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Assessment of dietary intake of lycopene by the Belgian adult population

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INTRODUCTION

The European law on the use of food additives is based on the risk assessment of different compounds. However, once a certain food additive is accepted for use it remains in use while the consumption habits data can change. Therefore, there is a safety mechanism included in the legislation which indicates that the intake of food additives which are available for use should be estimated in order to assess whether the intake does not exceed the established ADI values. Knowledge about the use and intake of food additives can serve as a base for eventual adjustments in the legislation. It is of outmost importance to therefore collect concentrations data of food additives in all relevant food groups.

Everyone is sensitive to the colour of foods. Appetite is stimulated or dampened in almost direct relation to the observer's reaction to colour. The colour we see indicates the flavour we are expected to taste. Authorisation for the use of colours depends on the criteria set out in Regulation 1333/2008. The use should not pose a safety concern; there is a reasonable technological need and its use does not mislead the consumer. Enhancing the organoleptic properties is a reasonable technological need, provided that the nature, substance or quality of the food is not changed in such a way as to mislead the consumer. Other cases include: a) restoring the original appearance of food of which the colour has been affected by processing, storage, packaging and distribution, whereby visual acceptability may have been impaired; b) making food more visually appealing; c) giving colour to food otherwise colourless.

Lycopene ($C_{40}H_{56}$) is a carotenoid that is naturally present in tomatoes, processed tomato products and other fruits. Directive 94/36/EC (European Parliament and Council, 1994) on colours for use in foodstuffs authorises the use of lycopene (E160d) in certain categories of foods listed in the Annex III and V, part 2 of the directive and sets maximum levels of use. Directive 2008/128/EC, replacing directive 94/45/EC is laying down specific purity criteria for food colours and specifies that “E160d lycopene is obtained by solvent extraction of the natural strains of red tomatoes (*Lycopersicon esculentum* L.) with subsequent removal of the solvent with residues of no more than 50 mg/kg” (European Parliament and Council, 1995). Recently, a modification of directive 2008/60/EC allows that lycopene can be obtained from other sources as well. Directive 2011/3/EU states that the entry “E160d” should be replaced by “E160d lycopene” and can comprise (i) lycopene from chemical synthesis, (ii) lycopene from red tomatoes and (iii) lycopene from *Blakeslea trispora* (European Parliament and Council, 2011). The different lycopene sources are also allowed to be used as a novel

food ingredient in a number of food products as specified in the Annex II of the Commission decision 2009/362/EC, 2009/365/EC and 2009/355/EC (European Parliament and Council, 2009b; European Parliament and Council, 2009c; European Parliament and Council, 2009a).

The Acceptable Daily Intake (ADI) for lycopene of 0.5 mg/kg bw/day was established by the EFSA Panel on Food Additives, Flavourings, Processing aids and Materials in contact with foods (AFC) in 2008 and this ADI refers to lycopene from all sources. Therefore, the aim of this study was to investigate whether the intake of lycopene from all sources by the Belgian population is exceeding or not the established ADI value. The contribution to the intake of lycopene from natural sources, from its use as a colour and from its use as a novel food ingredient will be investigated.

OBJECTIVES

The aim of this study was to:

1. Develop a suitable analytical method for lycopene determination in all relevant food groups.
2. To perform a label study for lycopene in foods on the Belgian market. To make a selection of food samples according to the Belgian consumption data of 2004-2005 and based on the knowledge obtained from the use of lycopene as a food colour, as a novel food ingredient and as a natural component of foods. The aim is to make an accurate estimation of the total dietary intake.
3. To analyse about 400 samples from the Belgian markets (supermarkets and catering).
4. To use the obtained analytical results for calculations of the lycopene intake. The intake calculations will lead to tables and figures with percentiles of intake in the Belgian population. An assessment of the food groups which contribute to the highest lycopene intake for various percentiles of the population (median contribution, 75 percentile, 90, 95 and 99 percentile) will be made.

1. LITERATURE RESEARCH

1.1 General data

Numerous epidemiological studies have shown an inverse association between fruit and vegetable consumption and chronic diseases, including different types of cancer and cardiovascular disease (Yahia, 2010). Therefore, interest in the health benefits of fruit and vegetable consumption is increasing, and the interest in understanding the type, concentration and mode of action of the different components in fruits and vegetables that confer health benefits is also increasing.

Carotenoids are natural fat-soluble pigments found in plants, such as orange, red or yellow fruits and vegetables and some dark green vegetables. These compounds are also present in some other photosynthetic organisms, such as algae, and some types of fungus and bacteria; they are synthesized by plants, which are the source of the carotenoids found in animals and microorganisms. A key property of carotenoids is their capacity for quenching singlet oxygen and free radicals; this capacity depends on the number of conjugated double bonds (Roldan-Gutierrez & Dolores Luque de Castro, 2007).

Lycopene is a carotenoid synthesized by plants and microorganisms but not by animals. Lycopene is a an acyclic isomer of β-carotene containing linearly arranged 11 conjugated and 2 unconjugated double bonds and a molecular mass of 536.85 (EFSA, 2005a). The unique chemical properties of lycopene derive from its structure (**Figure 1**) makes it extremely hydrophobic and soluble in tissues, milk and organic solvents (Roldan-Gutierrez & Dolores Luque de Castro, 2007). Lycopene from natural plant sources exists predominantly in an all-*trans* configuration, the most thermodynamically stable form with 11 double carbon bonds (Clinton, 1998). Of these 11 double bonds, 7 can be isomerised from the *trans*-form to the mono- or poly-*cis* forms under the influence of excess heat, light, or certain chemical reactions (**Figure 1**).

Since lycopene lacks the β-ionone ring structure, it cannot form vitamin A. Its biological effects in humans have therefore been attributed to mechanisms other than vitamin A. These include antioxidant effects and immune response modulators (Roldan-Gutierrez & Dolores Luque de Castro, 2007).

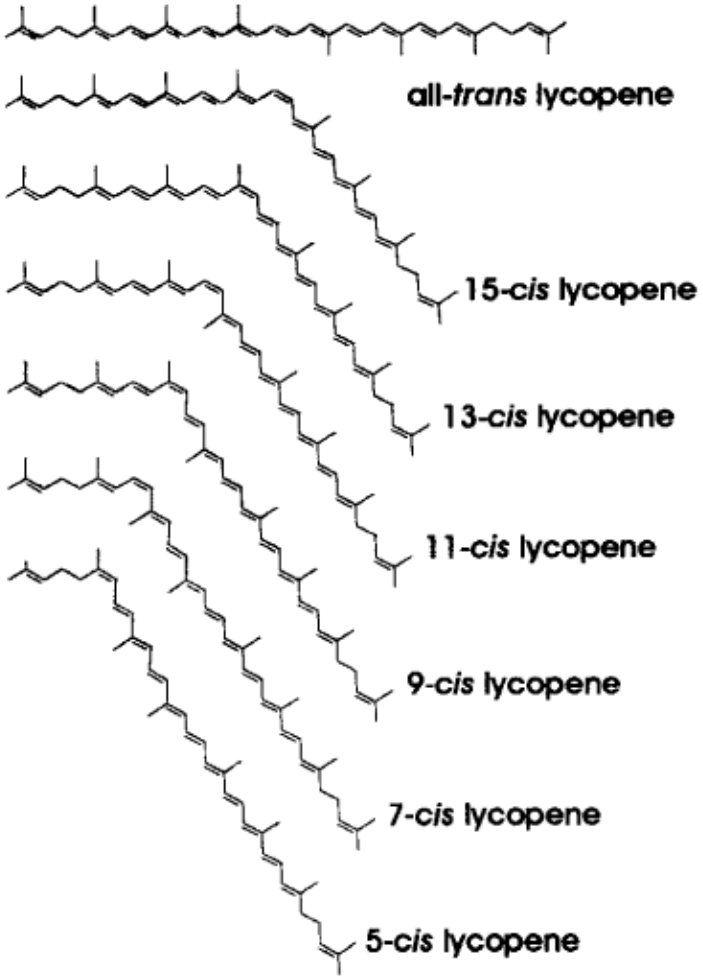

Figure 1 Structure of all trans-lycopene and some of its cis-isomers (Barber & Barber, 2002)

1.2 Lycopene – health claims

As mentioned previously, lycopene cannot be converted to vitamin A due to its lack in the β-ionone ring. Nevertheless, consumption of lycopene has been associated with a number of nutritional and health benefits. Lycopene is one of the most potent antioxidants, with a singlet-oxygen- quenching ability twice as high as that of β-carotene and 10 times higher than that of α-tocopherol (Di Mascio, Kaiser, & Sies, 1989). Dietary intake of tomatoes and tomato products containing lycopene has been shown to be associated with a decreased risk of chronic diseases, such as cancer and cardiovascular disease. Moreover, nutrients with redox modulator properties could also have beneficial effects on the risk of other chronic diseases, such as diabetes, neurodegenerative diseases, ocular disorders, as well as in asthma and viral infections (Garcia-Closas et al., 2004).

However, regulation EC N° 1924/2006 on nutrition and health claims made on food (http://eur-

lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:2006R1924:20080304:EN:PDF) was elaborated to ensure that the consumer is not misleading with false claims. Claims now have to be proven and authorised and are evaluated by scientists of EFSA. Several dossiers with claims on lycopene were submitted. EFSA has until now only given negative opinions on health claims on lycopene (EFSA 2009, 2010, 2011a, 2011b).

1.3 Risk assessment of lycopene and setting of ADI

The Acceptable Daily Intake (ADI) for lycopene of 0.5 mg/kg bw/day was established by the EFSA Panel on Food Additives, Flavourings, Processing aids and Materials in contact with foods (AFC) in 2008 based on a one-year rat study which established a No-Observable-Adverse-Effect level (NOAEL) of 50 mg/kg bw/day and taking an uncertainty factor of 100 (European Food Safety Authority, 2010). This ADI refers to lycopene from all sources. The critical end point was the non-reversible increase in serum alanine transaminase activity.

1.4 Dietary sources and intake

Dietary lycopene is derived from a limited list of foods, in contrast to the other major carotenoids. The principal source of dietary lycopene is undoubtedly tomatoes in most people's diets, although, lycopene content varies greatly in different varieties of tomatoes (Barber & Barber, 2002). Lycopene constitutes over 60 % of the carotenoids present in the tomatoes (**Figure 2**).

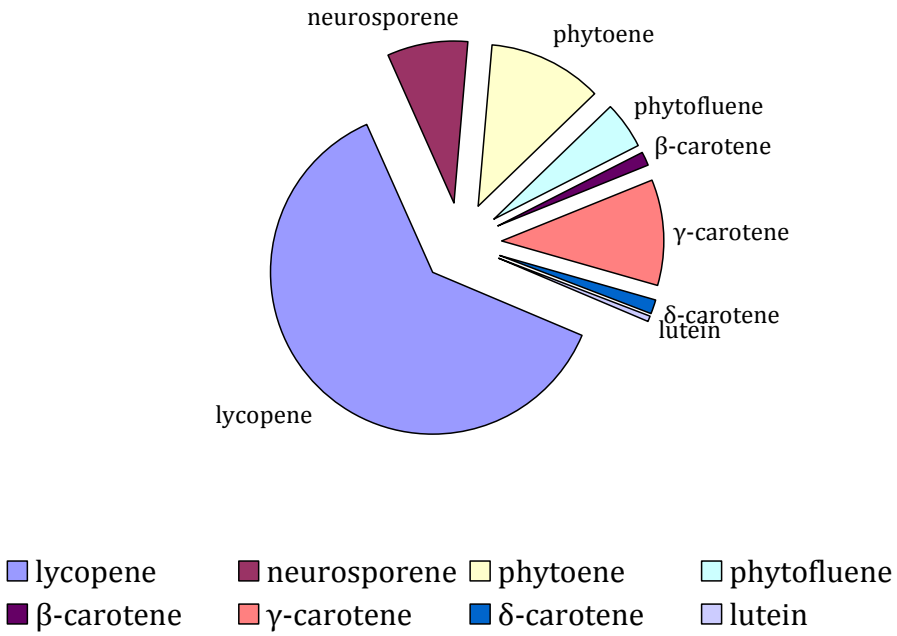

Figure 2 Carotenoid profile of tomato (Roldan-Gutierrez & Dolores Luque de Castro, 2007)

However, besides tomatoes and tomato derived products (tomato juice, sauces, paste etc), watermelon, pink grapefruit, guava and papaya represent important sources of lycopene (**Table 1**).

Table 1 Lycopene content of common foods (Barber & Barber, 2002)

Food	Content (mg/100 g)
Fresh tomatoes	0.88-4.20
Cooked tomatoes	3.70
Tomato sauce	6.20
Tomato paste	5.40-150.00
Condensed tomato soup	7.99
Tomato powder	112.63-126.49
Tomato juice	5.00-11.60
Sun dried tomato	46.50
Canned pizza sauce	12.71
Ketchup	9.90-13.44
Apricot	<0.01
Canned apricot	0.06
Dried apricot	0.86
Pink grapefruit	3.36
Guava	5.40
Guava juice	3.34
Watermelon	2.30-7.20
Papaya	2.00-5.30

According to dietary surveys, regular intakes of lycopene from natural dietary sources in different populations are estimated to be on average between 0.5 and 5 mg/day, with high intakes up to about 8 mg/day. High consumption of fruits and vegetables, especially tomato products, may result in occasional intakes of 20 mg lycopene/day or more (EFSA, 2005b). It was shown that about 50 – 65 % of the total exposure to lycopene (excluding lycopene added as a novel food ingredient) was originating from natural sources. Based on data from France, tomatoes, soups (other than tomato soups) and pasta dishes, and from UK, pasta dishes, tomato sauces and tomato ketchup were the most important natural sources (EFSA, 2010).

However, differences in the lycopene intake between countries were observed. Thus, it was shown that adults in Spain consume less lycopene (1.64 mg/day) compared to adults from France, UK, Republic of Ireland or the Netherlands where the intake was from 4.43 to 5.01 mg/day (O'Neill et al., 2001). Goldbohm et al (1998) reported a mean intake of 1.0 mg lycopene/day for men and 1.3 mg/day for women among subject of 55 - 69 year old by using a semi-quantitative food frequency questionnaire. In a study performed by Rao et al. (1998) the average daily dietary intake of lycopene in Canadian population, assessed by means of a food-frequency questionnaire, was estimated to be 25 mg/d with processed tomato products, accounting for 50 % of the total daily intake.

Table 2 Dietary lycopene intake from natural sources in selected countries (Porrini & Riso, 2005)

Study	Dietary intake (µg/day)	
	Male	Female
Spain (n = 70)	1640 (500 – 2640)	
France (n = 76)	4750 (2140 – 8310)	
Republic of Ireland (n = 76)	4430 (2730 – 71307)	
The Nederlands (n = 75)	4860 (2790 – 7530)	
United Kingdom (n = 42)	1068 (± 865)	
Ireland (n = 54)	7642 (± 6262)	8045 (± 9393)
United States (n = 307)	10497 (± 6177)	10405 (± 7278)
Canada (n = 1543)	6363 (± 11849)	
Australia (n = 115)	3813 (± 9752)	

Although comparative bioavailability values for lycopene from different tomato products are unknown, lycopene from processed tomato products appears to be more bioavailable than that from raw tomatoes. The release of lycopene from the food matrix due to processing has been reported to enhance lycopene bioavailability. The bound chemical form of lycopene can be converted by the temperature changes encountered during processing,

making it more easily absorbed by the body (Chen, Shi, Xue, & Ma, 2009). Moreover, lycopene is fat soluble, so absorption is improved when oil is added to the diet, causing much of the ingested lycopene to pass through the body (Gartner, Stahl, & Sies, 1997). The bioavailability of lycopene is also affected by the dosage and the presence of other carotenoids, such as β-carotene. It was shown that the bioavailability of lycopene was significantly higher when it was ingested along with β-carotene than when ingested alone.

The bioavailability of the synthetic lycopene is equivalent to the bioavailability of the tomato-based lycopene (Hope, Kramer, Ven der Berg, Steenge, & Van Vliet, 2003). However, no information regarding the bioavailability of the lycopene from α-tocopherol containing oil suspensions or cold water dispersible forms of lycopene obtained from *B. trispora* are available yet.

The fat soluble carotenoids, among which lycopene, are absorbed in the intestine and transported in chylomicrons to the blood stream via the lymphatics (Parker, 1996). In plasma, lycopene is transported by lipoproteins and due to its structure it is found in the hydrophobic part of the lipoprotein (Roldan-Gutierrez & Dolores Luque de Castro, 2007).

Porrini & Riso (2005) reported that the total daily intake of tomato products in Italy represents up to 175 g, in Spain up to 65 g and England about 30 g. According to the Syngenta Tomatoes Today portal, the per capita tomato consumption in Belgium constituted 10.44 kg in 2009 (http://www.tomatoestoday.com/en/). However, no data regarding the lycopene intake from natural sources or as food additive are available yet.

1.6 Lycopene stability during processing

The open-chain unsaturated structure of lycopene makes it more easily reactive with oxygen due to its instability with weak linked form, resulting in oxidative degradation, especially for the *cis*-isomer forms, including the mono-*cis* and poly-*cis* forms. Absorption of high energy levels may degrade lycopene, resulting in a reduction of total lycopene content during processing (Chen et al., 2009). Autoxidation of all-*trans* lycopene and the *cis* isomers occurred parallel to *trans*-*cis* isomerization causing a split of the lycopene molecule into smaller fragments, such as volatile aldehydes and ketones developing hay or grassy off-flavours (Anguelova & Warthesen, 2000). Environmental factors such as air, light, and temperature may be very important for the isomerization and autoxidation of lycopene in foods. These degradative reactions affect its bioactivity and health benefit functionality (Chen et al., 2009). Several reports regarding losses of lycopene content during processing are

available (Chen et al., 2009; Colle, Lemmens, Van Buggenhout, Van Loey, & Hendrickx, 2010; Ferreira & Rodriguez-Amaya, 2008; Goula & Adamopoulos, 2005). Comparing water-based and oil-based samples, it seems like the degradation upon temperature is more prominent in the water based samples indicating that oil stabilizes and protects the lycopene against oxidation (Chen et al., 2009). The main autoxidation product of lycopene that can be detected at 470 nm appears to be 5,6-dihydroxy-5,6-dihydrolycopene (Anguelova & Warthesen, 2000).

According to Lin & Chen (2005) during storage under light at 25°C the formation of the 15- and 13-*cis* isomers of lycopene are favoured. Additionally, Qui et al. (2006) have shown that the higher the storage temperature, the faster the losses of *trans*-lycopene and the higher the formation of 13-*cis* lycopene.

1.7 Lycopene – as food additive

The authorisation and use of food additives in the European Union are based on the framework Directive 89/107/EEC1 on food additives. On the basis of the framework Directive, three specific directives were adopted by the Council and European Parliament: on sweeteners (Directive 94/35/EC2), colours (Directive 94/36/EC3) and on additives other than colours and sweeteners (Directive 95/2/EC4). According to European Parliament and Council Directives 94/35/EC (Article 8), 94/36/EC (Article 6) and 95/2/EC (Article 7) on food additives, the Member States shall establish a monitoring system for the consumption of food additives. The objective is to monitor food additive consumption and to ensure that their use does not exceed the ADI values set for additives by the Scientific Committee on Food (SCF).

Directive 94/36/EC on colours for use in foodstuffs authorises the use of Lycopene (E160d) in certain categories of foodstuffs such as listed in Annex V part 2 of the directive (**Table 3**).

Table 3 Colours that might be used alone or in combination in the foods specified in Table 4 according to the Directive 94/36/EC4

E 100	Curcumine
E 102	Tartrazine
E 104	Quinoline Yellow
E 110	Sunset Yellow FCF
E 120	Cochineal, carminic acid, carmines
E 122	Azorubine, carmoisine
E 124	Ponceau 4R, cochineal red A
E 129	Allura Red AC
E 131	Patent blue FCF
E 132	Indigotine, indigo carmine
E 133	Brilliant blue FCF
E 142	Green S
E 151	Brilliant Black BN, black PN
E 155	Brown HT
E 160e	β-apo-8'-carotenal
E 160f	Ethyl ester of β-apo-8'-carotenal
E 160b	Lutein

Directive 95/45/EC laying down specific purity criteria for food colours amended further by the directive 2008/128/EC specifies that the E160d Lycopene is obtained by solvent extraction of the natural strains of red tomatoes (*Lycopersicon esculentum L.*) with subsequent removal of the solvent and specific purity limits set (European Parliament and Council, 1995; European Parliament and Council, 2008). After a careful evaluation of the intake of synthetic lycopene and lycopene from *Blakeslea trispora* as a food colour it was observed that they could add to the overall intake of lycopene although it is generally expected that the intake would remain within the set ADI of 0.5 mg/kg bw/day (EFSA, 2008b). Therefore, in 2011 an amending of the previous directives was made and the directive 2011/3 was adopted in which it is specified that the entry E160d should be replaced by:

a. E160di – synthetic lycopene obtained by Wittig condensation
b. E160dii – lycopene from red tomatoes obtained by solvent extraction
c. E160diii – lycopene from *Blakeslea trispora* obtained purified by crystallisation and filtration

Generally, in the case of the French "ratatouille", an Italian tomato soup or other tomato-based foods is mainly derived from the content of lycopene, the predominant carotenoid pigment present in tomatoes. As long as tomatoes or tomato concentrate - both common foodstuffs as such - are used for the preparation of such a meal, lycopene, although listed as an authorised food colour (E 160d) in the Colour Directive, is not regarded as a food colour additive within the meaning of the Directive.

Table 4 The maximum use levels for the sum of colours specified in Table 3 according to the Directive 94/36/EC

Foodstuffs	Maximum level
Non-alcoholic flavoured drinks	100 mg/L
Candied fruits and vegetables, mostarda di fruta	200 mg/kg
Preserved of red fruits	200 mg/kg
Confectionary	300 mg/kg
Decoration and coatings	500 mg/kg
Fine bakery wares (viennoiseries, biscuits, cakes and wafers)	200 mg/kg
Edible ices	150 mg/kg
Flavoured processed cheese	100 mg/kg
Desserts including flavoured milk products	150 mg/kg
Sauces, seasonings (such as curry powder, tandoori), pickles, relishes, chutney and piccalilli	500 mg/kg
Mustard	300 mg/kg
Fish paste and crustacean paste	100 mg/kg
Pre-cooked crustaceans	250 mg/kg
Salmon substitutes	500 mg/kg
Surimi	500 mg/kg
Fish roe	300 mg/kg
Smoked fish	100 mg/kg
Snacks: dry, savoury potato, cereal or starch based snack products:	
- extruded or expanded savoury snack products	200 mg/kg
- other savoury snack products and savoury coated nuts	100 mg/kg
Edible cheese rind and edible casings	*quantum satis*
Complete formulae for weight control intended to replace total daily food intake or individual meal	50 mg/kg
Complete formulae and nutritional supplements for use under medical supervision	50 mg/kg
Liquid food supplements/dietary integrators	100 mg/L
Solid food supplements/dietary integrators	300 mg/kg
Soups	50 mg/kg
Meat and fish analogues based on vegetable proteins	100 mg/kg
Spirituous beverages (including products less than 15 % alcohol by volume)	200 mg/L
Aromatised wines, aromatised wine-based drinks and aromatized wine product cocktails	200 mg/L
Fruit wines (still or sparkling); cider (except cider bouche) and perry; aromatized fruit wines, cider and perry	200 mg/L

In the statement of EFSA from 2010 (EFSA, 2010) it was proposed to revise the maximum allowed values of lycopene as mentioned in **Table 5**.

Table 5 Revised proposed maximum levels of use of lycopene (EFSA, 2010)

Foodstuffs	Proposed maximum levels of use
Non-alcoholic flavoured drinks	12 mg/L
Candied fruits and vegetables, mostarda di fruta	30 mg/kg
Confectionary	30 mg/kg
Decoration and coatings	30 mg/kg
Fine bakery wares (viennoiseries, biscuits, cakes and wafers)	25 mg/kg
Edible ices	40 mg/kg
Flavoured processed cheese	5 mg/kg
Desserts including flavoured milk products	30 mg/kg
Sauces, seasonings (such as curry powder, tandoori), pickles, relishes, chutney and piccalilli	50 mg/kg
Jam, jellies and marmalades as mentioned in directive 79/693/EC and other similar fruit preparations including low calories products	10 mg/kg
Fish paste and crustacean paste	30 mg/kg
Pre-cooked crustaceans	30 mg/kg
Salmon substitutes	10 mg/kg
Surimi	30 mg/kg
Fish roe	30 mg/kg
Smoked fish	50 mg/kg
Snacks: extruded or expanded savoury snack products	30 mg/kg
Snacks: other savoury snack products and savoury coated nuts	30 mg/kg
Edible cheese rind and edible casings	30 mg/kg
Complete formulae for weight control intended to replace total daily food intake or individual meal	30 mg/kg
Complete formulae and nutritional supplements for use under medical supervision	30 mg/kg
Liquid food supplements/dietary integrators	30 mg/kg
Solid food supplements/dietary integrators	30 mg/kg
Soups	20 mg/kg
Meat and fish analogues based on vegetable proteins	30 mg/kg
Spirituous beverages (excluding products <15 % alcohol by volume) except those mentioned in Annex II or III	30 mg/L
Aromatised wines, aromatised wine-based drinks and aromatized wine product cocktails as mentioned in Regulation (EC) N° 1601/91 except those mentioned in Annex II or III	10 mg/L
Fruit wines (still or sparkling); cider (except cider bouche) and perry; aromatized fruit wines, cider, perry	10 mg/L

1.8 Lycopene – novel food ingredient

Synthetic lycopene, lycopene extracted from *Blakeslea trispora* and the lycopene oleoresins from tomatoes can be also used as novel food ingredient.

Synthetic lycopene is prepared by the Wittig reaction of synthetic intermediates commonly used in the production of other carotenoids used in food, according to recognized principles of Good Manufacturing Practice (McClain & Bausch, 2003). The raw materials in

the synthesis are commonly used in the production of other carotenoids in food products. The specification for crystalline lycopene is 96 % pure lycopene. Synthetic lycopene is a red crystalline powder that is soluble in fat and most organic solvents, but insoluble in water consisting predominantly of all-*trans*-lycopene together with 5-*cis*-lycopene and minor quantities of other isomers (**Table 9**). Synthetic lycopene produced by BASF and DSM can be used as novel food ingredients as authorised by the EC/2009/348 and EC/2009/362. According to the Commission decision EC/2009/348 and EC/2009/362 synthetic lycopene may be placed on the market as a novel food ingredient in the foods specified in **Table 6**. The Commission decided that the designation of the novel food ingredient on the labelling of the foodstuffs should be "lycopene" (European Parliament and Council, 2009b).

Table 6 List of foods to which lycopene may be added as a novel food ingredient (synthetic lycopene) under commission decision EC/2009/348 and EC/2009/362

Food category	Maximum content of lycopene
Fruit/vegetable juice based drinks (including concentrates)	2.5 mg/100 g
Drinks intended to meet the expenditure of intense muscular effort, especially for sportsmen	2.5 mg/100 g
Foods intended for use in energy –restricted diets for weight reduction	8 mg/meal replacement
Breakfast cereals	5 mg/100 g
Soups, other than tomato soups	1 mg/100 g
Bread (including crispy bread)	3 mg/100 g
Dietary foods for special medical purpose	In accordance with the particular nutritional requirements
Food supplements*	15 mg per daily dose as recommended by the manufactures

Blakeslea trispora is a fungus found on a number of tropical plants, and strains of *B. trispora* are able to synthesise large quantities of carotenoids. Lycopene from *B. trispora* produced by "Vitatene" can be used as novel food ingredient according to the commission decision EC/2009/365 (European Parliament and Council, 2009a). Lycopene from *B. trispora* is extracted from the fungal biomass and purified by crystallization and filtration. It consists predominantly of all-*trans*-lycopene and it also contains minor quantities of other carotenoids. Isopropanol and isobutyl acetate are the only solvents used in its manufacture. Commercial lycopene preparations from *B. trispora* intended for use in food are formulated into a 20 % or 5 % high oleic sunflower oil suspension with α-tocopherol at 1 % of the lycopene level to minimize oxidation (**Table 9**) (EFSA, 2005a). The Commission decided that the designation

of the novel food ingredient derived from *Blakeslea trispora* on the labelling of the foodstuffs should be "lycopene" and can be used at maximum levels in the foods specified in **Table 7**.

Table 7 List of foods to which lycopene may be added as a novel food ingredient (lycopene from *Blakeslea trispora*) under commission decision EC/2009/365

Use group	Maximum levels of lycopene
Yellow fat spread	0.2 - 0.5 mg/100 g
Milk based and milk type products	0.3 – 0.6 mg/100 g
Condiments, seasoning, relishes, pickles	0.6 mg/100 g
Mustard	0.5 mg/100 g
Savoury sauces and gravies	0.7 mg/100 g
Soups and soup mixes	0.6 mg/100 g
Sugar, preserves, confectionary	0.5 mg/100 g

Advisory Committee for Novel Foods and Processes (ACNFP) indicated that there is no concern regarding the use of lycopene from *B. trispora* given the similarity of the production process of lycopene with the one of β-carotene (Advisory Committee for Novel Foods and Processes, 2004). The committee also concluded that lycopene from *B. trispora* meets criteria for acceptance of a novel food under regulation EC 258/97 (European Parliament and Council, 1997). Further, an opinion from the Scientific Panel on Dietetic Products, Nutrition and Allergies of EFSA has concluded that α-tocopherol containing oil suspensions of lycopene obtained from *B. trispora* for use as a novel food ingredient in foodstuffs leading to an additional intake of up to 2 mg/day is not of concern from the safety point of view (EFSA, 2005a).

The lycopene oleoresin from tomatoes consists of a lycopene-rich oleoresin obtained as an ethyl acetate extract from the pulp of ripe tomatoes variety *Lycopersicon lycopersicum* that has been selected based on its naturally high lycopene content. The novel food ingredient consists of 5 - 15 % lycopene (**Table 9**) together with a number of other constituents that occur naturally in tomato, including fatty acids and acylglycerols (69 - 74 %), unsaponifiable matter (14 -19 %), water soluble matter (2.7 - 4.7 %), water (0.48 - 0.86 %), phosphorous compounds (0.35 - 0.52 %), phospholipids (8.9 - 14 %), nitrogen (0.16 - 0.31 %) and sulphated ash (upon drying) (0.7- 0.8 %) (EFSA, 2008a). According to the commission decision 2009/355, lycopene oleoresin from tomatoes can be used as novel food ingredient with the mentioning on the label of "lycopene oleoresin from tomatoes'. The oleoresins might be used in a limited number of foods such as specified in **Table 8**:

Table 8 List of foods to which lycopene may be added as a novel food ingredient (lycopene oleoresin from tomatoes) under commission decision EC/2009/355

Food category	Maximum allowed content
Fruit/vegetable juice-based drinks (including concentrates)	2.5 mg/100 g
Drinks intended to meet the expenditure of intense muscular effort especially for sportsmen	2.5 mg/100 g
Foods intended for use in energy-restricted diets for weight reduction	8 mg/meal replacement
Breakfast cereals	5 mg/100 g
Fats and dressing	10 mg/100 g
Soups other than tomato soups	1 mg/100 g
Bread (including crispy breads)	3 mg/100 g
Dietary foods for special medical purposes	In accordance with the particular nutritional requirement

Below a comparison of the chemical composition of synthetic lycopene, lycopene from tomatoes, lycopene from *B trispora* and the lycopene oleoresin is given (**Table 9**).

Table 9 Comparison of the chemical composition of synthetic lycopene, lycopene from tomatoes and lycopene from B. trispora (EFSA, 2005a)

	Lycopene from tomatoes	Synthetic lycopene	Lycopene from *B trispora*	Lycopene oleoresin from tomatoes
Purity	≥ 5 % of total colouring matters	≥ 96 %	≥ 95 %	5 – 15 %
Impurities, other pigments	Other pigments, oils, fats, waxes and natural flavours	Up to 0.3 % of C_{25} aldehyde	Other carotenoids	Pb < 2 mg/kg Cd, Mo, Ni, Hg <1 mg/kg
All-*trans* isomer	94 – 96 %	> 70 %	≥ 90 %	90 – 95 %
5-*cis* isomer	3 -5 %	< 25 %	1 – 5 %	
9-*cis* isomer	0 – 1 %	< 1 %		n/s
13-*cis* isomer	1 %	< 1 %		
Other *cis* isomers	< 1 %	< 3 %		
Formulation	Oleoresins: 2 - 3 % lycopene or powder: 5 % lycopene	10 % lycopene with ascorbyl palmitate (5 %) and α-tocopherol (1.5 %)	5 or 20 % oil suspensions with α-tocopherol (1 % of the lycopene level)	Oleoresins containing 5- 15 % lycopene

n/s – not specified

1.9 Analytical methods used for the lycopene detection in foods

The availability of reliable information on lycopene content o foods is essential both for the evaluation of diet and for epidemiological research relating the intake of lycopene (either as natural source, as novel food ingredient or as food additive).

The spectrophotometric features of the carotenoids are produced by the conjugated double bonds. Lycopene contains three characteristic absorption peaks respectively (λ = 450, 470, 505 nm) (Xu, Yuan, & Dong, 2006). The molar extinction coefficient of 17.2 x10^4/M/cm is that reported by Zechmeister et al. (1943) for lycopene in hexane. Most extinction coefficients that have been reported subsequently were within 1–2 % of this value (Fish, Perkins-Veazie, & Collins, 2002).

Prior to HPLC analysis, the saponification procedure has to be often used as a step to simplify the separation by removing substances, such as chlorophylls and lipids which could interfere with the chromatographic detection. As a general rule, for samples with low fat content, milder conditions in saponification step seem to be needed while for high-fat content samples more severe conditions should be employed (Rodriguez-Bernaldo de Quiros & Costa, 2006).

After the saponification phase, carotenoids are extracted with ethyl ether, diethyl ether, n-hexane. Besides this, boiling ethanol, water saturated ethyl acetate or ethyl acetate alone has been proposed for lycopene extraction from tomato (Calvo, Dado, & Santa-Maria, 2007). It was previously shown that upon extraction with ethanol all-*trans* lycopene concentration increased with the increase in the extraction temperature from 25 to 50 °C. Similarly, for the ethyl acetate all-*trans* lycopene concentration was influenced by the extraction temperature, increasing the concentration with the increase in temperature. Further, Taungbodhitham et al. (1998) evaluated six different solvent combinations: acetone: hexane (4:6, v/v), ethanol: hexane (4:3, v/v), chloroform: methanol (2:1, v/v), dichloromethane: methanol (2:1, v/v), hexane: isopropanol (3:2, v/v) and acetone: petroleum ether (50:50, v/v) to extract lycopene from canned tomato juice, and the best recoveries were obtained with the ethanol: hexane mixture. Rozzi et al. (2002) reported a method to determine lycopene, α- and β-carotene, α-, γ- and δ-tocopherol from tomato skin and seeds using chloroform as extraction solvent.

Numerous methods for determining carotenoids among which lycopene in vegetables samples, as well as in human serum and plasma have been reported in the literature. Spectrophotometric methods are routinely used for total carotenoid content (Davis, Fish, &

Perkins-Veazie, 2003b; Davis, Fish, & Perkins-Veazie, 2003a), high speed counter-current chromatography (Baldermann, Ropeter, Kohler, & Fleischmann, 2008), fibre optic visible reflectance spectroscopy (Choudhary, Bowser, Weckler, & Maness, 2009), infrared spectroscopy (De Nardo, Shiroma-Kian, Halim, Francis, & Rodriguez-Saona, 2009)). However they consume too much time (usually > 20 min) and solvent in order to achieve separation of the lycopene with its *cis*-isomers (Bohm, 2001; Emenhiser, Simunovic, Sandler, & Schwartz, 1996; Huang, Liu, Di, Liu, & Li, 2010; Ishida, Ma, & Chan, 2001; Lee & Chen, 2001). However, HPLC analysis seems to be the most routinely used. Initially C18 reversed phase columns were used for carotenoids separation. Nowadays however HPLC methods are mainly combined with separation on C30 reversed-phase columns. It was previously shown that using C18 columns it was not possible to separate the isomers of different carotenoids. Seldom, the *trans* and *cis* isomers are co eluting together when such columns are used. Lee and Chen (2001) demonstrated that C30 column could provide more powerful resolution for lycopene and its *cis* isomers, however with drastically increased retention times compared to those obtained using C18 columns. The increase in retention time is obviously due to the greater hydrophobicity of the C30 stationary phase.

Lin and Chen (2003) developed a method to determine various carotenoids present in tomato juice, including all-trans-lutein, all-trans-b-carotene, all-*trans* lycopene and their 13 cis-isomers. The separation was achieved by using a C30 column and a gradient of ACN:1-butanol (70:30, v/v) and methylene chloride was used. Ishida et al. (2001) developed a HPLC method for carotenoids in tomatoes. Similarly a C30 column was used together with a mobile phase consisting of methyl-t-butyl ether, methanol and ethyl acetate allowing separation of lycopene and its isomers within 23 minutes. Huang et al. (2010) described al HPLC method similarly using a C30 column and methanolmethyl-tertbutyl ether as mobile phase allowing separation of all trans lycopene within 23 minutes.

2. MATERIALS AND METHODS

2.1 Materials

Lycopene standard (90 % *trans*-lycopene) and the β-carotene were purchased from Sigma Aldrich (Bornem, Belgium). Methanol, isopropyl alcohol, tetrahydrofuran (THF) containing 250 ppm butylated hydroxytoluene (BHT), acetone, hexane and ethanol 96 % were purchased from Biosolve (Valkenswaard, the Netherlands). Triethylamine (TEA) and the sodium chloride were purchased from BDH Prolabo (VWR International, Leuven, Belgium). Ammonium acetate and potassium hydroxide were purchased from Merck (Overijse, Belgium). Food samples were purchased in local stores and finely ground and homogenized before analysis.

2.2 Lycopene extraction without saponification

All steps of the sample preparations were performed in subdued light. Food samples (1 ± 0.05 g) were mixed for one minute with 20 mL of extraction buffer (hexane: acetone: ethanol 2:1:1) using an Ultra-Turrax (15000 rot/min) on ice. The obtained mixture was filtered and transferred into a separatory funnel. An aliquot of 50 mL of saturated NaCl solution was added and mixed well for 1 min. Once the phases were well separated the aqueous phase was decanted and the hexane phase was recovered and filtered over anhydrous $NaSO_4$ (5 g) which was rinsed 2 times with 2.5 mL of extraction buffer. The filtrate was further dried under nitrogen and the obtained residue was redissolved in THF with BHP and 0.05 % TEA to appropriate concentrations before being injected.

2.3 Lycopene extraction with saponification

Food samples containing more than 1 % of lipids were saponified before analysis according to the method described by Lee and Castle (Lee & Castle, 2001) with slight modifications. Briefly, 1 g (± 0.05) of sample was mixed for one minute with 20 mL of extraction buffer (hexane: acetone: ethanol 2:1:1) using an Ultra-Turrax (15000 rot/min) on ice. The obtained mixture was filtered and transferred into a separatory funnel containing 50 mL of saturated NaCl solution and mixed well. The aqueous phase was removed and 10 mL of 10 % methanolic KOH solution was added to the organic phase. The sample was stored in dark for 2 h with subsequent shaking each 20 min. After incubation, the sample was washed 3 times with 20 mL of ammonium acetate solution (50 mM) in order to neutralize the samples.

The obtained organic phase was further dried and redissolved in THF as mentioned previously.

2.4 HPLC – UV analysis of the lycopene

Lycopene was analyzed using reversed phase high-performance liquid chromatography (RP-HPLC) using isocratic elution and UV detection at 472 nm (Waters, Zellik, Belgium). A carotenoid C30 column (250 x 4.6 id, 3 µm) from YMC corporation from Waters (Zellik, Belgium) was used with MeOH/isopropyl alcohol/THF (30:30: 35) containing 250 ppm BHT and 0.05 % TEA as mobile phase. The flow rate was 1 mL/min, column temperature was 35°C and the injection volume 20 µL.

2.5 Preparation of the standard solutions

The lycopene standard (1 mg vials) was quantitatively transferred to a 25 mL volumetric flask with THF containing 250 ppm BHT and 0.05 % TEA. The obtained solution was stored at -80°C and before use the concentration of the lycopene was spectrophotometrically determined after dilution in hexane up to solutions giving an absorbance value of below 0.7 units. The concentration of the stock lycopene solution was calculated using the $A^{1\%}$ of 3450 in hexane at 472 nm (Craft, 2001). Further, calibration curves were prepared by diluting stock lycopene with methanol. All-*trans* lycopene was identified by comparing the retention time with the reference standard and the quantification was done by external standard calibration based on peak area. The β-carotene (1.25 µg/mL) was added to the lycopene standard and used as a control for the analytical process. Total lycopene was quantified by summing the peak area of *trans*-lycopene and the *cis*-isomers and based on the standard curve of all-*trans* lycopene.

2.6 Analytical method validation

Linearity was determined between 0 and 8.27 µg/mL using eight levels of calibration in triplicate. The Mandel's fitting test was used to evaluate the linearity of the straight line regression model (Van Loco, Elskens, Croux, & Beernaert, 2002).

Limit of detection (LOD) and limit of quantification (LOQ) were determined according to the method described by the International Conference on Harmonization (Dias, Camoes, & Oliveira, 2008; INTERNATIONAL CONFERENCE ON HARMONISATION, 2005; Lee & Chen, 2001). For this, standards of 36.5 to 547.5 ng lycopene /mL were prepared and injected three times each. The mean of the slopes (S) and standard deviation of the intercepts (σ) were

calculated from the three calibration curves obtained. The LOD and the LOQ were calculated according to the formulas below: (International Conference on Harmonization, 2005)

$$LOD = (3.3 * \sigma)/S$$

$$LOQ = (10 * \sigma)/S$$

For the assessment of the matrix effect, calibration curves (0 to 4.96 µg lycopene/mL) were prepared in the methanol or in the extract of dried apricots and cheese spread and analysed in triplicates. The matrix effect was evaluated based on the obtained calibration curves in the methanol or the apricot/cheese extract.

The precision, as a measure of the reproducibility of the whole analytical method (including sample preparation and analysis) was assessed by analysing spiked samples a sample with and without saponification on two different days in triplicate and expressed as the relative standard deviation.

The accuracy of the method was determined by recovery test using the addition of known amounts of lycopene to apricot when samples without saponification were analysed and to spreadable cheese (containing 24.5 % lipids) when samples with saponification were analysed.

2.7 Food label survey

The label survey was approached from the point of view that food additive labelling is mandatory, therefore, the food products where lycopene is used as a food colour or as a novel food ingredient was screened based on the information provided on the label. This was done by screening foods in 5 Belgian supermarkets and in 3 different restaurants. Sampling was performed between 9th of May and 3rd of August 2011.

Purchased samples were stored before analysis as recommended on the label (room temperature, fridge or freezer). Before analysis samples were thoroughly homogenized without pooling using a kitchen blender just before analysis to avoid any degradation of the lycopene. The homogenized samples were immediately used for extraction with or without saponification. Because the method was validated before food commodities analysis, the analysis was performed one time.

2.8 Intake assessment

A uniform methodology, designed by members of the SCOOP task force in view of realizing harmonized additive intake assessments, was previously reported and consisted of a 3-phase approach (European Commission 2004). Tier 1, which is based on theoretical food

consumption combined with maximum levels of additives as permitted by Directive 94/36/EC (European Parliament and Council 1994), is a conservative intake estimate carried out at European level and is not a task for Member States. Tier 2 and Tier 3 refer to assessment at the level of individual Member States and are based on a combination of national food consumption data with maximum permitted levels (Tier 2) and with actual use levels (Tier 3), respectively.

Consumption data from the Belgian Food Consumption Survey (dating from 2004) were used to perform the intake assessment. Aims, design and methods of this survey can be found elsewhere (De Vriese et al., 2005). The target population comprised all Belgian inhabitants of 15 years or older. The sample included 3245 participants which were randomly selected from the National Register using a multi-stage stratified procedure. Information on dietary intake was collected by two non-consecutive 24-h recalls in combination with a food frequency questionnaire. During the 24-h recall interviews, the respondent reported the quantity of all foods and beverages consumed during the preceding day. Both 24-h recalls, which were carried out using EPIC-SOFT software (Slimani & Valsta, 2002), were completed by 3083 participants (hence 6166 recalls).

The individual intake of lycopene from a certain food product was calculated by equation 1:

$$Y_i = (c_i * x_i)/bw_i$$

Where **yi** is the intake of the lycopene by individual **i** from a particular food on an interview day (mg/kg bodyweight/day); $\mathbf{c_i}$ is the concentration of the lycopene in the food (mg/kg); $\mathbf{x_i}$ is the consumption of a certain food by an individual **i** (kg); and $\mathbf{bw_i}$ is the self-reported bodyweight of individual **i** (kg). To estimate the total intake of lycopene per food group per day, individual daily intakes of lycopene from different foods were added up. In the Tier 2 approach, $\mathbf{c_i}$ represents the maximum permitted concentration of lycopene in the food, while in the Tier 3 approach $\mathbf{c_i}$ represents the actual mean concentration of lycopene detected in a particular food.

Due to the fact that some foods listed in Directive 94/36/EC (such as spices, salmon imitation, edible cheese crust, foods for medical use, food supplements) were not consumed or very infrequently consumed, these food groups were excluded from the intake assessments.

In the Tier 3 intake assessment arithmetic averages of the levels of lycopene in tomatoes, tomato products and foods containing lycopene derived from fruits and vegetables were calculated by grouping similar foods. This was to allow for variations in concentration by season and geographical location.

The mean intake distribution for lycopene was estimated with the Nusser-method (Nusser et al. 1996) using the C-side software (Iowa State University 1996). Several statistical methods are available to estimate mean intake distributions with the correct mean, variance and skewness. These statistical procedures adjust for within-person or day-to-day variability. The mean intake distribution was weighted and adjusted for the age and sex distribution of the Belgian population and adjusted for day of the week and season.

2.8.1 Tier 2 approach

In the TIER 2 approach the theoretical intake was calculated by combining actual national food consumption data with the maximum permitted use levels for a) the additive lycopene or b) the novel food ingredient lycopene. In addition, a tier 2 calculation was made using the maximum use levels of the new proposed food colour legislation. The approach was theoretical because in practice no lycopene was found to be used as an additive on the labels of the surveyed food products.

2.8.2 Tier 3 approach

In the TIER 3 approach the intake was calculated by combining actual national food consumption data with the actual levels of lycopene found after analysis. As no lycopene was used as an additive in foods commercialized on the Belgian markets, the Tier 3 presents the intake of lycopene naturally present in foods.

3. RESULTS AND DISCUSSION

3.1 Analytical method validation

Like other carotenoids, lycopene occurs in various geometrical isomers. In raw foods the all-*trans* isomers is the most predominant with lower amounts of other *cis*-isomers (Schierle et al., 1997). Food products are subjected to a large variety of processing conditions such as cooking in aqueous media, microwave cooking, extrusion, blanching, boiling, steaming or dry heat (oven roasting, oil roasting, infrared heating). During such processing steps, environmental factors such as air, light, and temperature may be very important for the isomerization and autoxidation of lycopene in foods which can further have an impact on the lycopene bioavailability as well (Chen et al., 2009).

Nowadays, the C30 columns are frequently used for the separation of the carotenoid isomers in food and biological samples. However, the acyclic carotenoid lycopene is much more strongly retained on the C30 stationary phases compared to other bicyclic carotenoids such as α- and β-carotene (Emenhiser et al., 1996). In this study, an isocratic HPLC method was developed which allowed separation of all-*trans* lycopene and several of its *cis*-isomers in less than 15 minutes (**Figure 4**). The β-carotene eluted with a retention time of about 4.2 min and the lycopene of about 11 min. The standard purchased from Sigma contained about 90 % of all-*trans* lycopene. Therefore, upon injection of higher concentrations of lycopene 4 additional picks could be observed in the retention time range between 5.5 to 8 min. These were named CX1 up to CX4 since it was difficult to assign what type of *cis*-isomer they were without proper standards available. Nevertheless, according to literature data these picks seem to represent the 15-*cis*, 13-*cis*, 9-*cis* and the 7-*cis* lycopene respectively (Ishida & Chapman, 2004).

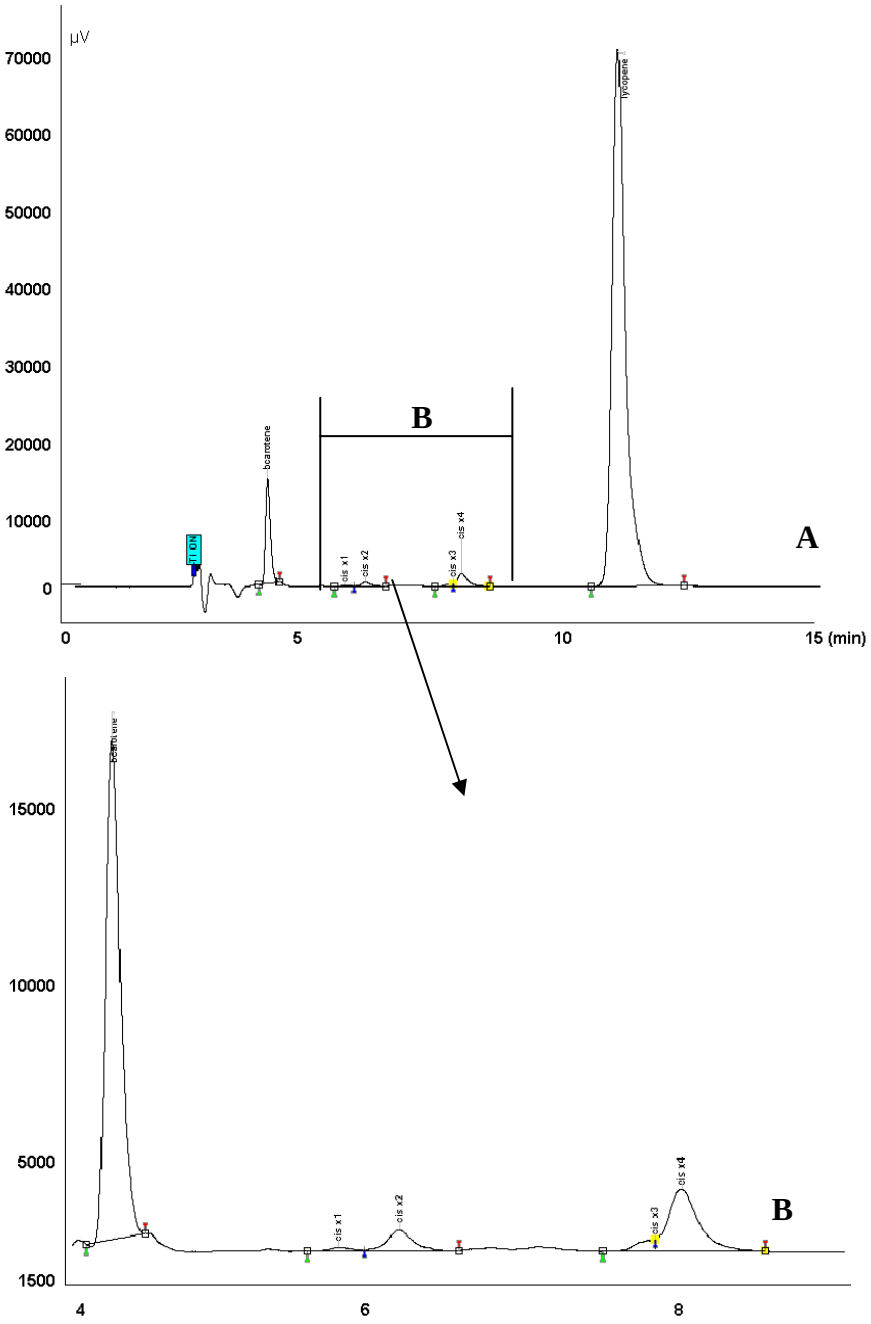

Figure 3 Chromatogram of a standard mixture of lycopene with β-carotene showing the elution profile of all-*trans* and *cis*-isomers.

Prior to analysis, the lycopene was extracted from foods either with or without a saponification step involved. The extraction procedure without saponification could be only employed for samples containing low amounts of lipids (<1 %). However, sauces and ready to eat foods contain higher amounts of lipids. Therefore, these samples had to be saponified prior to the analysis in order to remove the lipids and other interfering substances. However, the impact of the saponification on the lycopene content had to be tested first. As can be seen from **Figure 5** no significant difference could be seen in the amount of lycopene detected by either using the extraction method with or without saponification.

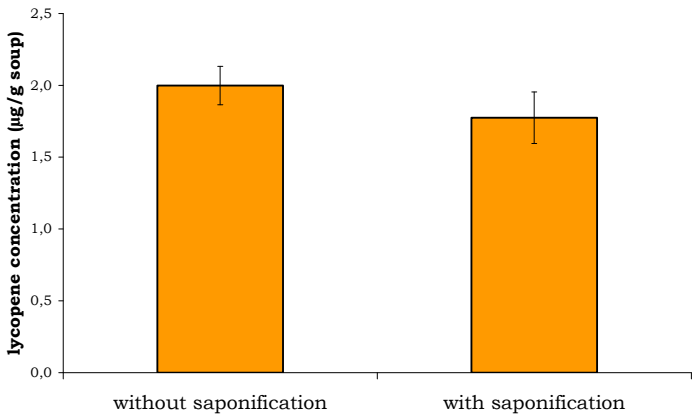

Figure 4 Impact of the saponification on the lycopene content in light tomato soup. Data points represent mean of 6 independent determinations and the error bars represent 95% confidence interval

The newly developed method was further validated by means of determination of the linearity, matrix effect, LOD and LOQ, precision and accuracy. The method linearity was tested by analyzing several standard solutions and by determining the Mandel's test values. The Mandel's test value obtained was 2.50 which was below the critical test value (F_{crit} = 13.75) indicating that a linear model was preferred.

Matrix effect was evaluated to determine whether there is a concentration dependent systematic error due the presence of the matrix. This was performed by comparing the slope of the standard calibration with slopes of the addition curves by means of a statistical *t*-test. The calculated *t* is compared with the tabulated *t* at the 95 % confidence level. The standard calibration was performed in methanol and addition curves performed in apricot extracts. The *t*-test values obtained for apricot and cheese were 0.47 and 1.14. These values were below the tabulated test value (representing 2.01) indicating that no interference on quantification based on the calibration curves is likely to take place.

Further, the LOD and the LOQ values of the method were determined. According to this method a LOD value of 10 ng/mL and a LOQ value of 30 ng/mL were obtained. This would correspond to a LOD of 20 ng lycopene/g of product and LOQ of 60 ng lycopene/g product considering that the extract of 1 g product was mainly redissolved in 2 mL of THF. The LOD value was moreover confirmed by a test in which apricot was spiked with 70 ng lycopene /g product where a recovery of 114.14 ± 5.44 % was obtained.

Repeatability standard deviation and within-laboratory reproducibility standard deviation were calculated according to ISO 5725-2 (ISO 5725-2, 1994) together with the coefficients of variation. This was done by performing spiking on the dried apricot or cheese

spread by performing several replicate analyses. The coefficient of variation for repeatability was of 4.96 and 5.67 % and for the within-laboratory reproducibility of 11.45 and 12.84 % for the samples analysed without and with saponification respectively. Moreover these calculated coefficients did not exceed the predicted values as determined by the Horwitz equation for the coefficient of variation for repeatability and within-laboratory reproducibility (14.7 and 22.0 % respectively) (Horwitz & Albert, 2006). Because no certified reference material was found available for lycopene, the recovery of the lycopene was determined by spiking dried apricot and cheese spread. Dried apricot was spiked at 4 different levels and the recovery varied from 76.28 % to 114.14 % (**Table 10**).

Table 10 Lycopene recovery from spiked dried apricots, data represent mean of 2 independent determinations ± SD

Spiking level (mg/kg)	Recovery (%)
0.07	114.14 ± 5.44
0.15	91.04 ± 2.13
1.32	76.28 ± 2.85
6.62	91.01 ± 5.86

Additionally, the recovery from dried apricot and cheese spread was determined daily by spiking with a fixed volume of stock lycopene solution (50 µL). The recovery represented on average 77 % which was within the limits of acceptance set in the commission decision 2002/657 (European Commission Decision 2002/657/EC, 2002). Considering this, further no correction for the recovery was made in the obtained results.

3.2 Lycopene content in foods

Once the analytical method was validated it was further used for monitoring the lycopene content in food commodities. Fresh fruits and vegetables (tomatoes, papaya, water melon, and fruits salad) were analysed together with processed foods (soups, sauces, pasta, and pizza). The most remarkable observation was the variability in the lycopene content between different samples. In the case of fresh tomatoes, total lycopene content ranged from 33.26 to 103.70 mg/kg (**Figure 5**).

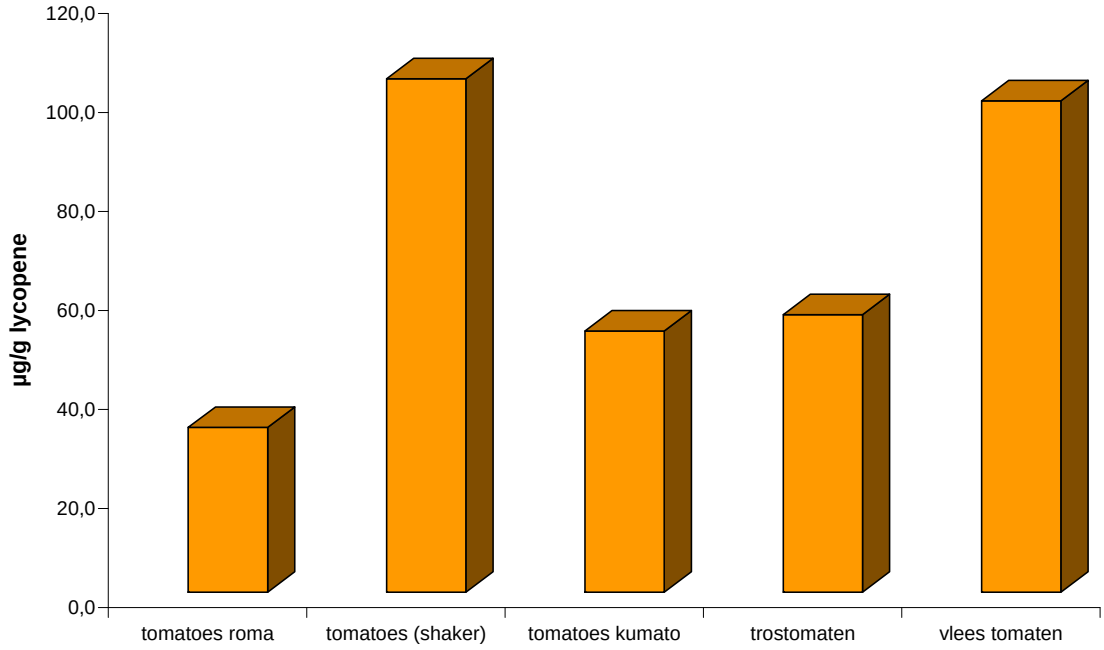

Figure 5 Lycopene content in fresh tomatoes

Similarly, variability wad observed for water melon and papaya. Such variability in the lycopene content is not unusual and has been previously reported as well (Gayosso-Garcia S.L.E., Yahia, & Gonzalez-Aguilar, 2011; Olives Barba, Címara Hurtado, Sanchez Mata, Fernandez Ruiz, & Lopez Saenz De Tejada, 2006; Perkins-Veazie, Collins, Davis, & Roberts, 2006). Moreover, in these fresh fruits and vegetables the ratio of the *trans*-lycopene constituted from about 94 to 99 % (**Table 11 & Figure 7 A**).

Considering that tomatoes are the most important source of lycopene it was evident that the tomato products such as tomato juice, tomato concentrates and double concentrates, canned tomatoes, sun dried tomatoes and ketchup were rich in lycopene as well. Similar as for the fresh tomatoes, the ratio of the *trans*-lycopene constituted about 94 % in these samples. On the contrary, for the severely processed foods such as soups, pizzas, pasta with tomato sauces and cheeses the *trans*-lycopene ratio represented from 76 to 87 %. This was moreover evident from the chromatograms of such samples (**Figure 7 B & C**) where an additional pick eluting after the *trans*-lycopene could be observed which could potentially represent the 5-*cis* lycopene as previously also shown (Ishida & Chapman, 2004). However, besides these products, tomato powder or tomato extract can be sometimes added to snacks and chips as coating or even candies. In these products the lycopene content was rather low (± 1 mg/kg product) mostly represented by the *trans*-lycopene.

Furthermore, it should be noted that the amount of tomato (products) used in recipes, as well as the percentage of dishes containing tomato or tomato products, varied considerably leading to variability in lycopene in various analysed food samples as well.

Table 11 All *trans*- and total lycopene content of common foods

	Analyzed samples (nr)	All *trans*-lycopene (mg/kg product)			Total lycopene (mg/kg product)		
		Average	Min	Max	Average	Min	Max
Raw tomatoes	5	64.97	31.35	98.59	69.01	33.26	103.70
Tomato concentrate	2	310.47	280.80	340.14	328.25	298.07	358.42
Tomato double concentrate	5	484.37	428.72	573.72	512.02	455.74	604.29
Canned tomato paste, whole, chopped	19	114.89	64.59	209.62	121.78	70.40	218.27
Tomato juice	5	68.62	57.59	78.98	72.21	60.56	82.47
Sun dried tomatoes	2	81.02	74.29	87.75	86.51	79.23	93.79
Pasta with various tomato sauces	27	19.68	4.75	37.84	25.44	11.17	45.11
Pizza	7	18.01	3.90	38.06	20.70	4.55	41.30
Ketchup	4	77.12	27.19	141.38	81.37	28.76	148.48
Pesto rosso	4	58.03	33.77	105.15	68.20	41.77	121.23
Pasta sauces	18	54.84	25.06	101.06	67.97	28.92	120.00
Other sauces	14	29.68	5.42	75.79	33.90	6.87	80.80
Soup	16	20.91	0.99	63.39	27.35	1.29	77.90
Chips and popped snacks*	8	0.79	0.24	1.76	0.79	0.24	1.76
Cheeses*	7	5.09	0.77	16.20	6.03	0.96	17.51
Candies*	6	1.13	0.28	2.49	1.21	0.63	2.86
Water melon	2	131.77	96.59	166.95	134.71	98.10	171.32
Papaya	3	16.49	4.73	32.48	17.07	5.30	33.18
Grapefruit	1	27.83	-	-	28.19	-	-
Fruit salads	6	6.77	1.28	19.05	7.02	1.28	19.48

* - only samples with “tomato extract” or “tomato powder” mentioned on the label were analyzed

Figure 6 gives an overview of the total lycopene content in all analyzed samples divided per food groups is given. The vegetables group contains the fresh tomatoes, tomato paste, tomato concentrate and double concentrate, chopped and whole canned tomatoes and dried tomatoes. The fruit group contains besides fresh papaya, melon, water melon and grapefruit also fruit salads and dried mixed fruits.

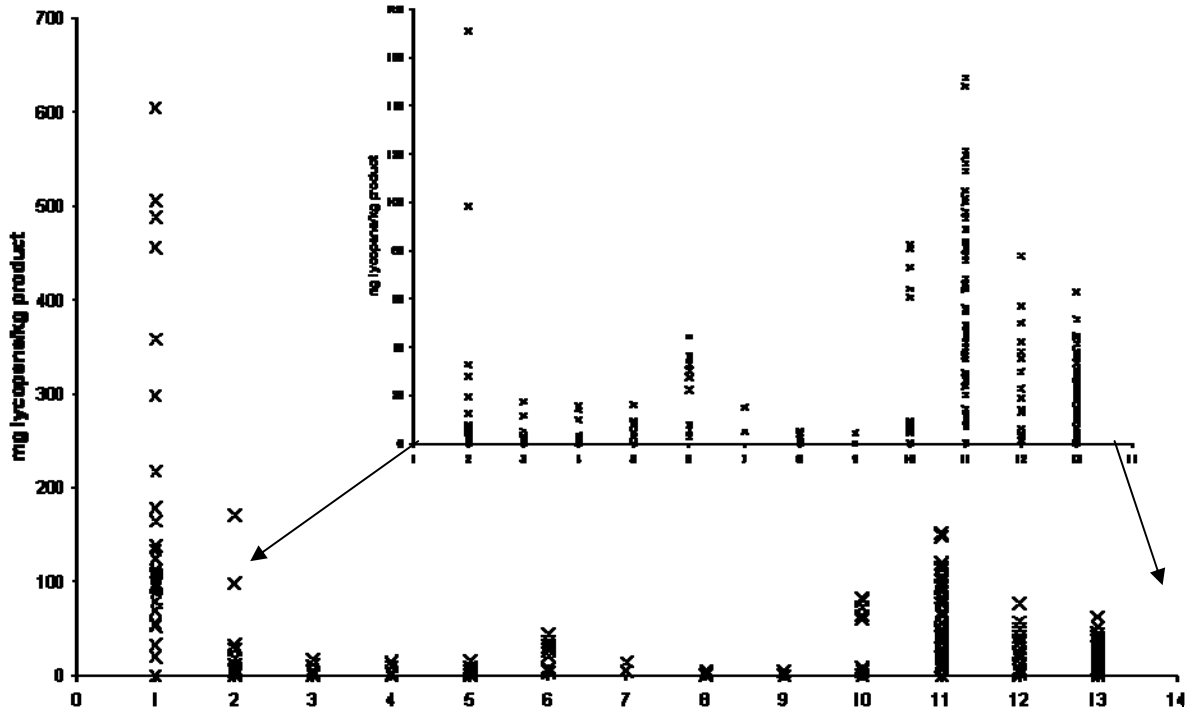

Figure 6 Total lycopene content in common food groups: 1 – vegetables and vegetable derived products, 2 - fruits, 3 – dairy products, 4 – cereals and cereal products, 5 – meat and meat products, 6 – fish and fish products, 7 – fats, 8 – sugar and confectionary, 9 – cakes, 10 – non alcoholic beverages, 11- condiments and sauces, 12 – soups, 13 – ready to eat foods.

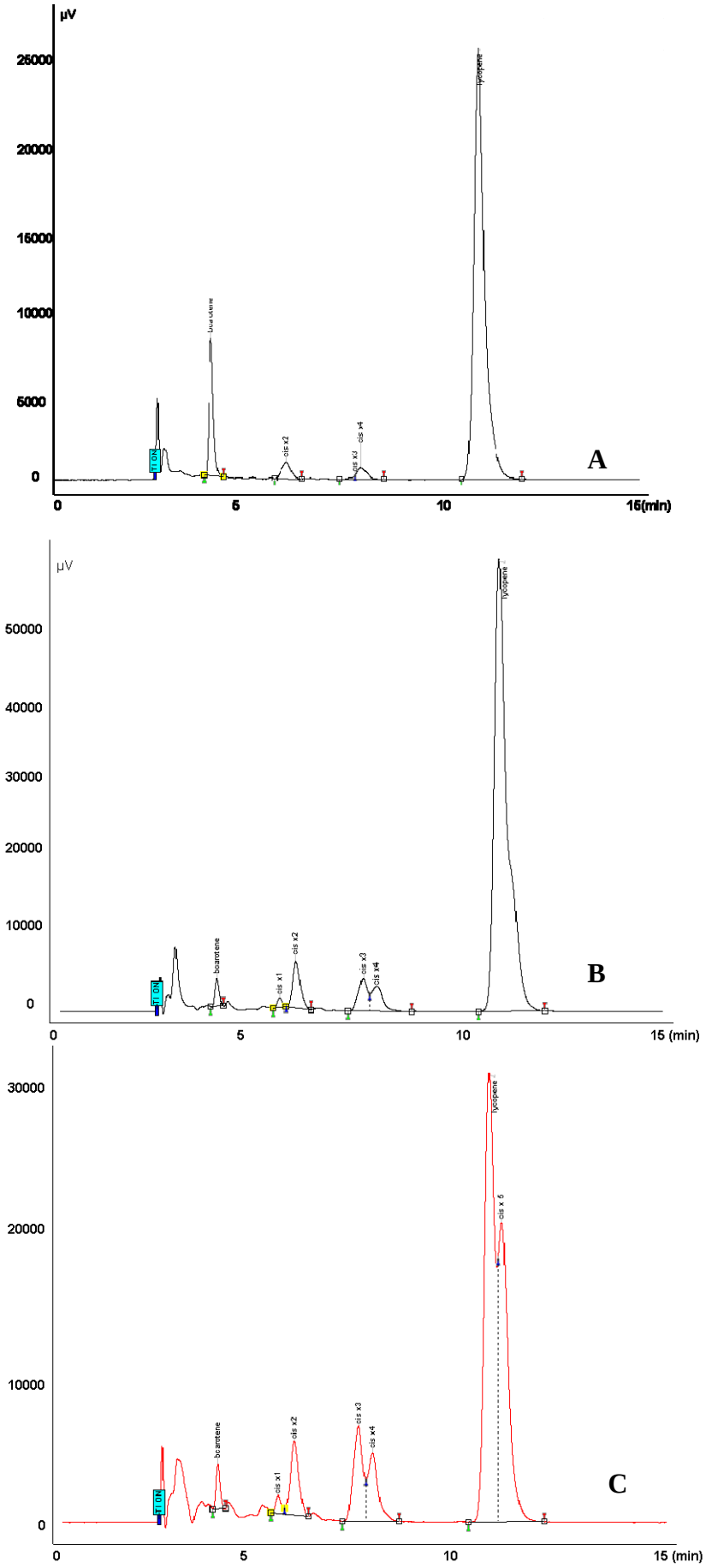

Figure 7 Chromatographic profile of (A) fresh tomato, (B) pasta sauce and (C) pasta sauce with dried tomatoes.

3.2 Label study

The label study performed on the Belgian market (represented by the 5 main supermarkets), indicated that no lycopene either as food colour or novel food ingredient is used in foodstuffs on the Belgian market. Taking into account this observation, more food products which are naturally containing lycopene were purchased and analysed.

3.3 Intake assessment

Methods for estimating food additive intakes vary from the extremely simple to the highly complex and so it is normal to adopt a hierarchical or 'tiered' approach that begins with very simple but conservative methods and gradually refines the method so that estimates become more accurate, such as that recommended by JECFA (WHO/FAO Joint Expert Committee on Food Additives, 2001). A tiered approach was also adopted in the EU Commission's report on Dietary Food Additive Intake in the European Union (Report from the Commission, 2001).

The Belgian food consumption data were analysed in order to evaluate the food patterns and the frequency of the intake of food products together with the type of food consumed by the adult Belgian population. The information regarding the consumption of foods was collected using two non-consecutive 24 recall interviews where 3245 individuals (older than 15 years) were asked to record the foods consumed during the previous meal.

3.3.1 Tier 2 approach

The accurate estimation of lycopene intake is dependent both on the accuracy of food consumption data and also on the food composition databases employed. It is important to monitor the intake of food additives and to establish whether the exposure of the consumers exceeds or not the set ADI levels.

The total mean lycopene intake according to the Tier 2 approach using the maximum allowed levels specified in the current legislation (94/36/EC) represented 0.711 mg/kg bw/day with a total lycopene intake at the 95th percentile of 1.550 mg/kg bw/day. This indicates that the intake of lycopene would exceed the established ADI value of 0.05 mg/kg bw/day already at the 37.5th percentile for which the intake was found to be 0.51 mg/kg bw/day (**Figure 7 & Table 15**). It means that 62.5% of the Belgian adult population would have an intake higher than the ADI. This approach does not include the lycopene naturally present in foods. According to this approach, the main contributing food groups to the lycopene intake were the

non-alcoholic flavoured drinks, fine bakery wares, sauces, desserts and spirits and aromatized wines (**Table 12**).

Table 12 Mean intake of lycopene (mg/kg bw/day) by the Belgian population (all population, all days) (n=6166 interviews; N=3083 respondents) according to the Tier 2 approach applied using the maximum levels specified in the current food colour legislation

Food group	Mean	SD	P95	% contribution to mean total intake	% contribution by the meant to the ADI
Spirits and aromatized wines	0.022	0.056	0.121	3.09	4.40
Fine bakery wares	0.122	0.088	0.295	17.15	24.40
Marmalade, jam, jellies	0.013	0.019	0.052	1.83	2.00
Desserts	0.033	0.047	0.127	4.64	6.60
Candied fruit and packed red fruit	0.001	0.013	0.000	0.14	0.20
Edible ices	0.012	0.019	0.054	1.69	2.40
Processed cheese	0.001	0.001	0.000	0.14	0.20
Mustard	0.001	0.001	0.003	0.14	0.20
Non-alcoholic, flavoured drinks	0.343	0.372	1.060	48.24	68.60
Sauces	0.105	0.071	0.242	14.77	21.00
Snacks	0.005	0.007	0.019	0.70	1.00
Soups	0.017	0.023	0.064	2.39	3.40
Foods for weight reduction	0.000	0.004	0.000	0.00	0.00
Coatings, decorations	0.001	0.006	0.000	0.14	0.20
Processed fish and fishery products	0.019	0.020	0.058	2.67	3.80
Meat replacers	0.001	0.004	0.010	0.14	0.20
Confectionary	0.005	0.015	0.033	0.70	1.00
Total	0.711	0.434	1.550	-	-

When using the maximum levels specified in the novel food legislation, it is clear from the distribution of lycopene intake that the established ADI value is not exceeded. The total mean lycopene intake represents 0.135 mg/kg bw/day with the intake for the 95th percentile representing 0.26 mg/kg bw/day (**Figure 8 & Table 15**). The main groups of foods contributing to the lycopene intake are in this case bread and fats and dressing (**Table 13**).

Table 13 Mean intake of lycopene (mg/kg bw/day) by the Belgian population (all population, all days) (n=6166 interviews; N=3083 respondents) according to the Tier 2 approach applied using the maximum levels specified in the novel food legislation

Food group	Mean	SD	P95	% contribution to mean total intake	% contribution by the meant to the ADI
Bread	0.053	0.024	0.097	39.26	10.60
Breakfast cereals	0.003	0.008	0.021	2.22	0.60
Fruit- and vegetable based juices	0.024	0.031	0.086	17.78	4.80
Soups, excluding tomato soups	0.003	0.004	0.012	2.22	0.60
Sport drinks	0.002	0.008	0.015	1.48	0.40
Fats and dressings	0.048	0.031	0.108	35.56	9.60
Foods for weight reduction	0.000	0.000	0.000	0.00	0.00
Total	0.135	0.066	0.261	-	-

When using the maximum levels suggested to be used in the future colour legislation, unlike observed for the current colour legislation, the intake would not exceed the established ADI. The mean intake of lycopene represents 0.1 mg/kg bw/day with the intake at the 95th percentile of 0.22 mg/kg bw/day (**Figure 8 & Table 15**). The main groups of foods contributing to the lycopene intake, when considering the revised maximum levels, were the non-alcoholic drinks, sauces, fine bakery ware and the soups (**Table 14**).

Table 14 Mean intake of lycopene (mg/kg bw/day) by the Belgian population (all population, all days) (n=6166 interviews; N=3083 respondents) according to the Tier 2 approach applied using the revised maximum levels of lycopene

Food group	Mean	SD	P95	% contribution to mean total intake	% contribution by the meant to the ADI
Spirits and aromatized wines	0.002	0.006	0.009	2.0	0.4
Fine bakery wares	0.015	0.011	0.037	15.0	3.0
Marmalade, jam, jellies	0.001	0.002	0.005	1.0	0.2
Desserts	0.006	0.008	0.023	6.0	1.2
Edible ice	0.003	0.005	0.143	3.0	0.6
Processed cheese	0.000	0.000	0.000	0.0	0.00
Foods for weight reduction	0.000	0.002	0.000	0.0	0.00
Flavoured fermented milk products	0.005	0.014	0.029	5.0	1.0
Non alcoholic drinks	0.041	0.044	0.127	41.0	8.2
Sauces	0.010	0.007	0.024	10.0	2.0
Snacks	0.001	0.002	0.005	1.0	0.2
Soups	0.007	0.009	0.026	7.0	1.4
Coatings, decoration	0.000	0.000	0.000	0.0	0.0
Processed fish and fishery products	0.002	0.002	0.007	2.0	0.4
Meat replacers	0.000	0.001	0.003	0.0	0.0
Candied fruit	0.000	0.000	0.000	0.0	0.0
Confectionary	0.001	0.002	0.003	1.0	0.2
Total	0.100	0.060	0.215	-	-

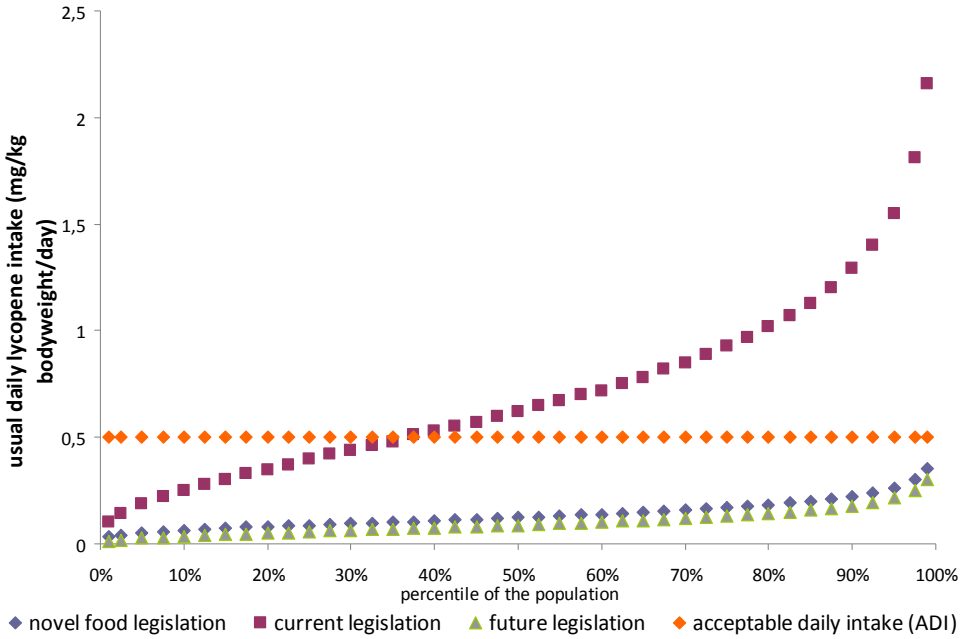

Figure 8 Estimated daily lycopene intake (mg/kg body weight/day) by the Belgian adult population (n=3083; all days all population) using the Tier 2 approach

Table 15 Estimated lycopene intake (mg/kg bodyweight/day) by the adult Belgian population, as assessed by Tier 2

Colour legislation	Average intake (mg/kg bw/day)	SD(mg/kg bw/day)	Percentile	Intake entire population	% ADI
Current (94/36/EC)	0.711	0.434	P50	0.62	124
			P95	1.55	310
			P97.5	1.81	362
			P99	2.16	432
Novel food	0.135	0.066	P50	0.12	24.6
			P95	0.26	52.2
			P97.5	0.30	59.0
			P99	0.35	70.6
Future	0.100	0.060	P50	0.09	17.6
			P95	0.22	43.0
			P97.5	0.25	50.4
			P99	0.30	60.4

3.3.2 Tier 3 approach and intake of lycopene as a natural component of food

In order to perform the Tier 3 intake assessment, the foods were classified into the following groups: vegetables and vegetable products (mainly tomatoes), fruits (mainly

watermelon), dairy products (cheeses with herbs, yoghurts), cereals and cereal products (chips, salted biscuits, breakfast cereals, pasta unprepared), meat (meat salads, tête pressée and merguez), fish (fish salads and fish products in tomato sauce), butter with herbs, confectionary including jam, biscuits containing fruits, non-alcoholic drinks (fruit juices, tomato juices,..), soups and a group of sauces and ready-to-eat meals containing tomatoes (ketch-up, pesto rosso, pasta sauces, other sauces, tapenades, pasta, pizza, lasagne,…)

The Tier 3 approach combined the mean actual concentrations of lycopene in foods with food consumption data which is more accurate. The Tier 3 approach presented here only includes lycopene intake from natural sources because of no reported use of lycopene as additive. As can be seen from **Table 16 & Figure 9** the Tier 3 approach resulted in lower intake of lycopene evidencing again the conservative character of the Tier 2 approach. The whole population had a lycopene intake below the established ADI representing 0.05 mg/kg bw/day on average with an intake at the 95th percentile of 0.123 mg/kg bw/day (**Table 17**).

Table 16 Mean intake of lycopene (µg/kg bw/day) as natural component by the Belgian population (all population) (n=6166 interviews; N=3083 respondents) according to the Tier 3 approach

Food group	Mean	SD	P95	% contribution to mean total intake	% contribution by the meant to the ADI
Vegetables	0.0230	0.0574	0.1446	42.99	4.60
Sauces and ready-to-eat foods	0.0220	0.0613	0.1584	41.12	4.40
Non alcoholic drinks	0.0027	0.0252	0.0127	5.04	0.54
Fruits	0.0025	0.0287	0.0011	4.67	0.50
Cereals	0.0009	0.0027	0.0066	1.68	0.18
Soups	0.0008	0.0117	0.0000	1.50	0.16
Confectionary	0.0006	0.0013	0.0030	1.12	0.12
Fish	0.0004	0.0028	0.0000	0.75	0.08
Biscuits	0.0003	0.0011	0.0022	0.56	0.06
Meat	0.0003	0.0022	0.0000	0.53	0.06
Dairy	0.0002	0.0006	0.0009	0.37	0.04
Butter	0.0000	0.0003	0.0000	0.00	0.00
Total	0.0535	0.0914	0.2358	-	-

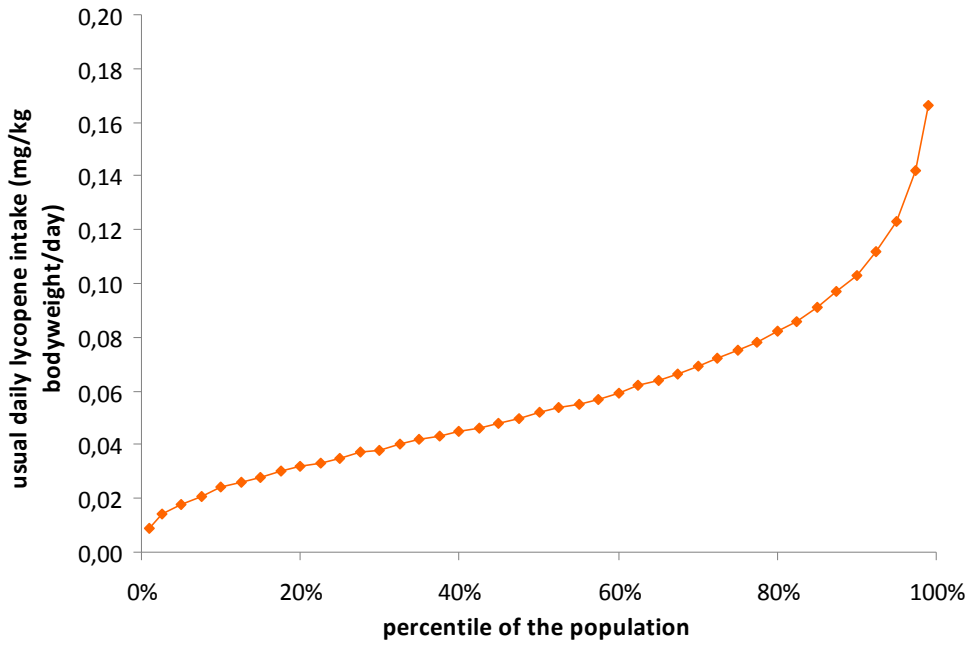

Figure 9 Estimated daily intake of lycopene as natural component (mg/kg body weight/day) by the Belgian adult population (n=3083; all days all population) using the Tier 3 approach

Table 17 Estimated lycopene intake as natural component (mg/kg bodyweight/day) from natural sources by the adult Belgian population, as assessed by Tier 3

Percentile	Intake entire population	% ADI
P50	0.052	10.4
P95	0.123	24.6
P97.5	0.142	28.6
P99	0.166	33.2

There are scarce data about lycopene intake as colour in other countries. The only available data on lycopene intake as a colour in non-alcoholic beverages are reported by Tennant et al. (2008). The main remark about lycopene was however that no reported usage of lycopene was observed in England.

In the combined approach, the lycopene intake was calculated taking into account the maximum allowed concentrations from the novel food legislation, the maximum allowed concentrations from the future colouring agent legislation and the presence of lycopene as a natural component in foods. This approach is used to derive a potential total lycopene intake. The mean total lycopene intake using this approach was 0.256 mg/kg body weight per day, while the total lycopene intake at the 95th percentile was 0.594 mg/kg body weight per day (**Table 18**).

Table 18 Combined tired approach for the potential total intake of lycopene (mg/kg bodyweight per day)

Percentile	Total lycopene intke
Mean	0.256
Std. Deviation	0.176
P95	0.594
P97.5	0.704
P99	0.843

These data represent the mean intake over both interview days; the usual long-term intake could not be calculated because the combined distribution could not be transformed to a normal distribution. It can not be excluded that for some people the ADI could be exceeded when eating food in compliance with the legislation.

Conclusions

In this report the intake of lycopene by the Belgian population was studied. The intake of lycopene from the natural sources but also as a food colour and ingredient in novel foods was investigated. A standardised methodology was used for the intake assessment which is based on the combination of the national consumption data and the authorized maximum levels of lycopene or the real lycopene concentrations depending on the approach used (Tier 2 and Tier 3).

The data from the conservative Tier 2 approach indicated that the average mean intake for the Belgian population would by a 3 fold exceed the ADI value if the maximum levels indicated in the current legislation would be used. On the contrary, considering the maximum levels mentioned in the novel food legislation and the revised values for the future legislation the ADI value would not be exceeded (expressed as % of ADI) for the 95th percentile; novel food legislation – 52 % and future legislation – 43 %).

Further, the analytically determined lycopene concentrations obtained after sampling of a representative number of foods were implemented in the consumption data to estimate the intake of lycopene via a more realistic TIER 3 approach. However, considering that lycopene was not found to be used as food colour, only natural lycopene intake was investigated via this approach. The data obtained indicated that the mean lycopene intake would not exceed the ADI value and that the intake for the 95^{th} percentile represents 25 % of the established ADI. It was therefore concluded that adult Belgian consumers are not at risk of excessive lycopene intake.

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SUMMARY

Based on EC regulation 1333/2008, each member of the European Union is supposed to evaluate the intake of food additives by its population. This project resulted in a demand of the Federal Department of Public Health, Safety of the Food Chain and Environment to the Scientific Institute of Public Health to investigate lycopene in foods and to estimate the total intake of lycopene (as colour, as ingredient in novel foods and from natural sources) by the Belgian population. Directive 94/36/EC on colours for use in foodstuffs authorises the use of lycopene (E160d) in certain categories of foods and sets maximum levels of use. Directive 2011/3/EU, amending directive 94/45/EC is laying down specific purity criteria for food colours and specifies that entry "E160d lycopene" can comprise (i) lycopene from chemical synthesis, (ii) lycopene from red tomatoes and (iii) lycopene from *Blakeslea trispora* (European Parliament and Council, 2011). However, lycopene can be also used as a novel food ingredient. The ADI for lycopene of 0.5 mg/kg bw/day was established by the EFSA Panel on Food Additives, Flavourings, Processing aids and Materials in contact with foods (AFC) in 2008 and this ADI refers to lycopene from all sources. The purpose of this study was to establish whether the Belgian adult population was at risk of exposure to lycopene levels that exceeded the established ADI values.

Initially a conservative approach (Tier 2) was applied in which national consumption data (available from the food consumption survey) were combined with maximum authorized levels of lycopene in the current legislation, the novel food legislation and using the revised maximum lycopene levels suggested to be used in the future legislation. The data from the Tier 2 approach indicated that the average mean intake for the Belgian population would by 3 fold exceeded the established ADI value if the maximum levels indicated in the current legislation would be used. On the contrary, considering the maximum levels mentioned in the novel food legislation and the revised values for the future legislation the ADI value would not be exceeded (expressed as % of ADI) for the 95th percentile; novel food legislation – 52 % and future legislation – 43 %). Further, the analytically determined lycopene concentrations obtained after sampling of a representative number of foods were implemented in the consumption data to estimate the intake of lycopene via a more realistic TIER 3 approach. However, considering that lycopene was not found to be used as food colour, only natural lycopene intake was investigated via this approach. The data obtained indicated that the mean lycopene intake would not exceed the ADI value and that the intake for the 95th percentile

represents 25 % of the established ADI. It was therefore concluded that currently adult Belgian consumers are not at risk of excessive lycopene intake.

RÉSUMÉ

En application du règlement CE 1333/2008, chaque membre de l'Union européenne doit suivre la consommation des additifs alimentaires de sa population. Ce projet répond à une demande nationale du Service de Santé publique, Sécurité de la Chaine alimentaire et Environnement à l'Institut Scientifique de la Santé publique pour réaliser une étude d'estimation du lycopène et l'apport total du lycopène (comme le colorant, comme ingrédient dans les aliments nouveaux et à partir de sources naturelles) par la population belge. La directive 94/36/CE sur les colorants à utiliser dans les aliments autorise l'utilisation de lycopène (E160d) dans certaines catégories d'aliments et fixe des teneurs maximales d'utilisation. La Directive 2011/3/EU, modifiant la directive 94/45/CE et fixant des critères de pureté spécifiques pour les colorants alimentaires précise que l'entrée «E160d lycopène» peut comprendre: (i) le lycopène de synthèse chimique, (ii) le lycopène des tomates rouges et (iii) le lycopène issu de Blakeslea trispora. Toutefois, le lycopène peut également être utilisé comme ingrédient de nouveaux aliments. La DJA de 0,5 mg / kg pc / jour pour le lycopène a été établie en 2008 par le groupe de l'EFSA sur les additifs alimentaires, les arômes, les auxiliaires technologiques et les matériaux en contact avec les aliments (AFC) et cette DJA se réfère au lycopène provenant de toutes sources. Le but de cette étude était d'établir si la population adulte belge était à risque d'exposition à des niveaux de lycopène qui dépassaient les valeurs de la DJA établie.

Initialement, une approche conservative (Tier 2) a été appliquée dans laquelle les données de la consommation nationale (disponibles à partir l'enquête de consommation alimentaire) ont été combinées avec les niveaux maxima de lycopène autorisés dans la législation actuelle, dans la législation concernant les nouveaux aliments et en utilisant les niveaux maxima révisés de lycopène suggérés pour être utilisés dans la future législation. Les données de Tier 2 ont indiqué que l'apport moyen de lycopène par la population belge serait 3 fois dépassé si les niveaux maxima indiqués dans la législation actuelle étaient utilisés. Au contraire, compte tenu des niveaux maxima mentionnés dans la législation des aliments nouveaux et les valeurs révisées pour la future législation, la DJA ne serait pas dépassée (exprimée en % de la DJA) pour le 95e percentile (législation aliments nouveaux – 52 % et future législation – 43 %). En outre, les concentrations en lycopène déterminées analytiquement obtenues après prélèvement d'un nombre représentatif d'aliments ont été utilisées ensemble avec les données de consommation pour estimer l'ingestion de lycopène

par une approche plus réaliste Tier 3. Toutefois, considérant que le lycopène n'a pas été trouvé être utilisé comme colorant alimentaire, seule la consommation de lycopène naturel a été étudiée dans le cadre de cette approche. Les données obtenues indiquent que l'apport moyen en lycopène ne dépasse pas la valeur de la DJA et que l'apport pour le 95e percentile représente 25 % de la DJA établie. On peut donc conclure que les adultes belges ne sont pas à risque de la consommation excessive de lycopène.

SAMENVATTING

In het kader van de EG-verordening 1333/2008 dient elke lidstaat van de Europese Unie de inname van levensmiddelenadditieven door zijn populatie op te volgen. Dit project werd uitgevoerd door het Wetenschappelijk Instituut Volksgezondheid op vraag van de FOD Volksgezondheid, Veiligheid van de Voedselketen en Leefmilieu. De doelstellingen van het project waren: onderzoek naar het gehalte van lycopeen in voedingsmiddelen en berekening van de totale inname van lycopeen (als kleurstof, als ingrediënt in nieuwe voedingsmiddelen en uit natuurlijke bronnen) door de Belgische bevolking. In de richtlijn 94/36/EG betreffende kleurstoffen voor gebruik in levensmiddelen is het gebruik van lycopeen (E160d) in bepaalde categorieën levensmiddelen aangegeven en maximale waarden worden vastgesteld. Richtlijn 2011/3/EU, tot wijziging van Richtlijn 94/45/EG betreffende specifieke zuiverheidseisen voor kleurstoffen, bepaalt dat entry "E160d lycopeen" kan bestaan uit (i) lycopeen uit chemische synthese, (ii) lycopeen uit tomaten (iii) lycopeen uit Blakeslea trispora (Europees Parlement en de Raad, 2011). Maar lycopeen kan ook worden gebruikt als nieuwe voedingsmiddelen ingrediënt. De ADI voor lycopeen van 0,5 mg / kg lichaamsgewicht / dag werd vastgelegd door het EFSA-panel voor levensmiddelenadditieven, aroma's, technische hulpstoffen en materialen in contact met voedingsmiddelen (AFC) in 2008 en dit ADI verwijst naar lycopeen uit alle bronnen. Het doel van deze studie was om vast te stellen of de Belgische volwassen bevolking risico loopt op blootstelling aan lycopeen niveaus die de gevestigde ADI waarden overschrijden.

In eerste instantie werd een conservatieve benadering (Tier 2) toegepast waar de nationale voedselconsumptie (gegevens voedselconsumptiepeiling 2004) werd gecombineerd met de maximaal toegelaten niveaus van lycopeen in zowel de huidige wetgeving, de wetgeving rond nieuwe levensmiddelen en de toekomstige wetgeving. De resultaten van de Tier 2 tonen dat de gemiddelde inname door de Belgische bevolking 3 maal de ADI overschrijdt indien de maximumgehalten vermeld in de huidige wetgeving worden gebruikt. Met de maximumgehalten vermeld in de wetgeving voor nieuwe voedingsmiddelen en de herziene waarden voor de toekomstige wetgeving wordt de ADI-waarde niet overschreden (uitgedrukt in % van de ADI voor de 95ste percentiel; nieuwe voedingsmiddelen wetgeving – 52 % en in de toekomstige wetgeving – 43 %). Verder werden de actuele lycopeen concentraties verkregen na bemonstering van een representatief aantal voedingsmiddelen en toegepast in de meer realistische TIER 3 aanpak.

Echter, gezien het feit dat lycopeen bleek niet te worden gebruikt als kleurstof, werd enkel inname van natuurlijk aanwezig lycopeen onderzocht met behulp van deze aanpak. De resultaten van de Tier 3 benadering tonen dat de gemiddelde inname van lycopeen de ADI-waarde niet overschrijdt en dat de inname voor het 95ste percentiel 25 % van de ADI zou zijn. Daarom werd geconcludeerd dat de volwassen Belgische consumenten geen risico lopen op een overmatige lycopeen inname.

ANNEXES

Annexe 1: Samples purchased at supermarket 1

#	Description	Ingredients	Purchase date
		Condiments and sauces	
0651	Chopped tomato flesh	Tomatoes 98%, modified starch, sugar, salt, citric acid	9-mai-11
0643	Brochettes, tomato and paprika	Minced tomatoes 85%, paprika 10%, olive oil, onion, garlic, basil, oregano, salt	9-mai-11
0642	Piperade	Tomatoes, paprika, onion, tomato concentrate, vegetable oil, salt, sugar, concentrated lemon juice, garlic, natural aromas	9-mai-11
0653	Vegetable dressing tomatoes and almonds	Carrot puree (rapeseed oil, water, egg yolk, vinegar, starch, mustard (water, mustard grains, salt, vinegar, sugar, curcuma); salt, thickening agents (E412, E415), conservatives (E202, E211), celeriac puree, water, yellow paprika, ground almonds, potato flakes (potatoes, stabilizers E471, acidifiers E304, E300, E223,E330), spices, natural aromas, tomato concentrate (tomato, salt), sugar, herbs extracts (chilli, sugar, soya, gluten, yeast, tamarind, anchovies, rosemary, cloves, Muscat nut, aroma, sugar, food sugars (E330), salt, vinegar, acids (E327, E262, E330), pepper, salt, stabilizers (E412)	9-mai-11
0658	Tapenade tricolore	Tomatoes 34%, vegetable oil, green olives, back olives, water, capers, cashew nuts, vinegar, tomato juice, sugar, salt, anchovies, garlic, cheese, pepper, spices and herbs, E211, E202, E412, E415, aromas, E330	9-mai-11
0667	Rouille Provencal	Fish stock (water, different fish varieties, vegetables, olive oil, tomato concentrate, modified starch, sunflower oil, pepper, guar gum, xanthan gum, saffron	9-mai-11
0660	Tomato tapenade	Tomatoes 52%, vegetable oil, concentrated tomatoes, green olives, sugar, garlic water, salt, vinegar, capers, anchovies, cheese, pepper, E211, E202, E415, E412, herbs and spices, modified starch, E330, aromas	9-mai-11
0659	Tricolore tapenade	Tomatoes	
0669	Tomatade caprolive	Tomatoes 50% (half dried tomatoes and tomato concentrate), sunflower oil, red pepper (pepper, water, vinegar, salt, sugar, citric acid), olive oil, black olives (olives, water, salt, lactic acid, iron gluconate), capers (capers, water, salt, vinegar), salt, oregano, garlic, sugar, vinegar balsamic (water, grape juice, vinegar, caramel E150d, sulphites), basil, citric acid	9-mai-11
0668	Mango chutney	Mango puree 55%, grilled onion, grilled red paprika, mango pieces, curry (garlic, water, curcuma, ginger, celery seeds, coriander, pepper, cumin, chilli pepper, Muscat nut, fennel seeds, lavas, spring onion, sunflower oil, salt, red pepper, E330, E412, E415, E300, E202, vinegar, sugar, modified starch, red pepper, salt, E202, E211, E262	9-mai-11
0658	Salsa	Red paprika (salt, citric acid, rapeseed oil, calcium ascorbate, black olives, water, salt, Fe gluconate, K ascorbate, parmesan, basil, garlic, pepper, salt, K ascorbate, Na benzoate, citric acid, Na-acetate	9-mai-11
0672	Andalouse	Rapeseed oil, peeled tomatoes, mustard (water, mustard seeds, salt, vinegar, sugar, curcuma), egg yolks,	9-mai-11

		spices, natural extracts and aromas, water, vinegar, capers, salt, citric acid, guar gum and xanthan, b-carotene, rosemary extract	
0671	Americaine	Rapeseed oil, tomato concentrate, egg yolk, vinegar, natural extracts and aromas, mustard (water, mustard seeds, salt, vinegar, curcuma, sugar), capers, sugar, citric acid, hydrolysed soybean proteins, paprika extract as colorant, rosemary extract	9-mai-11
0626	Brochettes, tomatoes and olives	85% tomatoes, 10% olives olive oil, onion, garlic, basil, wild marjoram, salt	9-mai-11
0624	Sicilian pasta sauce with aubergine	Tomatoes 54%, aubergine 15%, tomato paste, olive oil, onion, parmesan, sugar, salt, herbs, aubergine aroma, lactic acid	9-mai-11
0641	Pasta sauce with dried tomatoes	Water, dried tomatoes, olive oil, sunflower oil, tomato concentrate, garlic, vinegar, tomato powder, salt, basil, bay, concentrated lemon juice, pepper	9-mai-11
0622	Pasta sauce, Provencal	Tomatoes puree, tomato pulp, water, onion, aubergine, zucchini, vegetable oil, modified starch, salt, sugar, natural aromas, aromas	9-mai-11
0623	Roman pasta sauce with ricotta	Tomato pulp, tomato paste, ricotta, olive oil, parmesan, pecorino, onion, natural aroma of meat, cashew nuts, aromatic herbs, sugar, salt, lactic acid	9-mai-11
0614	Sweet-sour sauce	Water, vegetables (carrots, bamboo sprouts, green paprika, onion, red paprika, celery), sugar, vinegar, concentrated tomatoes, pineapple, modified starch, salt, white wine, spices and aromas	9-mai-11
0621	Pesto rosso	Sunflower oil, tomato concentrate, water, basil, sun dried tomatoes, red paprika, cashew nuts, grana padana cheese, pecorino, Romano cheese, salt, carrots, lactic acid, pine nuts, olive oil, garlic, sodium dioxide	9-mai-11
0628	Bolognese sauce	Water, minced meat (pork, beef, breadcrumbs, salt, fibbers, glucose syrup, lactose, dextrose,) peeled tomatoes, tomato concentrate, onion, herbs mix, sugar, modified starch, soya proteins, lactic acid, salt	9-mai-11
0612	Vegetable sauce	Vegetables (tomatoes, paprika, zucchini, onion, mushrooms, tomato puree), olive oil, salt, garlic, vegetable stock, spices, herbs, cane sugar, glucose, lactic acid, Na lactate	9-mai-11
0627	Kids pasta sauce	Tomatoes, water, carrots, tomatoes pasta, onion, red paprika, modified starch, zucchini, milk proteins, aromas, olive oil, basil, salt, ascorbic acid, garlic, spices extract, white pepper	9-mai-11
		Fish products	
0649	Sardines in tomato	Sardines, tomato puree, water, salt	9-mai-11
0655	Salad nicoise	Thon 23%, potato 20%, cherry tomatoes 15%, green beans 12%, water, onion, olives, red paprika, vinegar, olive oil, salt, basil, sugar, natural aromas, modified starch, guar gum, xanthan	9-mai-11
0638	Mackerel fish in tomato sauce with basil	Mackerel filet, water, tomato concentrate, rapeseed oil, vinegar, salt, modified starch, sugar, Na glutamate, guar gum, xanthan gum, onions, basil, paprika extract as colorant	9-mai-11
		Vegetables	
0620	Vegetable mix for couscous	Vegetables (carrots, chickpea, zucchini, turnip, red paprika), water, double concentrated tomatoes, harissa (red beet, carrots), water, pepper, vegetable oil, salt, modified starch, coriander, caraway seed, citric acid, garlic, rapeseed oil, modified starch, natural aromas, spices	9-mai-11
0630	Tomatoes double concentrate	Tomatoes	9-mai-11

0629	Chopped tomato flesh	Tomatoes 81%, vegetables 15% (onion, carrots, zucchini), sunflower oil, sugar, salt, modified starch, spices and herbs, citric acid	9-mai-11
0664	Tomato flesh with basil	Tomatoes 91%, onions, sunflower oil, salt, modified starch, sugar, spices and basil, aroma basil, citric acid	9-mai-11
0661	Tomatoes double concentrated	Tomatoes	9-mai-11
0637	Tomato concentrate	Tomatoes, salt	9-mai-11
1167	Red cabbage	red cabbage, fresh	29-juin-11
		Soups	
0618	Vegetable mix soup	Vegetables (potatoes, carrots, onion, celery, cauliflower, turnip, leach, green beans, water, reconstituted whole milk, modified starch, butter, salt, parsley, yeast extract, natural aromas, vitamins (B5, PP, B2,B9)	9-mai-11
0619	Tomatoes	Water, cucumber, celery, red paprika, onion, green beans, tomato puree and tomatoes, butter, modified starch, salt, rice starch, sugar, yeast extracts, b-carotene, vitamins (PP, B5, B2, B9, A)	9-mai-11
		Miscellaneous	
0654	Meat balls in tomato sauce	Sauce 60% (water, tomatoes 25%, onion, sugar, modified corn starch, salt, beef stock, aroma, salt, glucose syrup, sunflower oil, spices, modified potato starch, dried vegetables (onion, celery), colour - ammoniac caramel, spices); meat balls 40% (pork, beef, beef fat, breadcrumbs (wheat flour, salt, yeast), modified potato starch, fibbers from bamboo, salt, dextrose, spices, triphosphates, colour – ammoniac caramel)	9-mai-11
0652	Italian dish	Sauce 42% (water, tomato puree, pork, sugar, onion, salt, E621, spices), macaroni 36% (wheat dough), meat balls 22% (pork, turkey, pork collagen, water, breadcrumbs, turkey fat, turkey collagen, salt, onion, E451i, coriander, white pepper	9-mai-11
0646	Pasta minute, conchiglie bolognaise	Pasta 60% (wheat flour, water, egg), minced meat 14% (beef, pork, pork collagen, pork fat, water, breadcrumbs (wheat flour, salt, yeast), salt, vegetable fibbers, diphosphates E450, and triphosphates E452, mixed spices), tomatoes, tomato pasta, vegetable oil, corn starch, onion, carrot, sugar, olive oil, garlic, salt, aroma, spices, basil, ascorbic acid, paprika extract, parsley	9-mai-11
0670	Ravioli with beef	Water, tomato puree, vegetables (carrots and anions), beef, sugar, salt, modified starch, sunflower oil, aromas; dough(wheat flour, water); filling (beef, breadcrumbs (wheat flour, salt), vegetables (carrots and onions), salt, basil, sunflower oil	9-mai-11
0615	Beef goulash	Water, beef, red paprika, green paprika, onion, modified starch, tomato concentrate, wheat flour, beef fat, margarine (vegetable oils and beef fat partially hydrogenised - palm, soya and rapeseed), water, soya lecithin, mono and di-glycerides of fatty acids, salt, sugar, potassium sorbate, citric acid, aromas, b-carotene, salt, sugar, herbs and spices	9-mai-11
0639	White beans in tomato sauce	White beans, tomato sauce (water, tomato puree, sugar salt, modified starch, onion powder, aroma)	9-mai-11
0613	Chilli con carne	Red beans, water, tomato pulp, beef, onion, red paprika, tomato concentrate, corn, peanut oil, sugar, modified starch, salt, stock (salt, hydrolysed soya and corn proteins, matodextrin), herbs and spices, potato starch, citric acid	9-mai-11

1322	Merguez sausage	Lamb meet 78%, sauce 10% (water, tomatoes, dextrose, spices, salt, sugar, taste enhancers E621, rapeseed oil, colour - E120, eggs, E325, bread crumbs (wheat flour, yeast, salt), salt, spices	27-juil-11
1323	Pizza pepperoni	Flour, water, rapeseed oil, salt, yeast, grated cheese (milk, salt, annatto), potato starch, coulis (tomatoes, onion, modified starch, salt, garlic, spices, sugar), mushrooms (champignons, vinegar, salt), chorizo 10% (pork meat, salt, spices, dextrose, lactose, milk powder, milk proteins, garlic, Na ascorbate, nitrite de Na, red paprika, olives, spices	27-juil-11
1324	Pizza bolognaise	Wheat flour, water, tomato concentrate, cheese, vegetable oils and fats, pork meat, modified maize starch, potato starch, sugar, milk proteins, yeast, salt, spices, herbs, garlic, colour – β-carotene	27-juil-11
1325	Meat balls in tomato sauce	Tomatoes 45%, meat balls 42% (pork meat, beef, eggs, wheat flour, bread crumbs (wheat flour, yeast, salt, oil, herb mix), tomato juice 5%, onion, modified starch, guar gum, xanthan gum, dextrose, rapeseed oil, sunflower oil, lecithin, natural aroma, sugar, chicken stock (chicken extract, salt), salt, pepper	27-juil-11
1326	Penne arrabbiata	Penne 55% (durum wheat semolina, water), tomatoes 25% (tomatoes, tomato juice, tomato puree, salt), bacon 9% (pork meat, salt, dextrose, spices, antioxidants Na ascorbate, mono Na acetate, Na nitrite, Na acetate, smoke) ketchup (tomatoes, vinegar, sugar, salt, herbs extract, herbs), cheese(milk, salt, lysozyme, olive oil, pine nuts, basil, onion, sambal, thyme; curry powder, garlic powder	27-juil-11
1327	Spaghetti bolognaise	Spaghetti 44% (flour, water, egg white) tomatoes 35%, minced pork meat 7%, tomato concentrate 6%, onion, rapeseed oil, starch, salt, herbs and spices, sugar, paprika extract, sunflower oil, paprika extract as colour	27-juil-11
1328	Lasagne with chicken, tomatoes and cheese	Tomatoes 33%, skimmed milk, chicken 12% cheese 9% (milk, salt, rennet), wheat flour, onion, modified starch, margarine, salt, aroma, colour – β-carotene, eggs, wheat flour, rapeseed oil, herbs and spices, salt, stock (matodextrin, aroma, chicken fat and meat, salt, potato starch, lactose, spices), garlic, sugar, starch, aroma, xanthan gum, hydroxy-propyl-methylcellulose	27-juil-11
1329	Spicy turkey salad	Turkey 44%, rapeseed oil, onion, ketchup (tomato puree, glucose-fructose syrup, vinegar, modified starch, salt, sugar), water, egg yolk, vinegar, sugar (lactic acid, acetic acid, citric acid, mustard, Spanish pepper, paprika, guar gum, xanthan gum, salt, K sorbate, benzoic acid, Na benzoate, lemon juice, paprika extract	27-juil-11
1330	Capellini pomodori	Boiled capellini 47% (water, semolina, egg white) tomatoes 27%, tomato juice 12%, cheese 4%, onion, olive oil, salt, starch, dextrose, sugar, parsley, pepper, guar gum and xanthan gum	27-juil-11
1331	Chicken salad Spanish way	Chicken 40% (chicken, salt), emulsified sauce (soy oil, mustard (water, mustard seeds, vinegar, salt), egg yolk, vinegar, tomato puree, water, modified starch, sugar, citric acid, guar gum, xanthan gum, carrot, celery (celery, vinegar, salt), onion, herbs and spices, K sorbate, Na benzoate	27-juil-11
1332	Mini quiche with tomato and mozzarella	Dough (wheat flour, margarine, water, salt, mono and di-glycerides of fatty acids, citric acid, colour-carotene, aroma) water, salt, wheat fibbers, eggs, sugar, cysteine; tomatoes 21%, cream, eggs 15%, mozzarella 7% (milk, potatoes starch, salt, brine, CaCl2, milk, salt, white pepper, basil, garlic	27-juil-11
1333	Mexican salad with ham	Ham 21% (pork meat, water, sugar, salt, E452, E407, aroma, E301, E331, E250, E262, corn 17%, water, pea, beans, paprika, rapeseed oil, tomato ketchup (tomato puree, glucose-fructose syrup, vinegar, modified starch, salt, sugar, E330, E202, E211, pickles, vinegar, paprika extract, egg yolk, mustard, E412, 415, modified corn starch, E270 E262, E352, E202, 211, natural aroma	27-juil-11
1334	Tagliatelle with chicken and red pesto	Tagliatelle 42% (flour, egg white, water), tomatoes 35%, chicken 5%, cream, onion, pesto 2% (olive oil, sunflower oil, basil, cheese, cashew nuts, salt, milk, vinegar, aroma, bread crumbs, herbs), cheese, starch	27-juil-11

		modified, thickening agents - guar gum, xanthan gum), dextrose, salt, herbs and spices, garlic, sunflower oil, olive oil, concentrated lemon juice, sugar, natural colour - paprika extract, yeast	
1335	Lasagne with vegetables	Tomatoes 45%, zucchini 18%, aubergine 10%, onion 8%, flour, cheese, carrots 4%, olive oil, herbs and spices, modified starch, egg, aroma, salt, garlic, sugar, potato flakes, celery extract	27-juil-11
1336	Cannelloni bolognese	Tomato pulp 30%, durum wheat semolina, beef 12%, water, onion, eggs 4,6%, double concentrated tomatoes 4,2%, Carrots, rice starch, butter, sunflower oil, white wine, celery, pecorino cheese, bread crumbs (wheat flour, water, salt), wheat flour, basil, salt, sugar, garlic, oregano, pepper bay	27-juil-11
		Fruit	
0647	Cocktail of dried fruit	Sugar, papaya, pineapple, mango, strawberries, citric acid, ascorbic acid, colour - tartrazine, orange yellow S, allura red, brilliant blue FCF; sodium dioxide, lemon juice, aroma	9-mai-11
0640	Papaya slices in syrup	Papaya 57%, water, sugar, citric acid, ascorbic acid	9-mai-11
0666	Blueberries in wine	Blueberries, sugar, wine, pectin, cinnamon	9-mai-11
0631	Dried papaya slides	Papaya 70%, sugar, sulphur dioxide	9-mai-11
0648	Dried cranberry	Cranberry, sugar, sunflower oil	9-mai-11
0625	Peach slices in syrup	Peach 62%, sugar, citric acid, ascorbic acid	9-mai-11
1169	Water melon, fresh	Water melon	29-juin-11
1173	Passion fruit, fresh	Passion fruit	29-juin-11
1174	Mango, fresh	Mango	29-juin-11
		Sugar and confectionary	
0650	Peach compote	Peach 85%, sugar 15%, pectin, ascorbic acid	9-mai-11
0663	Jam enjoy with exotic fruits	Pineapple 39%, passion fruit 11%, mango 10%, lemon juice 6%, guava 4%, cane sugar, fructose, pectin, calcium citrate	9-mai-11
0665	Peach – apricot compote	Sugars extracted from fruits 49,2%, peach 25%, apricot 25%, pectin, calcium lactate	9-mai-11
		Non-alcoholic beverages	
0645	Pressed grapefruit	100% pure grapefruit juice	9-mai-11
0634	guava juice	Water, pink guava puree 25%, sugar, concentrated black berry juice 1,5%, concentrated lemon juice, ascorbic acid	9-mai-11
0635	e mango juice	Water, mango puree 30%, sugar, concentrated lemon juice, ascorbic acid	9-mai-11
0633	peach juice	Peach puree 50%, water, sugar, lemon juice, ascorbic acid	9-mai-11
0616	Peach, mango, passion fruit	Apple juice 73%, peach puree 15%, mango puree 8% passion fruit puree 4%	9-mai-11
0644	Mango-passion fruit, smoothie	Banana puree 30%, orange juice 25%, mango puree 15%, apple puree 15%, passion fruit puree 11%, orange cells 4%	9-mai-11

1168	Vegetable juice bio	Tomato juice 61%, carrot juice 13%, celery juice 4%, red beet juice, cucumber juice, sauerkraut juice, paprika pulp, onion juice, pea juice, salt and herbs	29-juin-11
1170	Tomato juice	Tomato juice, 0,6% salt	29-juin-11
		Dairy products	
0662	Cheese with tomato and pesto	Cheese 73%, milk proteins, basil, melted cheese, salt, dried tomatoes, garlic, sugar, modified starch, lemon juice, lactic and citric acid	9-mai-11
		Cereals and cereal products	
0632	Bruschettine (salted biscuits) with tomato and basil	Wheat flour, palm oil hydrogenized, olive oil, dried tomatoes, salt, basil	9-mai-11
0617	Biscuits olives and tomatoes	Wheat flour, vegetable oil, mono and di-glycerides, aromas, cheese, olives mixture, salt, citric acid, tomato puree, dried tomatoes, basil, salt, olive oil, modified starch, sugar, citric acid, yeast, milk, salt	9-mai-11
0656	Tortilla with cheese flavour	Corn, sunflower oil, cheese flavour (cheese powder, whey powder, buttermilk powder, wheat flower, monosodium glutamate, disodium-5-ribonucleotides, tomato powder, onion powder, spices, dextrose, colours (paprika extract, annatto, caramel), citric acid, sugar, salt	9-mai-11
0657	Potato chips with bolognese flavour	Potatoes, sunflower oil, bolognese sauce flavour (whey powder, paprika powder, tomato, onion powder, black pepper, chilli pepper, parsley), monosodium glutamate, disodium guanylate, disodium inosinate, sugar, citric acid, smoke flavours, salt	9-mai-11
0636	Monster munch, popped cereals	Vegetable oil, potato puree powder, corn starch, wheat flour, potato starch, sugar, salt, flavouring, tomato powder, paprika powder, yeast, monosodium glutamate, disodium guanylat, disodium inosinate, citric acid	9-mai-11
		Sugar and confectionary	
1171	Candies “Tapis fraise”	Sugar, glucose-fructose syrup, wheat flour, E296, E330, dextrose, palm oil, aroma, E300, E306, extracts (apple, tomato, radish, pumpkin)	29-juin-11
1172	Candies “Lacetes fraise”	Glucose -fructose syrup, wheat flour, dextrose, vegetable oil, E330, aroma, fruit extracts (apple), plant extracts (tomato, radish, pumpkin), E300, E309, E901	29-juin-11

Annexe 2: Samples purchased at supermarket 2

#	Description	Ingredients	Purchase date
		Condiments and sauces	
00608	Pesto rosso	Sunflower oil 39%, tomatoes 36%, sun dried tomatoes 10%, cashew nuts 6%, basil 4,6%, potato flakes, salt, garlic, grana padano, lactic acid, glucono-delta-lactone	11-mai-11
0609	Sauce with aubergine and paprika "melanzane e pepperoni"	Red and yellow paprika, sunflower oil 32%, aubergines 13%, double tomato concentrate 12%, milk proteins, onion, salt, sugar, garlic, parsley, lactic acid	11-mai-11
		Vegetables	
0603	Tomato slices	Tomatoes, tomato juice, basil, citric acid	11-mai-11
0605	Tomato paste	Tomatoes, salt	11-mai-11
0610	Whole tomatoes in tomato juice	Tomatoes, tomato juice, citric acid	11-mai-11
		Soups	
0606	Tomato vegetable soup	Tomato 40% (tomato on basis of minced tomatoes and tomato concentrate), vegetables 13,5% (potatoes, carrots, celery), modified starch, sugar, salt, olive oil, garlic, natural aromas	11-mai-11
		Miscellaneous	
0611	White beans in tomato sauce	White beans, tomato sauce 48% (water, tomato puree, sugar, salt, modified starch, onion powder, aroma (extracts of spices, onion, garlic, herbs)	11-mai-11
		Fruit	
0607	Fruit fun - compote	Apples 77%, banana 6%, apricots 6%, sugar 5%, mangos 3%, passion fruit from concentrate 1%, ascorbic acid, B1, B2, B3, B6, E	11-mai-11
		Non alcoholic beverages	
0602	Fruit juice	Grape juice 52%, apple juice 28%, black berries juice 8%, blackberries 7%, cranberry puree 5%	11-mai-11
0601	Blood orange juice	blood oranges	11-mai-11
		Sugar and confectionary	
0604	Candy mix 'strawberry cables'	Sugar, glucose-fructose syrup,, wheat flower, malic acid, citric acid, dextrose, vegetable oil, aroma, ascorbic acid, E306, extracts (apple, pumpkin, tomato, radish)	11-mai-11
	Candy mix 'strawberry lacetes'	Glucose-fructose syrup, wheat flour, sugar, dextrose, vegetable oil, citric acid, aroma, ascorbic acid, E306, extracts (apple, pumpkin, tomato, radish), bee wax	11-mai-11

Annexe 3: Samples purchased at supermarket 3

#	Description	Ingredients	Purchase date
		Condiments and sauces	
0600	Mango-curry sauce	Vegetable oil 28%, water, vinegar, sugar, mango 8%, whey powder, onion, apricot, curry, salt, spices, citric acid, modified starch, xanthan gum, guar gum, β-carotene	11-mai-11
		Fish products	
0587	Lobster soup	Water, tomato puree, modified corn starch, *alaska pollack*, corn starch, salt, shrimp powder, white wine, vegetable oil, powdered whole milk, flavourings (E621, E627, E631), colouring E150d, lobster 0,5%, cognac, brandy, flavouring enhancer (E621), herbs and spices, sugar, citric acid	11-mai-11
0576	Mackerel in tomato sauce	Mackerel filet 65%, tomato sauce 30% (water, tomato puree, sunflower oil, sugar, vinegar, onion powder, wheat flour, salt, vinegar, garlic powder, carob gum, guar gum, spices, onion whole pickled	11-mai-11
		Miscellaneous	
0588	Risotto tomato and Italian herbs	Rice 73%, tomatoes 7%, tomato puree 6ù, dried tomatoes (tomatoes, rapeseed oil, salt, oregano, garlic), cream, olive oil, salt, stock, garlic, yeast extracts, oregano, basil, parsley, sugar, onion, rosemary, onion powder, spices and extract of spices	11-mai-11
		Fruits	
0581	Cranberry compote	Cranberries 30%, glucose, sugar, water	11-mai-11
0579	Cranberry sauce	Cranberries 42%, sugar, water, red whine, stock, wheat flour, aromas, colorant E150c, vegetable oils, tomatoes, onion, modified starch, salt, matodextrin, taste enhancers E621, E627, E631, meat extract, acidifier E330, white pepper, rosemary, garlic extract, thickening agent E414, stabilizers: guar gum, xanthan, black pepper	11-mai-11
0580	Cooked cranberries	Cranberries48%, red wine 3% (red wine, salt, pepper, sulfites), concentrated lemon juice, pectin	11-mai-11
0577	Tropical fruit mix in syrup	Fruits in variable proportions (papaya, (yellow or red), pineapple), pineapple juice, white grape juice from concentrate, citric acid, natural flavour, ascorbic acid	11-mai-11
0578	Sunny fruit mix in syrup	Fruits in variable proportions (pineapple , watermelon, cantaloupe, melon), pineapple juice, white grape juice from concentrate, citric acid, ascorbic acid	11-mai-11
1177	Fruit salad rainbow	Orange, apple, grape, pineapple, grapefruit, water melon, melon, water, glucose-fructose syrup, E202, E330, E300	29-juin-11
1179	Frozen tropical fruit mix	Pineapple 21%, tangerine 18%, mango 18%, grapes 15%, papaya 10%, green melon 9%, orange melon 9%	29-juin-11
		Sugar and confectionary	
0582	Mangoes and ginger jam	Mango 51%, sugar, salt, vinegar, pectin, sodium alginate, aroma, ginger 0,2%	11-mai-11
0593	Apricot jam	Apricots, glucose-fructose syrup, sugar, E330, E440a	11-mai-11

0597	Chocolate flakes with cranberry	Sugar, cocoa butter, cranberry-apple fruit preparation (glucose-fructose syrup, apple, sugar, glycerol, wheat fibber, cranberry, pectin, vegetable fat, flavouring, fruit extracts), cornflakes (corn, sugar, salt, barley malt extracts), cocoa mass, milk powder, skimmed milk powder, milk sugar, whey powder, butter fat, soy lecithin +E476, flavouring, salt	11-mai-11
0598	Dragibus soft - candies	Glucose syrup, sugar, starch, dextrose, citric acid, mono-Na citrate, aromas, fruit and vegetable concentrates (saflor, spirulina), colour (antocyanes, mixed carotenoids, carbo medicinalis vegetalis, curcuma, inverted sugar, carnauba wax	11-mai-11
		Vegetables	
1178	Vegetable mix for red soup	Tomatoes, carrot, red onion, white onion, red beet	29-juin-11
1180	Grilled red paprika	Grilled red paprika, water, sugar, vinegar, salt, sunflower oil	29-juin-11
1181	Red cabbage with apples	Red cabbage 76%, water, sugar, apples 4,3%, salt, vinegar, E330, pepper, Muscat nut	29-juin-11
0583	Whole tomatoes	Tomatoes, tomato juice, E330	11-mai-11
0584	Minced tomatoes	Tomatoes, tomato juice, E330	11-mai-11
0586	Tomato puree	Tomatoes, salt	11-mai-11
0585	Double concentrated tomato	Tomatoes	11-mai-11
		Non-alcoholic beverages	
0596	Apple - cranberry juice	Water, apple juice based on concentrate 35%, cranberry juice from concentrate 10%, sugar, concentrated juice of arania and lemon	11-mai-11
0595	Soft drink cranberry classic - light	Water, cranberry juice from concentrate 25%, pectin, tri-Na citrate, natural aromas, sucralose	11-mai-11
0594	Concentrated fruit drink cranberry 0% sugar	Water, fruit juice from concentrate 8% (black berries, raspberries, elder berry, strawberry), red berries 2% , dextrin, E330, E466, E415, aromas (cranberries, raspberries, vanilla), acesulfame K, cyclamate, sucralose), E202	11-mai-11
1183	Carrot juice	Carrot juice fermented with lactic bacteria	29-juin-11
		Cereals and cereal products	
0591	Griss - Italian salty biscuit	Wheat flour, olive oil, vegetable oil, tomato 3%, sweet herbs 2%, yeast, salt, malt, spices 1%	11-mai-11
0590	Pasta - spirelli tricolore	Wheat flour, dehydrated tomatoes, spinach	11-mai-11
0589	Pasta - spirelli tricolore	Wheat flour, tomato powder, spinach powder	11-mai-11
0592	Crunchy muesli fruit	Oatmeal, dried fruits (dried grapes, coconut, banana slices (bananas, vegetable oil, sugar, aroma), sugared slices of cranberries (cranberries, sugar, glycerol, citric acid), apple, brown sugar, vegetable oil, wheat flour, inverted sugar syrup, salt, barley malt extract, aroma, soya lecithin, vitamins (B3, B6, B2, B1, B9, B12) Fe	11-mai-11

		Cakes	
0599	Petit dejeuner raspberries and cranberries - biscuits	Cereal 56,5% (wheat flour, whole grains (whole grains flour, oat flakes, whole grain barley flour, ray flour), sugar, fructose-glucose syrup, vegetable oils, glycerol, concentrated fruit puree (equivalent of raspberry puree, cranberry purée, currants puree),Na carbonate, di-Na diphosphates, acid carbonate of ammonium, Ca lactate, pectin, minerals (Mg carbonate, Fe), emulsifiers (soya lecithin, sunflower lecithin,), salt, skimmed milk powder, lactic acid, aromas, vitamins (E, B3, B1)	11-mai-11
		Dairy products	
1175	nature - cheese	Cheese fresh85%, milk proteins, salt, stabilizer (carob flour)	29-juin-11
1182	Nature - cheese	Whey proteins rehydrated, cheese, cream, melting salts: orthophosphate and polyphosphates of Na, citric acid, milk proteins, salt	29-juin-11
		Fats	
1176	Steak and grill butter	Butter, buttermilk, spices mix, onion, chive, pepper, paprika, salt, citric acid	29-juin-11

Annexe 4: Samples purchased at supermarket 4

#	Description	Ingredients	Purchase date
		Condiments and sauces	
0849	Cocktail sauce, light	Tomato puree, vegetable oil, sugar, vinegar, egg yolk, mustard (vinegar, mustard seeds, water, salt, spices), modified starch, scotch whiskey 2%, dextrose, salt, citric acid, malic acid lactic acid, K sorbate, guar gum, xanthan gum, aromas, spices, antioxidant E385	9-mai-11
0845	Argentina steak & grill	Tomato puree 22%, sugar, vinegar, red paprika, dextrose, mustard (vinegar, mustard seeds, water, salt, spices), salt, modified starch, hydrogenated vegetable oil, spices, herbs, aromas, wheat flour, smoke aroma	9-mai-11
0859	Tartinade with sun dried tomatoes	Dried tomatoes 37,3%, tomato concentrate, rapeseed oil, olive oil, sugar, natural extracts and aromas	9-mai-11
0827	Pomodoro & mascarpone	Tomatoes (tomatoes slices and juice) 36%, water, mascarpone 16%, butter, sunflower oil, fresh onion, salt, modified starch, fructose, parsley, fresh garlic, aromas, basil, E270, black pepper	9-mai-11
0828	Bruschettina pomodoro & basilico	Tomatoes 80% (tomato slices, juice and concentrate), olive oil 6%, basil 3,5%, garlic, onion, grana padano, pine nut, fructose, salt, lactic acid	9-mai-11
0826	Tapenade di pomodoro & peperoncino	Dried tomatoes 51%, sunflower oil, vinegar, red pepper, salt, basil, sugar, garlic powder, black pepper, dried thyme, E330, E270, E300	9-mai-11
0825	Tapenade di pomodoro	Dried tomatoes 57%, sunflower oil, vinegar, salt, natural aromas, garlic powder, sugar, black pepper, lactic acid	9-mai-11
0830	Bolognese	Tomato semi concentrate 20%, water, beef meat 13,3%, tomato concentrate 13%, pork meat 10%, tomato pulp 10%, onion 4%, carrots 3%, olive oil 2%, raw ham (pork leg, salt), salt, sugar, celery 0,6%, flavourings, lactic acid, spices, rosemary 0,01%	9-mai-11
0821	Salsa mild	Tomato pulp 40% (tomatoes, tomato juice), tomato puree 33%, onion, green paprika, vinegar, modified starch, sugar, salt, jalapeno pepper, coriander, natural aromas, citric acid	9-mai-11
0844	Pasta sauce with tomatoes and grilled vegetables	Tomato pulp 68%, grilled paprika 11%, grilled zucchini 7%, double concentrated tomato, onion, olive oil, salt, garlic, concentrated lemon juice, smoked aromas, basil, oregano, parsley, citric acid	9-mai-11
0842	Pasta sauce tomatoes and olives	Tomato puree 67%, green olives 1% (olives, water, salt, ascorbic acid, citric and lactic acid), black olives 8% (olives, water, salt, lactic acid, Fe gluconat), vegetables 9% (onion, carrots), olive oil 3,5%, sugar, modified starch, salt, dried garlic, pepper, thyme	9-mai-11
0822	Tomato sauce with cream	Tomato puree 48%, cream 9%, salt, sugar, olive oil, pectin, xanthan, dried onion, dried garlic, whey powder, natural aromas, thyme, coriander, rosemary, bay, parsley, pepper	9-mai-11
0813	Base for fish sauce Provencal	Tomato powder, modified starch, salt, sugar, matodextrin, garlic, yeast extract, vegetable oil, aromas, spices, red beet juice, E330, spices	9-mai-11
0814	Base for tomato sauce (meat balls in sauce)	Tomato puree, corn starch, salt, onion powder, yeast extract, matodextrin, sugar, vegetable oil, garlic powder, paprika extract, parsley powder, onion aroma, hydrolysed wheat flour, salt, oregano, white pepper, bay, rosemary, basil	9-mai-11

0847	Hot ketchup	Tomato concentrate, water, sugar, vinegar, modified starch, salt, spices, parsley, aroma	9-mai-11
0855	Provencal sauce with vegetables	Tomatoes 37%, water, onion, double concentrate of tomatoes, red paprika, green paprika, zucchini, modified starch, sugar, aroma, rapeseed oil, spices extract, salt, garlic, thyme, parsley, citric acid	9-mai-11
0854	Zigeuner sauce	Tomato puree, onion, vinegar, paprika, glucose-fructose syrup, sugar, salt, modified starch, guar flour, spices, aroma	9-mai-11
0850	Yogorette paprika	Water, paprika, water, vinegar, sugar, salt, E509, vegetable oil, fermented milk, sugar, vinegar, mustard (water, vinegar, mustard seeds, salt, spices), egg yolk, salt, tomato extract, E415, spices, E200, aroma	9-mai-11
0848	American sauce	Vegetable oil, water, salt, tomato puree, vinegar, whey proteins, mustard seeds, salt, onion, modified starch, molasses, parsley, soya extract, sugar, lemon juice, colorant - caramel, paprika extract, anchovies, glucose-fructose extract, spices extract, tamarind, spices, aroma, xanthan	9-mai-11
0831	Italian sauce	Tomato puree, tomato pulp (tomatoes, tomato juice), water, onion, modified starch, sugar, salt, vegetable oil, natural aroma, concentrated lemon juice, basil, oregano, thyme	9-mai-11
0846	Ketchup	Tomatoes, vinegar, sugar, salt, spices extract, spices	9-mai-11
0834	Pasta sauce	Water, tomato puree, onion, corn starch, sugar, salt, sunflower oil, basil, natural aroma, thyme, citric acid	9-mai-11
0840	Pasta sauce bolognese	Water, peeled tomatoes (tomatoes, tomato juice, citric acid), minced meat (pork, beef, bread crumb, salt), tomato concentrate, onion, herbs and spices (paprika, garlic, oregano, basil, marjoram, rosemary, bay, pepper, cayenne pepper, sugar, modified starch, salt, dextrose, pepper extract, lactic acid	9-mai-11
0853	Steak sauce	Tomato puree, glucose fructose syrup, vinegar, apple juice, sugar, mango chutney (mango, sugar, spices, palm vinegar), modified starch, salt, spices, Na and K alginat and carob gum, green paprika, herbs, mustard seeds, aroma	9-mai-11
0852	Coctail sauce	Vegetable oil, tomato puree, vinegar, egg yolk, mustard (vinegar, mustard seeds, water, salt, spices), dextrose, glucose syrup, scotch whiskey, sugar, salt, guar gum, xanthan gum, aroma, spices, E385	9-mai-11
0851	Thousands islands dressing	Water, vegetable oil, glucose-fructose syrup, vinegar, tomato, onion, cucumbers, sugar, paprika, whey product, salt, modified starch, mustard seed, chive, lemon juice, guar gum, xanthan gum, spices, aroma	9-mai-11
0824	Pesto rosso & ricotta	Tomato concentrate 21%, sunflower oil, water, ricotta 15%, basil 5%, cashew nuts, red paprika, pecorino Romano, grana padano, salt, carrots, fructose, lactic acid, citric acid, modified starch, olive oil, food fibbers, garlic, sulfur dioxide	9-mai-11
0832	Bolognese sauce	Tomatoes, tomato puree, pork, beef, sugar, carrots, wheat flour, vegetable oil, salt, onion, garlic, concentrated lemon juice, yeast extract, thyme, basil, oregano, meat extract, celery seeds, leak, olive oil, parsley	9-mai-11
0812	Mix for sauce	Vegetables (tomato, onion, leak, carrot, green pea, paprika, potato starch, wheat flour, sugar, salt, vegetable oil, yeast extract, garlic, matodextrin, aroma, thyme, oregano, white pepper, concentrated red beet, lemon juice, rosemary, bay, paprika extract, dextrose	9-mai-11
		Fish products	
0811	Mackerel fish in tomato sauce	Mackerel filets, tomato concentrate, sunflower oil, salt	9-mai-11
1344	Rillette de dorade a la provencale	Dorado 40%, ray, rapeseed oil, water, tomatoes 7%, onion, vinegar, wheat flour, carrageenan, xanthan gum, microcrystalline cellulose, carboxymethylcellulose, carob flour, aroma, salt, milk proteins and lactose, parsley, dextrose, olive oil, garlic, basil, bamboo sprouts fibbers	27-juil-11

1345	Cray fish salad	Soybean oil, crayfish 20%, egg, white fish, starch, sugar, tangerine, pineapple, vinegar, egg yolk, tomato puree, proteins, crab extract, pepper, salt, mustard, aroma, whiskey, E202-2011, spices, cognac, food fibbers, stabilizers E261, 412, 415, colour - E160e,120, E575, matodextrin, concentrated fat	27-juil-11
1351	Anchovies oriental way	Anchovies filets, salt, vinegar, rapeseed oil, paprika sauce (red paprika, salt, vinegar)	27-juil-11
1358	Spreadable salad spicy tuna salad	Mayonnaise (rapeseed oil, egg yolk, water, vinegar, salt, sugar, E412, 410, 415, preservatives E202 and spices extract, tuna 29%, salt, water, vegetable extracts, eggs, pickled cucumber, carrot, celery, double concentrate of tomato, starch, food fibbers, animal proteins (eggs), salt, acidifiers E270, 334, 327, spices, sugar, preservatives E262i, 262ii, 202, 211, antioxidants E330, glucose syrup, water, colour E160c, dextrose, sunflower oil, parsley, pili pili	25-juil-11
0810	Mackerel fish in tomato sauce	Mackerel 65%, tomato sauce, salt	9-mai-11
		Miscellaneous	
0792	Cassoulet	Sauce (water, tomato concentrate, pork lard, modified starch, salt, natural aromas), white beans 33%, garniture 20,5% (sausages (pork, pork fat, pork rind, water, turkey meat, pork plasma, salt, pea starch, natural aromas, pepper, paprika, Muscat), milk proteins, glucose syrup, coriander, garlic, salted pork meat (pork, water, salt)	9-mai-11
0796	Ratatouille	Vegetables (zucchini, tomatoes, aubergines, onion, red paprika, green paprika), tomato juice, olive oil, sugar, salt, modified starch, natural aromas, lemon juice, citric acid, xanthan gum, guar gum, spices)	9-mai-11
0794	Tortellini	Sauce 50% (water, double concentrate of tomato, beef meat, onion, carrots, celery, modified starch, sugar, salt, aromas, basil, garlic, spices and herbs, parsley. Dough and minced meat 50% (water, wheat flour, egg, pork, pork lard, salt, milk proteins, herbs, aromas, bread crumbs (flour, water), salted ham, salt, palm oil, aromas, grana padano cheese	9-mai-11
0793	Ravioli	Sauce 73,5% (water, tomato concentrate, tomato pulp, beef, fresh vegetables (onion, carrots), modified starch, salt, sugar, rapeseed oil, sunflower oil, wine, natural aromas. Dough 18,5% (wheat flour, water). Filling 8% (beef, bread crumbs (wheat flour, salt, carbonate acid of amminium), carrots, onion, natural aromas, salt	9-mai-11
0789	Panza cup, bolognese	Water, tomato pulp with pieces and tomato puree 29%, pasta 15% (wheat flour, gluten, egg white), onion, beef (beef 5,9%, salt), sunflower oil, carrots, sugar, pork gelatine, aromas, salt, modified starch, paprika extract, rosemary extract	9-mai-11
0791	Tagliatelle a la tomate	Tomato 70%, pasta (Tagliatelle 23% (water, wheat flour, salt), potato starch, sugar, glucose syrup, vegetable oil, herbs, pepper, aromas, salt, E472, E340, milk proteins	9-mai-11
0788	Rice a la Mediterranean	Rice 87%, tomato puree 4%, sunflower oil, tomato powder, half dried tomatoes (tomatoes, rapeseed oil, salt, oregano, garlic), vegetable stock, herbs (basil, rosemary, oregano), garlic, sugar, salt, yeast extract, spices, colour-paprika extract	9-mai-11
0797	White beans in tomato sauce	White beans, tomato juice, sugar, salt, vinegar, modified starch, aroma	9-mai-11
0843	Ravioli bolognese	Sauce (water, tomato concentrate, onion, carrots, beef meat, rapeseed oil, modified starch, aroma, spices, vitamins B, B2). Pasta (wheat flour, water, egg white). Filling (beef, breadcrumbs (wheat flour, salt, palm and rapeseed oil, yeast, paprika), onion, carrots, salt	9-mai-11

0795	Spaghetti bolognese	Sauce (water, beef meat, double concentrated tomato, onion, carrots, rapeseed oil, modified starch, salt, sugar, aroma, herbs (basil, oregano, marjoram), matodextrin, fructose, dextrose, palm oil, caramel, gum, spaghetti	9-mai-11
0790	Cannelloni with beef	Water, beef, wheat flour (wheat flour, salt, rapeseed oil, yeast, paprika), tomato concentrate; onion, salt, carrots, olive oil, sugar, modified starch, aroma, smoke aroma, garlic	9-mai-11
0787	Pasta bolognese	Dough (wheat, water), tomato concentrate, whey, palm oil, aroma, beef, carrots, onion, glucose syrup, tomato pieces, red paprika, milk proteins, basil, rosemary	9-mai-11
0786	Bolognese pasta	Pasta (wheat), tomato, rice flour, beef, salt, onion, sugar, potato starch yeast extract, aroma, herbs (parsley, basil, rosemary), red paprika, matodextrin, garlic powder, black pepper, matodextrin, salt, E330, onion juice concentrated	9-mai-11
1352	Filet americain martino	Beef 66%, sauce 34% (rapeseed oil, water, egg, stabilizers E410, E415, E412; vinegar, salt, E270, E330, modified starch, spices, Worcester (soya extract, fish extract), sugar, colorants -E160c, E120, E202, antioxidants E300, lactose	25-juil-11
1354	Spreadable salad chicken Hawaii	Chicken 40%, pineapple 25%, vegetable oil, tomato, sugar, vinegar, egg yolk, salt, mustard, brandy, whiskey, stock (celery), spices, modified starch, lemon juice, milk proteins, soy proteins, acetic acid, lactic acid, E412, E415, E202, E211, colour - paprika extract	25-juil-11
1355	Spreadable salad chicken andalouse	Chicken 51%, andalouse sauce 39% (rapeseed oil, double concentrated tomato, water, egg yolk, mustard (waters, mustard seeds, salt, sugar, vinegar, curcuma), vinegar, sugar, spices, salt, onion, E270, modified starch, E412 - 415, colour E160c, parsley, preservative E200, rosemary extract, eggs, starch, food fibber, animal proteins, sugar, preservatives E262i, 262ii, 202, 211, antioxidant E330, glucose syrup, dextrose, E 334, 270, 327, sunflower oil	25-juil-11
1356	Champignons a la greque	Champignons 27,5%, onion 20%, rapeseed oil, water, vinegar, sugar, salt, tomato puree, champignon powder, white wine, palm oil, spices, E270, E330, stabilizers E1422, 407, 410, 412, 415, spices, herbs, garlic powder, glucose-fructose syrup, yeast extract, aroma, preservatives E202, E211, colour E160c	25-juil-11
1357	Sandwich with ham	Bread 50%(wheat flour, water, yeast, salt), cheese 13% (milk, salt, acidifier, brine, colorant E160b, preservative 251), ham 11% (pork meat, water, salt, sugar, soya proteins, stabilizers E450a, 450b, preservative E250, antioxidant E301), salad, tomato, mayonnaise (water, oil, egg yolk, mustard, starch, vinegar, matodextrin, glucose syrup, salt, sugar, E202, E415, E160a, E330, E385	25-juil-11
1359	Brawn with tomato	Pork head meat 27%, stock, pork tongue 23%, tomato concentrate 9,5%, champignons, pork gelatine, salt, Madeira wine, corn proteins, soy proteins, pork proteins, glucose, fried onion (onion, palm oil, wheat flour), herbs, spices, potato starch, milk proteins, lactose, antioxidants (Na ascorbate, Na citrate), thickening agents (carrageen), stabilizers (diphosphates, triphosphates,), preservatives (K sorbate, Na nitrite) aroma	25-juil-11
1360	Vegetarian food “javaanse schijf”	Soy proteins 48%, water, bread crumbs (colour annatto), vegetable oil, wheat gluten, egg proteins, cover (wheat flour, corn flour, modified wheat starch, salt), ketchup (sugar, molasses, water, soya souse, salt, vinegar, wheat starch, modified potato starch, , sugar, lactose, guar gum, onion powder, yeast extract, carrot extract, garlic powder, vitamin C, B6, B1, B12	25-juil-11
1361	Moussaka	Fried potatoes 20,5% (with palm and sunflower oil), skimmed milk, pork meat 15,5%, aubergines 11%, tomato concentrate, water, zucchini 5,5%, cheese (milk, salt, lactose), margarine (vegetable oil, water, salt, aroma, colour - b carotene), modified starch, onion, olive oil, wheat flour, salt, potato starch, herbs and spices, lactose, garlic, aroma	25-juil-11

1362	Lasagne verde	Sauce 84% (skimmed milk, water, pork meat, spinach, tomato concentrate, onion, vegetable oil and fats (palm, rapeseed, sunflower), modified starch, carrots, wheat flour, salt, cream, white wine, sugar, spices and herbs, aroma, garlic), Pasta 10% (wheat flour, water, eggs, salt), grated cheese 6% (cheese - milk, salt, potato starch)	25-juil-11
1363	Lasagne bolognese	Bolognese sauce 50% (pork meat 48%, tomato concentrate, onion, water, wheat flour, modified starch, carrot, salt, herbs, spices, natural aroma. Béchamel sauce 32% (water, cheese 13%, skimmed milk powder, butter, vegetable oils (palm, rapeseed), milk proteins, wheat flour, modified starch, salt, lactose, natural aroma, mono and di-glycerides of fatty acids, citric acid	25-juil-11
1364	Preparé	Pork meat 55%, beef 16%, sauce (water, oil, starch, egg yolk, vinegar, salt, mustard, herbs and spices, Worcester sauce, sugar, lactic acid, citric acid, aroma, onion, carminic acid, paprika extract, Na benzoate, K sorbate, guar flour, xanthan gum	25-juil-11
1365	Poolbread with salmon	Bread (wheat flour, ray flour, sugar, vegetable oils, salt E471, 472e, 503i, 330, smoked salmon (salmon, salt, smoke), cheese (pasteurised milk, salt, milk proteins), salad, tomato, rocket)	25-juil-11
1366	Pizza margherita	Wheat flour, water, cheese, ham (pork meat, water, milk proteins, aroma, salt, antioxidants - Na citrate, Na ascorbate, ascorbic acid, stabilizers - triphosphates, preservatives - Na nitrate, Na citrate, herbs), tomato concentrate, champignons, tomatoes 4%, onion, vegetable oil, modified starch, salt, yeast, sugar, spices and herbs, wheat starch, garlic	25-juil-11
1337	Girasoli with tomatoes and mozzarella	Pasta (semolina, eggs, water, salt, tomato powder), filling (mozzarella, ricotta (whey, CaCl2, cream), edam, dried tomatoes, grated chesses, salt	27-juil-11
1338	Original bun's bolognaise	Dough 48% (wheat flour, water, margarine, colour – β-carotene), eggs, oat flour, sugar, milk powder, yeast, salt, malt extract, fermented wheat flour), filling 52% (beef 21%, onion, tomato, melted emmental (emmental, cheese, milk protein butter, E452, E339, salt), tomato concentrate, cheese preparation (cheese, water, vegetable oils, milk proteins, modified starch, salt, b-carotene), mozzarella, carrot, meat proteins, modified starch, meat stock (salt, yeast extract, starch, matodextrin, vegetable fats, aroma, meat extract, caramelised sugar, onion, curcuma, mace, pepper, lemon juice, onion extract, dextrose, salt, sugar, E461, meat stock (beef meat, yeast extract, matodextrin, glucose, salt, beef aroma, sugar, vegetable fats, paprika powder, yeast extract, garlic, basil, margarine, aroma of smoked pork meat, cayenne pepper, oregano, pepper extract	27-juil-11
1339	Meat balls with tomato sauce and potato puree	Pork meat, beef meat, spices, onion, bread crumbs, lactose, dextrose, citric acid, sauce (tomatoes, vegetable oil, salt, sugar, onion, pepper, garlic, thyme, water, onion, Neapolitan sauce (tomatoes, onion, salt, sugar, potato starch, sunflower oil, yeast extract, garlic, sugar, thyme, aroma, paprika extract, pepper, bay), pepper, garlic, salt), puree (water, potatoes, milk,; eggs, Muscat nut, salt, pepper)	27-juil-11
1340	La mergerita	Wheat flour, tomato puree 25%, water, mozzarella 20%, salt, vegetable oil, olive oil, modified starch, yeast, oregano, basil	27-juil-11
1341	Ratatouille	Tomatoes, sauce (water, pealed tomatoes, herbs - tomato powder, garlic, salt, sugar, modified starch), guar gum, palm and sunflower oil, citric acid, spices extract, colour - paprika extract, olive oil, tomato concentrate, garlic, aubergine, zucchini, red paprika, onion, basil	27-juil-11
1342	Lasagne bolognese	Bolognese sauce 52,8% (water, tomato puree, beef meat 15,8%, tomato concentrate, modified starch, onion, wheat proteins, salt, sugar, beef fat, lactose, milk proteins, basil, garlic, wheat flour, rosemary, natural pepper aroma, bay, thyme, Provencal herbs, oregano, coriander), pasta 24,2% (semolina, water, egg white), béchamel	27-juil-11

		sauce 20,5% (water, lactose and milk proteins, rapeseed oil, wheat flour, salt, natural Muscat aroma), upper layer 2,5% (water, palm oil, milk proteins, potato starch, salt, colour –β-carotene, natural aroma	
1343	Pizza mozzarella	Wheat flour, water, tomato puree 12%, edam 9,2%, cherry tomatoes 6,6%, mozzarella, vegetable oil, salt, basil, lactose, yeast, corn starch, olive oil, eggs, guar gum, methyl cellulose, ester of mono and diacethyltartric of mono and di-glycerides of fatty acid, mono and di-glycerides of fatty acids, dextrose, sugar, parsley, spinach, modified starch, garlic, vegetable oil, oregano, whey protein isolate, barley extract, soya proteins, cayenne pepper, skimmed milk, glucose syrup, hydrogen carbonate of Na, orthophosphate of Ca and di-Na diphosphates, caramel, paprika, aroma	27-juil-11
1346	Ravioli with beef meat	Ravioli 30,4% (semolina, water, eggs, beef, bread crumbs vegetable stock (water, salt, lactose, sugar, onion, celery, yeast extract t, rice flour), vegetables (carrot, spinach, celery, onion, garlic), tomato pulp, spices, salt, sunflower oil, tomato pieces 19,5% (peeled tomatoes, tomato juice, citric acid), tomatoes 14,2%, water, zucchini 11,3%, onion, tomato puree, modified starch, basil, vegetable oil, sugar, garlic, natural aroma, salt, white wine extract	27-juil-11
1347	Tagliatelle bolognese	Boiled Tagliatelle 37% (water, semolina, egg), water, minced meat, concentrated tomato puree, tomato pieces (tomatoes, tomato juice, salt E509), onion, modified starch, sugar, stock of beef (aroma, salt, lactose, vegetable oil, E551, matodextrin), vegetable oil, salt, oregano, basil, garlic extract, pepper	27-juil-11
1348	Meat balls with tomato sauce and puree	Potato puree (potatoes, water, vegetable oil, egg yolk, skimmed milk powder, salt, pepper), tomato sauce 39% (water, tomato puree, tomatoes, onion, vegetable oil, wheat flour, corn starch, vegetable stock (salt, yeast, sugar, vegetable oil, natural meat aroma, natural vegetable aroma, mushroom extract, vegetable extract (leach, carrot, celery, onion, mushrooms), Muscat nut, lemon juice, salt, sugar, celery salt, cayenne pepper, meat balls 18% (pork meat, beef meat, bread crumbs, salt, pepper, Muscat nut, champignons	27-juil-11
1349	Pizza with bacon and goat cheese	61% garniture (tomato sauce (tomato puree, water, wheat flour, salt, olive oil, spices, herbs, onion powder, garlic powder, salt), smoked bacon 31% (bacon, water, salt, lactose, dextrose, E451, glucose syrup, smoke aroma, Na arythrobate, Na nitrite) emmental 15%, goat cheese 14%, basil, oregano	27-juil-11
1350	Shrimps with tomato sauce and noodles	Noodles 38% (semolina, egg, potato), tomatoes 29%, shrimps 18%, paprika, water, onion, modified starch, salt, herbs, spices, citric acid, sugar, fish extract, matodextrin, vegetable extract, palm oil, yeast extract	27-juil-11
		Soups	
0804	Cup soup tomatoes cream	Tomatoes 29%, potato starch, sugar, salt, lactose, matodextrin, yeast extract, vegetable oil, milk proteins, wheat flour, basil, onion, red beet, lavas, oregano, parsley, dextrose	9-mai-11
0809	Soup tomato veloute	Tomatoes 76%, wheat flour, water, rapeseed oil, modified starch, milk powder, sugar, salt, butter, onion powder, citric acid, potato powder	9-mai-11
0800	Tomato soup	Tomatoes 70%, skimmed milk, water, wheat flour, vegetable oil, salt, sugar, onion powder, yeast extract, E621, spices, aromas	9-mai-11
0801	Tomato soup with meat balls	Tomatoes 47%, water, skimmed milk, meat balls 9,2% (horse meat, pork meat, starch, salt, onion, modified starch, vegetable oil, sugar, E621, yeast extract, citric acid, spices, herbs, aromas	9-mai-11
0806	Soup legume du soleil	Vegetables 64% (tomatoes, carrots, zucchini, onion, celeriac, red and yellow paprika, leach, beans, aubergine), water, olive oil, sugar, salt, modified starch, aromas, garlic powder, K ascorbate	9-mai-11
0805	Cup soup tomatoes	Tomato 43%, glucose syrup, potato flakes, KCl, NaCl, carrot, vegetable oil, salt, chicken fat, parsley, colour -	9-mai-11

		riboflavin, b-carotene, red beet, E621, E627, E631, aroma, milk proteins, E340, E471, onion extract, extract of spices, sugar, celery extract, wheat flour, anti-agglomerate agent (silicium dioxide)	
0808	Cup soup tomatoes w croutons	Tomatoes 23%, potato starch, glucose syrup, croutons (wheat flour, palm oil, salt, yeast), salt, vegetable oils (palm and rapeseed), whey proteins, monosodium glutamate, sugar, yeast extract, wheat flour, vegetables (onion, red beet), milk proteins, herbs (parsley, basil), Na acetate, dipotasium orthophosphate, aromas, garlic, curcuma, mono and di-glycerides of fatty acids, celery extract	9-mai-11
0798	Tomato, red beet and herbs cold soup	Tomato 27%, red beet 23%, cucumber 5%, red paprika 5%, cream, onion, vinegar, olive oil, lemon juice, salt, garlic, herbs, white pepper	9-mai-11
0799	Gazpacho	Tomato, paprika, cucumber, onion, olive oil, vinegar, salt, garlic, lemon juice	9-mai-11
0803	Soup grootmoeders wijze	Water, vegetables tomatoes, carrot, celery, onion, paprika, leach), meat balls (pork, water, beef, modified starch, herbs, salt), modified starch, potato starch, salt, aroma, carvel, chicken fat, garlic, basil, yeast extract, matodextrin, white pepper	9-mai-11
0802	Tomato soup with meat balls	Tomatoes 49%, water, meat balls (pork, water, beef, potato starch, herbs, salt, aroma, cream, modified starch, potato starch, skimmed milk, onion, salt, sugar, vegetable oil, vitamin (C, B6, B9), E334, aroma, bay, spices	9-mai-11
0807	Minestrone in pieces	Water, vegetables (tomatoes, carrots, leak, celery, green pea, red pea), potatoes, pasta rigati (wheat flour, egg white), modified starch, salt, olive oil, yeast extract, skimmed milk, extracts of pepper, bay and thyme, aroma, cayenne pepper	9-mai-11
		Sugar and confectionary	
0858	Cherry, cranberry and raspberry, jam	Fruits (cherries 50%, cranberries 30%, raspberries 20%), sugar, amidated pectin, concentrated lemon juice	9-mai-11
0856	Peach and passion fruit jam	Peach 35%, passion fruit 15%, sugar, glucose-fructose syrup, pectin, citric acid, ascorbic acid	9-mai-11
0857	Peach jam	Peach, sugar, glucose-fructose syrup, pectin, citric acid, ascorbic acid	9-mai-11
0816	Candied mango	Glucose syrup, sugar, 7,5% mango pulp, , gelatine, passion fruit juice 5,5%, citric acid, lactic acid, milk powder, pectin, natural aromas, whey powder, lactose, concentrated elderberry juice, white bee wax	9-mai-11
		Fruits	
0817	Apricot, dried	Apricots	9-mai-11
0860	Apple compote with mango and passion fruit	Apple, mango, sugar, passion fruit, citric acid, aroma, acid ascorbic	9-mai-11
1147	Grapefruit, fresh	Grapefruit	29-juin-11
1148	Persimmon, fresh	Persimmon	29-juin-11
1149	Apricot, fresh	Apricots	29-juin-11
1150	Papaya, fresh	Papaya	29-juin-11
1153	Nectarines, fresh	Nectarines	29-juin-11

1158	Mango, fresh	Mango	29-juin-11
1159	Apricot, fresh	Apricot	29-juin-11
1160	Melon, fresh	Melon	29-juin-11
		Vegetables	
1151	Tomatoes roma	Tomatoes roma	29-juin-11
1152	Red paprika	Red paprika	29-juin-11
1154	Tomatoes snack, NL	Tomatoes snack (shaker)	29-juin-11
1155	Tomatoes kumato	Tomatoes kumato	29-juin-11
1156	Hot pepper mix	Hot pepper mix	29-juin-11
1157	Tomatoes	"Tros" tomatoes	29-juin-11
1161	Asparagus	Asparagus	29-juin-11
0829	Whole tomatoes in sauce	Whole tomatoes 60%, tomato juice, citric acid	9-mai-11
0837	Tomato concentrate	Tomato, salt	9-mai-11
0833	Passata di pomodoro con basilico	Tomatoes, basil, salt	9-mai-11
0823	Double concentrated tomatoes	Tomatoes, salt	9-mai-11
0835	Tomato frito	Tomatoes, vegetable oil (backed with onion and garlic), sugar, salt, modified starch	9-mai-11
0841	Peeled tomatoes concasse	Tomato pulp, concentrated tomato juice	9-mai-11
0839	Tomato flesh	Tomato cubes, tomato juice, citric acid	9-mai-11
0838	Dried tomatoes in oil	Dried tomatoes, sunflower oil, peppers, capers, wine vinegar, salt, herbs, spices, flavours, citric cid, ascorbic acid	9-mai-11
0836	Tomato puree	Tomatoes, salt	9-mai-11
		Non-alcoholic beverages	
0767	Apple mango	Apple juice 85%, mango puree 15%, vitamin C	9-mai-11
0765	Pink grapefruit	Pink grapefruit juice from concentrate	9-mai-11
0756	Mango	25% mango puree, apple juice, banana puree, grape juice, orange juice and passion fruit juice	9-mai-11
0755	Mango and passion fruit smoothie	Apple juice, apple puree, banana puree, mango puree, peach puree, orange juice, passion fruit juice	9-mai-11
0770	Grapefruit	Pink grapefruit juice from concentrate	9-mai-11

0769	Blood orange from concentrate	Blood orange juice from concentrate 60%, grape juice from concentrate, aronia juice from concentrate, juice from violet carrots from concentrate, blue berry juice from concentrate	9-mai-11
0759	Mango, orange and carambola	Fruit juice from concentrate (apple, white grape, orange, mango, acerola, lemon, carambola), natural aromas	9-mai-11
0766	Essential multivitamin	Fruit juice and puree (orange, apple, grape, pineapple, passion fruit, apricot, banana, mango, peach, guava, pear, lemon), vitamins C, E, B6, B2, B1 and provitamin A	9-mai-11
0768	Blood orange juice	Blood orange juice	9-mai-11
0764	Blood orange	Blood orange juice	9-mai-11
0760	Peach, happy day	Peach puree, water, sugar, citric acid, vitamin C	9-mai-11
0761	Passion fruit, happy day	Water, passion fruit juice from concentrate, sugar, pectin, vitamin C	9-mai-11
0783	Tropical	Water, fruit juices from concentrate (orange, guava, apricot, mango, passion fruit, sugar	9-mai-11
0758	Tomato juice	Tomato juice from concentrate	9-mai-11
0763	Tomato juice	Tomato juice, salt	9-mai-11
0757	Grapefruit juice	Pink grapefruit juice from concentrate, water, sugar, pulp from grapefruit,	9-mai-11
0784	Vegetables	Tomato juice 86%, vegetable juice 13% (carrots, celery, red beet, lettuce, cress, spinach), salt, spices extract	9-mai-11
0771	Passion fruit, dilutable Concentrate	Sugar, fruit juice from concentrate, glucose-fructose syrup, water, colour - luteine and paprika extracts, aroma	9-mai-11
0762	Pink grapefruit	Pink grapefruit juice	9-mai-11
		Cereal and cereal products	
0864	Chips with tomato ketchup taste	Potato, sunflower oil (33%), tomato ketchup flavour (sugar, flavouring, tomato powder), KCl, citric acid, paprika extract, salt	9-mai-11
0861	Tortilla chips, taco	Corn flour 72%, palm oil, taco aroma (salt, wheat flour, lactose, spices, sugar, yeast extract, tomato powder, aromas, dried garlic, dried onion)	9-mai-11
0862	Popped chips, Provencal taste	Potato 83%, sunflower oil, Mediterranean herbs (dextrose, whey powder, salt, onion powder, tomato powder, herbs (basil, thyme, oregano, yeast extract, dried vegetables, flavouring	9-mai-11
0865	Peppies bacon, popped chips	Wheat flour, potato starch, vegetable oil, salt, paprika powder, tomato powder, sweet whey powder, spices, flavouring, smoke flavouring, monosodium glutamate, colour-carminic acid, ammonia caramel, vegetable carbon	9-mai-11
0863	Oven baked chips with barbecue taste	Potato flakes 65%, starch, sunflower oil, BBQ flavour (sugar, rusk (wheat), monosodium glutamate, dextrose, flavouring, paprika powder, onion powder, tomato powder, garlic powder, parsley, citric acid, malic acid, smoke flavouring, sugar, soy lecithin, dextrose, salt, colour-curcuma	9-mai-11
		Cakes	
0815	Italian herbs	Wheat flour, tomato puree (glucose-fructose syrups, glycerol), dextrose, bread crumbs (wheat flour, yeast), concentrated tomato paste, pectin, lactic acid, Na citrate, citric acid), ammonium carbonate, Na carbonate, di-	9-mai-11

		Na diphosphates, gluten, salt, food fibbers, herbs (thyme, basil, parsley, oregano, chervil), leach, dextrose, calcium phosphate, natural herbs aroma, natural aroma	
		Sugar and confectionary	
0820	Strawberry cables	Sugar, glucose-fructose syrup, wheat flour, malic acid, citric acid, dextrose, vegetable oil, aroma, ascorbic acid E306, extract (apple, pumpkin, radish, tomato)	9-mai-11
0819	Strawberry mats	Sugar, glucose-fructose syrup, wheat flour, malic acid, citric acid, dextrose, vegetable oil, aroma, ascorbic acid E306, extract (apple, pumpkin, radish, tomato)	9-mai-11
0818	Strawberry laces	Sugar, glucose-fructose syrup, wheat flour, malic acid, citric acid, dextrose, vegetable oil, aroma, ascorbic acid E306, extract (apple, pumpkin, radish, tomato)	9-mai-11
		Dairy products	
0782	Ham taste	Water, cheese, butter, ham 7,5% (ham, salt, dextrose, glucose-syrup, aromas), stock (water, spices, aroma), E316, E301, E250, E508, whey proteins, salt, Na polyphosphate, and phosphates, citric acid, milk proteins, natural aromas, monosodium glutamate, concentrated tomato puree, salt	9-mai-11
0779	Tomatoes and herbs	Cream 57%, whole milk, tomato concentrate, lactic bacteria, salt, skimmed milk powder, onion, herbs, carrageenan, carob flour, white pepper, paprika powder, sorbate de K	9-mai-11
0776	Tomatoes and basil, for salad	Pasteurized milk and cream, tomato 3%, lactic ferments, salt 1,1%, stabilizers E1442, basil 0,4%, chives, preservative potassium sorbate	9-mai-11
0774	Toscana, melted cheese	Cheese, water, butter, milk proteins, skimmed milk power, tomatoes, mozzarella, basil, salt, onion, saccharose, garlic, aroma, pepper, E452, E331, E450, E339, E330, natural aroma of garlic and other aroma, salt, E407, E410, E202, E234, , smoke aroma, monosodium glutamate	9-mai-11
0773	Original, melted cheese	Water, cheese, tomato concentrate, water, sugar, salt, onion, garlic, aroma, monosodium glutamate	9-mai-11
0777	Mango taste	Yoghurt, sugar, fruits (peach and mango), arabic gum, modified starch, corn starch, pectin, malic acid, citric acid, aroma, colour- paprika extract	9-mai-11
0775	Mango, vitalinea	Yoghurt, mango, polydextrose, pectin, modified starch, gum guar, colour - b-carotene, citric acid, Ca citrate, aspartame, sucralose, acesulfame K, aroma, Vitamin D	9-mai-11
0780	Mango apricot	Whole milk, sugar, apricot, cream, mango puree, apricot puree, modified starch, aroma, carrageen, tri-Na citrate, colour -β carotene	9-mai-11
0781	cheese with peach taste	Cheese, milk, cream, peach, glucose-fructose syrup, sugar, milk proteins, modified starch, guar gum, gelatine, Ca citrate, citric acid, aroma, colour - paprika extract, luteine	9-mai-11
0778	mango	Yoghurt, mango, sugar, modified starch, pectin, guar gum, aroma, Na citrate, ca phosphate, citric acid, colour - paprika extract	9-mai-11
		Fats	
0772	Barbecue	Butter, honey, paprika, tomato, salt, buttermilk, parsley, onion, garlic, spices, vinegar, natural aromas, matodextrin, citric acid, sugar, smoke	9-mai-11

Annexe 5: Samples purchased at supermarket 5

#	Description	Ingredients	Purchase date
		Condiments and sauces	
0891	Salsa dip medium	Pealed tomatoes in slices (58%) onion 10%, water, sugar, wine vinegar, modified corn starch, jalapeno pepper 2,4%, green pepper 2,2%, red pepper 2%, salt, aroma (with gluten and celery), garlic 0,5%, antioxidants-ascorbic acid, spices, concentrated lemon juice, colorant - paprika extract	9-mai-11
0889	Sweet sour sauce	Water, vegetables in slices 23% (celery, paprika, onion, carrots, bamboo shoots), sugar, pineapple slices, vinegar, tomato concentrate, concentrated lemon juice, concentrated pineapple juice, modified corn starch, iodated salt (salt, potassium iodide), spices, spices extracts, acetic acid, xanthan gum, guar gum flour, Na saccharinate	9-mai-11
0879	Stroganoffsauce	Water, vegetables (paprika, mushrooms, tomato puree, carrots, garlic), sugar, cream (skimmed milk, 42% cream (47% fat), modified starch, stabilisers: Na citrate/ carboxymethylcellulose / carrageenan, emulsifiers: mono- and di-glycerides of fatty acids, rapeseed oil, onion, beef stock (glucose, yeast extracts, salt, aroma, beef fat), salt spices and herbs, vinegar, aroma (contains milk), acids: lactic acid, preservatives: sodium benzoate/potassium ascorbate, thickening agents: carob & guar gum, carrageenan)	9-mai-11
0887	Salsa di pomodoro	Minces tomatoes (85%, onion 6%, carrots 5%, vegetable oil, sugar, salt, modified corn starch	9-mai-11
0888	Sugo di pomodori con basilico	Minced tomatoes 79%, tomato concentrate, olive oil 2%, onion, basil 2%, modified corn starch, sugar, salt, garlic, natural aromas	9-mai-11
0890	Fajita sauce, spicy	Tomatoes 34%; water, onion 11,7%, red paprika 7,8%, green paprika 7,8%, tomatoes puree 5,8%, aromas (contains gluten), vinegar, salt, sugar, rice modified starch, concentrated lemon juice, antioxidant E300	9-mai-11
0886	Ketchup with herbs	Tomato juice, sugar, vinegar, tomato puree, salt, herbs, modified starch, guar gum, carob gum, citric acid, Na glutamate	9-mai-11
0883	Tomatoes ketchup	Tomato puree 70%, sugar, vinegar, salt, spices	9-mai-11
0894	Cocktail sauce	Vegetable oil, ketchup (water, tomatoes concentrate, sugar, vinegar, salt, modified starch, herbs and spices), sugar, egg yolk, mustard (water, mustard seeds, salt, vinegar, sugar, curcuma); whisky, salt, lactic acid, water, English sauce (water, glucose syrup, vinegar, salt, sugar, soya sauce,(water, soybeans, wheat, salt) aromas, onion extract, garlic extract, anchovies pasta, lemon concentrate, spices, sunflower oil), thickening agents guar gum, xanthan gum, NaOH, colour: paprika extract, antioxidant, Ca diNa EDTA	9-mai-11
0893	Andalouse sauce	Vegetable oil, tomato concentrate, water, egg yolk, mustard (water, mustard seeds, salt, vinegar, sugar, curcuma), vinegar, herbs and spices (paprika, pepper, curry, cumin, parsley, ginger, cayenne paper), onion, lactic acid, colour: sulfite ammonia caramel, NaOH, rosemary extract	9-mai-11
		Fish products	
0878	Mackerel fillets in tomato sauce	Mackerel fillets 64%, water, tomatoes puree 11,5%, sugar, vinegar, spices, salt	9-mai-11
0877	Herring filets in pepper sauce	Herring filets 60%, water, tomato puree, vegetable oil, red and green papers, vinegar, sugar, spices, salt, modified starch, guar gum, seasoning (water, hydrolysed plant proteins with soya, milk proteins, flavouring	9-mai-11

		Vegetables	
0892	Dried tomatoes in oil	Dried tomatoes 45%, sunflower oil 45%, olive oil 5%, capers, garlic, spices, wine vinegar, sugar, salt, lactic acid, ascorbic acid sulfur dioxide	9-mai-11
1162	Tomato	"vlees" tomato	29-juin-11
1166	red cabbage with apple, canned	Red cabbage 70%, sugar, apple pieces 5%, vinegar, salt, modified corn starch, natural aroma	29-juin-11
0880	Tomato puree	Tomatoes 99.5%, salt	9-mai-11
0882	Polpa di pomodoro	Peeled tomatoes 60%, tomato juice 39,6%, citric acid	9-mai-11
0885	Chopped tomatoes with onion and garlic	Peeled chopped tomatoes 63%, tomato juice 33,55%, onion 2%, sugar, salt, garlic flavouring, onion flavouring	9-mai-11
0884	Sugo pronto con basil fresco	Tomatoes 93,6%; tomato puree, onions, salt, sugar, basil (0,6%)	9-mai-11
0881	Tomato concentrate	Tomatoes 99,5%, salt	9-mai-11
		Miscellaneous	
0895	Cassoulet with tomato sauce	Water, lard, tomato concentrate, wheat flour, salt, sugar, gum guar, aromas (celery and mustard), taste enhancers (Na glutamate). Boiled white beans (33%), smoked sausages (pork head meat, water, lard, turkey meat, pork meat, wheat flour, salt, pea fibbers', soy proteins, pork rind, thickening agent E470a, milk proteins, salted pork shoulder (salt, water), preservative E250, E316, stabilizers di- and tri- phosphates	9-mai-11
0896	Couscous royal with chicken and beef	Stock: water, tomato concentrate, salt, spices and aromas (celery), thickening agents flour of carob gum and guar gum, vegetables carrots, zucchini, chickpea, onion, paprika, chicken, beef prepare in salt (water, lactose, salt, stabilizers E451)	9-mai-11
0897	Ravioli Bolognese	Sauce 70,5%: water, pork, beef, tomato puree, vegetables (onion, carrot, celery) white wine, salt, extra virgin olive oil, spices, corn flour, sugar, flavouring. Ravioli 29,4% (pasta 20%: durum wheat, water, egg white, filling 9,4%: beef, breadcrumbs, vegetables (carrot, onion) salt	9-mai-11
		Non-alcoholic beverages	
0876	Smoothie mango-maracuja	Apple juice, banana puree, mango puree 19,2%, orange juice, orange cells, passion fruit juice 7,2%	9-mai-11
0874	Apple, prickly pear and lime juicy drink	Water, apple juice 35,9% from concentrate, glucose-fructose syrup, apple puree 3,8%, sugar, juice if pricky pear 1,3% from concentrate lime juice 1% from concentrate, aroma, citric acid, ascorbic acid, colour: curcuma and copper complexes of chlorophylls	9-mai-11
0875	Carbonated soft drink with bloody orange pulp	Water, juice based on concentrates 12% (blood oranges 6%; orange, lemon, grapefruit, mandarin) sugar, orange pulp 2%, aromas, Na benzoate	9-mai-11
1165	Fruit juice with whey and vitamin C	Whey product, fruit juice from concentrate (orange, apple, lemon, pineapple, grapefruit, passion fruit), sugared whey product, fructose from apple, orange, peach, apricots, bananas and guava purée, pectin, natural aroma, citric acid, vitamin C, niacin, vitamin E, pantothenic acid, provitamin A, B6, folic acid, biotin, B12, aspartame and acesulfame K	29-juin-11

		Fruits	
1163	Water melon, fresh fruit	Water melon	29-juin-11
1164	Mango, fresh fruit	Mango	29-juin-11
		Cereal and cereal products	
0867	Salted biscuits with pizza taste	Wheat flour, cheese 16%, vegetable oil (palm oil, coconut oil, rapeseed oil, salt, emulsifier mono-and di-glycerides of fatty acids; lactic acid, flavourings), glucose syrup, flavouring, breadcrumbs (wheat flour, salt, yeast, colour - annatto), modified potato starch, herbs 1,3%, salt, vegetable powder 0,9% onion powder and garlic powder, milk proteins, colours paprika extract, annatto, antioxidants: tocopherol, dextrose)	9-mai-11
0871	Snack-hits (coated peanut)	Containing tomatoes powder	9-mai-11
0868	Salted biscuits with tomato and basil taste	Wheat flour, vegetable oil (palm, coconut, rapeseed, salt, emulsifier mono and di-glycerides of fatty acids, lactic acid, flavourings, cheese 5%, salt, tomatoes concentrate 1,7%, flavouring, sun dried tomatoes 1,1%, breadcrumbs (wheat flour, salt, yeast, colour annatto), basil 1%, modified potato starch, yeast, herbs (parsley, basil); olive oil, emulsifiers: mono and di-glycerides of fatty acids; thickening agent: hydroxy propyl distarch phosphate, sugar, colours paprika extract, annatto, citric acid, antioxidants: tocopherol	9-mai-11
0873	Salted biscuits with barbecue taste	Potatoes 58%, vegetable oil, aromas (with herbs, taste enhancer E621, cheese powder, tomatoes powder E330, soya, wheat), salt 1,6%	9-mai-11
0870	Mama mia's, cheese and paprika flavour	Potato powder, potato flakes, sunflower oil 22%, cheese and paprika taste (aroma - cheese, paprika powder, dextrose, whey powder, monosodium glutamate, citric acid, salt	9-mai-11
0869	Cereals red fruits bar	Rice and wheat flakes, sugar, wheat gluten, skimmed milk powder, salt, wheat germs, barley, glucose-fructose syrups, milk chocolate (sugar, cacao mass, cacao butter, whole milk powder, soya lecithin, vanilla), druid fruits with strawberry taste (sugar, cranberry 2,6%, citric acid, natural strawberry aroma, elderberry juice concentrate) coco fat, glycerol, fructose, sugar, dextrose, citric acid, vitamins C, B3, B6, B2, B1, folic acid, B12; mono and di-glycerides of fatty acids	9-mai-11
		Sugar and confectionary	
0872	Candies “mats and lancets” with strawberry taste	Sugar, glucose/fructose syrup, wheat flour, malic acid, citric acid, dextrose, vegetable oil, aroma, antioxidants: ascorbic acid, D-tocopherol, fruit extracts (apple, pumpkin, tomato, radish)	9-mai-11

Annexe 6: Samples purchased in restaurants

#	Description	Ingredients	Purchase date
Restaurant 1	Pizza		2-aug-11
Restaurant 1	Spaghetti tomato and basilic		2-aug-11
Restaurant 1	Spachetti salciccia		2-aug-11
Restaurant 1	Lasagne bolognaise		2-aug-11
Restaurant 2	Tagliatelle sicilie		3-aug-11
Restaurant 2	Tagliatelle bolognaise		3-aug-11
Restaurant 2	Lasagne bolognaise		3-aug-11
Restaurant 3	Penne tomato		3-aug-11
Restaurant 3	Penne mozzarella tomatoes		3-aug-11
Restaurant 3	Salade (tomato, mozzarella, roquet)		3-aug-11