dairy products were a Russian organic kefir, a Tunisian drinking yoghourt with peach flavour, and a product called *labnah ṭamrah* from a flight from Israel. Butters and creams from Turkey, Egypt, and Armenia were mostly artisanal, and the colour and smell suggested that many of them were made from sheep milk. Flights from Eritrea yielded a butter preparation called *ṭäsəme*. It refers to a butter cleared with onions, ginger, and many spices, and filtered afterwards. Creams comprised a tin of cream from Bahrain and to three glasses of a cream-containing dairy spread from Egypt.

Most samples were cheeses, cheese preparations and processed cheeses (n = 187; tab. 2). Within this group, cheeses of the pasta filata type were most numerous (31.02 % of cheeses), followed by fresh (20.32 %), processed (14.44 %) and brine cheeses (11.76 %). It shows that the greatest variety of specific cheeses was encountered in pasta filata (19 types), brine (10), fresh and processed cheeses (nine types each). Among the pasta filata, string and braided cheeses (eventually smoked) from the Circumcircassian region were most frequently recorded. The Armenian *ṫel panir* displayed several colours and shapes, apparently due to colorants. Some of these string and braided cheeses were further processed by adding spices or herbs. Other typical cheese preparations included *šanklīš,* Levantine balls of fresh cheese rolled in the Arabic spice mixture za'atar, and *miş.* Among the processed cheeses, the Russian *syr kolbasa Luhskij* ("Luhskij sausage cheese", fig. 1) was relatively conspicuous at registration since this product came sausage-shaped, even wrapped in a plastic sausage skin, and was mistaken for a mortadella before opening.

Tab. 3 details the original names of the cheeses (unless this name is written with non-Latin letters in which case this information is detailed in tab. 4). There was a wide array of different products. This diversity is characterised by the following:

- One cheese type was rarely encountered ≥five times; exceptions were *beyaz peynir* type, cottage cheese type, *Dumiaṭī, Isṭanbūlī, miş* (including variations), plain processed cheese, *Rūmī, ṫel panir, tulum peyniri* (type), and *yumuşak peynir.* A more sophisticated differentiation of more common cheeses, e. g. into young and aged *Rūmī* or young and aged *Kaşar peyniri,* or *"Rūmī light"*, was omitted in order to keep groups as big as possible.
- The array of products varied according to the country of provenance, with Turkey displaying the highest degree of varieties, followed by Egypt and the Russian Federation. While pasta filata cheeses were introduced from many countries, particularly Turkey, no sample from Egypt was recorded. From the latter country however, a high amount of yellow cheeses (in this case *Rūmī*) was introduced, a type of cheese that was almost absent in most other countries.
- The country of origin of the product did not necessarily correspond to the country of provenance. This was

TABLE 3: *Typical cheeses recorded; numbers in brackets refer to the sample size "(clearly identified samples, type samples)"; see text for the meaning of "type" samples. Geographical denominations start with capital letters.*

	Country of provenance			
Cheese type	Turkey*	Egypt	Russian Fed.	Other countries
Fresh	*Berendi tulum* (2), *Ezine* (1), *Istanbolly cheese* (1), *labne* (1), *lor* (2), *tulum* (1, 17)	*ğibnah baiḍā' Isṭanbūlī* (3, 1), *labne* (1)	*syrku* (1, 1)	cottage cheese type (5), *labne* type (1), *ḳyoṭgi* (1)
Brine	*beyaz* (4, 1), *Lighvān panīr* (1)	*Dumiaṭī* (4), *feta cheese* (3), *ğibnah baiḍā' barāmīlī* (1), *qarīš* (1)	*slivočnyj* (1), *panir Lori* (1), *syr Lori syčužnyj* (1)	*Lighvān panīr* (1), *ğibnah ʿAkāwī* type (1), *ğaban nābūlsī* type (2), *Šarsko bieno sireñe* (1)
Soft	*yumuşak* (1, 6), *füme çerkez* (1)	*yumuşak peynir* (1)	*Adygejskij* (2) *yumuşak peynir* (1)	*Adygejskij* type (1)
Pasta filata	*Antep* (2, 4), *burgu* (1), *çeçil* (2), *dil* (1, 1), *hellim* (1), *ip* (1), *Kaşar* (9, 9), *kolot* (1, 1), *Köy* (2), *örgü* (2), *stroka syr* (1), *sünme* (1), *ṫel panir* (1), *tel* (1, 3)	.	*spagetti* (1), *stroka syr* (3, 1), *ṫel panir* (2)	*ğibnah mağdūlah* type (3), *ğibnah mašallālah* (1), *kolot peyniri* (1), *queijo coalho* (1), *sen ichi kama* (1), *ṫel panir* (1), *ṫelak panir* (1)
Yellow	.	*Gouda* type (1), *Rūmī* (11)	*panir Alaškert* (1)	.
Blue	.	*Danablu* (2)	.	.
Hard	*Mihaliç* type (1)	.	.	.
Preparation	*lavaş* type (3), *Van otlu* type (2)	*miš* (4), *miš dumiaṭī* (1), *miš qarīš* (1)	.	*šanklīš* (2)
Processed	*dilimli* (1), *yağlı* (1)	plain** (2), with *Cheddar* (1), *mudaḥina* cheese (1), *Rūmī* (1) taste,	*syr kolbasa Luhskij* (2), plain (4), with ham (1)	plain (12)

*Regarding original Turkish cheeses originating from Turkey, the terms "peynir" resp. "peyniri" (cheese) were omitted; **"Plain" refers to processed cheeses of specific brands without any added flavours or spices

Language	Original	Transcription
Arabic	جبن نابولسي	*ğaban nābūlsī*
	جبنة بيضاء إسطنبولي	*ğibnah baiḍāʾ Isṭanbūlī*
	جبنة بيضاء براميلي	*ğibnah baiḍāʾ barāmīlī*
	جبنة عكاوي	*ğibnah ʿAkāwī*
	جبنة مجدولة	*ğibnah mağdūlah*
	جبنة مشللة	*ğibnah mašallālah*
	دمياطى	*Dumiaṭī*
	رومي	*Rūmī*
	شنكليش	*šanklīš*
	قريش	*qarīš*
	لبنة طمرة	*labnah ṭamrah*
	مش	*miš*
	مش دمياطي	*miš dumiaṭī*
	مش قريش	*miš qarīš*
Armenian	թել պանիր	*ṫel panir*
	թելակ պանիր	*ṫelak panir*
	պանիր Ալաշկերտ	*panir Alaškert*
	պանիր Լորի	*panir Lori*
Farsi	پنیر لیقوان	*panīr Lighvān*
Hebrew	קְיוֹטְגִי	*ḳyoṭgi*
Japanese	千一かま	*sen ichi kama*
Macedonian	Шарско бено сирење	*Šarsko bieno sireńe*
Russian	Адыгейский	*Adygejskij*
	сливочныи	*slivočnyj*
	спагетти	*spagetti*
	строка сыр	*stroka syr*
	сыр колбаса Лухский	*syr kolbasa Luhskij*
	сыр лори сычужный	*syr Lori syčužnyj*
	сырку	*syrku*
Tigrinya	ጥዕሚ	*ṭäsəme*

◀ **TABLE 4:** *Original scripts of the seized dairy products.*

particularly true for Armenian products which were more frequent in flights from the Russian Federation and Turkey. In fact, the Armenian brine cheese *panir Lori* was encountered twice on Russian flights, one with a Russian, one with an Armenian label. The Iranian *Lighvān panīr* was only encountered in non-Iranian flights although both airports service this country. The only sample from Viet Nam was the *Šarsko bieno sireńe* cheese, a Macedonian product.

Potential risks for the human health

With the list of encountered products, a literary review on documented presence of pathogens in the dairy products was conducted. It however excludes data on well-known dairy products (i. e. liquid milks, sweetened condensed milk, drinking yoghourt, butter, processed cheeses (either plain or with added flavours and preparations), and blue, cottage, feta, and Gouda cheeses, since risks for these products have been documented extensively and worldwide (Benkerroun, 2013; Barros de Melo et al., 2014b). If not already reported expressly for them (Khalifa et al., 2013; Muir et al., 1999), it is likely that the same risks may also occur in those products which only difference is the region of origin, e. g. raw milk from Egypt or plain processed cheese from the Russian Federation.

Regarding the less-known products, the tab. 5 to 7 contain typical microbiological hazards as recorded in the literature. Although not all types of products have been analysed for all parameters, the data shows that there are considerable risks for the human health by means of these hazards.

Regarding other pathogens, traditional Maghrebi dairy products are known to yield high amounts of pathogenic

▼ **TABLE 5:** *Microbiological risks of less-known dairy products (literature review): fresh and brine cheeses; numbers refer to bacterial counts [log cfu/g], "." to no data, "+" to positive, and "–" to negative..*

	Salmonella spp.	*L. monocytogenes*	*E. coli*	Enterobacteriaceae	yeasts and moulds	coagulase-positive staphylococci	Total bacterial count	references
fresh cheeses								
Istanbolly cheese	.	.	.	.	3.1 ± 0.1	.	.	Khalifa et al., 2013
labne	-	-	-	+	.	-	7.0 - 7.3	Dib et al., 2012; Semaan et al., 2011
lor peyniri	.	.	<4.6	.	3.9 – 6.7	1.5 – 6.9	5.8 – 10.0	Çiftçioğlu et al., 2008; Kavaz et al., 2012; Sömer and Kılıç, 2012
tulum	+	+	2.00 – 4.8	1.0 – 5.8	2.7 – 9.7	2.0 – 8.0	3.0 – 10.7	Çolak et al., 2007; Hayaloğlu et al., 2008a; Kıvanç, 1989; Morul and İşleyici, 2012
brine cheeses								
beyaz peyniri	-	+	0.6 – 5.2	.	5.9 – 8.0	3.5	7.0 – 10.1	Aygün and Pehlivanlar, 2006; Gülmez and Güven, 2001b; Hassanien et al., 2014; Hayaloğlu et al., 2002; Kara et al., 1999; Kıvanç, 1989
Dumiaṭī	+	+	+; EPEC	ampicillin-resistant strains	2.3 – 6.0	2.7 – 5.5	2.3 – 5.8	Ahmed et al., 1983; Benkerroun, 2013; El-Kholy et al. 2014; Gwida and Al-Ashmawy, 2014; Hammad et al., 2009
ğaban nābūlsī	-	+	.	.	5.6	2.5	4.1 - 8.9	Al-Dabbas et al., 2014; Ayyash and Shah, 2011; Osaili et al., 2012
ğibnah ʿAkāwī	.	+	.	.	.	.	.	Osaili et al. 2012
panir Lori	-	+	+; EHEC	>4.0	+	.	.	Truzyan, 2003
qarīš	+	.	+; EIEC EPEC, STEC	5.6	4.7 ± 0.0	5.59	.	Ahmed et al., 1988; El-Sharoud et al., 2009; Fadel and Ismail, 2009; Gwida and Al-Ashmawy, 2014

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TABLE 6: *Microbiological risks of less-known dairy products (literature review) soft, pasta filata, and yellow cheeses ; numbers refer to bacterial counts [log cfu/g], "." to no data, "+" to positive, and "–" to negative..*

	Salmonella spp.	*L. monocytogenes*	*E. coli*	Enterobacteriaceae	yeasts and moulds	coagulase-positive staphylococci	Total bacterial count	References
soft cheeses								
füme çerkez peynir	.	.	-	.	3.5 – 4.4	.	3.9 – 5.6	Aydınol and Özcan, 2013
pasta filata								
çeçil peyniri	.	+	2.5 – 5.5	<2.3 – 8.0	2.7 – 9.2	2.8 – 9.7	≤9.0	Elmalı and Uylaşer, 2012; Gülmez and Güven, 2001a; 2001b; Hayaloğlu et al., 2008b; Kamber, 2005; Kara et al., 1999; Yıldız et al., 2010
Kaşar peyniri	.	-	+	4.3 ± 0.3	0.3 – 6.0	3.0 ± 0.2	4.3 - 7.0	Çağrı-Mehmetoğlu et al., 2011; Kamber, 2005; Öksüztepe et al., 2009 ; Sert et al., 2007
Köy peyniri						3.0 – 4.5		Kesenkaş et al., 2012
queijo coalho	+	.	+	+	.	.	.	Simões Dantas, 2012
yellow cheeses								
Rūmī	-	.	+; ETEC, STEC	5.5	.	5.5	.	Fadel and Ismail, 2009

enterococci (Benkerroun, 2013), possibly a reason why Tunisian and Moroccan flight passengers typically brought along processed cheeses which have been submitted to a more intensive heat treatment. Coliform organisms are other typical dwellers in dairy products, identified e. g. in *lor peyniri, tulum peyniri, Dumiaṭī, ğaban nābūlsī, Kaşar peyniri, çeçil peyniri, queijo coalho, lavaş peyniri, miš* (Al-Dabbas et al., 2014; Çelik et al., 2001; El-Kholy et al., 2014; Elmalı and Uylaşer, 2012; Gülmez and Güven, 2001a; Hayaloğlu et al., 2008b; Kamber, 2005; Simões Dantas, 2012; Sulieman et al., 2011).

Other serious health risks for humans associated with North African dairy products include enteropathogenic viruses, protozoans (e. g. *Cryptosporidium* spp., also in Russian kefir), and chlamydiae. *Dumiaṭī* can contain *Campylobacter* spp., *Vibrio* spp., and *Clostridium perfringens* (Benkerroun, 2013; Robertson and Chalmers, 2013). *Campylobacter* spp. was found in *beyaz peyniri,* and clostridia also occurred in *miş* (Benkerroun, 2013; Gülmez and Güven, 2001b). Several fungi have been isolated from these cheeses, among them opportunistic species like *Candida albicans, Clavispora lusitaniae,* and *Issatchenkia orienalis* which is the teleomorph of *Candida krusei. Issatchenkia orienalis* was also found in *qarīş* (El-Sharoud et al., 2009; Pfaller, 2008). Mycotoxins (specifically AM1) have been identified from many raw and industrially-processed milk samples, in *ğibnah ᶜAkāwī,* and particularly in *šanklīš* (with values between 0.22 and 2.55 µg/kg; Addas et al., 2012; Benkerroun, 2013; Hassan and Kassaify, 2014). A corresponding study in Lebanon (Hassan and Kassaify, 2014) showed that season of the year, species of origin and type of product (including *ᶜAkāwī* and *šanklīš*) significantly affected AFM1 content. Still, mean values for these products were extremely high.

Industrialized processing is thought to improve the hygienic conditions of products. Inactivation of *L. monocytogenes, S. aureus,* and salmonellae was achieved by keeping pasteurized "white pickled cheese" (presumably *Dumiaṭī*) in a 4 % salt brine for 60 d (i. e., similar for feta cheese), with a brine pH of <4.7 (Abdalla et al., 1993). Still, an Egyptian study (Ibrahim and Sobeih, 2010) showed that bacterial counts of a soft cheese (again presumably *Dumiaṭī*) increased more when packaged in plastic containers than in cardboard laminated packaging, possibly due to a contamination of the plastic containers.

Discussion

Array of products

The results as seen in tab. 1 to 3 showed a wide variety of products, most of them being cheeses. A similar condition was found at other international airports (Barros de Melo, 2014b).

The choice of products reflected the preferences of the travellers resp. the persons that should receive the products

TABLE 7: *Microbiological risks of less-known dairy products (literature review): cheese preparations and condensed milks; numbers refer to bacterial counts [log cfu/g], "." to no data, "+" to positive, and "–" to negative..*

	Salmonella spp.	*L. monocytogenes*	*E. coli*	Enterobacteriaceae	yeasts and moulds	coagulase-positive staphylococci	Total bacterial count	References
cheese peparations								
lavaş peyniri					4.7 ± 0.7	1.1 ± 0.3	6.8 ± 0.6	Çelik et al. 2001
miš	+	.	<4.8	.	3.4 – 4.9	<6.0	4.0 – 6.0	Abdalla and El Zubeir, 2006; Abd-El Salam and Benkerroun, 2006; Sulieman et al., 2011
Van otlu peyniri	+	+	+; EHEC	.	≤8.3	6.1	7.7 – 10.5	Fadel and Ismail, 2009; Hayaloğlu and Fox, 2008; Kıvanç, 1989
condensed milks								
doce de leite	-	.	.	.	<4.0	+	<2.0	Sousa et al., 2002

inside Germany. Thus, traditional produces which are not easily available in Germany were predominantly encountered, leading to many different products in small sample sizes. However, the authors observed that retail shops specialized in ethnic foodstuffs, e. g. Turkish products, do offer typical cheeses, but made in Germany.

In fact, most confiscated dairy products can be considered as traditional. This is particularly true for regional (eventually hand-made) cheeses, butter and butter products (Alichanidis and Polychroniadou, 2008; Benkerroun, 2013; Simões Dantas, 2012). However, the array also contained heat-treated, liquid milk and plain processed cheeses of transnational brands which can be readily obtained within European borders. Passengers from Tunisia frequently introduced a specific processed cheese in great quantities, although the same product is available in Germany. One reason for this could the fact that these products are cheaper in Northern African than they are in Germany. However, processed cheeses are a popular foodstuff (as the authors could witness while visiting Morocco and Jordan) in the Arabic world and its usage is, to a certain degree, "traditional".

The array of countries represented in this survey depends on many factors (flight connection, socio-economical profile of passengers etc.). Besides, dairy products play a changing role in the culture of people, ranging from everyday's staple food to a less relevant foodstuff or a rare delicacy (Abdelgadir et al. 1998).

Almost 40 % of samples were artisanally-crafted cheeses, and there is a strong chance that these cheeses were hand-made by either the family or friends of the passengers or bought at local markets, which is generally associated with a higher risk of contamination due to lack of standardization and possible poor hygiene (Bintsis and Papademas, 2002).

Identification and categorization

While industrial products were relatively easy to identify by their labels, unlabelled products yielded a series of difficulties. As the samples are considered as category 2 material according to regulation (EC) 1069/2009, no sensory analyses were performed, and identification was either done purely optically, in situ or afterwards by means of the pictures taken at registration.

The amount of dairy foodstuffs world-wide is overwhelming, and many countries (e. g. Turkey) recognize >50 different products (Hayaloğlu et al., 2008a). They typically receive the name from the region they are traditionally produced (Kan et al., 2010). Turkey has been enhancing rural development and cheese manufacture, promoting regional cheeses (Yaşar, 2009).

In addition, the country of provenance did not necessarily have to be the one of origin of the product. The authors, apart from consulting the literature, relied on the personal experience of persons involved with the countries of provenance. In some cases, a definite diagnosis was not possible, leading to the "type" products. It is clearly feasible that many types of one product actually are several autonomous products. To give an example, Hayaloğlu et al. (2008a) state that "tulum" cheese usually refers to the variety *Erzincan şavak tulum,* cite a variety of different *tulum* cheeses, e. g. *İzmir salamuralı tulum, divle, karın Kaymağı,* or *tomas peyniri,* but do not mention *Berendi tulum peyniri.* The authors themselves state that the categorization of Turkish cheeses needs research.

Categorization of the foodstuffs varies strongly among nations, especially in the case of cheeses. The present paper is based on the German system, but modified according to the actual needs of the material. Hayaloğlu et al. (2008a; 2008b) resp. Hayaloğlu and Fox (2008) categorized Turkish cheeses into "ripened in goat-skin bags" (i. e. *tulum peyniri*), "brine cheeses" (including *beyaz peynir, hellim peyniri, Mihaliç peyniri, Ezine peyniri, orgu peyniri, çeçil* (also called *civil*) *peyniri,* and *dil peyniri*), and "varieties containing herbs and spices". Their classification is, however, inconsistent, as it includes *Van otlu peyniri* in the two last categories, and many other types registered in the present paper, e. g. *Antep* or *füme çerkez peyniri,* are not mentioned. A wide variety of pasta filata cheeses from the Circumcircassian region was recorded. However, this cheese type is not considered *per se* in many categorization schemes. Durlu-Ezkaya and Gün (2015) present a more detailed classification – including a category called *tel peynirleri* for the string cheeses – with many examples, but they omit data on compositional and microbiological standards. In their review, Alichanidis and Polychroniadou (2008) categorized East-Mediterranean cheeses into brined cheeses (white [among them *beyaz peyniri, Edirne peyniri, Lighvān, ᶜAkāwī, Dumiaṭī,* and *miš*] and miscellaneous [e. g. *hellim* and *nabūlsī* including pasta filata cheese in brine like *örgü*]), pasta filata cheeses (e. g. *Kaşar*), whey cheeses (including *lor peyniri*), and hard and soft cheeses (e. g. *Rūmī* and *Mihaliç*). For other countries beyond this region, no categorizations beyond product lists could be encountered.

Microbiological hazards

The results of the literature review showed that the products encountered in this survey can contain a wide variety of obligate and opportunistic pathogens, of which most are well-known, also from other traditional and industrial dairy products. Depending on the product, literature was eventually scarce and also relying on small sample sizes. Besides and despite being cited there, production methods and hygiene status vary strongly (e. g. Hayaloğlu et al., 2008a; 2008b), so that many data cannot be considered as standard but rather a status quo.

Benkerroun (2013) explains that most traditional North African dairy products are made from raw milk and basically rely on the fermentation by lactic acid bacteria, i. e. low pH values. As those products regularly still contain pathogenic and spoiling microorganisms, other hurdles for microbial growth have been added, i. e. (extreme) salting (e. g. *miş* or *nabūlsī*), drying (e. g. *ǧamīd,* a Bedouin dried and salted cheese), and aromatic plants with potentially antimicrobial properties. Spices and herbs are known to reduce microbiological counts of *qarīş*, especially those of yeasts and moulds (Wahba et al., 2010). Black cumin seed oil has showed a similar effect (in *Staphylococcus (S). aureus, E. coli, L. monocytogenes,* and *Salmonella Enteritidis*) in *in vitro* manufactured *Dumiaṭī* (Hassanien et al., 2013). Still, many raw milk pathogens survive despite these measures, and secondary contaminants also find their ways into the products. Extreme temperatures, "lack of good manufacturing practice (GMP) and personal hygiene, (…) improper storage conditions, (…) poor sanitary conditions during milking and the lack of veterinary care for the Traditional small herders (…) in addition to the low hygienic quality of water" are the main causes for this condition (Benkerroun 2013, p. 66–67). This leads to total bacterial

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counts of 6.0 log cfu/ml and >4.0 log cfu/ml faecal coliforms in raw milk, regardless from which domestic species the milk originated from. *Campylobacter jejuni,* EHEC, *L. monocytogenes, Mycobacterium bovis, M. tuberculosis,* and *S. aureus* are common findings in North African raw milk (Benkerroun, 2013).

As a consequence, a consciousness for food-borne diseases started to emerge (WHO, 2012), and some popular traditional cheeses are manufactured industrially using pasteurized milk. However, these traditional cheeses relied on their indigenous flora to commence ripening, making it necessary to deal with substitutes flora to be added to pasteurized milk. Still, taste differences occur, and therefore there is still a certain preference for traditional products (Abd-El Salam and Benkerroun, 2006). However, outbreaks of food-borne diseases via e. g. white brined cheese have largely been associated with raw or insufficiently pasteurized milk, and the advantages of food safety outweigh the "slower and less intensive development of flavor" (Bintsis and Papademas, 2002, p. 116).

Still, these hazards are not unique to non-EU products. In 2010, Franzen and Usleber analysed German fresh cheeses and fresh cheese preparations and also detected *Enterobacteriaceae* and coliforms (up to 4.5 log cfu/g). A more specific differentiation of the bacteria involved yielded food-borne pathogens like e. g. *Enterobacter cloacae, Klebsiella pneumonia* ssp. *pneumoniae,* and *E. coli.*

Sanitary controls at borders are essential to ensure public health and should be performed thoroughly in every country. The Brazilian study (Barros de Melo et al., 2014a; 2014b) detected serious zoonotic pathogens including *Brucella* spp. and *Mycobacterium* spp. in many dairy products, including heat-treated ones (e. g. milk powder) coming from countries that supposedly have a functioning food safety control framework, e. g. EU countries, USA, and Argentina. The fact that these pathogens were found may be due to a lack of control during manufacture or to a lack of proper handling of the foodstuffs while travelling, particularly the inability to maintain a cold chain. In this way, an industrial treatment of a dairy product does not infer its safety when encountered during a customs control.

Conclusion

Airplane passengers attempt to import a great variety of dairy products into the EU. The kind of product, its popularity and its origin (artisanal or industrial) varied strongly from one country of provenance to the other. Unlabelled products were difficult to identify even when persons coming from the countries of provenance were consulted. The literature review showed clearly that, on one hand, many traditional dairy products coming to EU borders bear the quality of hand-made items, i. e. a lack of standardisation and possible a poor hygienic management. Third countries' consumers and governments become aware of this public health problem and started to use heat-treated milk, but this is an on-going process which has not been concluded yet which means that the risk is still immanent. On the other hand, data from other airport control showed that even products deemed as safe because of its heat treatment and/or is provenance from countries with functioning food safety protocols may contain zoonotic pathogens. Against that background, it is important to seize and destroy illegal dairy products regardless of their origin and type.

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Conflict of interest

The authors certify that they have no affiliation with nor involvement in any organization/entity with any financial or non-financial interest in the subject's matter nor materials included in this manuscript.

References

Abdalla OM, DavidsonPM, Christen GL (1993): Survival of selected pathogenic bacteria in white pickled cheese made with lactic acid bacteria or antimicrobials. J Food Prot 11: 972–976.

Abdalla WM, El Zubeir IEM (2006): Microbiological hazards associated with fermented milk (roub and mish) processing in Sudan. International Journal of Dairy Science 1: 21–26.

Abdelgadir WS, Ahmed TK, Dirar HA (1998): The traditional fermented milk products of the Sudan. Int J Food Microbiol 44: 1–13.

Abd-El Salam M, Benkerroun H (2006): North African brined cheeses. In: Tamime AY (ed.): Brined cheeses. Blackwell Publishing, Oxford, GB, 139-187.

Addas M, Hilali MED, Rischkowsky B, Kefalas P (2012): The quality of Syrian shanklish a traditional dairy product. Tropentag "Resilience of agricultural systems against crises", Göttingen, Germany 2012, http://www.tropentag.de/2012/abstracts/links/Rischkowsky_RqFhshxZ.pdf. Accessed last on June 17th 2015

Ahmed, AAH, Ahmed SH, Moustafa MK (1983): Growth and occurrence of *Staphylococcus aureus* in Egyptian Domiati cheese. J Food Prot 5: 412–415.

Ahmed, AAH, Ahmed SH, Moustafa MK (1988): Occurrence of fecal coliforms and enteropathogenic *Escherichia coli* (EEC [sic]) in Egyptian soft cheese. J Food Prot 6: 442–444.

Al-Dabbas MM, Saleh M, Abu-Ghoush MH, Al-Ismail K, Osaili T (2014): Influence of storage, brine concentration and in-container heat treatment on the stability of white brined Nabulsi cheese. Int J Dairy Technol 67: 427–436.

Alichanidis E, Polychroniadou A (2008): Characteristics of major traditional cheese varieties of East-Mediterranean countries: a review. Dairy Sci Technol 88: 495–510.

Aydınol P, Özcan T (2013): The effect of natural and liquid smokes on the benzo[a] pyrene content and quality parameters of Circassian smoked cheese. Int J Dairy Technol 66: 498–504.

Aygün O, Pehlivanlar S (2006): *Listeria* spp. in the raw milk and dairy products in Antakya, Turkey. Food Control 17: 676–679.

Ayyash MM, Shah NP (2011): The effect of substituting NaCl with KCl on Nabulsi cheese: chemical composition, total viable count, and texture profile. J Dairy Sci 94: 2741–2751.

Barros de Melo C, Pinheiro da Sá ME, Faria Alves F, McManus C, Fernandes Aregão, Benin Belo B, Campani PR, Cavalcanti da Matta Ribeiro A, Isoldi Seabra C, Seixas L (20014a): Profile of international air passengers intercepted with illegal animal products in baggage at Garulhos and Galeão airports in Brazil. SpringerPlus Open journal 3:69. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3925492/pdf/40064_2013_Article_818.pdf. Accessed last on June 17th 2015

Barros de Melo C, Pinheiro da Sá ME, dos Reis Souza A, Macedo de Oliveira A, Coelho Mota PMP, Campani PR (20014b): Bacteria in dairy products in baggage of incoming travelers, Brazil. Emerg Infec Dis 20: 1933–1934.

Benkerroun N (2013): Traditional fermented food in North African countries: technology and food safety challenges with regard to microbiological risks. Compr Rev Food Sci Food Saf 12: 54–89.

Bintsis T, Papademas P (2002): Microbiological quality of white-brined cheeses: a review. Int J Dairy Technol 55: 113-120.

Bundesministeriums der Justiz und für Verbraucherschutz (2013): Käseverordnung in der Fassung der Bekanntmachung vom 14. April 1986 (BGBl. I S. 412), die zuletzt durch Artikel 19 des Gesetzes vom 25. Juli 2013 (BGBl. I S. 2722) geändert worden ist. http://www.gesetze-im-internet.de/bundesrecht/k_sev/gesamt.pdf. Accessed last on June 17th 2015

Çağrı-Mehmetoğlu A, Yaldirak G, Bodur T, Şimşek M, Bozkır H, Eren NM (2011): Incidence of *Listeria monocytogenes* and *Escherichia coli* O157:H7 in two Kasar cheese processing environments. Food Control 22: 762–766.

Çelik Ş, Özdemir C, Özdemir S (2001): Production techniques and some properties of traditional lavas cheese. Online J Biol Sci 1: 603–605.

Çiftçioğlu G, Erkan ME, Vural A, Aksu H (2008): Assessment of some microbiological and chemical properties of lor whey cheese. Journal of Food, Agriculture & Environment 6: 109–113.

Çolak H, Hampikyan H, Bingöl EB, Ulusoy B (2007): Prevalence of *L. monocytogenes* and *Salmonella* spp. in tulum cheese. Food Control 18: 576–579.

Dib H, Semaan H, Mrad R, Ayoub J, Choueiry L, Moussa H, Bitar G (2012): Identification et évaluation de l'effet probiotique des bactéries lactiques isolées dans des fromages caprins traditionnels. Lebanese Science Journal 13: 43–58.

Durlu-Özkaya F, Gün İ (2015): Anadolu'da peynir kültürü. Online publication of the Atatürk Kültür, Dil ve Tarih Yüksek Kurum, http://www.ayk.gov.tr/wp-content/uploads/2015/01/DURLU-%C3%96ZKAYA-F%C3%BCgen-G%C3%9CN-%C4%B0lhan-ANADOLU%E2%80%99DA-PEYN%C4%B0R-K%C3%9CLT%C3%9CR%C3%9C.pdf, 485-505. Accessed last on June 17th 2015

El-Kholy AM, El-Shinawy SH, Meshref AMS, Korany AM (2014): Microbial quality of Domiati cheese and the influence of probiotics on the behavior of *Staphylococcus aureus* and *Escherichia coli* O157:H7 in Domiati cheese. J Food Saf 34: 396–406.

Elmalı G, Uylaşer V (2012): Geleneksel gıdalardan çeçil peynirin üretmi ve özellikleri. Ziraat Fakültesi Dergisi 26: 83–92.

El-Sharoud WM, Belloch C, Peris D, Querol A (2009): Molecular identification of yeasts associated with traditional Egyptian dairy products. Food Microbiology and Safety 74: M341–M346.

El-Sharoud WM, O'Brien S, Negredo C, Iversen C, Fanning S, Healy B (2009): Characterization of *Cronobacter* recovered from dried milk and related products. BMC Microbiol 9: 9 pp.

Fadel HM, Ismail J (2009): Prevalence and significance of *Staphylococcus aureus* and *Enterobacteriaceae* species in selected dairy products and handlers. International Journal of Dairy Science 4: 100-108.

Franzen V, Usleber E (2010): Zur mikrobiologischen Qualität von Frischkäse und Frischkäsezubereitungen des deutschen Marktes. Arch Lebensmittelhyg 61: 197–228.

Gülmez M, Güven A (2001a): Kars ilinde satışa sunulan çeçil (civil) peynirlerin bazı mikrobiyolojik ve kimyasal özellikleri. Kafkas Üniv Vet Fak Derg 7: 63–70.

Gülmez M, Güven A (2001b): Beyaz ve çeçil peynirlerinde *Campylobacter, Salmonella* ve *Listeria* türlerinin araştırılması. Kafkas Üniv Vet Fak Derg 7: 155–161.

Gwida MM, Al-Ashmawy MAM (2014): Culture versus PCR for *Salmonella* species identification in some dairy products and dairy handlers with special concern to its zoonotic importance. Vet Med Int, Article ID 502370, 5 pp.

Hammad AM, Ishida Y, Shimamoto T (2009): Prevalence and molecular characterization of ampicillin-resistant *Enterobacteriaceae* isolated from traditional Egyptian Domiati cheese. J Food Prot 3: 456–684.

Hassan HF, Kassaify Z (2014): The risks associated with aflatoxins M1 occurrence in Lebanese dairy products. Food Control 37: 68–72.

Hassanien MFR, Maghoub SA, El-Zahar KM (2014): Soft cheese supplemented with black cumin oil: impact on food borne [sic] pathogens and quality during storage. Saudi J Biol Sci21: 280–288.

Hayaloğlu AA, Güven M, Fox PF (2002): Microbiological, biochemical and technological properties of Turkish White cheese 'Beyaz Peynir'. Int Dairy J 12: 635–648.

Hayaloğlu AA, Fox PF, Güven M, Çakmakçı S (2008a): Cheeses of Turkey: 1. Varieties ripened in goat-skin bags. Lait 87: 79–95.

Hayaloğlu AA, Özer BH, Fox PF (2008b): Cheeses of Turkey: 2. Varieties ripened under brine. Dairy Sci Technol 88: 225–244.

Hayaloğlu AA, Fox PF (2008): Cheeses of Turkey: 3. Varieties containing herbs and spices. Dairy Sci Technol 88 : 244–256.

Ibrahim EMA, Sobeih AMK (2010): Effect of packaging containers on the bacteriological profile of soft cheese. Glob Vet 4: 349–356.

Jansen W, Grabowski NT, Gerulat B, Klein G (2015a): Food safety hazards and microbiological zoonoses in European meat imports detected in border inspection in the period 2008–2013. Zoonoses Public Health, in print.

Jansen W, Grabowski N, Klein G (2015b): Legal regulations for the introduction of products of animal origin in personal consignments into the European Union and their implementation in Germany. Journal of Food Safety and Food Quality, Arch Lebensmittelhyg 66, 41–45.

Kamber U (2005): Kars'ta satışa sunulan Kaşar ve çeçil (civil) peynirlerinin bazı mikrobiyolojik ve kimyasal kalite nitelikleri. Kafkas Üniv Vet Fak Derg 11: 33–38.

Kan M, Gülçubuk B, Kan A, Küçükçongar M (2010): Coğrafi işaret olarak Karaman Divle tulum peyniri. KMÜ Sosyal ve Ekonomik Araştırmalar Dergisi 12: 15–23.

Kara AA, Algur ÖF, Kaya M (1999): Erzurum Piyasasından temin edilen beyaz ve civil peynirlerden, 1türlerinin izolasyon ve identifikasyonu. Turk J Biol 23: 331–337.

Kavaz A, Arslaner A, Bakırcı (2012): Comparison of quality characteristics of Çökelek and lor cheeses. Afr J Biotechnol 11: 6871–6877.

Kesenkaş H, Dinkçi N, Kınık Ö (2012): Farklı işletmelerde üretilen Köy peynirlerinin özellikleri. Ege Üniversitesi Ziraat Fakültesi Dergesi 49: 167–173.

Khalifa MI, Al-Ashmay MA, Abdel-Khalik A, El-Sherbini M (2013): Mycological evaluation of serving some dairy poducts with special reference to mycotoxins production in Azhar University student hostels. World Journal of Dairy & Food Sciences 8: 165–170.

Kıvanç M (1989): A survey on the microbiological quality of various cheeses in Turkey. Int J Food Microbiol 9: 73–77.

Meyer-Rochow VB (2009): Food taboos: their origin and purposes. J Ethnobiol Ethnomed 5:18, (only online; doi:10.1186/1746-4269-5-18). Accessed last on June 17th 2015.

Morul F, İşleyici (2012): Divle tulum peynirinin kimyasal ve mikrobiyolojik özellikleri. YYU Veteriner Fakültesi Dergisi 23: 71–76.

Muir DD, Tamime AY, Shenana ME, Dawood AH (1999): Processed cheese analogues incorporating fat-substitutes 1: composition, microbiological quality and flavour changes during storage at 5 °C. LWT Food Science and Technology 32: 41–49.

Öksüztepe G, Patır B, Dikici A, İlhak Oİ (2009): Elazığ'da tüketime sunulan vakum paketli taze Kaşar peynirlerinin mikrobiyolojik ve kimyasal kalitesi. Fırat Üniversitesi Sağlık Bilimleri Veteriner Dergisi 23: 89–94.

Osaili TM, Al-Nabulsi AA, Taha MH, Al-Holy MA, Alaboudi AR, Al-Rousan WM, Shaker RR (2012): Occurrence and antimicrobial susceptibility of *Listeria monocytogenes* isolated from brined white cheese in Jordan. J Food Sci 77: M528–M532.

Pfaller MA (2008): *Candida krusei,* a multidrug-resistant opportunistic fungal pathogen: geographic and temporal trends from the ARTEMIS DISK Antifungal Surveillance Program, 2001 to 2005. J Clin Microbiol 46: 515–521.

RKI, Robert-Koch-Institut (ed., 2014): Infektionsepidemiologisches Jahrbuch meldepflichtiger Krankheiten 2013. RKI, Berlin, Germany.

Roberston LJ, Chalmers RM (2013): Foodborne cryptosporidiosis: is there really more in Nordic countries? Trends Parasitol 29: 3–9.

Semaan EH, Dib H, Abi Ramia R, Chedid M (2011): Caractérisation chimique et qualité bactériologique de produits laitiers caprins traditionnels libanais. Lebanese Science Journal 12: 21–29.

Sert D, Ayar A, Akın N (2007): The effects of starter culture and chemical composition, microbiological and sensory characteristics of Turkish Kaşar cheese during ripening. Int J Dairy Technol 60: 245–252.

Simões Dantas D (2012): Qualidade microbiológica do queijo de coalho comercializado no município de Patos, PB. Patos, Brazil, Universidade Federal de Campina Grande, diss.

Sömer VF, Kılıç GB (2012): Microbiological, physicochemical properties and biogenic amine contents of the strained yoghurts from Turkish local markets. Afr J Biotechnol 11: 14336–14343.

Sousa CL, Neves ECA, Carneiro CAA, de Farias JB, Peixoto MRS (2002): Avaliação microbiológica e físico-química de doce de leite e requeijão produzidos com leite de búfala na Ilha de Marajó – PA. Boletim do Centro de Pesquisa e Processamento de Alimentos/Universidade Federal do Paraná, Centro de Pesquisa e Processamento de Alimentos, CEPPA , 20: 194-202.

Sulieman AMEH (2007): Effect of pretreatment of milk quality characteristics of jibna-beida (white cheese). International Journal of Food Engineering 3: DOI 10.2202/1556–3758.1123.

Truzyan N (2003): Baseline assessment of the microbiological contamination of Lori cheese sold in Yerevan markets. Yerevan, Armenia, American University of Armenia, diss.

Wahba NM, Ahmad AS, Ebraheim ZZ (2010): Antimicrobial effects of pepper, parsley, and dill and their role in the microbiological quality enhancement of traditional Egyptian kareish cheese. Foodborne Pathogens and Diseases 7: 411–418.

WHO (ed.; 2012): Promoting a healthy diet for the WHO Eastern Mediterranean Region: user-friendly guide. WHO, Cairo, Egypt.

Yaşar Z (2009): Bögesel kalkınmada yöresel ürunlerin kullanımı: Divle Tulum peyniri örneği. Adana, Turkey, Çukurova Üniversitesi, diss.

Yıldız F, Yetisemiyen A, Senel E, Özkaya D, Öztekin S, Sanlı E (2010): Some properties of Civil cheese: a type of traditional Turkish cheese. Int J Dairy Technol 63: 575–580.

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