Opinion on the re-evaluation of acacia gum (e 414) as a food additive in foods for infants below 16 weeks of age and the follow-up of its re-evaluation as a food additive for uses in foods for all population groups

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Opinion on the re-evaluation of acacia gum (E 414) as a food additive in foods for infants below 16 weeks of age and the follow-up of its re-evaluation as a food additive for uses in foods for all population groups

EFSA Panel on Food Additives and Flavourings (FAF),
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Abstract

EFSA is re-evaluating the safety of food additives already permitted in the Union before 20 January 2009 and issuing scientific opinions on their safety in line with Regulation (EC) No 1333/2008. Acacia gum (E 414) was re-evaluated in 2017 by the former EFSA Panel on Food Additives and Nutrient sources added to Food (ANS). As follow-up to this assessment, the Panel on Food Additives and Flavourings (FAF) was requested to assess the safety of acacia gum (E 414) as carry-over in food for infants below 16 weeks of age belonging to food categories 13.1.1 (Infant formulae) and 13.1.5.1 (Dietary foods for infants for special medical purposes and special formulae for infants) and to address the issues already identified during the re-evaluation of the food additive when used in food for the general population. The process involved the publication of a call for data to allow the interested parties to provide the requested information to complete the risk assessment. Based on the analytical data submitted in response to this call, the Panel recommended to lower the limits in the specifications for toxic elements and identified the need for further specifications for aluminium, microbiological criteria and protein residues. The Panel noted that information was not provided for oxidising enzymes and recommended that oxidases and peroxidases should be inactivated during the manufacturing process. The interested parties did not submit toxicological, clinical and post-marketing surveillance data specific for the assessment of the safety of acacia gum (E 414) in infants below 16 weeks of age. However, taking the highest doses tested without adverse effects from the subchronic studies available from the previous re-evaluation and comparing them with the estimated exposure in infants, the margins of safety were large indicating that there is no reason for health concern.

Keywords: Acacia gum, E 414, food additive, infants

Requestor: European Commission

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Summary

In accordance with Regulation (EU) No 257/2010, the European Food Safety Authority (EFSA) is currently re-evaluating the safety of food additives already permitted in the Union before 20 January 2009 and issuing scientific opinions on their safety when used in food as per Annexes II and III to Regulation (EC) No 1333/2008. The risk assessment approach followed in the re-evaluation has not covered the use of food additives in food for infants below 12 weeks of age. Additionally, while re-evaluating the safety of food additives referred to above, EFSA identified some concerns, namely (1) data gaps that have triggered recommendations in the published scientific opinions; and/or; (2) data gaps that have increased uncertainties linked to the risk assessment and/or which prevented the Panel from concluding on some aspects of it.

On 31 May 2017, EFSA published a guidance on the risk assessment of substances present in food intended for infants below 16 weeks of age, thus enabling EFSA to assess the safety of food additive used in food for infants below this age. The age up to 16 weeks was selected in the guidance because infants are exposed to formula feeding until this age as the only source of food since complementary feeding is not supposed to be introduced before.

As follow-up, this Opinion addresses the data gaps previously identified during the re-evaluation of acacia gum (E 414) as a food additive in 2017 by the former EFSA Panel on Food Additives and Nutrient sources added to Food (ANS) and the safety in the special subpopulation of infants below 16 weeks of age.

The process followed involved the publication of a dedicated call for data allowing all interested parties to provide the requested information for completing the assessment and to confirm that the additive is present as carry-over in food categories 13.1.1 (Infant formulae) and 13.1.5.1 (Dietary foods for infants for special medical purposes and special formulae for infants). The data submitted in response to the call for data on acacia gum (E 414) comprised technical information and literature studies i.e. clinical studies on gastrointestinal effects in adults.

Acacia gum (E 414) is a dried exudate obtained from the stems and branches of natural strains of *Acacia senegal* (L.) Willdenow or closely related species. Specifications for acacia gum (E 414) have been defined in Commission Regulation (EU) No 231/2012. According to the submitter, the limits defined in the EU specification reflect the lowest technologically achievable levels for lead, mercury, cadmium and arsenic. The Panel, however, noted that the submitted data by the interested parties allow to lower the limits in the specifications for toxic elements and also identified the need for further specifications for aluminium, microbiological criteria and protein residues. The Panel further noted that no information was provided for oxidising enzymes. The Panel recommended that during the manufacturing process the oxidases and peroxidases present in acacia gum should be inactivated by heating to prevent the possible oxidative degradation of components in preparations to which acacia gum is added.

Information on particular specification requirements for identity and the purity of acacia gum (E 414) to be used in the food categories FC 13.1.1 and 13.1.5.1 (e.g. content residual proteins and enzymes, toxic elements) have been requested but were not provided. Analytical data on impurities in the final foods for infants below 16 weeks of age, when no legal limit has been established, were requested but were not provided. Analytical data on toxic elements in final infant formulae were not provided by the interested party. Therefore, the Panel considered that the manufacturers have no particular specifications requirements for the additive for the use in infant formulae.

According to Regulation (EC) No 1333/2008 (Annex III, part 5, section B), acacia gum (E 414) is authorised for use as a food additive in nutrient preparations intended to be used in foodstuffs for infants and young children, including food for infants below 16 weeks of age. Dietary exposure to acacia gum (E 414) from its use as a food additive was assessed based on maximum permitted level (MPL) set out in the EU legislation. The interested party confirmed that that the level of use of acacia gum (E 414) in infant formulae is compliant with this limit. The exposure scenario is based on the consumption levels recommended in the relevant Scientific Committee Guidance to be used in risk assessment; 200 and 260 mL formula/kg body weight (bw) per day as conservative mean and high level consumption values for 14- to 27-day-old infants. For infants below 16 weeks of age consuming infant formulae (FC 13.1.1) or infant food for special medical purpose (FSMP) (FC 13.1.5.1), mean exposure to acacia gum (E 414) was estimated to be 2 mg/kg bw per day while the high level was estimated at 2.6 mg/kg bw per day. The Panel also noted that the exposure estimates are based on the maximum levels for carry-over of acacia gum (E 414) from nutrient formulations used in infant formulae into the final product.

The interested party did not submit toxicological and clinical data which can be used to assess the safety of the acacia gum in infants below the age of 16 weeks. In addition, post-marketing surveillance data were not provided. However, in this special situation, where the exposure is low and only due to the carry over, a margin of safety (MOS) approach can be applied using available data from adult animals. Taking the highest doses tested without adverse effects in subchronic studies of 5,000 mg acacia gum/kg bw per day in rat and 20,000 mg acacia gum/kg bw per day in mice from the former EFSA evaluation in 2017 and comparing them with the exposure in infants of 2.6 mg/kg bw per day (high level estimate), MOS are roughly 2,000 and 8,000. These large MOS indicate that there is no reason for health concern. It is further noted that the data available from the former EFSA evaluation in 2017 did not show genotoxicity. Additionally, cases of allergenicity were not identified in the literature and in the former assessment.

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1. Introduction

The present opinion deals with:

- the risk assessment of acacia gum (E 414) in food for infants below 16 weeks of age in the food categories (FC) 13.1.1 (Infant formulae as defined by Directive 2006/141/EC) and 13.1.5.1 (Dietary foods for infants for special medical purposes and special formulae for infants) according to uses in nutrient formulations authorised in section B of part 5 of Annex III to the Regulation (EC) No 1333/2008[1] on food additives.
- the follow-up on issues that have been expressed in the conclusions and recommendations of the Scientific Opinion on the re-evaluation of acacia gum (E 414) as a food additive (EFSA ANS Panel, 2017).

1.1. Background and Terms of Reference as provided by the requestor

1.1.1. Background

The composition of food intended for infants and young children, as defined by Regulation (EU) No 609/2013[2], is regulated at EU level and such rules include requirements concerning the use of substances as food additives.

The use of food additives is regulated by Regulation (EC) No 1333/2008 on food additives. Only food additives that are included in the Union list, in particular in Annex II and III to that Regulation, may be placed on the market and used in food under the conditions of use specified therein.

In accordance with Regulation (EU) No 257/2010[3], EFSA is currently re-evaluating the safety of food additives already permitted in the Union before 20 January 2009 and issuing scientific opinions on their safety when used in food as per Annexes II and III to Regulation (EC) No 1333/2008. However, the risk assessment approach followed until now has not covered the use of food additives in food for infants below 12 weeks of age.

In addition, in these opinions EFSA identified some concerns, namely (1) Data gaps that have triggered recommendations in the published scientific opinions; and/or; (2) Data gaps that have increased uncertainties linked to the risk assessment and/or which prevented the Panel from concluding on some aspects of it.

On 31 May 2017, EFSA published a guidance document (EFSA Scientific Committee, 2017) on the risk assessment of substances present in food intended for infants below 16 weeks of age (SCF, 1998), thus enabling EFSA to assess the safety of food additive used in food for infants below 12 weeks of age. EFSA has launched dedicated calls for data to be able to perform such risk assessments.

The EC considers it is more effective that EFSA, in the context of these dedicated calls for data, also addresses all the issues and data gaps already identified in the relevant published scientific opinions on the re-evaluation of the safety of food additives permitted in food category 13.1.

In accordance with the current EC approach (European Commission, online) for the follow-up of EFSA's scientific opinions on the re-evaluation of the safety of permitted food additives for which some concerns have been identified, a specific call for data would be published by the EC on DG SANTE's website[4] on food additives and additional (missing) information would then be provided by interested parties to the EC.

However, for those scientific opinions on the re-evaluation of the safety of permitted food additives in food category 13.1 for which the risk assessment does not address their uses in food for infants below 12 weeks of age and for which some concerns have been identified by EFSA, the EC considers that for the sake of efficiency it would be appropriate to streamline the approach as described above.

[1] Regulation (EC) No 1333/2008 of the European Parliament and of the Council of 16 December 2008 on food additives. OJ L 354, 31.12.2008, p. 16–33.

[2] Regulation (EU) No 609/2013 of the European Parliament and of the Council of 12 June 2013 on food intended for infants and young children, food for special medical purposes, and total diet replacement for weight control and repealing Council Directive 92/52/EEC, Commission Directives 96/8/EC, 1999/21/EC, 2006/125/EC and 2006/141/EC, Directive 2009/39/EC of the European Parliament and of the Council and Commission Regulations (EC) No 41/2009 and (EC) No 953/2009. OJ L 181, 29.6.2013, p. 35–56.

[3] Commission Regulation (EU) No 257/2010 of 25 March 2010 setting up a programme for the re-evaluation of approved food additives in accordance with Regulation (EC) No 1333/2008 of the European Parliament and of the Council on food additives. OJ L 80, 26.3.2010, p. 19–27.

[4] https://ec.europa.eu/food/safety/food_improvement_agents/additives/re-evaluation_en

Therefore, the EC requests EFSA to address all the issues and data gaps already identified in the relevant published scientific opinions of those food additives (or groups of additives that can be addressed simultaneously) as part of the upcoming work on the safety assessment of food additives uses in food for infants below 12 weeks of age.

This follow-up aims at completing the re-evaluation of the food additives in question for all food categories, and includes calls for data covering the actual use and usage levels of food additives in food for both infants below 16[5] weeks of age as well as for older infants, young children and other groups of the population for which EFSA has already finalised its assessment.

The future evaluations of EFSA should systematically address the safety of use of food additives for all age groups, including the infants below 16 weeks of age.

1.1.2. Terms of Reference

In accordance with Article 29(1)(a) of Regulation (EC) No 178/2002[6], and as part of EFSA's work in completing its risk assessments concerning the use of food additives in food for infants below 12 weeks of age,[5] covered by the re-evaluation programme and its terms of reference, the European Commission requests the European Food Safety Authority to address all the data gaps specified in the recommendations made in this scientific opinions on the re-evaluation of the safety of food additives permitted in food category 13.1 (food for infants and young children) of annex II to Regulation (EC) No 1333/2008.

1.1.3. Interpretation of Terms of Reference

The assessment will address the safety of acacia gum (E 414) in food intended for infants up to 16 weeks of age which are exposed to formula feeding until this age as the only source of food since complementary feeding is not supposed to be introduced before this age (see EFSA Scientific Committee, 2017).

1.2. Previous evaluations of acacia gum (E 414) for use in foods for infants

Acacia gum (E 414) was never formally evaluated by the EU Scientific Committee for Food (SCF). Nevertheless, acacia gum (E 414) was accepted for use in weaning food (SCF, 1991). In 1999, the SCF considered 'that the use of acacia gum/gum arabic in coatings for nutrient preparations containing trace elements is acceptable provided carry-over levels in infant formulae, follow-on formulae or FSMP[7] do not exceed 10 mg/kg' (SCF, 1999). In 1982 and 1990, the Joint FAO/WHO Expert Committee on Food Additives (JECFA) evaluated acacia gum; based on the lack of adverse effects in the available toxicity studies, an acceptable daily intake (ADI) 'not specified' was allocated (JECFA, 1982, 1990).

Acacia gum has also been reviewed by the Nordic Council of Ministers (TemaNord, 2002), who concluded that even though the existing data do not raise any toxicological concern, allergy/intolerance and the problem of marketing gums originating from acacia species not included in their evaluation should be considered in future evaluations.

1.3. Summary of the previous EFSA re-evaluation of acacia gum (E 414) for uses in food for all population groups except for infants below 12 weeks of age[8]

Under the frame of Regulation (EC) No 257/2010, the EFSA Panel on Food Additives and Nutrient Sources added to Food (ANS) has re-evaluated the safety of acacia gum (E 414) when used as a food additive (EFSA ANS Panel, 2017).

[5] According to the EFSA Scientific Committee Guidance (EFSA Scientific Committee, 2017) this opinion will include infants up to 16 weeks of age.

[6] Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety. OJ L 31, 1.2.2002, p. 1–24.

[7] Food for special medical purposes.

[8] According to the EFSA Scientific Committee Guidance (EFSA Scientific Committee, 2017), this opinion will include infants up to 16 weeks of age.

In its scientific opinion, the ANS Panel reviewed available technical, biological and toxicological data on acacia gum (E 414) used as a food additive. Having considered the data available, the ANS Panel concluded that acacia gum is unlikely to be absorbed intact and is slightly fermented by the intestinal microbiota. The fermentation of acacia gum would lead to products considered of no safety concern by the ANS Panel such as short-chain fatty acids (SCFA). Acacia gum is considered to have low acute oral toxicity. Adverse effects were not reported in subchronic and carcinogenicity studies at the highest dose tested with the highest doses tested being 5,000 mg acacia gum/kg body weight (bw) per day in rat and 20,000 mg acacia gum/kg bw per day in mice and there was no concern with respect to genotoxicity. In the available studies addressing developmental and reproductive toxicity, effects were not reported up to the highest tested doses. Case reports on allergic reactions after oral exposure to acacia gum were not identified by the ANS Panel. The oral intake for up to 18 days of large amounts of acacia gum (up to 30,000 mg acacia gum/person per day approximately equivalent to 430 mg acacia gum/kg bw per day) was well tolerated in adults. Some individuals experienced flatulence which was considered by the ANS Panel as undesirable but not adverse effect. No cases of allergenicity after oral exposure to acacia gum were identified. Overall, the ANS Panel concluded that a numerical ADI was not needed for acacia gum (E 414) and that there was no safety concern for the general population at the refined exposure assessment (EFSA ANS Panel, 2017).

The ANS Panel, however, considered that the conclusions reached on the re-evaluation of the food additive were not applicable to the use of acacia gum (E 414) in food for infants under the age of 12 weeks.[5] The ANS Panel considered that these uses would require a specific risk assessment.

In addition, recommendations for revisions of the specifications were included in the ANS opinion. In particular, the ANS Panel noted that the detected levels of the toxic elements (lead, cadmium, mercury and arsenic) were far below those defined in the European Commission specifications for acacia gum, and therefore, recommended that the current limits should be lowered in order to ensure that acacia gum (E 414) as a food additive will not be a significant source of exposure to those toxic elements, in particular for infants and children. The ANS Panel also recommended the inclusion of limits for aluminium in the specifications. Furthermore, the inclusion of criteria for total aerobic microbial count (TAMC) and total combined yeast and mould count (TYMC) as well as limits for residual enzymatic activities and for protein content was recommended. Finally, the ANS Panel recommended that the oxidases and peroxidases in acacia gum should be inactivated during the manufacturing process to avoid any oxidative degradation of components in preparations to which acacia gum is added.

2. Data and methodologies

2.1. Data

EFSA launched a public call for data[9] and, if relevant, contacted other risk assessment bodies to collect relevant information from interested parties.

The Panel based its assessment on information submitted to EFSA following the public call for data, information from previous evaluations and additional available literature up to 2 October 2019.

The Mintel's Global New Products Database (GNPD) is an online database which monitors new introductions of packaged goods in the market worldwide. It contains information of over 3 million food and beverage products of which more than 1,100,000 are or have been available on the European food market. Mintel started covering EU's food markets in 1996, currently having 20 out of its 28 member countries and Norway presented in the Mintel's GNPD. This database was used to verify the use of the food additive acacia gum (E 414) in food products.

2.2. Methodologies

This opinion was formulated following the principles described in the EFSA Guidance on transparency with regard to scientific aspects of risk assessment (EFSA Scientific Committee, 2009) and following the relevant existing guidance documents from the EFSA Scientific Committee and in particular the EFSA Guidance of the Scientific Committee on the risk assessment of substances present in food intended for infants below 16 weeks of age (EFSA Scientific Committee, 2017).

[9] Call for technical and toxicological data on acacia gum (E 414) as a food additive for uses in foods for all population groups including infants below 16 weeks of age. Published: 10 October 2019. Available from: https://www.efsa.europa.eu/en/consultations/call/181010-4#_ftn2

In order to conclude on the safety of acacia gum (E 414), the FAF Panel assessed the information provided:

- for the follow-up on issues that have been raised in the conclusions and recommendations of the Scientific Opinion on the re-evaluation of acacia gum (E 414) as a food additive (EFSA ANS Panel, 2017); and
- for the risk assessment of acacia gum (E 414) in food for infants below 16 weeks of age in the FC 13.1.1 (Infant formulae as defined by Directive 2006/141/EC) and 13.1.5.1 (Dietary foods for special medical purposes and special formulae for infants) according to uses in nutrient formulations authorised in section B of part 5 of Annex III to the Regulation (EC) No 1333/2008[1] on food additives.

When in animal studies, the test substance was administered in the feed or in drinking water, but doses were not explicitly reported by the authors as mg/kg bw per day based on actual feed or water consumption, the daily intake is calculated by the Panel using the relevant default values. In case of rodents, the values as indicated in the EFSA Scientific Committee Guidance document (EFSA Scientific Committee, 2012) are applied. In the case of other animal species, the default values by JECFA (2000) are used. In these cases, the dose was expressed as 'equivalent to mg/kg bw per day.' When in human studies in adults (aged above 18 years) the dose of the test substance administered was reported in mg/person per day, the dose in mg/kg bw per day was calculated by the Panel using a body weight of 70 kg as default for the adult population as described in the EFSA Scientific Committee Guidance document (EFSA Scientific Committee, 2012).

Dietary exposure to acacia gum (E 414) from its use as a food additive in nutrient formulations for use in foods for infants below 16 weeks of age was estimated combining the mean and highest consumption figures reported for the period of 14–27 days of life which corresponds to values of 200 and 260 mL/kg bw per day, respectively, with the maximum levels according to Annex III to Regulation (EC) No 1333/2008 and/or reported use levels and analytical data submitted to EFSA following a call for data. Different scenarios were used to calculate exposure (see Section 3.3.1). Uncertainties on the exposure assessment were identified and discussed.

3. Assessment

3.1. Technical data

3.1.1. Identity of the substance

According to Commission Regulation (EU) No 231/2012[10], the food additive 'E 414' is named as 'acacia gum'. A synonym for 'acacia gum' is 'gum arabic' (Commission Regulation (EU) No 231/2012[8]; JECFA, 2006). Acacia gum is a dried exudate obtained from the stems and branches of natural strains of *Acacia senegal* (L.) Willdenow or closely related species (Commission Regulation (EU) No 231/2012; JECFA, 2006).

3.1.2. Specifications

The specifications for acacia gum (E 414) as defined in the Commission Regulation (EU) No 231/2012 and as proposed by JECFA (2006) are listed in Table 1.

[10] Commission Regulation (EU) No 231/2012 of 9 March 2012 laying down specifications for food additives listed in Annexes II and III to Regulation (EC) No 1333/2008 of the European Parliament and of the Council (Text with EEA relevance).

Table 1: Specifications for acacia gum (E 414) according to Commission Regulation (EU) No 231/2012 and proposed by JECFA (2006)

	Commission Regulation (EU) No 231/2012	**JECFA (2006)**
Definition	Acacia gum is a dried exudation obtained from the stems and branches of strains of *Acacia senegal* (L) Willdenow or closely related species of *Acacia* (family Leguminosae). It consists mainly of high molecular weight polysaccharides and their calcium, magnesium and potassium salts, which on hydrolysis yield arabinose, galactose, rhamnose and glucuronic acid	Gum arabic is a dried exudate obtained from the stems and branches of *Acacia senegal* (L.) Willdenow or *Acacia seyal* (fam. Leguminosae) Gum arabic consists mainly of high-molecular weight polysaccharides and their calcium, magnesium and potassium salts, which on hydrolysis yield arabinose, galactose, rhamnose and glucuronic acid. Items of commerce may contain extraneous materials such as sand and pieces of bark, which must be removed before use in food
Synonym	Gum arabic	Gum arabic (*Acacia senegal*), gum arabic (*Acacia seyal*), Acacia gum, arabic gum, INS No. 414
CAS Numbers		9000-01-5
EINECS	232-519-5	
Molecular weight	Approximately 350,000	
Description	Unground acacia gum occurs as white or yellowish-white spheroidal tears of varying sizes or as angular fragments and is sometimes mixed with darker fragments. It is also available in the form of white to yellowish-white flakes, granules, powder or spray-dried material	Gum arabic (*A. senegal*) is a pale white to orange-brown solid, which breaks with a glassy fracture. The best grades are in the form of whole, spheroidal tears of varying size with a matt surface texture. When ground, the pieces are paler and have a glassy appearanceGum arabic (*A. seyal*) is more brittle than the hard tears of gum arabic (*A. senegal*) Gum arabic is also available commercially in the form of white to yellowish white flakes, granules, powder, roller dried or spray-dried material An aqueous solution of 1 g in 2 mL flows readily and is acid to litmus
Identification		
Solubility	1 g dissolves in 2 mL of cold water forming a solution which flows readily and is acid to litmus; insoluble in ethanol	1 g dissolves in 2 mL of water; insoluble in ethanol
Gum constituents		Proceed as directed under Gum Constituents Identification (FNP 5) using the following as reference standards: arabinose, galactose, mannose, rhamnose, galacturonic acid, glucuronic acid and xylose. Arabinose, galactose, rhamnose and glucuronic acid should be present. Additional spots corresponding to mannose, xylose and galacturonic acid should be absent
Optical rotation		Gum from *A. senegal*: aqueous solutions are levorotatory Gum from *A. seyal*: aqueous solutions are dextrorotatory Test a solution of 10 g of sample (dry basis) in 100 mL of water (if necessary, previously filtered through a No. 42 paper or a 0.8 μm Millipore filter), using a 200-mm tube

	Commission Regulation (EU) No 231/2012	JECFA (2006)
Purity		
Loss on drying	Not more than 17% (105°C, 5 h) for granular and not more than 10% (105°C, 4 h) for spray-dried material	Not more than 15% (105°, 5 h) for granular and not more than 10% (105°, 4 h) for spray-dried material Unground samples should be powdered to pass through a No. 40 sieve and mixed well before weighing
Total ash	Not more than 4%	Not more than 4%
Acid insoluble ash	Not more than 0.5%	Not more than 0.5%
Acid insoluble matter	Not more than 1%	Not more than 1%
Starch or dextrin	Boil a 1 in 50 solution of the gum and cool. To 5 mL add 1 drop of iodine solution. No bluish or reddish colours are produced	Boil a 1 in 50 solution of the sample, cool and add a few drops of Iodine T.S. No bluish or reddish colour should be produced
Tannin	To 10 mL of a 1 in 50 solution, add about 0.1 mL of ferric chloride solution (9 g $FeCl_3 \cdot 6H_2O$ made up to 100 mL with water). No blackish coloration or blackish precipitate is formed	To 10 mL of a 1 in 50 solution of the sample, add about 0.1 mL of ferric chloride TS. No blackish colouration or blackish precipitate should be formed
Arsenic	Not more than 3 mg/kg	
Lead	Not more than 2 mg/kg	Not more than 2 mg/kg
Mercury	Not more than 1 mg/kg	
Cadmium	Not more than 1 mg/kg	
Hydrolysis products	Mannose, xylose and galacturonic acid are absent (determined by chromatography)	
Microbiological criteria		
Salmonella spp.	Absent in 10 g	Negative per test
Escherichia coli	Absent in 5 g	Negative in 1 g

CAS: Chemical Abstracts Service; EINECS: European Inventory of Existing Commercial Substances.

3.1.2.1. Analytical data from commercial samples of the food additive

Analytical data for acacia gum as raw and spray-dried material have been provided by one of the interested parties in response to the call for data (Documentation provided to EFSA n. 1). According to the submitter, the limits defined in Regulation (EC) No 231/2012 reflect the lowest technologically achievable levels for lead, mercury, cadmium and arsenic. The Panel noted that the analytical data on toxic elements submitted by the interested party also in response to the former call for data (EFSA ANS Panel, 2017) were substantially lower. In the current data submission from the interested party, all the data (n = 29) for arsenic, cadmium and mercury were < 0.05, < 0.01 and < 0.008 mg/kg, respectively. For lead, 29 sample results of raw and spray-dried material were provided in the current submission. The levels ranged between < 0.005 and 0.048 mg/kg (median: < 0.02 mg/kg, mean: 0.029 mg/kg, 90th percentile: 0.043 mg/kg).

A lowest technologically achievable level of 100–120 mg/kg is proposed for aluminium (not currently included in the specification) by the interested party. The Panel noted that in the former re-evaluation the analytical data for aluminium ranged between 3.71 and 14.74 mg/kg while in the current data submission (n = 29), the aluminium level ranged between 3.1 and 235.2 mg/kg (median: 25.9 mg/kg; 90th percentile: 99.5 mg/kg).

The interested party proposed that the lowest total aerobic microbial count (TAMC) should be 10,000 CFU/g and total combined yeast and mould count (TYMC) 1,000 CFU/g. The Panel noted that in 12 samples of raw material the TAMC ranged between 240 and 8,200 CFU/g and the TYMC between < 10 and 13,000 CFU/g. For 13 samples of spray-dried material, the corresponding values were < 10 to 7,400 CFU/g and < 10 and 90 CFU/g, respectively. The Panel further noted that the TYMC counts

are nearly exclusively due to moulds and the moulds count are substantially lower in the spray-dried material compared to the raw material.

Analytical data on current levels of residual proteins in the acacia gum (E 414) preparations were provided; the lowest technologically achievable level for residual protein was proposed to be set at not more than 3.5%. Analytical data on toxic elements in final infant formulae were not provided by the interested party. Information on the lowest technologically achievable levels for oxidising enzymes (oxidases and peroxidases) requested in the call for data were not provided, it should be clarified that enzymes are part of the protein fraction.

Ten commercial samples of spray-dried acacia gum (E 414) were tested for *Cronobacter (Enterobacter) sakazakii* (method ISO/TS 22964), five for Salmonella spp. (method NF EN ISO 6579-15 (A)) and *Listeria monocytogenes* (method NF EN ISO 11290-1(A)). All tested samples (between 25 and 250 g) were negative (Documentation provided to EFSA n. 1).

3.1.3. Proposed revision to existing EU Specifications for E 414

Based on the analytical data provided by the Association for International Promotion of Gums in response to the recommendations issued by the ANS Panel, the FAF Panel recommends the revisions listed in Table 2.

Table 2: Proposal for a revised version of the existing EU Specifications for acacia gum (E 414)

Commission Regulation (EU) No 231/2012		**Comment/Justification for revision**
Definition	Acacia gum is a dried exudation obtained from the stems and branches of strains of *Acacia senegal* (L) Willdenow or closely related species of *Acacia* (family Leguminosae). It consists mainly of high molecular weight polysaccharides and their calcium, magnesium and potassium salts, which on hydrolysis yield arabinose, galactose, rhamnose and glucuronic acid	Unchanged
Synonyms	Gum arabic	Unchanged
EINECS	232-519-5	Unchanged
Molecular weight	Approximately 350,000	Unchanged
Description	Unground acacia gum occurs as white or yellowish-white spheroidal tears of varying sizes or as angular fragments and is sometimes mixed with darker fragments. It is also available in the form of white to yellowish-white flakes, granules, powder or spray-dried material	Unchanged
Identification		
Solubility	1 g dissolves in 2 mL of cold water forming a solution which flows readily and is acid to litmus; insoluble in ethanol	Unchanged
Purity		
Loss on drying	Not more than 17 % (105 °C, 5 h) for granular and not more than 10 % (105 °C, 4 h) for spray-dried material	Unchanged
Total ash	Not more than 4 %	Unchanged
Acid insoluble ash	Not more than 0.5 %	Unchanged
Acid insoluble matter	Not more than 1 %	Unchanged
Starch or dextrin	Boil a 1 in 50 solution of the gum and cool. To 5 mL add 1 drop of iodine solution. No bluish or reddish colours are produced	Unchanged

Commission Regulation (EU) No 231/2012		Comment/Justification for revision
Tannin	To 10 mL of a 1 in 50 solution add about 0.1 mL of ferric chloride solution (9 g $FeCl_3 \cdot 6H_2O$ made up to 100 mL with water). No blackish coloration or blackish precipitate is formed	Unchanged
Arsenic		Current levels (3 mg/kg) should be lowered on the basis of the analytical data provided and taking into account the measurement uncertainty
Lead		Current levels (2 mg/kg) should be lowered on the basis of the analytical data provided and taking into account the measurement uncertainty
Mercury		Current levels (1 mg/kg) should be lowered on the basis of the analytical data provided and taking into account the measurement uncertainty
Cadmium		Current levels (1 mg/kg) should be lowered on the basis of the analytical data provided and taking into account the measurement uncertainty
Aluminium		Added. The levels should be defined on the basis of the analytical data provided and taking into account the measurement uncertainty
Hydrolysis products	Mannose, xylose and galacturonic acid are absent (determined by chromatography)	Unchanged
Proteins	< 3.5%	Added on the basis of the available data
Microbiological criteria		
Salmonella spp.	Absent in 250 g	Changed on the basis of the available data
Escherichia coli	Absent in 5 g	Unchanged
Cronobacter sakazakii	Negative in 150 g	Added on the basis of the available data*
Listeria monocytogenes	Negative in 125 g	Changed on the basis of the available data
TYMC	< 100/g	Added on the basis of the available data*
TAMC	$< 10^4$/g	Added on the basis of the available data*

EINECS: European Inventory of Existing Commercial Substances; TYMC: total combined yeast and mould count; TAMC: total anaerobic microbial count.
*: Based on data on the spray-dried acacia gum.

While interested parties stated that the current limits defined in Regulation (EC) No 231/2012 for lead, arsenic, cadmium and mercury reflect the lowest technologically achievable levels, the analytical data submitted show that their actual concentrations are substantially lower. The Panel considered that the maximum limits in the EU specifications for toxic elements should be established based on actual levels in the food additive. Therefore, if the European Commission decides to revise the current limits in the EU specifications to more realistic values, the following calculations could be considered.

Using the analytical data provided by the interested parties on the content of arsenic (As), cadmium (Cd), and mercury (Hg) in samples of acacia gum, which were all below the limit of detection (LOD) of 0.005, 0.01 and 0.008 mg/kg, respectively, and multiplying these by an 'uncertainty' factor of 10 to cover uncertainties, such as representativeness, homogeneity and analytical measurements, the maximum limit values for the revision of the EU specifications would be 0.5, 0.1 and 0.1 mg/kg, respectively. For

lead (Pb), some levels in acacia gum submitted by the interested parties were above the LOD. Thus, the P90 of 0.04 mg/kg may be used as a limit value for the revision of the EU specification for lead.

According to interested parties, the lowest technologically achievable level for aluminium (Al) is 100–120 mg/kg acacia gum. The Panel also considered that a maximum limit for aluminium should be included in the EU specifications. In the absence of a specific limit proposed from interested parties, using the analytical data provided and taking the P90 value, a maximum limit of 100 mg Al/kg may be included in the EU specifications.

The Panel emphasises that the choice of the 'uncertainty' factor and the percentile to conclude on the maximum limits for toxic elements in the specifications is in the remit of risk management.

In the earlier opinion on acacia gum (EFSA ANS Panel, 2017) the most exposed population group was toddlers. The Panel considered that the non-brand-loyal scenario covering the general population was the more appropriate and realistic scenario for risk characterisation. In that scenario, the highest P95 in toddlers was 719 mg/kg bw day. The above mentioned maximum limits for the toxic elements combined with the intake of acacia gum of (719 mg/kg bw per day) would result in an exposure which can be compared with the following health-based guidance values or reference values for the five toxic elements: a tolerable weekly intake (TWI) of 2.5 μg/kg bw for cadmium (EFSA CONTAM Panel, 2009), a TWI of 4 μg/kg bw for mercury (EFSA CONTAM Panel, 2012), a tolerable weekly intake (TWI) of 1,000 μg/kg bw for aluminium (EFSA, 2008), a BMDL01 of 0.5 μg/kg bw per day for lead (EFSA CONTAM Panel, 2010) and a BMDL01 of 0.3 to 8 μg/kg bw per day for arsenic (EFSA CONTAM Panel, 2009).

The outcome of such an exercise illustrates the health impact that would result if the specification values mentioned above were to be used: for Cd, Hg and Al the exhaustion of the health based guidance values would be 20%, 13% and 50%, respectively; for Pb and As the MOS/MOE would be 17 and 0.8–22, respectively. This supports the recommendation to decrease the current maximum limits for lead, arsenic, cadmium and mercury and to include a new limit to aluminium in the EU specification for acacia gum (E 414) considering also other sources of exposure.

3.1.3.1. Information on particular specification requirements for the additive for use in infant formulae

Information on particular specification requirements for identity and the purity of acacia gum (E 414) to be used in the food categories FC 13.1.1 and 13.1.5.1 (e.g. content residual proteins and enzymes, toxic elements) have been requested but were not provided. Analytical data on impurities in the final foods for infants below 16 weeks of age, when no legal limit has been established, were requested but were not provided. Analytical data on toxic elements in final infant formulae were not provided by the interested party. Therefore, the Panel considered that the manufacturers have no particular specifications requirements for the additive for the use in infant formulae.

3.1.3.2. Stability of the substance, and reaction and fate in food

No data were provided in response to the call for data, concerning the stability of the additive and possible reactions and fate in foods for infants below 16 weeks of age (i.e. infant formulae). There was the simple statement that; no reaction products are known to occur in this food category (Documentation provided to EFSA n. 1). The earlier evaluation of acacia gum (EFSA ANS Panel, 2017) observed that only limited information on reaction and fate of acacia gum in foods was available but noted that the gum is stable in acid conditions and also has excellent heat stability. So, it can be concluded that no undesirable reactions of the gum are to be expected if used in infant formulae.

Although not concerning reactions and fate of the gum itself, the ANS Panel in 2017 recommended that the oxidases and peroxidases in acacia gum should be inactivated during the manufacturing process to avoid any oxidative degradation of components in preparations to which acacia gum is added (EFSA ANS Panel, 2017). Any such oxidative reactions would also be of potential concern for use of the additive in infant formulae. As described in Section 3.1.2 above, the call for data did not elicit any information on the lowest technologically achievable levels for oxidases and peroxidases. This topic is considered further in the discussion and recommendations sections of the current Opinion.

3.2. Authorised uses and use levels

Maximum levels of acacia gum (E 414) in foods for infants below 16 weeks of age are defined in Regulation (EC) No 1333/2008 on food additives, as amended. In this opinion, these levels are termed maximum permitted levels (MPLs).

According to Regulation (EC) No 1333/2008 (Annex III, part 5, section B), acacia gum (E 414) is authorised as a food additive in nutrient preparations intended to be used in foodstuffs for infants and young children, including infants below 16 weeks of age. The MPLs in all nutrient preparations are set at 150,000 mg/kg and as carry-over at 10 mg/kg in the final products, including food categories 13.1.1 (Infant formulae as defined Directive 2006/141/EC) and 13.1.5.1 (Dietary foods for infants for special medical purposes and special formulae for infants).

Table 3: MPLs of acacia gum (E 414) in foods for infants below 16 weeks of age according to Annex III, Part 5, Section B to Regulation (EC) No 1333/2008

E number	Name of the food additive	Maximum permitted level	Nutrient to which the food additive may be added	Food category
E 414	Acacia gum	150,000 mg/kg in the nutrient preparation and 10 mg/kg carry-over in final products	All nutrients	Foods for infants and young children

3.3. Exposure data

Some food additives are authorised in the EU in infants' formulae as defined by Commission Directive 2006/141/EC (FC 13.1.1) and in dietary foods for infants for special medical purposes and special formulae for infants (FC 13.1.5.1) at a specific MPL. However, a food additive may be used at a lower level than the MPL. Therefore, actual use levels are required for performing a more realistic exposure assessment.

In the framework of Regulation (EC) No 1333/2008 on food additives and of Commission Regulation (EU) No 257/2010 regarding the re-evaluation of approved food additives, EFSA issued a public call[11] for technical and toxicological data on acacia gum (E 414) as a food additive for uses in foods for all population groups including infants below 16 weeks of age. In response to this public call, information on the actual use levels of acacia gum (E 414) in foods was made available to EFSA by industry. No analytical data on the concentration of acacia gum (E 414) in foods were made available by the Member States.

3.3.1. Reported use levels in food category 13.1.1 and 13.1.5.1 as a carry-over from the authorised use according to Annex III to Regulation No 1333/2008, Part 5, Section B

Industry did not provide EFSA with use levels but indicated that the MPL of 10 mg/kg final food set in Annex III to Regulation No 1333/2008, is the level used whenever a nutrient preparation containing acacia gum (E 414) is used in FC 13.1.1 or FC 13.1.5.1. Therefore, the assumption of 10 mg/kg final food is also the one taken on for the refined exposure assessment scenario.

3.3.2. Summarised data extracted from the Mintel's Global New Products Database

The Mintel's GNPD is an online database which monitors new introductions of packaged goods in the market worldwide. It contains information of over 3 million food and beverage products of which more than 1,100,000 are or have been available on the European food market. Mintel started covering EU's food markets in 1996, currently having 25 out of its 28 member countries and Norway presented in the Mintel GNPD.[12]

For the purpose of this Scientific Opinion, the Mintel's GNPD[13] was used for checking the labelling of food and beverage products and food supplements for acacia gum (E 414) within the EU's food market as the database contains the compulsory ingredient information on the label.

[11] Call for technical and toxicological data on acacia gum (E 414) for uses as a food additive in foods for all population groups including infants below 16 weeks of age. Available from: http://www.efsa.europa.eu/sites/default/files/consultation/callsfordata/2018-00775_call_for_data_acacia_gum_E_414.pdf

[12] Missing Cyprus, Luxembourg and Malta.

[13] http://www.gnpd.com/sinatra/home/ accessed on 16/5/2019.

No products intended for use in infants below 16 weeks were found in the Mintel's GNPD as labelled with acacia gum (E 414). The additive is only authorised according to Annex III for which the labelling is not mandatory.

3.4. Exposure estimates for infants below 16 weeks

Exposure to acacia gum (E 414) from its uses as a food additive in nutrient preparations intended to be used in formulae for infants below 16 weeks was estimated. This scenario is based on the - consumption levels recommended in the relevant SC Guidance (EFSA Scientific Committee, 2017) to be used in risk assessment. This guidance 'recommends values of 200 and 260 mL formula[14] /kg bw per day as conservative mean and high level consumption values to be used for performing the risk assessments of substances which do not accumulate in the body present in food intended for infants below 16 weeks of age'. These recommended consumption levels correspond to 14- to 27-day-old infants' consumption. For the regulatory maximum level exposure assessment scenario, the MPL for infant formulae (10 mg/kg for both FC 13.1.1 and FC 13.1.5.1) was used as well as for the refined scenario.

3.4.1. Dietary exposure to acacia gum (E 414) from infant formulae

Table 4 summarises the estimated exposure to acacia gum (E 414) from its use as a food additive in nutrient preparations added to both, FC 13.1.1 and FC 13.1.5.1 for infants below 16 weeks of age (Table 4).

Table 4: Dietary exposure to acacia gum (E 414) in foods for infants below 16 weeks of age according to Annex III, Part 5, Section B to Regulation (EC) No 1333/2008 (in mg/kg bw per day)

	Infants (< 16 weeks of age)
Regulatory maximum level exposure assessment scenario/Refined estimated exposure assessment scenario	
• Mean consumption (200 mL/kg bw per day)	2
• High level consumption (95th percentile, 260 mL/kg bw per day)	2.6

bw: body weight.

Only one scenario was estimated as regulatory and refined scenarios use the same level.

3.4.2. Uncertainty analysis

In accordance with the guidance provided in the EFSA opinion related to uncertainties in dietary exposure assessment (EFSA, 2007), the following sources of uncertainty have been considered and summarised in Table 5.

Table 5: Qualitative evaluation of influence of uncertainties on the dietary exposure estimate

Sources of uncertainties	**Direction[(a)]**
Consumption data: one reference point only to estimate exposure during the period of up to 16 weeks of age	+/–
Regulatory maximum level exposure assessment scenario: – exposure calculations based on the MPL according to Annex III to Regulation (EC) No 1333/2008 (carry-over)	+
Refined exposure assessment scenarios: – exposure calculations based on the maximum level	+

MPL: maximum permitted level.
(a): +, uncertainty with potential to cause overestimation of exposure; –, uncertainty with potential to cause underestimation of exposure.

Acacia gum (E 414) is authorised as a food additive in nutrient preparations used in foods for infants (FC 13.1) according to Annex III to Regulation (EC) No 1333/2008. Based on the assumption that carers of children would be brand-loyal to an infant formula (FC 13.1.1) or infant formulae for

[14] Editorial.

special medical purposes (FC 13.1.5.1), the exposure assessment scenario (Table 4) would in general result in a reliable estimation of exposure.

3.5. Biological and toxicological data

3.5.1. Previous evaluation by ANS Panel (2017)

The following text (in italics) is from the opinion published in 2017 (EFSA ANS Panel, 2017). New information and assessments related to the specific age group below 16 weeks of age are added in the following paragraph.

The in vitro degradation and the in vivo digestibility of acacia gum have been investigated in animals and humans models and in a human study. The ANS Panel considered that these data indicated that acacia gum would be not absorbed intact but fermented by enteric bacteria in humans. The rate of hydrolysis in the gastrointestinal tract in humans is unknown; however, the ANS Panel considered that acacia gum is unlikely to be absorbed intact, and that the limited extent of its fermentation would lead to products such as SCFA which were considered of no safety concern by the ANS Panel.

Acacia gum was regarded by the ANS Panel as having a low acute oral toxicity.

In a subacute toxicity study (Anderson et al.*, 1984), no histopathological changes were identified by electron microscopic examination of organs from rats fed diets containing 1–8% acacia gum daily (equivalent to 1,180–9,440 mg acacia gum/kg bw per day) for 28 days.*

Among other studies, the subchronic (13 weeks) oral toxicity of acacia gum was investigated by Anderson et al. *(1982). The animals received acacia gum in their diet and the study was conducted in two consecutive experimental phases. In the first one, the rats were given doses ranging from 0 to about 5,000 mg acacia gum/kg bw per day and in the second phase, they received 0 or 14,000 mg acacia gum/kg bw per day. The Panel noted that these two studies were done independently and that merging their data may not be straightforward. The ANS Panel considered that no toxicological effect was observed in these studies by Anderson* et al. *(1982). From the first study, no adverse effects have been identified up to 5,220 and 5,310 mg acacia gum/kg bw per day in male and female, respectively, the highest dose tested.*

Overall, the short-term and subchronic administration of oral doses up to 5,000 mg acacia gum/kg bw per day to rats and 20,000 mg acacia gum/kg bw per day to mice, the highest doses tested, did not induce any biologically relevant adverse effects. In some studies, caecal enlargement was observed. The ANS Panel considered that an increased caecum weight in animals fed high amounts of carbohydrates is considered as a physiological response to an increased fermentation by the intestinal microbiota.

Based on the data available, the ANS Panel considered that there was no concern with respect to the genotoxicity of acacia gum.

No chronic toxicity studies according to OECD guidelines (452) or equivalent were identified by the ANS Panel.

Acacia gum was tested for carcinogenicity in rats and mice receiving diets containing 2.5% and 5% acacia gum in the feed for 103 weeks equivalent to 1,250 and 2,500 mg acacia gum/kg bw per day in rats, and 3,750 and 7,500 mg acacia gum/kg bw per day in mice (NTP, 1982; Melnick et al.*, 1983). From this study, the ANS Panel considered that acacia gum is not of concern with respect to carcinogenicity.*

In a dietary combined fertility and developmental toxicity study in rats (Collins et al.*, 1987), a NOAEL of 10,647 mg acacia gum/kg bw per day for reproductive, developmental and parental effects was identified, the highest dose tested. In addition, other reproductive studies in rats showed no effects at the highest dose tested (Morseth and Ihara 1989a, Huynh* et al.*, 2000). In the identically performed prenatal developmental tests with acacia gum by gavage in mice, rats and hamsters (FDRL, 1972b), 1,600 mg/kg bw per day (the highest doses tested) showed no dose-related developmental effects.*

No case reports on allergic reaction after oral exposure to acacia gum could be identified by the Panel.

In humans, the repeated oral daily intake of a large amount of acacia gum up to 30 g (approx. 430 mg acacia gum/kg bw per day) for up to 18 days was well tolerated and had only a minimum effect on stool weight and decrease in serum cholesterol. Some individuals experienced flatulence which was considered by the Panel as undesirable but not adverse.

3.5.2. Newly available data

Toxicological data

No new toxicological data were submitted by the interested parties which allow to assess the safety of acacia gum (E 414) when used in foods for infants below 16 weeks of age.

The Panel, performing a literature search, identified a publication on the effects of gum arabic[15] in which development, behaviour and biochemical parameters were tested after administration via drinking water of 0, 1 and 4 mg/kg bw per day to female mice (Swiss-Webster strain) from gestation day (GD) 0 to postnatal day (PND) 15 (Binjumah et al., 2018).

When reviewing the publication, the Panel noted that the study and the reporting showed several serious flaws and, therefore, considered that the study cannot be used for risk assessment.

Clinical data

Clinical data from two studies in adults have been submitted focusing on gastrointestinal effects.

In the study of Bliss et al. (2001), patients with stool incontinence were treated with psyllium, gum arabic,[15] or a placebo for 31 days after a run-in period of 8 days. From 42 patients (age 34–76 years; 62 ± 3 (mean ± SEM) years) recruited for the study 39 completed the study according to the protocol. The dose of gum arabic was 25 g/day given mixed with half-strength fruit juice in two servings (morning and evening). Whereas the proportion of 'incontinent' stools was significantly less in the gum arabic group compared to the control, no influence on the frequency of flatus (in the initial period the dose was given in increasing doses until after 6 days the full dose was reached) and on SCFAs concentration in stool was observed.

In the double-blinded, controlled study of Calame et al. (2008) 54 healthy volunteers (age 30.6 ± 13 years) were randomly assigned to six groups being treated with water as control, or 5, 10, 20 and 40 g of EmulGold (which is a tradename of gum arabic[17]) per day or inulin as positive control (10 g Fibruline per day which is the tradename) over 4 weeks. The primary endpoint was the change in microbiota whereby the genera of *Bifidobacteria* and lactobacilli were taken as potentially beneficial bacteria and those of *Bacteroides*, *Clostridium difficile* and enterococci as potentially non-beneficial. The secondary endpoint was side effects, in particular diarrhoea. There were some statistically significant changes in the numbers of *Bifidobacteria* and lactobacilli (increase at 10 g/day) and also in *Bacteroides* (increase at 10 g/day). The Panel considered the changes as not clinically meaningful. Gastrointestinal side effects, in particular diarrhoea, did not occur more frequently in all treated groups compared to control.

In summary, the two studies in adults did not show adverse effects of gum arabic up to a dose of 40 g/day (0.64 g/kg bw per day, calculated with the actual weight) in healthy volunteers treated over 4 weeks and up to 25 g/day (0.30 g/kg bw per day, calculated with the actual weight) in patients with stool incontinence. However, one study focuses on effects on the microbiome which cannot be evaluated at the present state of knowledge and the other was performed in patients with stool incontinence. In addition, these studies in adults cannot be used to assess the safety of the use of acacia gum in infants below 16 weeks of age.

Post-marketing data

The interested parties did not submit post-marketing surveillance reports on undesired and adverse reactions requested in the call for data.

3.6. Discussion

According to the submitter, the limits defined in Regulation (EC) No 231/2012 reflect the lowest technologically achievable levels for lead, mercury, cadmium and arsenic. The Panel, however, noted that the submitted data by the interested parties allow to lower the limits in the specifications for toxic elements and also indicates the need for further specifications for aluminium, microbiological criteria and protein residues. This would apply for all food categories including those consumed by infants up to 16 weeks of age. The Panel further noted that no information was provided for oxidising enzymes. The Panel recommends that during the manufacturing process the oxidases and peroxidases present in acacia gum should be inactivated by heating to prevent the possible oxidative degradation of components in preparations to which acacia gum is added in line with earlier publications (Glicksman and Sand, 1973; Billaud et al., 1996; Ternes et al., 2007).

[15] Synonym for acacia gum, see Table 1.

According to Regulation (EC) No 1333/2008 (Annex III, part 5, section B), acacia gum (E 414) is authorised for use as a food additive in nutrient preparations intended to be used in foodstuffs for infants and young children, including in food for infants below 16 weeks of age. Dietary exposure to acacia gum (E 414) from its use as a food additive was assessed based on maximum carry over level set out in the EU legislation. The interested party confirmed that that the level of use of acacia gum (E 414) in infant formulae is compliant with this limit.

The exposure scenario is based on the consumption levels recommended in the relevant SC Guidance (EFSA Scientific Committee, 2017) to be used in risk assessment 200 and 260 mL formula[14]/kg bw per day as conservative mean and high level consumption values for 14 to 27 day old infants.

For infants below 16 weeks of age consuming infant formulae (FC 13.1.1) or infant food for special medical purpose (FSMP) (FC 13.1.5.1), mean exposure to acacia gum (E 414) was estimated to be 2 mg/kg bw per day while the high level was estimated at 2.6 mg/kg bw per day. Exposure estimates are based on the MPL for carry-over from nutrient formulations of 10 mg acacia gum (E 414)/kg in final foods for infants set in Annex III to Regulation (EC) No 1333/2008.

The interested parties did not submit toxicological and clinical data which can be used to assess the safety of the acacia gum in infants below the age of 16 weeks. In addition, post-marketing surveillance data were not provided. However, in this special situation, where the exposure is low and only due to the carry over, a MOS approach can be applied using available data from adult animals. Taking the highest doses tested without adverse effects in subchronic studies of 5,000 mg acacia gum/kg bw per day in rat and 20,000 mg acacia gum/kg bw per day in mice (EFSA ANS Panel, 2017) and comparing them with the exposure in infants of 2.6 mg/kg bw per day (high level estimate), the margins of safety (MOS) are roughly 2,000 and 8,000. These large MOS indicate that there is no reason for health concern. It is further noted that the data do not show genotoxicity (EFSA ANS Panel, 2017). Cases of allergenicity were not identified in the literature and in the former assessment (EFSA ANS Panel, 2017).

In Appendix A, the information sought by the call for data, the responses from interested parties and the results of the assessment from the Panel in the form of a comment are given.

4. Conclusions

Concerning the risk assessment for infants below 16 weeks of age, the Panel concluded that there is no reason for health concern considering the large MOS of roughly 2,000 and 8,000. These large MOS result from comparing the highest doses tested in rats and mice without adverse effects in subchronic studies with the high level estimate for the exposure of infants.

Concerning the follow-up on the former re-evaluation of acacia gum (E 414) as a food additive for all population groups (EFSA ANS Panel, 2017), the Panel noted that the specifications of acacia gum (E 414) for toxic elements, microbiological criteria and protein residues should be updated for all food categories. The Panel further noted that no information was provided by the interested parties for oxidising enzymes in the food additive and recommends that during the manufacturing process the oxidases and peroxidases present in acacia gum should be inactivated.

5. Recommendation

The Panel recommends:

- the European Commission considers lowering the limits in the specifications for acacia gum (E 414) for toxic elements and introducing specifications for aluminium, microbiological criteria and protein residues (see Table 2).
- the European Commission considers requiring that the oxidases and peroxidases in acacia gum (E 414) should be inactivated during the manufacturing process to avoid any oxidative degradation of components in preparations to which acacia gum (E 414) is added.

Documentation as provided to EFSA

1) Association for International Promotion of Gums (AIPG), 2019. Submission of data in response to the call for technical and toxicological data on acacia gum (E 414) for uses as a food additive in foods for all population groups including infants below 16 weeks of age. Submitted on March 2019.

2) DSM Nutritional Products Europe Ltd, 2019. Reply to the call for technical and toxicological data on acacia gum (E 414) for uses as a food additive in foods for all population groups including infants below 16 weeks of age. Submitted on March 2019.

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Glossary and/or abbreviations and/or acronyms

ADI	acceptable daily intake
ANS Panel	EFSA Panel on Food Additives and Nutrient Sources added to Food
APC	aerobic plate count
BMDL	Benchmark dose level
bw	body weight
CAS	Chemical Abstract Service
EINECS	European Inventory of Existing Commercial Substances
CFU	colony forming unit
FAF Panel	EFSA Panel on Food Additives and Flavourings
FAO/WHO	Food and Drug Organization/World Health Organization
FC	food category
FSMP	food for special medical purposes
GD	gestation day
JECFA	Joint FAO/WHO Expert Committee on Food Additives
LOD	limit of detection
Mintel	GNPD Mintel's Global New Products Database
MOE	margin of exposure
MOS	margin of safety
MPL	maximum permitted levels
NOAEL	no-observed-adverse-effect level
NOEL	no-observed-effect level
PND	postnatal day
SC	Scientific Committee of EFSA
SCF	Scientific Committee on Food
TAMC	total anaerobic microbial count
TWI	tolerable weekly intake
TYMC	total combined yeast and mould count

Appendix A – Data requested in the call for data (Call for technical and toxicological data on acacia gum (E 414) for uses as a food additive in foods for all population groups including infants below 16 weeks of age.[16]

Kind of data	Data requested in the call for data	Responses from interested parties	Comment
A. Information regarding the follow-up of the conclusions and the recommendations of the EFSA ANS Panel opinion on the safety of acacia gum (E 414) as a food additive			
1. Technical data	Analytical data on current levels of aluminium, lead, mercury, cadmium and arsenic in commercial samples of the food additive	Received	Used in the proposal for new specifications
	The lowest technologically achievable level for aluminium, lead, mercury, cadmium, and arsenic in order to adequately define their maximum limits in the specifications	Received	Not accepted, recommendation to lower the levels
	Current levels of residual proteins and oxidising enzymes (oxidases and peroxidases) in acacia gum (E 414) preparations	1) Protein: received 2) Oxidising enzymes (oxidases and peroxidases): not received	1) Added to the specifications, recommendation 2) Recommendation to inactivate the enzymes; to introduce residual limits
	Data demonstrating the lowest total aerobic microbial count (TAMC) and total combined yeast and mould count (TYMC) that can be achieved	Received	Included into the new specifications, recommendation
2. Literature searches	Literature searches	Received	Assessed, no further follow-up

[16] Available from: https://www.efsa.europa.eu/en/consultations/call/181010-4 and responses from interested parties.

Kind of data	Data requested in the call for data	Responses from interested parties	Comment
B. Information required for the risk assessment of acacia gum (E 414) as a food additive for use in foods for infants below 16 weeks of age			
1. Technical data	Information on the resulting concentrations of acacia gum (E 414), alone or in combination with other thickening agents (indication of food additive name and resulting concentration) in these foods	Not received	Assessed, no further follow-up
	Information on the fate and the reaction products of acacia gum (E 414) in these food categories	Received	Assessed, no further follow-up
	Information on particular specification requirements for identity and the purity of acacia gum (E 414) to be used in these food categories (e.g. content residual proteins and enzymes, toxic elements). Analytical data on impurities in the final foods for infants below 16 weeks of age need to be provided when no legal limit has been established	Not provided	Assessed, no further follow-up
	Data demonstrating the absence of *Cronobacter* (Enterobacter) *sakazakii* in the food additive	Received	Included into the new specifications, recommendation
2. Toxicological data	Clinical data focusing on gastrointestinal effects to assess the safety of acacia gum (E 414) when present in foods for infants below 16 weeks of age	No data received	Assessed, no further follow-up
	Post-marketing surveillance reports on undesired and adverse reactions (including e.g. flatulence, gastrointestinal discomfort, changes of stool-frequencies and -consistency, diarrhoea and allergic reactions), indicating the ages and other relevant data of the exposed infants and young children and the use level of acacia gum (E 414) in the marketed products	No data received	Assessed, no further follow-up
3. Literature searches	Literature searches should be conducted relevant for the safety evaluation of acacia gum (E 414) when used in foods for infants below 16 weeks of age up to the date of the data submission, as described in the Guidance for submission for food additive evaluations (Section 5.3)	Received	Assessed, no further follow-up