



JOINT FAO/WHO FOOD STANDARDS PROGRAMME

CODEX COMMITTEE ON FOOD ADDITIVES

Forty Fifth Session

Beijing, China, 18 – 22 March 2013

INFORMATION DOCUMENT FOR THE 45TH CCFA

INVENTORY OF SUBSTANCES USED AS PROCESSING AIDS (IPA), UPDATED LIST

Prepared by New Zealand

BACKGROUND

1. The Codex Committee on Food Additives and Contaminants (CCFAC) at its 36th Session recognized that the development of a positive list of processing aids was not a realistic approach at the present time due to a lack of resources. However, the value of the Inventory of Processing Aids (IPA) itself, as a useful reference tool, has been recognized and the Committee agreed to maintain the IPA for the time being and decided that New Zealand would prepare updated versions of the IPA for consideration at subsequent sessions of the Committee¹.
2. The IPA includes substances in the original list in CAC/MISC 3 and subsequent updates presented to CCFA as information documents.
3. The title of the Inventory was changed to the *Inventory of Substances used as Processing Aids* at the 40th Session. This is to recognise that substances used as processing aids may also have other uses including as food additives and food². For convenience and simplicity the acronym *IPA* continues to be used.
4. The 43rd Session agreed to develop a prototype of a new processing aid database with the aim of replacing IPA³. The delegation of New Zealand confirmed at the 44th Session that the IPA would be maintained until work on the database is completed.

CHANGES INTRODUCED IN THIS UPDATE:

5. Further information on the use of dimethyl dicarbonate (DMDC) in grape wine, fruit wine, water-based beverages, fruit and vegetable juices and nectars as proposed by Dr Simon Brook-Taylor.
6. The introduction of a new category *Microbial nutrients and microbial nutrients* based a similar category in the *Australia New Zealand Food Standards Code* proposed by New Zealand. The category includes yeast nutrients used in wine making.
7. Polydimethylsiloxane (INS 900a) updated with an ADI re-established by JECFA at its 74th meeting.
8. Pullulanase - *Bacillus licheniformis d-Bacillus deramifican*) updated with an ADI "not specified" established by JECFA at its 74th meeting.
9. An updated the section on enzymes by AMFEP who propose this to be used as a basis for the Database of Substances Used as Processing Aids.

UPDATING ISSUES FOR FUTURE CONSIDERATION⁴

10. New Zealand is prepared to provide further annual updates to the IPA until work on the new processing aids database is completed.

¹ ALINORM 07/30/12 paragraph 134.

² ALINORM 07/30/12 paragraph 133

³ REP11/FA paragraph 172

⁴ ALINORM 06/29/12 paragraph 95 and Appendix XV.

INVENTORY OF SUBSTANCES USED AS PROCESSING AIDS (IPA)

Prepared by New Zealand (February 2013)

BACKGROUND

1. The title of the Inventory has been changed to the *Inventory of Substances used as Processing Aids* to recognise that substances used as processing aids may also have other uses including as food additives and food⁵. For convenience and simplicity the acronym *IPA* continues to be used.
2. The IPA was originally a collection of information submitted by national authorities⁶ to provide a list of those substances whose sole function is that of a processing aid.
3. At its 21st session in 1989, Codex Committee on Food Additives and Contaminants (CCFAC) agreed that the IPA be submitted to the CAC for adoption as a Codex advisory text. It was first published as a Codex advisory text in 1991 and included amendments agreed to at the CCFAC meetings in 1990 and 1991.
4. On initiation of the list, CCFAC's primary purposes for the IPA were to:
 - a) develop information on substances used as processing aids; and
 - b) determine priorities for the review of processing aids by JECFA.
5. CCFAC agreed that the IPA was not intended to be a positive list of permitted processing aids to be used, for example, by reference in Codex Commodity Standards. Further, CCFAC has not conducted its own risk assessment of the substances on the inventory.
6. CCFAC at its 36th Session recognized that the development of a positive list of processing aids was not a realistic approach at the present time due to a lack of resources. However, the value of the IPA itself, as a useful reference tool, has been recognized and agreed to maintain the IPA for the time being and decided that New Zealand would prepare updated versions of the IPA for consideration at sessions of the Committee.

INTRODUCTION

7. The Inventory is not intended to be complete or a "positive list" of permitted aids.
8. The Updated IPA includes:
 - Substances in the original list in CAC/MISC 3
 - Additions to the IPA presented in subsequent updates.
9. Substances that may also function as food additives or foods are designated by an asterisk (*).
10. The Inventory is arranged in tabular format for presentation of information that will be necessary for the Committee to select substances for JECFA evaluation. The following information is provided:
 - Category - the functional effect classification.
 - Processing Aid - the chemical name or description of the substance used as a processing aid.

⁵ ALINORM 07/30/12 paragraph 133

⁶ ALINORM 89/12A, Appendix VIII.

Inventory of Substances used as Processing Aids (IPA), Main List

- Area of Use - the foods or food processing procedures in which the processing aid is utilised.
- Level of Residues - the level of processing aid remaining in food after processing. The levels should be designated with respect to those:
 - (1) directly measured by analysis or
 - (2) estimated by other means. Values are in mg/kg and values at the detection limit of available analytical procedures are reported as "less than" (<).
- Interaction with Food - describes the degree of chemical interaction with food components. Provides data on levels of interaction products in food.
- JECFA Evaluation – “Yes” indicates that the substance has been reviewed or considered by a JECFA. Note that JECFA consideration of a substance does not necessarily mean that JECFA has reviewed the processing aid use(s) of the substance, nor that JECFA assigned an ADI to the substance.
- JECFA specification – “Yes” indicates that there is a relevant monograph covering the identity and purity of the substance.
- ADI-the latest JECFA ADI in mg/kg body weight or other end point of their safety assessment. Abbreviations used in this column are :
 - NS for ADI “not specified”
 - NL for ADI “not limited”
 - DP for decision postponed
 - PTWI for provisional tolerable weekly intake
 - MTDI for maximum tolerable daily intake
- JECFA comments includes any relevant comments in respect to the ADI or in some cases the specification.
- JECFA monographs and evaluations are available on <http://www.fao.org/food/food-safety-quality/scientific-advice/jecfa/jecfa-additives/en/>
- References - this includes the references from which the original 1989 list was developed (ALINORM 98/12A Appendix VIII) plus a notation when new substances have been added.

11. Appendix A catalogues substances that are used as processing aids but not included in the main inventory as they have functions also as food additives or foods.

(Note that substances already covered in the main IPA were formerly listed and annotated as (1.). These have been deleted to avoid repetition.)⁷

12. The substances are annotated according to the following system:

2. indicates those materials that are both food additives and processing aids (i.e. the substance functions as a processing aid in one food but may have a different function in another food).
3. indicates those compounds that, because of carry-over residues, would seem to usually be considered only as food additives.
4. indicates those materials that might actually have simultaneous function as processing aids and functionality in the finished food.

⁷ CX/FAC 06/38/13.

Inventory of Substances used as Processing Aids (IPA), Main List

(Appendix B of the earlier versions of the IPA has been deleted to avoid unnecessary duplication as it reproduces the Microbial Enzyme Preparation Section of the main Inventory.)⁸

13. The Committee recognises that any food additive, even if not included in the inventory or the appendix, may be used as a processing aid and is eligible for addition to the appendix. In some cases, however, the processing aid use of the food additive may require a separate JECFA evaluation.

14. In general the list does not include substances used in the manufacture of food additives (but some substances used as solvents in the manufacture of flavourings and colourings are mentioned in the main list).

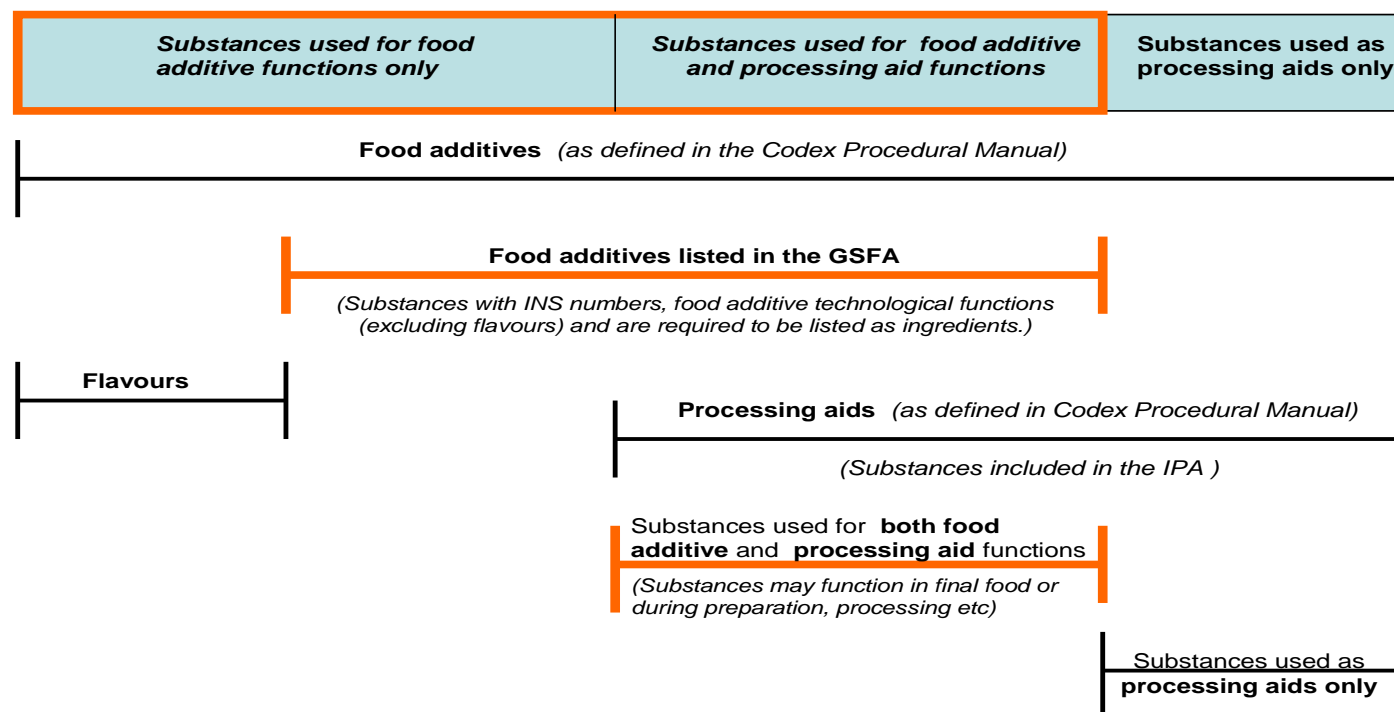
⁸ CX/FAC 06/38/13

THE RELATIONSHIP BETWEEN FOOD ADDITIVES AND PROCESSING AIDS IN THE CODEX SYSTEM

The diagram below shows the relationship between food additives and substances used as processing aids. The diagram takes into account the *Codex Procedural Manual* definitions and the scope of the *General Standard for Food Additives (GSFA)* and the IPA. It is important to note that the term *food additive* as defined in the *Codex Procedural Manual*, includes substances used as processing aids, and that the GSFA does not include flavours or substances used only as processing aids or any processing aids functions of listed food additives.

Relationship between Food Additives and Processing Aids

(Not to scale)



INVENTORY OF SUBSTANCES USED AS PROCESSING AIDS (IPA)

Main List

IPA CATEGORIES

Antifoam Agents

Boiler water additives

Catalysts

Clarifying agents/ filtration,aids

Contact freezing & cooling agents

Desiccating agent/anticaking agents

Detergents (wetting agents)

Enzyme immobilization agents & supports

Flocculating agents

Ion exchange resins, membranes, and molecular sieves

Lubricants, release and anti stick agents, moulding aids

Micro-organism control agents

Microbial nutrients and microbial nutrient adjuncts

Propellant and packaging gases

Solvents, extraction & processing

Washing and Peeling agents

Other processing aids

Food enzymes preparations (including immobilized enzymes)

Inventory of Substances used as Processing Aids (IPA), Main List

CATEGORY * These substances may also function as a food additive or foods	Use	Residues (mg/kg) (=< less than)	Inter-action with food	JECFA Eval.	Specifications	JECFA comments	ADI mg/kg bw	References
Antifoam Agents								
Fatty acid methyl ester	Vegetable protein							31
Fatty acid polyalkylene glycol ester (1-5 moles ethylene oxide or propylene oxide)	Vegetable protein							31
Fatty alcohols (C8-C30)	Vegetable protein							
Formaldehyde	Sugar beet processing	< 0.05	None					39
	Yeast processing	< 0.05	None					
*Hydrogenated coconut oil	confectionery Vegetable protein	May-15						36, 49
Mixtures of polyoxyethylene and polyoxypropylene esters of C8-C30 fatty acids	Vegetable protein							31
*Mono- and diglycerides of fatty acids from feed fat (E471)	Jams, jellies and marmalades			Yes	Yes	Mono and diglycerides differ little from food therefore use NL	NL	CCFA 41 54, CCFA42 (IFU)
Oxoalcohols (C9-C30)								31
*Polydimethylsiloxane (INS 900a)	Beer Fats and oils Vegetable protein, Juice making	10 (Frying/deep frying purposes only) 10		Yes	Yes	Evaluated as antifoaming agent, anticaking agent ADI of 0-1.5	0-1.5	57 Fats and Oils CCFAC 22 CCFA 41 JECFA 69 CCFA 44
Polyoxyethylene esters of C8-C30 fatty acids	Vegetable protein							31
Polyoxypropylene esters of C8-C30 fatty acids	Vegetable protein							31
Polyoxyethylene esters of C9-C30 oxoalcohols	Vegetable protein							31
Polyoxypropylene esters of C9-C30 oxoalcohols	Vegetable protein							31
Boiler water additives								
Acrylamide-sodium acrylate resin	boiler water							

Inventory of Substances used as Processing Aids (IPA), Main List

CATEGORY * These substances may also function as a food additive or foods	Use	Residues (mg/kg) (<= less than)	Inter-action with food	JECFA Eval.	Specifications	JECFA comments	ADI mg/kg bw	References
*Ammonium alginate	boiler water			Yes	Yes	Group ADI for alginic acid and its ammonium, calcium, potassium and sodium salts	NS	CCFAC 22
Cobalt sulphate	boiler water							CCFAC 22
1-Hydroethylidene-1,1-diphosphoric acid and its sodium and potassium salts	boiler water							CCFAC 22
Lignosulfonic acid	boiler water							CCFAC 22
Magnesium sulfate	boiler water			Yes	Yes	Evaluated as Nutrient	NS	CCFAC 22
Monobutyl ethers of polyethylene-polypropylene glycol produced by random condensation of a 1:1 mixture by wt. Of ethylene oxide and propylene oxide with butanol	boiler water							CCFAC 22
*Pentasodium triphosphate	boiler water			Yes	Yes	Expressed as P from all sources	MTDI 70	CCFAC 22
Poly (actylic acid co-hypophosphite), Na salt	boiler water							CCFAC 22
*Polyethylene glycols	boiler water			Yes	Yes	Evaluated as Carrier solvent and Excipient	0-10	CCFAC 22
Polymaleic acid and/or its sodium salt	boiler water							CCFAC 22
Polyoxypropylene glycol	boiler water							CCFAC 22
*Potassium alginate	boiler water			Yes	Yes	Group ADI for alginic salts Evaluated as stabiliser, thickener, gelling agent and emulsifier	NS	CCFAC 22
*Potassium carbonate	boiler water			Yes	Yes		NL	CCFAC 22
*Potassium tripolyphosphate	boiler water			Yes	Yes	Expressed as P from all sources specification as texturiser	MTDI 70	CCFAC 22
*Sodium acetate	boiler water			Yes	Yes		NS	CCFAC 22
*Sodium alginate	boiler water			Yes	Yes	Group ADI for alginates	NS	CCFAC 22

Inventory of Substances used as Processing Aids (IPA), Main List

CATEGORY * These substances may also function as a food additive or foods	Use	Residues (mg/kg) (<= less than)	Inter-action with food	JECFA Eval.	Specifications	JECFA comments	ADI mg/kg bw	References
Sodium aluminate	boiler water							CCFAC 22
*Sodium carbonate	boiler water			Yes	Yes		NL	CCFAC 22
*Sodium carboxymethyl cellulose	boiler water			Yes	Yes	Group ADI for modified celluloses	NS	CCFAC 22
Sodium glucoheptonate	boiler water							CCFAC 22
*Sodium hexametaphosphate	boiler water			Yes	Yes	Expressed as P from all sources Evaluated as emulsifier, sequestrant, texturizer	MTDI 70	CCFAC 22
Sodium humate	boiler water							CCFAC 22
*Sodium hydroxide	boiler water			Yes	Yes		NL	CCFAC 22
Sodium lignosulfonate	boiler water							CCFAC 22
*Sodium metasilicate	boiler water							CCFAC 22
*Sodium nitrate	boiler water			Yes	Add.3/173 as anti-microbial and colour tentative	Expressed as nitrate ion; (or 0-5 mg/kg bw expressed as sodium nitrate) Evaluated as antimicrobial preservative, colour fixative	0-3.7	CCFAC 22
*Sodium phosphate (mono-, di-, tri-)	boiler water			Yes	Yes. Specification withdrawn for tri form	Expressed as P from all sources	MTDI 70	CCFAC 22
Sodium polyacrylate	boiler water							
*Sodium polyphosphates	boiler water				See sodium hexa-meta phosphate			CCFAC 22
*Sodium silicate	boiler water			Yes	Not prepared		NS	CCFAC 22
*Sodium sulfate	boiler water			Yes	Yes	Evaluated as colour adjuvant	NS	CCFAC 22
*Sodium sulfite	boiler water			Yes	Yes	Group ADI for sulfite ion	0-0.7	CCFAC 22
*Sodium tripolyphosphate	boiler water			Yes	Yes	Expressed as P from all sources	MTDI 70	CCFAC 22

Inventory of Substances used as Processing Aids (IPA), Main List

CATEGORY * These substances may also function as a food additive or foods	Use	Residues (mg/kg) (=< less than)	Inter-action with food	JECFA Eval.	Specifications	JECFA comments	ADI mg/kg bw	References
*Starch, unmodified	boiler water							
*Tannin (including quebracho extract)	boiler water			Yes	Yes	Evaluated as a clarifying agent, flavouring agent, flavour adjunct. For use as a filtering aid where GMP ensures it is removed from food after use	NS	CCFAC 22
Tetrasodium diphosphate	boiler water				see Tetrasodium pyrophosphate below			CCFAC 22
Tetra sodium EDTA	boiler water							
*Tetrasodium pyrophosphate	boiler water			Yes	Yes	Expressed as P from all sources	MTDI 70	CCFAC 22
Catalysts								
Alloys of 2 or more listed metals	Hydrogenated food oils							5,22
Aluminum				Yes	Yes	Evaluated as a contaminant	PTWI 1 mg/kg bw	
Chromium	Hydrogenated food oils	< 0.1						1,22
Copper	Hydrogenated food oils	< 0.1		Yes		Evaluated as a contaminant. Provisional daily requirement/ maximum tolerable daily intake	PTDI 0.5	1, 22
Copper chromate								33
Copper chromite								45
Ferric chloride hexahydrate								CX/FAC 92/7
Manganese	Hydrogenated food oils	<0.4						1, 22
Molybdenum	Hydrogenated food oils	< 0.1						1, 22

Inventory of Substances used as Processing Aids (IPA), Main List

CATEGORY * These substances may also function as a food additive or foods	Use	Residues (mg/kg) (=< less than)	Inter- action with food	JECFA Eval.	Specifications	JECFA comments	ADI mg/kg bw	References
Nickel	Polyols	< 1						1, 36, 55
	Hardened oil manufacturing	< 0.8						6
	Hydrogenated food oils	0.2 to 1						22
Palladium	Hydrogenated food oils	< 0.1						1, 22
Platinum	Hydrogenated food oils	< 0.1						1, 22
Potassium metal	Interesterified food oils	< 1						1, 5, 22
Potassium methylate (methoxide)	Interesterified food oils	< 1						22
Potassium ethylate (ethoxide)	Interesterified food oils	< 1						1,22
Silver	Hydrogenated food oils	< 0.1		Yes		No info on use in/on foods insufficient data to evaluate	DP	5,22
Sodium amide	Interesterified food oils	< 1						1,22
Sodium ethylene (sodium ethylate)	Interesterified food oils	< 1						1, 22, 57
Sodium metal	Interesterified food oils	< 1						1,22
Sodium methylate (methoxide)		<1						
Trifluomethane sulfonic acid	Cocoa butter substitute	< 0.01	None					38
Various metal oxides	Hydrogenated food oils	< 0.1						5,22
Zirconium								16
Clarifying agents/ filtration aids								
Absorbent clays (bleaching, natural or activated earths)	Starch hydrolysis Sugars Edible vegetable oil, Juice making	GMP						61 CCFA 42 (IFU)
Absorbent resins	Juice making	GMP						CCFA 42 (IFU)

CATEGORY * These substances may also function as a food additive or foods	Use	Residues (mg/kg) (=< less than)	Inter-action with food	JECFA Eval.	Specifications	JECFA comments	ADI mg/kg bw	References
Activated carbon	Sugars Oils Juice making	GMP				Evaluated as a adsorbent, decolouring agent	NL	32,55 CCFAC 25 CCFA 42 (IFU)
*Albumin								1
Asbestos				Yes	-	Evaluated as contaminant. Concerns of carcinogen characteristics	No tolerable intake est.	6, 17,25
Bentonite	Starch hydrolysis Juice making	GMP		Yes		No info on use or impurities for JECFA to evaluate	No ADI allocated	1, 6, 37,39,49 CCFA42 (IFU)
Calcium hydroxide	Juice making	GMP (Grape juice only)						CCFA 42 (IFU)
*Calcium oxide	Sugar			Yes	Yes	Evaluated as Alkali, dough conditioner and yeast food		6, 15
Cellulose	Juice making	GMP						CCFA 42 (IFU)
Chitin/ Chitosan	Juice making	GMP						CCFAC 22, CCFA 42 (IFU)
Chloromethylated aminated styrene- divinylbenzene resin	Sugar processing	<1	None					58
Colloidal silica	Juice making	GMP						CCFA 42 (IFU)
Diatomaceous earth	Fruit juices Starch hydrolysis general use			Yes	Yes	Evaluated as filtering aid	DP	2,6,37,49
Divinylbenzene-ethylvinylbenzene copolymer	Aqueous foods (excluding carbonated beverages)	0.00002 (ex-tractives from copolymer)	None					58
Fuller's earth	Starch hydrolysis, Oils							CCFAC 25
Gelatin (from skin collagen))	Juice making			Yes			Yes	CCFA 42 (IFU)
Ion exchange resins (see ION EXCHANGE RESINS)	Juice making			Yes			Yes	CCFA 42 (IFU)

Inventory of Substances used as Processing Aids (IPA), Main List

CATEGORY * These substances may also function as a food additive or foods	Use	Residues (mg/kg) (<= less than)	Inter-action with food	JECFA Eval.	Specifications	JECFA comments	ADI mg/kg bw	References
*Nitrogen				Yes	Yes	Packaging gas, cryogenic freezant, propellant	Not necessary, inert	1
Desiccating agent/anticaking agents								
Aluminum stearate				Yes	Yes	Evaluated as anion and cation	PTWI for Al 1 mg/kg bw NS for stearates	61
Amorphous hydrophobic silica								CCFA 42 (Brooke-Taylor & Co Pty Ltd)
Calcium phosphate (tricalcium phosphate)				Yes	Yes	Expressed as P from all sources	MTDI 70	28
Calcium Stearate				Yes	Yes		Not allocated	61
Magnesium oxide	anticaking agent and neutralising agent			Yes	Yes	Evaluated as anticaking agent	NL	14
Magnesium stearate				Yes	Yes		Not allocated	61
Octadecyl ammonium acetate (in ammonium chloride)								28
Potassium aluminum silicate								
Sodium alumino silicate				Yes	Yes	Anticaking agent Group ADI for silicon dioxide and certain silicates.	NS	28
Sodium calcium silicoaluminate				Yes	Yes	Anticaking agent	NS	61
Detergents (wetting agents)								
*Dioctyl sodium sulfosuccinate	Fruit drinks	<10		Yes	Yes	Evaluated as emulsifier or wetting agent	0-0.1	26
Magnesium Sulphate	Fats and oils							CCFAC 25
Methyl glucoside of coconut oil ester	Molasses	320						26
Quaternary ammonium compounds								
Sodium lauryl sulphate	Food fats and oils	< 1						221 39

Inventory of Substances used as Processing Aids (IPA), Main List

CATEGORY * These substances may also function as a food additive or foods	Use	Residues (mg/kg) (≤ less than)	Inter-action with food	JECFA Eval.	Specifications	JECFA comments	ADI mg/kg bw	References
Sodium xylene sulphonate	Food fats & oils	<1						
Enzyme immobilization agents & supports								
Polyethylenimine (# ADI acceptable provided migration into food reduced to lowest technologically possible)				Yes	Yes	Evaluated as immobilizing agent. New method of analysis prepared at 29 th to ensure < 0.1 mg/kg in enzyme preparations of ethylenimine.	Suitable #	42
Glutaraldehyde								33
Glass		Starch hydrolysis						33,49
Diatomaceous earth				Yes	Yes	Evaluated as filter aid	DP	33
Ceramics	Starch hydrolysis							37, 49
Diethylaminoethyl Cellulose								14, 33,
Ion exchange resins								55
Flocculating agents								
Acrylate-acrylamide resin	Sugar	(10 in sugar liquor)						3,24,56
Chitin/Chitosan								CCFAC 22
Complexes of soluble aluminum salt and phosphoric acid	Drinking water							57
								32
Dimethylimine -epichlorohydrin copolymer	Sugar processing	< 5	None					58
Fuller's earth (calcium analogue of sodium montmorillonite)								32
*Isinglass				Yes	Yes	Evaluated as thickener, stabilizer and emulsifier	NL	
*Dried and powdered blood plasma								
Modified acrylamide resin	Sugar, boiler water							3, 24
Polyacrylic acid	Sugar							1,15,17
Polyacrylamide	Sugar (beet)							

Inventory of Substances used as Processing Aids (IPA), Main List

CATEGORY * These substances may also function as a food additive or foods	Use	Residues (mg/kg) (<= less than)	Inter-action with food	JECFA Eval.	Specifications	JECFA comments	ADI mg/kg bw	References
Sodium polyacrylate	Sugar (beet)							6, 17 6
*Trisodium diphosphate				Yes	Withdrawn (2004)	P from all sources Evaluated at stabiliser, leavening agent, emulsifier, nutrient	MTDI 70	28,16,57
*Trisodium orthophosphate				26	Comp /1559	P from all sources Evaluated as buffer, sequestrant, emulsion stabiliser	MTDI 70	28,16,57
Ion exchange resins, membranes, and molecular sieves.								
Resins:	Enzyme immob. Starch hydrolysis	<. 1 (calculated at Total Organic Carbon)						49
Completely hydrolyzed copolymers of methyl acrylate and divinylbenzene.								3
Completely hydrolyzed terpolymers of methyl acrylate, divi-nylbenzene and acrylonitrile.								3
Cross-linked phenol-formaldehyde activated with one or both -of the following:								3
Triethylenetetramine								
Tetraethylenepentmine								
Cross-linked polystyrene, first chloremethylated then aminated with trimethylamine, dimethylamine, diethylenetriamine or dimethylethanolamine.								3
Diethylenetriamine, triethylenetetramine, tetraethylenapentamine cross-linked with epichlorohydrin								3
Epichlorohydrin cross-linked with ammonia.								3
Epichlorohydrin cross-linked with ammonia and then quaternized with methyl chloride to contain tot more than 18 percent strong base capacity by weight of total exchange capacity	Water used in food processing	None						58

Inventory of Substances used as Processing Aids (IPA), Main List

CATEGORY * These substances may also function as a food additive or foods	Use	Residues (mg/kg) (<= less than)	Inter- action with food	JECFA Eval.	Specifications	JECFA comments	ADI mg/kg bw	References
Methacrylic acid-divinylbenzene copolymer.								3
Methacrylic acid-divinylbenzene copolymer with RCOO active groups.								6
Methyl acrylate-divinylbenzene copolymer containing not less than 2 percent by weight of divinylbenzene, aminolyzed with dimethylaminopropylamine.								3
Methyl acrylate-divinylbenzene copolymer containing not less than 3.5 percent by weight of divinyl benzene, aminolyzed with dimethylaminopropylamine								3
Methyl acrylate-divinylbenzenediethylene glycol divinyl ether terpolymer containing not less than 3.5 percent by weight of divinylbenzene and not more than 0.6. percent by weight of diethylene glycol divinyl ether, aminolyzed with dimethyl-aminopropylamine.								3
Methyl acrylate-divinylbenzene-diethylene glycol divinyl ether terpolymer containing not less than 7 percent by weight of divinylbenzene and not more than 2.3 percent by weight of diethylene glycol divinyl ether, aminolyzed with dimethylaminopropyl-amine and quaternized with methyl chloride.	Sugar processing	0.015 (extractives from resin)	None					58
Polystyrene- divinylbenzene reticulum with trimethylammonium groups.	Sugar, distilled liquors	Migrants from resin <1						17
Reaction resin of formaldehyde, acetone and tetraethylpentamine								3
Styrene-divinylbenzene cross-linked copolymer, first chlormethylated then animated with dimethylamine and oxidized with hydrogen peroxide whereby the resin contains not mor6 than 15 percent by weight of vinyl N,N-dimethyl- benzylamine-N-oxide,and not more than 6.5 percent by weight of nitrogen.								3
Sulfite-modified cross-linked phenol-formaldehyde, with modification resulting in sulfonic acid groups on side chains								3
Sulfonated anthracite coal meeting the requirements of American society for Testing and Materials D388-38, Class 1, Group 2								
Sulfonated copolymer of styrene and divinylbenzene.								3
Sulfonated terpolymers of styrene, divinylbenzene and acrylonitrile. or methyl acrylate.								3

Inventory of Substances used as Processing Aids (IPA), Main List

CATEGORY * These substances may also function as a food additive or foods	Use	Residues (mg/kg) (<= less than)	Inter-action with food	JECFA Eval.	Specifications	JECFA comments	ADI mg/kg bw	References
Sulfonated tetrapolymer of styrene, divinylbenzene, acrylonitrile and methyl acrylate derived from a mixture of monomers containing not more than a total of 2 percent by weight of acrylonitrile and methyl acrylate.								3
Counter ions for resins								3, 36
Aluminum								
Bicarbonate								
Calcium								
Carbonate								
Chloride								
Hydronium								
Hydroxyl								
Magnesium								
Potassium								
Sodium								
Strontium								
Sulfate								
Membranes: Polyethylene - polystyrene base modified by reaction with chloromethyl ether and subsequent amination with trimethylamine, diethylenetriamine or dimethylethanolamine.								46
Polymers and copolymers containing the following components: cellulose (such as cellulose diacetate, cellulose triacetate, cellulose ethers, cellulose), Polysulfone - sulfonated polyethersulfone, Polyethersulfone - sulfonated polyethersulfone, Fluoropolymers (such as polyvinylidene fluoride, chlorotrifluoroethylene-vinylidene fluoride copolymer, polytetra-fluoroethylene), Polysulfonamides, aliphatic/aromatic polyamide and copolyamides (such as polypiperazineamides, m-phenylene-diamine trimesamide polymer), Polyesters (such as polyethyleneterephthalate), Polyolefins (such as polypropylene, polyethylene), Polyamide-imide polymers, Polyimides, Polyacrylonitriles, Polyvinylpyrrolidone, Polystyrene-sulfonated polystyrene, chitin/chitosan and derivatives, polyureas - polyurethanes, Polyethers, and Polyamines.								

Inventory of Substances used as Processing Aids (IPA), Main List

CATEGORY * These substances may also function as a food additive or foods	Use	Residues (mg/kg) (<= less than)	Inter-action with food	JECFA Eval.	Specifications	JECFA comments	ADI mg/kg bw	References
Polymers and copolymers containing the following components: cellulotics (such as cellulose diacetate, cellulose triacetate, cellulose ethers, cellulose), Polysulfone - sulfonated polyethersulfone, Polyethersulfone - sulfonated polyethersulfone, Fluoropolymers (such as polyvinylidene fluoride, chlorotrifluoroethyl-ene- vinylidene fluoride copolymer, polytetra-fluoroethylene), Polysulfonamides, aliphatic/aromatic polyamide and copolyamides (such as polypiperazineamides, m-phenylene-diamine trimesamide polymer), Polyesters (such as polyethyleneterephthalate), Polyolefins (such as polypropylene, polyethylene), Polyamide - imide polymers, Polyimides, Polyacrylonitriles, Polyvinylpyrrolidone, Polystyrene-sulfonated polystyrene, chitin/chitosan and derivatives, polyureas - polyurethanes, Polyethers, and Polyamines.				29	Comp /265	Anticaking agent	NS	28
Lubricants, release and anti stick agents, moulding aids								
Bentonite	Confectionery			Yes	Not prepared	Anticaking agent .No significant uses known, no data on impurities	No ADI allocated	2
*Dimethylpolysiloxane				Yes	Yes	ADI only applies to compounds with 200 – 300 subunits	0-1.5	16
Kaolin (Aluminum Silicate)	Confectionery			Yes	Yes	As anticaking agent	NS	2
Micro-organism control agents								
Acidified sodium chlorite (ASC)	Poultry Meats Vegetables Fruit Seafood	Chloride	None	Yes	Yes	The available toxicological data were sufficient to assess the safety of ASC by setting ADIs for chlorite and chlorate.	0.03 (chlorite) 0.01 (chlorate)	CCFA 40

Inventory of Substances used as Processing Aids (IPA), Main List

CATEGORY * These substances may also function as a food additive or foods	Use	Residues (mg/kg) (<= less than)	Inter- action with food	JECFA Eval.	Specifications	JECFA comments	ADI mg/kg bw	References
*Chlorine dioxide #	Flour			Yes	Withdrawn (2000)	Flour treatment agent conditional, 30-75; acceptable level of treatment for flours to be consumed by man		57
*Dimethyl dicarbonate	Grape wine Fruit and vegetable wine Beverages Water-based flavoured drinks, including: "sport", "energy", or "electrolyte" drinks and particulated drinks Fruit and vegetable juices, nectars.	None		Yes	Yes	Acceptable for use as a cold sterilization agent in beverages when used according to good manufacturing practice up to a maximum concentration of 250mg/l	acceptable	58 CCFA 40 CCFA45 (DMDC INS 242 is permitted for use as a preservative in GSFA categories 14.1.4 (250mg/kg) 14.1.5 (250mg/kg) 14.2.2 (250mg/kg) 14.2.3 (200mg/kg) 14.2.4 (250mg/kg) 14.2.5 (200mg/kg) Australia New Zealand Food Standards Code Std 1.3.3)
Formaldehyde	Sugar							56
Hydrogen peroxide	Sugar.			Yes	Yes	Small residues of hydrogen peroxide on food (which has been treated with antimicrobial washing solutions) at the time of consumption would not pose a safety concern-		14,24 CCFA 42 (IFU)

Inventory of Substances used as Processing Aids (IPA), Main List

CATEGORY * These substances may also function as a food additive or foods	Use	Residues (mg/kg) (≤ less than)	Inter- action with food	JECFA Eval.	Specifications	JECFA comments	ADI mg/kg bw	References
Hypochlorite	Food oils							22
Iodophors	Food oils							22
Lactoperoxidase system (lactoperoxidase, glucose oxidase, thiocyanate salt)								47
Peracetic acid								
Peroxyacid antimicrobial solutions								CCFAC 38
Quaternary ammonium compounds	Food oils							22
Salts of sulfurous acid	Corn milling Starch hydrolysis	< 100						32,37,57
Sodium metasilicate (Sodium sulphate or sodium carbonate can be added to reduce silicate scaling on equipment)	Meat and poultry carcasses, half carcasses and cuts							CCFA 40
*Trisodium phosphate	Meat and poultry carcasses, half carcasses and cuts			Yes	Yes	Expressed as P from all sources	MTDI 70	CCFA 40
Microbial nutrients and microbial nutrient adjuncts								
Adenine Adonitol Ammonium sulfate Ammonium sulphite Ammonium phosphates Arginine Asparagine Aspartic acid Benzoic acid Biotin Calcium pantothenate Calcium propionate Copper sulphate Cystine Cysteine monohydrochloride Dextran Ferrous sulfate Glutamic acid Glycine	Microbial nutrients or microbial nutrient adjuncts in the course of manufacture of a food or drink							CCFA 45 (Australia New Zealand Food Standards Code Std 1.3.3)

Inventory of Substances used as Processing Aids (IPA), Main List

CATEGORY * These substances may also function as a food additive or foods	Use	Residues (mg/kg) (≤ less than)	Inter- action with food	JECFA Eval.	Specifications	JECFA comments	ADI mg/kg bw	References
Isobutane	Propellant in vegetable oil pan spray (for professional use only)							CCFAC 37
*Nitrous oxide				Yes	Yes	At its twenty-ninth meeting (1985), the Committee concluded that use of nitrous oxide as a propellant for food was acceptable. At its fifty-fifth meeting (2000), the Committee was requested by the CCFAC to evaluate the additional use of nitrous oxide as a packaging gas, but the Committee could not carry out this request because no information on intake of nitrous oxide for such use was available.	Use acceptable as a propellant	1, 6
*Nitrogen	Juice making	GMP		Yes	Yes	Packaging gas; cryogenic freezant, propellant	No ADI necessary	1,3,6 CCFA 42 (IFU))
Octafluorocyclobutane								1
Propane				Yes	Not prepared	Evaluated as propellant; extraction solvent	NS	1
Trichlorofluoromethane (F 11)								43.6

Inventory of Substances used as Processing Aids (IPA), Main List

CATEGORY * These substances may also function as a food additive or foods	Use	Residues (mg/kg) (=< less than)	Inter-action with food	JECFA Eval.	Specifications	JECFA comments	ADI mg/kg bw	References
Solvents, extraction & processing. (NB The International Organization of the Flavor Industry (IOFI) is reviewing this category- December 2012)								
Acetone (Dimethyl ketone)	Flavourings, colours, food oils	< 30, 2, & 0.1		Yes	Yes	Extraction solvent, flavouring agent	Acceptable	1, 3, 4,17, 22, 14
Amyl acetate	Flavourings, colours			Yes	Yes	As carrier solvent, flavouring agent. Included in ADI for amyl butyrate expressed as isoamyl alcohol	0-3	2,59
Benzyl alcohol	Flavourings, colours, fatty acids			Yes	Yes	As carrier solvent, flavouring. ADI for total benzoate from all sources	0-5	2,59
*Butane	Flavourings, food oils	<1, 0.1		Yes	Not prepared	Propellant	Not allocated	1, 4, 17,22,19
Butane-1,3-diol	Flavorings	0-4		23	Comp/ 241	As carrier solvent	0-4	3
Butan-1-ol	Fatty acids	<1000		Yes	Yes	Evaluated as extraction solvent, flavouring agent	Acceptable	2,4,19
	flavourings, colours							
Butan-2-ol	Flavorings	1		Yes	Yes	Extraction solvent, flavour	Not allocated	56
*Butyl acetate				Yes	Yes	Evaluation as flavouring agent.	Acceptable	56
*Carbon dioxide				Yes	Yes	Carbonating agent, propellant, preservative, freezing agent, extraction solvent		56
Cyclohexane	Flavourings, food oils	< 1		Yes	Yes	Extraction solvent	Not allocated	4.17.19
Dibutyl ether	Flavourings	<2						4,19

Inventory of Substances used as Processing Aids (IPA), Main List

CATEGORY * These substances may also function as a food additive or foods	Use	Residues (mg/kg) (<= less than)	Inter-action with food	JECFA Eval.	Specifications	JECFA comments	ADI mg/kg bw	References
1,2 Dichloroethane	Decaf. Coffee	< 5		Yes	Not prepared	Evidence of genotoxicity and carcinogenicity; should not be used in food	Not allocated	1, 17
Dichlorodifluoromethane	Flavourings, colour	< 1		Yes	Not prepared	Propellant; Liquid Freezant	0-1.5	2,4,19,59,
Dichloromethane (methylene chloride)	Flavourings, decaf. Coffee, food oils	< 2,5,10		Yes	Yes	Should be limited to current uses (extraction solvent)		2,4,17,22,19
Dichlorotetrafluoroethane	Flavourings	<1						4,19
Diethyl citrate	Flavourings, colours							2
Diethyl ether	Flavourings, colours	<2		Yes	Yes	Extraction solvent	Not allocated	2,4,19
Di- iso propylketone								2
*Ethanol	Vegetable protein			Yes	Yes	Specification for extraction and carrier solvent	Limited by GMP	56
*Ethyl acetate				Yes	Yes	No safety concerns at current level of intakes when used as a flavouring agent	0-25	56
Ethyl methyl ketone (butanone)	Fatty acids, flavourings, colourings. Decaffeination of coffee, tea	< 2		Yes	Yes	Extraction solvent, flavouring agent	Acceptable	2, 4, 19
Glycerol tributyrat	Flavourings, colours							2
Glycerol tripropionate	Flavourings, colours							2,59
Heptane	Flavourings, food oils	< 1		Yes	Yes	Extraction solvent	Limited by GMP	1, 4, 6,22
Hexane	Flavourings. food oils,	< 0.1		Yes	Yes	Extraction solvent JECFA 65	Limited by GMP	1,3,4,

CATEGORY * These substances may also function as a food additive or foods	Use	Residues (mg/kg) (<= less than)	Inter- action with food	JECFA Eval.	Specifications	JECFA comments	ADI mg/kg bw	References
						recommended a re-evaluation of hexanes as there was insufficient information to change current specifications		
	Chocolate and chocolate products	1						CCFAC 37
*Isobutane	Flavourings	<1						4,19
Isoparaffinic petroleum hydrocarbons	Citric acid							3
Isopropyl myristate	Flavourings colours			Yes	Yes	Carrier solvent. No safety concerns at current level of intakes when used as a flavouring agent	Not allocated	2
Methylene chloride (dichloromethane)	Food oils	< 0.02		Yes	see above in dichloromethane			1,22
Methyl acetate	Coffee	20						56
	Decaffeination flavoring							
	Sugar refining							
		1						
Methyl propanol-1	Flavorings	1						56
Nitrous oxide				Yes	Yes	evaluated as propellant Use acceptable as a propellant	acceptable	45
n-Octyl alcohol	Citric acid							3
Pentane	Flavourings, food oils	< 1						1,4, 22
Petroleum ether (light petroleum)	Flavourings, food oils	< 1		Yes	Yes	Extraction solvent	NS	1,4,6,22,19

Inventory of Substances used as Processing Aids (IPA), Main List

CATEGORY * These substances may also function as a food additive or foods	Use	Residues (mg/kg) (≤ less than)	Inter-action with food	JECFA Eval.	Specifications	JECFA comments	ADI mg/kg bw	References
*Propane	Flavourings, food oils	< 1, 0.1		Yes	Not prepared	Propellant; Extraction solvent Limited use and residue mean unnecessary to establish ADI	NS	4, 17,22,19
Propane-1,2-diol	Fatty acids flavourings, colours,							2,59
Propane-1-ol	Fatty acids, flavourings, colours			25	Comp/1205	Carrier/extraction solvent/ flavouring. Further tox studies required.	Not allocated	2,59
*Propylene Glycol				Yes	Yes	As solvent, humectant and glazing agent	0-25	CX/FAC 92/7
Tertiary butyl alcohol								38
1,1,2-Trichloroethylene	Flavourings, food oils	< 2		Yes	Withdrawn (2000)	Use as extraction solvent should be limited to ensure levels are as low as practicable	Not allocated	1,4,17,22, 19
Trichlorofluoromethane	Flavourings	<1						4,19,59
Tridodecylamine	Citric acid							3
Toluene	Flavourings	<1		Yes	Yes	Residues of toluene occurring in food when this solvent is used in accordance with GMP would not pose any toxicological problems	NS	4, 19

Inventory of Substances used as Processing Aids (IPA), Main List

CATEGORY * These substances may also function as a food additive or foods	Use	Residues (mg/kg) (<= less than)	Inter-action with food	JECFA Eval.	Specifications	JECFA comments	ADI mg/kg bw	References
Washing and peeling agents								
A mixture of alkene oxide adducts of alkyl alcohol and phosphate esters of alkylene oxide adducts of alkyl alcohols consisting of alpha-alkyl(C12-C18)-omega-hydroxy- poly(oxy-ethylene) (7.5-8.5moles) poly(oxypropylene) block copolymer having an average molecular weight of 810, alpha-alkyl- (C12-C18)-omega-hydroxy-poly(oxyethylene) (3.3-3.7 moles) polymer having an average molecular weight of 380, and subsequently esterified with 1.25 moles phosphoric anhydride; and alpha-alkyl (omega-hydroxy-poly(oxyethylene) (11.9-12.9 moles)/poly(oxypropylene) copolymer having an average molecular weight of 810 and sub-sequently esterified with 1.25 moles phosphoric anhydride	Fruits and vegetables	< 0.001 up to 0.01	None					3, 54
Alkylene oxide adducts of alkyl alcohols and fatty acids	Sugar beets	No Information Available						6,51,54
Aliphatic acid mixture consisting of valeric, caproic, enanthic, caprylic, and pelargonic acids	Fruits and vegetables	0.04-0-11	None					3,54
Alpha-alkyl-omega-hydroxy-poly (oxyethylene)	Sugar beets	0.001in sugar beets, 0 in sugar		None				3,51.54
Ammonium chloride, quaternary	Sugar beets							53
Ammonium orthophosphate	Fruits and vegetables			Yes	Yes	Expressed as P from all sources	MTDI 70	
*Calcium chloride	Fruits and vegetables			Yes	Yes	Firming agent	NL	53
*Calcium hydroxide	Sugar beets			Yes	Yes	Specification for neutralizing agent; buffer; firming agent	NL	53
*Calcium oxide	Sugar beets			Yes	Yes	Specification for Alkali, dough conditioner, yeast food	NL	53
Carbamate	Sugar beets							53
Dialkanolamine	sugar beets	0.001 in sugar beets, 0 in sugar	None					3,54
Diammonium orthophosphate	Fruits and vegetables for canning			Yes	Yes	Expressed as P from all sources	MTDI 70	

Inventory of Substances used as Processing Aids (IPA), Main List

CATEGORY * These substances may also function as a food additive or foods	Use	Residues (mg/kg) (=< less than)	Inter-action with food	JECFA Eval.	Specifications	JECFA comments	ADI mg/kg bw	References
Diammonium orthophosphate, (5% aqueous solution)	Fruits and vegetables for canning			Yes	Yes	Expressed as P from all sources	MTDI 70	
Dithiocarbamate	Sugar beets							53
Ethylene dichloride	Sugar beets	0.00001 in sugar beets, 0 in sugar	None	23				3,54
Ethylene glycol monobutyl ether	Sugar beets	0.00003 in sugar beets, 0 in sugar	None					3,54
Hydrogen peroxide		No Information -Available		Yes	Yes	As antimicrobial agent	Acceptable	54
Linear undecylbenzenesulfonic acid	Sugar beets	0.001 in sugar beets 0 in sugar	None					3,54
Monoethanolamine	Fruits and vegetables, sugar beets	100						3,52
Monoethanolamine	Sugar beets	0.0001 in sugar beets, 0 in sugar	None					54
Monoethanolamine (8%)	Fruits and vegetables for canning							56
Organophosphates	Sugar beets							53
Peroxyacid antimicrobial solutions containing 1-hydroxyethylidene-1,1-				Yes		The peroxy compounds in these solutions (hydrogen peroxide, peroxyacetic acid and peroxy-octanoic acid) would break down into acetic acid and octanoic acid, and small residual quantities of these acids on foods at the time of consumption would not pose a safety concern. HEDP does not		
diphosphonic acid (HEDP) Containing HEDP and three or more of the following components: peroxacetic acid, acetic acid, hydrogen peroxide, octanoic acid and peroxyoctanoic acid.					Yes			
Acetic acid					Yes			
1-Hydroxyethylidene-1,1-diphosphonic acid (HEDP)					Yes			
Hydrogen peroxide					Yes			
Octanoic acid (as food additive)					Yes			

Inventory of Substances used as Processing Aids (IPA), Main List

CATEGORY * These substances may also function as a food additive or foods	Use	Residues (mg/kg) (≤ less than)	Inter-action with food	JECFA Eval.	Specifications	JECFA comments	ADI mg/kg bw	References
						pose a safety concern at the levels of residue that are expected to remain on foods at the time consumption.		
Polyacrylamide	Fruits and vegetables, sugar beets	< 1	None					3,51,54
Potassium bromide	Fruits and vegetables							3,54
Sodium dodecylbenzenesulfonate (alkyl group predominantly C12 and not less than 95 percent C10-C16).	Fruits and vegetables, meat and poultry	< 2		None				3, 6, 54
Sodium 2-ethylhexyl sulphate	Fruits and vegetables	< 20		None				3,54
*Sodium carbonate				Yes	Yes	Alkali	NL	52
*Sodium hydroxide	Fruits and vegetables, sugar beets			Yes	Yes	Alkali	NL	53
Sodium hydroxide (10%, max.)	Fruits and vegetables for canning					See above		52
Sodium hydroxide (2%)	Mackerel for canning					See above		52
Sodium hypochlorite	Fruits and vegetables	No Information Available				No Information Available		3,52.54
Sodium mono- and di-methyl naphthalene- sulfonates (mol. wt. 245-260)	Fruits and vegetables	< 0.2	None					3, 54
Sodium n-alkylbenzenesulfonate (alkyl group predominantly C12 and C13 and not less than 95 percent C10-C16).	Fruits and vegetables	Same as sodium dodecylbenzenesulfonate	None					3, 6, 54
*Sulfuric acid	Locust bean seeds			Yes	Yes	As acid		CCFAC 25

Inventory of Substances used as Processing Aids (IPA), Main List

CATEGORY * These substances may also function as a food additive or foods	Use	Residues (mg/kg) (<= less than)	Inter-action with food	JECFA Eval.	Specifications	JECFA comments	ADI mg/kg bw	References
Tetrapotassium pyrophosphate	Sugar beets	0.00002 in sugar beets 0 in sugar	None	Yes	Yes	Specification as emulsifier, texturiser. MTDI for P from all sources	MTDI 70	3,54,57
Tetrasodium ethylenediaminetetraacetate	Sugar beets	0.000003 in sugar beets 0 in sugar	None					3,54
Triethanolamine	Sugar beets	0.00005 in sugar beets 0 in sugar	None					3, 54
Other processing aids								
Aluminum oxide								
Aluminum potassium sulphate				Yes	Yes	Acidity Regulator; firming agent, raising agent Group ADI for AI	PTWI 1 mg/kg bw expressed as AI	28
Ammonium nitrate								
Benzoyl peroxide	Bleaching whey			Yes	Yes	Treatment of whey with benzoyl peroxide at a maximum concentration of 100 mg/kg does not pose a safety concern.	Acceptable	
Beta – cyclodextrin	flavour adjunctor and cholesterol extraction in butter			Yes	Yes	As encapsulating agent for food additives, flavours and vitamins, thickening agent	0-5	CCFAC 25
*Erythorbic acid				Yes	Yes	Antioxidant	NS	58
Calcium lignosulfonate (40-65)	Protective colloid/carrier for fat-soluble vitamins and carotenoids			yes	yes		0-20	CCFA 41 JECFA 69
Calcium tartrate				Yes	Not prepared	Acidity regulator	No ADI allocated	

Inventory of Substances used as Processing Aids (IPA), Main List

CATEGORY * These substances may also function as a food additive or foods	Use	Residues (mg/kg) (=< less than)	Inter-action with food	JECFA Eval.	Specifications	JECFA comments	ADI mg/kg bw	References
*Citric Acid	Fats and Oils			Yes	Yes	As acidulant, antioxidant synergist, sequestrants,, flavouring agent	NL	CCFAC 25
Ethyl parahydroxybenzoate				Yes	Yes	Preservative As sum of ethyl, methyl and propyl esters of p-hydroxybenzoic acid	0-10	32
Gibberellic acid								
*Glucono -delta lactone	pre acidification of milk in cheese making			Yes	Yes	As acidifier , raising agent, sequestrant	NS	CCFAC 25
Glycerol ester of adipic acid								32
Hydrogen								
Magnesium tartrate				Yes	Not Prepared		No ADI allocated	
*Phosphoric Acid	Fats and Oils			Yes	Yes	As P from all sources Evaluated as acidulant sequestrant, antioxidant synergist	MTDI 70	CCFAC 25
Polyvinyl polypyrrolidone	Beverages			Yes	Yes	As colour stabiliser, colloidal stabiliser, clarifying agent	NS	13
Potassium gibberellate								
Propyl parahydroxybenzoate				Yes	Withdrawn (2006)	As preservative In view of the adverse effects in male rats, propyl paraben (propyl p-hydroxybenzoate) should be	Withdrawn (2006)	32,58

Inventory of Substances used as Processing Aids (IPA), Main List

CATEGORY * These substances may also function as a food additive or foods	Use	Residues (mg/kg) (<= less than)	Inter- action with food	JECFA Eval.	Specifications	JECFA comments	ADI mg/kg bw	References
						excluded from the group ADI for the parabens used in food.		
Sodium								
*Sodium Hydroxide	Fats and Oils			Yes	Yes	As alkali	NL	CCFAC 25
Sodium hypochlorite								
*Sodium silicate				Yes	Not prepared		NS	

FOOD ENZYMES (INCLUDING IMMOBILIZED ENZYMES)

AMFEP PROPOSALS FOR UPDATING THE IPA AS A BASIS FOR THE DATABASE OF SUBSTANCES USED AS PROCESSING AIDS

December 2012

The proposals mentioned below are based on the Prototype (see: ftp://ftp.fao.org/codex/meetings/CCFA/CCFA44/fa44_18x.pdf) for the database as presented at the CCFA of 2012

Entries of the Database as proposed in the Prototype	Entries proposed by Amfep and reasoning
<u>Name of Substance:</u> enzyme name (origin, including donor), Code number, CAS number, INS number	Currently also included in the IPA under the column 'Category' . However, the origins as well as donors do not belong to the name of an enzyme (one enzyme can be derived from various origins and donors). It is therefore proposed to list origin and donors separately. CAS and INS numbers should be replaced by IUBMB numbers. The current IPA contains a lot of mistakes and duplications, due to the fact that many enzymes have synonyms. It is therefore proposed to list the enzymes on basis of the Accepted Name according to the IUBMB, and include all synonyms so that these become also searchable (see list below).
<u>Technological function:</u> all food enzymes are falling under the category 'enzyme preparations' – followed by either animal, plant or microbial	Not included in the current IPA , as all enzymes are listed separately. As has been decided at the 43th session of the CCFA, the technological function should be changed into: 'Food enzymes'. If the origin is listed separately, there is no need to divide animal, plant or microbial enzymes. In the list below, plant and animal enzymes have therefore been integrated into the microbial ones.
<u>Description:</u> definition and general description of substance, including composition, chemical structure, etc	Not included in the current IPA . Enzymes are described by their activity, not by their composition or chemical structure. It is therefore proposed not to include this item for enzymes and provide a link to the IUBMB information instead (see links included in the IUB numbers in the list below)
<u>Area of use:</u> food or food processing procedures in which the substance is used. This part should not include examples of utilization.	Not included in the current IPA . It is not clear to Amfep what is meant with the explanation in the prototype, especially 'this part should not include examples of utilization'. In the case of enzymes, it is not possible to give an exhaustive list of applications (which would be needed if the database is turning into a positive listing!). One specific food enzyme can often be used in the processing of various food raw materials and ingredients, depending on whether the substrate the enzyme acts on is present in the raw material or the ingredient. There are two main reasons why an enzyme is used: 1) to get rid of the substrate (e.g. lactose, asparagine), or 2) to create a certain reaction product (e.g. glucose, coagulated casein). In order to take these issues into account, it is proposed to change the heading into 'functional use' with the following footnote: <i>The functionality of a food enzyme depends on the presence of its substrate on which it acts. These naturally occurring substrates are not distributed over food in the same way as the food categories defined by Codex. As a consequence, the 'use' describes the functionality (reaction catalysed) of the food enzyme instead.</i> Of course, this information could also be obtained when clicking on the IUBMB link.
<u>Interaction with food:</u> degree of chemical interaction with food components. Levels of interaction products in food.	Not included in the current IPA . Food enzymes per definition have a chemical interaction with food. This is described by the reaction catalysed (see Area of use above). It is therefore proposed not to include this item for enzymes.
<u>Residues:</u> level of substance remaining in food after processing	Not included in the current IPA . It is proposed not to include this item for enzymes. The term 'residue' is not defined and it is not clear whether it should refer to the enzyme protein that is listed or to the total enzyme preparation. Moreover, the 'residue level' will not only differ per application, but also per individual food producer. For calculation of consumption data it is therefore assumed that the amount left in the food or food ingredient is equal to the amount added (which is minute to begin with!).
<u>JECFA evaluation:</u> provide link to evaluation	Currently also included in the IPA . OK to keep this item. Links have already been included in the list below.
<u>JECFA specification:</u> provide link to specification	Currently also included in the IPA . OK to keep this item. Links have already been included in the list below.

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

Entries of the Database as proposed in the Prototype	Entries proposed by Amfep and reasoning
<u>JECFA comments:</u>	Currently also included in the IPA. In principle, the whole JECFA evaluations and specifications – including any comments – can be easily retrieved if the link to the evaluations and specifications is given. However, other comments might be relevant. Therefore, Amfep proposes to change this item into ‘Comments’ in general (see list below).
<u>ADI:</u>	Not included in the current IPA , although sometimes mentioned under the column ‘JECFA comments’. There seems to be no need to keep this item if a link to the JECFA evaluations is given. Moreover, there are no food enzymes (yet) with a numerical ADI
<u>Identity:</u>	Not included in the current IPA. No need to keep this item if a link to the JECFA evaluations and specifications is given. Moreover, it is not clear what additional information this should give, as the identity is determined by the name of the enzyme and its functionality as described in IUBMB.
<u>Purity:</u>	Not included in the current IPA. No need to keep this item if a link to the JECFA evaluations and specifications is given.
<u>Adoption:</u> session in which the substance was adopted by CCFA	Currently also included in the IPA under the column ‘References’. Since substances used as processing aids are handled outside the CCFA, they will not be adopted by the CCFA. The item should therefore read: Codex session where food enzyme was listed.
<u>Other evaluations:</u> other safety evaluations than JECFA	Not included in the current IPA. It will be a considerable job to collect this information and keep it updated. For the time being, Amfep proposes not to include this item. See also approval information.
<u>Special Use History:</u> information about current legal use in one or more member countries	Not included in the current IPA. It is proposed to delete this item. In most countries the use of processing aids is not legally regulated. Consequently, authorities are not aware of such use. It is proposed that industry is asked instead to declare which of the processing aids presently listed are indeed still on the market, in order to prevent that processing aids are listed that are not used anymore.
<u>Approval information:</u> approval information in member countries	Not included in the current IPA. This item seems to be linked to the item ‘other evaluations’. It will be a considerable job to collect this information and keep it updated. Apart from the effort, it might be misleading, creating the impression that the food enzyme has not been approved (yet) in other countries. Therefore, Amfep proposes not to include this item, at least not for the time being

On basis of the proposals above, Amfep has updated the IPA in such a way as we believe it should be transferred into a data base.

All changes when compared to the current IPA text and table are highlighted in yellow.

Apart from the fact that animal- and plant- derived food enzymes have been integrated into the microbial derived ones and the fact that some entries have been merged with their synonyms, the order of the list below follows the existing IPA. Due to the fact that all names have now been based on the ‘Accepted’ IUBMB names, the order is therefore not completely alphabetical anymore. The enzyme names which are present in the existing IPA are indicated in **bold** and are not highlighted in yellow. In those cases where the specifications mentions more than one enzyme under ‘active principles’, the evaluations and specifications were added under each of these enzymes. Consequently, some new entries were added as well (marked completely yellow). Since for carbohydrase from *A. niger* the specifications were withdrawn in 2000, this could not be done in the case of this enzyme. However, for each starch splitting enzyme (i.e. ‘carbohydrase’) it was mentioned in the comment box that it was evaluated as carbohydrase.

The references to the date of listing have not been checked. The New Zealand delegate suggested deleting the existing references and replacing them with the date at which the Database is filled. This should still be decided, as the original entry in the IPA could be used as an argument for history of safe use, if needed.

INVENTORY OF SUBSTANCES USED AS PROCESSING AIDS (IPA): AMFEP proposal for changes (see yellow highlights):

IPA CATEGORIES: Food enzymes (including immobilized enzymes)

FOOD ENZYMES (INCLUDING IMMOBILIZED ENZYMES)

Microbially derived enzymes from genetically modified organisms are listed with the producing host organism name followed by a d-(name) to identify the source of the donor organism gene.

Note: Due to taxonomic changes of many micro-organisms used to produce enzymes, it would be necessary to mention all the synonyms in each case. This would make the table quite unreadable and require regular updating. Therefore please consult the following list of taxonomic changes for the current correct names of specific micro-organisms that produce enzymes.

- *Aspergillus niger* covers strains known under the names *Aspergillus aculeatus*, *A. awamori*, *A. ficuum*, *A. foetidus*, *A. japonicus*, *A. phoenicis*, *A. saitoi*, *A. usarii* and *A. tubingensis*.
- *Bacillus subtilis* formerly also covered the strains now known under the name *Bacillus amyloliquefaciens*.
- *Bacillus stearothermophilus* is also known as *Geobacillus stearothermophilus*
- *Endothia parasitica* is the former name of *Cryphonectrica parasitica*
- *Hansenula polymorpha* is also known as *Pichia angusta*
- *Humicola lanuginosa* is also known as *Thermomyces lanuginosus*
- *Klebsiella aerogenes* is the former name of *Klebsiella pneumoniae*
- *Kluyveromyces fragilis* is the former name of *Kluyveromyces marxianus* (var. *marxianus*)
- *Kluyveromyces lactis* is also known as *Kluyveromyces marxianus* var. *lactis*
- *Leuconostoc oenos* is the former name of *Oenococcus oeni*
- *Micrococcus lysodeicticus* is the former name of *Micrococcus luteus*
- *Mucor miehei* is the former name of *Rhizomucor miehei*
- *Mucor pusillus* is the former name of *Rhizomucor pusillus*
- *Nonomurea flexuosa* is the former name of *Thermopolyspora flexuosa*
- *Penicillium emersonii* is the former name of *Talaromyces emersonii*. It is also known as *Geosmithia emersonii*. In 2011 the species was renamed as *Rasamsonia emersonii*
- *Rhizopus arrhizus* is the former name of *Rhizopus oryzae*.

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

- *Sporotrichum dimorphosporum* is the former name of *Disporotrichum dimorphosporum*
- *Streptoverticillium mobaraense* is the former name of *Streptomyces mobaraensis*
- *Trichoderma longibrachiatum* is also known as *Trichoderma reesei*. The sexual form of this fungus is known as *Hypocrea jecorina*
- *Verticicladiella procera* is the former name of *Leptographium procerum*

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
1.10.3.3	L-Ascorbate oxidase Synonyms: ascorbate; ascorbic acid oxidase; ascorbate oxidase; ascorbic oxidase; ascorbate dehydrogenase; L-ascorbic acid oxidase; AAO; L-ascorbate:O ₂ oxidoreductase; AA oxidase; L-ascorbate:oxygen oxidoreductase	4 L-ascorbate + O ₂ = 4 monodehydroascorbate + 2 H ₂ O	<i>Cucurbita pepo</i>					CCFA 43 (AMFEP)
			<i>Cucurbita moschata</i>					
4.1.1.5	Acetolactate decarboxylase Synonyms: α-acetolactate decarboxylase; (S)-2-hydroxy-2-methyl-3-oxobutanoate carboxy-lyase; (S)-2-hydroxy-2-methyl-3-oxobutanoate carboxy-lyase [(R)-2-acetoin-forming]; (2S)-2-hydroxy-2-methyl-3-oxobutanoate carboxy-lyase [(3R)-3-hydroxybutan-2-one-forming]	(2S)-2-hydroxy-2-methyl-3-oxobutanoate = (3R)-3-hydroxybutan-2-one + CO ₂	<i>Bacillus licheniformis</i>					
			<i>Bacillus subtilis</i>	<i>Bacillus brevis</i>	FAS 40-JECFA 49/85	Compendium addendum 7/FNP 52 Add 7/1; FAO JECFA Monographs 1 vol.1/9		
			<i>Saccharomyces cerevisiae</i>	<i>Enterobacter s.</i>				CCFA 40 (CRD14 AMFEP)
3.2.1.52	β-N-Acetylhexosaminidase Synonyms: hexosaminidase; β-acetylaminodeoxyhexosidase; N-acetyl-β-D-hexosaminidase; N-acetyl-beta-hexosaminidase; β-hexosaminidase; β-acetylhexosaminidase; β-D-N-acetylhexosaminidase; β-N-acetyl-D-hexosaminidase; β-N-acetylglucosaminidase; hexosaminidase A; N-acetylhexosaminidase; β-D-hexosaminidase; β-N-acetyl-D-hexosaminidase; N-acetylhexosaminohydrolase	Hydrolysis of terminal non-reducing N-acetyl-D-hexosamine residues in N-acetyl-β-D-hexosaminides	<i>Streptomyces violaceoruber</i>	<i>Streptomyces sp.</i>				CCFA 43 (AMFEP)
3.1.3.2	Acid phosphatase Synonyms:	a phosphate monoester + H ₂ O = an alcohol +	<i>Aspergillus niger</i>					in CX/FAC 92/7

⁹ The functionality of a food enzyme depends on the presence of its substrate on which it acts. These naturally occurring substrates are not distributed over food in the same way as the food categories defined by Codex. As a consequence, the 'use' describes the functionality (reaction catalyzed) of the food enzyme instead.

¹⁰ Include foot note on synonyms of microorganisms

¹¹ All food enzyme preparations should comply to the General Specifications as laid down by JECFA: [General specifications and considerations for enzyme preparations used in food processing](#)

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed	
	acid phosphomonoesterase; phosphomonoesterase; glycerophosphatase; acid monophosphatase; acid phosphohydrolase; acid phosphomonoester hydrolase; uteroferin; acid nucleoside diphosphate phosphatase; orthophosphoric-monoester phosphohydrolase (acid optimum); phosphate-monoester phosphohydrolase (acid optimum)	phosphate							
1.1.1.1	Alcohol dehydrogenase Synonyms: aldehyde reductase; ADH; alcohol dehydrogenase (NAD); aliphatic alcohol dehydrogenase; ethanol dehydrogenase; NAD-dependent alcohol dehydrogenase; NAD-specific aromatic alcohol dehydrogenase; NADH-alcohol dehydrogenase; NADH-aldehyde dehydrogenase; primary alcohol dehydrogenase; yeast alcohol dehydrogenase; alcohol:NAD ⁺ oxidoreductase	1) a primary alcohol + NAD ⁺ = an aldehyde + NADH + H ⁺ 2) a secondary alcohol + NAD ⁺ = a ketone + NADH + H ⁺	<i>Saccharomyces cerevisiae</i>		NMRS50/TRS48 8-JECFA15/11			15	
4.2.2.3	Poly(β-D-mannuronate) lyase Synonyms: alginate lyase I ; alginate lyase; alginase I; alginase II; alginase; poly(β-D-1,4-mannuronide) lyase; poly[(1→4)-β-D-mannuronide] lyase	Eliminative cleavage of polysaccharides containing β-D-mannuronate residues to give oligosaccharides with 4-deoxy-α-L-erythrohex-4-enopyranuronosyl groups at their ends	<i>Sphingobacterium multivorum</i>					CCFA 43 (AMFEP)	
3.2.1.1	α-Amylase Synonyms: glycogenase; endoamylase; Taka-amylase A; 1,4-α-D-glucan glucohydrolase;	Endohydrolysis of (1→4)-α-D-glucosidic linkages in polysaccharides containing three or more (1→4)-α-linked D-glucose units	<i>Aspergillus niger</i>				Evaluated as carbohydrate	7	
			<i>Aspergillus niger</i>	<i>Aspergillus niger</i>					
			<i>Aspergillus niger</i>	<i>Rhizomucor pusillus</i>					
			<i>Aspergillus oryzae</i>		FAS 22-JECFA 31/5	Compendium addendum 8/FNP 52 Add.8/7; FAO JECFA Monographs 1 vol.1/83		7	
			<i>Bacillus amyloliquefaciens</i>					CX/FAC 92/7	
			<i>Bacillus amyloliquefaciens</i>	<i>Bacillus amyloliquefaciens</i>					
			<i>Bacillus</i>	<i>Thermoactinomyces</i>				CCFA 40	

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
			<i>amyloliquefaciens</i>	<i>sp.</i>				(CRD14 AMFEP)
			<i>Bacillus licheniformis</i>		FAS 20-JECFA 29/3	FNP 34-JECFA 29/41; Compendium/FNP 52/363; FAO JECFA Monographs 1 vol.1/295	As carbohydrase	7
			<i>Bacillus licheniformis</i>	<i>Bacillus amyloliquefaciens</i>				
			<i>Bacillus licheniformis</i>	<i>Bacillus licheniformis</i>	FAS 52-JECFA 61/3	Compendium addendum 11/FNP 52 Add.11/5; FAO JECFA Monographs 1 vol.1/77	modified gene	CCFAC 37
			<i>Bacillus licheniformis</i>	<i>Geobacillus sp.</i>			modified gene	CCFA 43 (AMFEP)
			<i>Bacillus licheniformis</i>	<i>Pseudomonas sp.</i>				CCFA 43 (AMFEP)
			<i>Bacillus licheniformis</i>	<i>Bacillus stearothermophilus</i>				
			<i>Bacillus stearothermophilus</i>		FAS 28-JECFA 37/63	Compendium addendum 2/FNP 52 Add.2/9; FAO JECFA Monographs 1 vol.1/87		
			<i>Bacillus subtilis</i>		FAS 28-JECFA 37/67	Compendium addendum 2/FNP 52 Add.2/11; FAO JECFA Monographs 1 vol.1/91		7
			<i>Bacillus subtilis</i>	<i>Bacillus megaterium</i>	FAS 28-JECFA 37/77	Compendium addendum 7/FNP 52 Add.7/7; FAO JECFA		in CX/FAC 92/7

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
						Monographs 1 vol.1/85		
			<i>Bacillus subtilis</i>	<i>Bacillus stearothermophilus</i>	FAS 28-JECFA 37/71	Compendium addendum 7/FNP 52 Add.7/9; FAO JECFA Monographs 1 vol.1/89		in CX/FAC 92/7
			<i>Bacillus subtilis</i>	<i>Bacillus subtilis</i>				
			Bacillus subtilis	Thermoactinomyces sp.				
			Bovine pancreas					
			Hog pancreas					10,23
			Malted barley		NMRS50/TRS48 8-JECFA15/11			
			<i>Microbacterium imperiale</i>					
			<i>Pseudomonas fluorescens</i>	<i>Thermococcus sp.</i>			modified gene	CCFA 43 (AMFEP)
			<i>Rhizopus delemar</i>					7
			<i>Rhizopus oryzae</i>		NMRS50/TRS48 8-JECFA15/12	FAS 2/NMRS 50B-JECFA 15/28; Compendium/FN P52/365; FAO JECFA Monographs 1 vol.1/297	Specifications as carbohydrase (together with amyloglucosidase and pectinase)	7
			<i>Thermomonospora viridis</i>					
			<i>Trichoderma longibrachiatum</i>	<i>Aspergillus sp.</i>				CCFA 43 (AMFEP)
3.2.1.22	α-Galactosidase Synonyms: melibiase ; α -D-galactosidase; α -galactosidase A; α -galactoside galactohydrolase; α -D-galactoside galactohydrolase	Hydrolysis of terminal, non-reducing α -D-galactose residues in α -D-galactosides, including galactose oligosaccharides, galactomannans and galactolipids	<i>Aspergillus niger</i>				Evaluated as carbohydrase	
			<i>Aspergillus oryzae</i>					
			<i>Aspergillus oryzae</i>	<i>Aspergillus niger</i>				
			<i>Mortierella vinacea</i>					7
			<i>Saccharomyces carlsbergensis</i>		NMRS50/TRS48 8-JECFA15/11			7,31
			<i>Saccharomyces cerevisiae</i>	Guar seed				

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
3.5.1.14	Aminoacylase Synonyms: dehydropeptidase II; histozyme; hippuricase; benzamidase; acylase I; hippurase; amido acid deacylase; L-aminoacylase; acylase; aminoacylase I; L-amino-acid acylase; α -N-acylaminoacid hydrolase; long acyl amidoacylase; short acyl amidoacylase; N-acyl-L-amino-acid amidohydrolase	an N-acyl-L-amino acid + H ₂ O = a carboxylate + an L-amino acid	<i>Aspergillus melleus</i>					CCFA 40 (CRD14 AMFEP)
3.4.11.xx ¹²	Aminopeptidase(s)	Release of N-terminal amino acids from peptides	<i>Aspergillus niger</i> <i>Aspergillus oryzae</i>		FAS 22-JECFA 31/8	Compendium addendum 8/FNP 52 Add.8/91: FAO JECFA Monographs 1 vol.3/203	As protease	
			<i>Aspergillus oryzae</i>	<i>Aspergillus sp.</i>				CCFA 43 (AMFEP)
			<i>Lactococcus lactis</i>					
			<i>Rhizopus oryzae</i>		NMRS50/TRS48 8-JECFA15/12			
			<i>Trichoderma longibrachiatum</i>					
3.5.4.6	AMP deaminase Synonyms: adenylic acid deaminase; AMP aminase; adenylic deaminase; adenylyate deaminase; 5-AMP deaminase; adenosine 5-monophosphate deaminase; 5-adenylate deaminase; adenylic deaminase; 5-adenylic acid deaminase; adenosine monophosphate deaminase; adenylyate aminohydrolase; adenylyate desaminase; adenosine 5-phosphate aminohydrolase; 5-adenylate deaminase; AMP aminohydrolase	AMP + H ₂ O = IMP + NH ₃	<i>Aspergillus melleus</i> <i>Aspergillus oryzae</i>					CCFA 43 (AMFEP)
			<i>Streptomyces murinus</i>					
3.2.1.99	Arabinan endo-1,5-α-L-arabinanase Synonyms: endo-1,5- α -L-arabinanase; endo- α -1,5-arabanase; endo-arabanase; 1,5- α -L-arabinan 1,5- α -L-arabinanohydrolase; arabinan endo-1,5-	Endohydrolysis of (1 \rightarrow 5)- α -arabinofuranosidic linkages in (1 \rightarrow 5)-arabinans	<i>Aspergillus niger</i>				Evaluated as carbohydrate	CCFA 40 (CRD14 AMFEP)

¹² Covers 3.4.11.1 till 3.4.11.25.

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
	α-L-arabinosidase ; 5-α-L-arabinan 5-α-L-arabinanohydrolase							
3.2.1.55	α-N-Arabinofuranosidase Synonyms: α-L-arabinosidase ; α-L-arabinosidase ; α-L-arabinosidase ; α-L-arabinofuranosidase ; polysaccharide α-L-arabinofuranosidase ; α-L-arabinofuranoside hydrolase ; L-arabinosidase ; α-L-arabinanase ; α-L-arabinofuranoside arabinofuranohydrolase	Hydrolysis of terminal non-reducing α-L-arabinofuranoside residues in α-L-arabinosides	<i>Aspergillus niger</i>				Evaluated as carbohydrate	31
			<i>Aspergillus niger</i>	<i>Aspergillus niger</i>				
3.5.1.1	Asparaginase Synonyms: asparaginase II ; L-asparaginase ; colaspase ; elspar ; leunase ; crasnitin ; α-asparaginase ; L-asparagine amidohydrolase	L-asparagine + H ₂ O = L-aspartate + NH ₃	<i>Aspergillus niger</i>	<i>Aspergillus niger</i>	FAS 60-JECFA 69/3 ; TRS 952-JECFA 69/19	Compendium/FAO JECFA Monographs 5/3		JECFA 69 CCFA 41
			<i>Aspergillus oryzae</i>	<i>Aspergillus oryzae</i>	FAS 59-JECFA 68/55	Compendium/FAO JECFA Monographs 4/3		AMFEP CRD14 JECFA 68 CCFA 40
3.2.1.2	β-Amylase Synonyms: saccharogen amylase ; glycogenase ; β amylase ; β-amylase ; 1,4-α-D-glucan maltohydrolase ; 4-α-D-glucan maltohydrolase	Hydrolysis of (1→4)-α-D-glucosidic linkages in polysaccharides so as to remove successive maltose units from the non-reducing ends of the chains	malted or ungerminated barley Soya <i>Bacillus cereus</i> <i>Bacillus flexus</i> <i>Bacillus licheniformis</i> <i>Bacillus megaterium</i> <i>Bacillus subtilis</i>		NMRS50/TRS488-JECFA15/11			7 in CX/FAC 92/7 7, 8 7
3.2.1.6	Endo-1,3(4)-β-glucanase Synonyms: endo-1,3-β-D-glucanase ; laminarinase ; laminaranase ; β-1,3-glucanase ; β-1,3-1,4-glucanase ; endo-1,3-β-glucanase ; endo-β-1,3(4)-glucanase ; endo-β-1,3-1,4-glucanase ; endo-β-(1→3)-D-glucanase ; endo-1,3-1,4-β-D-glucanase ; endo-β-(1-3)-D-glucanase ; endo-β-1,3-glucanase IV ; endo-1,3-β-D-glucanase ; 1,3-(1,3;1,4)-β-D-glucan 3(4)-glucanohydrolase ; 3(or 4)-β-D-glucan 3(4)-glucanohydrolase	Endohydrolysis of (1→3)- or (1→4)-linkages in β-D-glucans when the glucose residue whose reducing group is involved in the linkage to be hydrolysed is itself substituted at C-3	<i>Aspergillus niger</i> <i>Aspergillus oryzae</i> <i>Aspergillus oryzae</i> <i>Bacillus amyloquefaciens</i> <i>Bacillus amyloquefaciens</i> <i>Bacillus circulans</i>	<i>Thermoascus sp.</i> <i>Bacillus amyloquefaciens</i>	FAS 22-JECFA 31/15 ; TRS 789-JECFA35/15	Compendium addendum 2/FNP 52 Add.2/61; FAO JECFA Monographs 1 vol.2/87		7 7 CCFA 40 (CRD14 AMFEP) in CX/FAC 92/7 7

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
			<i>Bacillus subtilis</i>					7
			<i>Cellulosimicrobium cellulans</i>					CCFA 41 (CRD12 AMFEP)
			<i>Disporotrichum dimorphosporum</i>					56
			<i>Humicola insolens</i>		FAS 52-JECFA 61/77	Compendium addendum 11/FNP 52 Add.11/41; FAO JECFA Monographs 1 vol.2/391	Mixed with xylanase	
			<i>Leuconostoc mesenteroides</i>					CCFA 43 (AMFEP)
			<i>Penicillium funiculosum</i>			Compendium addendum 8/FNP 52 Add.8/43; FAO JECFA Monographs 1 vol.1/365	As cellulase	
			<i>Penicillium multicolour</i>					
			<i>Pseudomonas paucimobilis</i>					
			<i>Rhizopus delemar</i>					7
			<i>Rhizopus oryzae</i>		NMRS50/TRS48 8-JECFA15/12			7, 30
			<i>Streptomyces violaceoruber</i>	<i>Streptomyces sp.</i>				
			<i>Talaromyces emersonii</i>					7
			<i>Trichoderma harzianum</i>		FAS 22-JECFA 31/25	Compendium addendum 8/FNP 52 Add.8/55; FAO JECFA Monographs 1 vol.2/89	Also covers Exo-1,3-beta-glucosidase (3.2.1.58)	20
			<i>Trichoderma longibrachiatum</i>		FAS 22-JECFA 31/31; FAS 30-JECFA 39/15	Compendium addendum 1/FNP 52 Add.1/35; FAO	As cellulase	in CX/FAC 92/7

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
						JECFA Monographs 1 vol.1/371 ; Compendium/FNP 52/417 ; FAO JECFA Monographs 1 vol.1/		
			<i>Trichoderma longibrachiatum</i>	<i>Trichoderma longibrachiatum</i>				
3.2.1.21	β-Glucosidase Synonyms: gentiobiase; cellobiase ; emulsin; elaterase; aryl- β -glucosidase; β-D-glucosidase ; β -glucoside glucohydrolase; arbutinase; amygdalinase; <i>p</i> -nitrophenyl β -glucosidase; primeverosidase; amygdalase; linamarase; salicilinase; β -1,6-glucosidase; β -D-glucoside glucohydrolase	Hydrolysis of terminal, non-reducing β -D-glucosyl residues with release of β -D-glucose	<i>Aspergillus niger</i>				Evaluated as carbohydrate	7
			<i>Penicillium decumbens</i>					
			<i>Penicillium multicolor</i>					CCFA 40 (CRD14 AMFEP)
			<i>Trichoderma harzianum</i>					
			<i>Trichoderma longibrachiatum</i>					7, 20
			<i>Trichoderma longibrachiatum</i>	<i>Trichoderma longibrachiatum</i>				
3.2.1.37	Xylan 1,4-β-xylosidase Synonyms: xylobiase; β -xylosidase; exo-1,4- β -xylosidase; β -D-xylopyranosidase; β-xylosidase ; β -xylosidase; exo-1,4-xylosidase; exo-1,4- β -D-xylosidase; 1,4- β -D-xylan xylohydrolase; 4- β -D-xylan xylohydrolase	Hydrolysis of (1 \rightarrow 4)- β -D-xylans, to remove successive D-xylose residues from the non-reducing termini	<i>Trichoderma longibrachiatum</i>					55
2.4.1.18	1,4-α-Glucan branching enzyme Synonyms: branching enzyme; amylo-(1,4 \rightarrow 1,6)-transglycosylase; Q-enzyme; α -glucan- branching glycosyltransferase ; amylose isomerase; enzymatic branching factor; branching glycosyltransferase; enzyme Q; glucosan transglycosylase; glycogen branching enzyme; plant branching enzyme; α -1,4-glucan: α -1,4-glucan-6-glycosyltransferase; starch branching enzyme; 1,4- α -D-glucan:1,4- α -D-glucan 6- α -D-(1,4- α -D-glucano)-transferase; (1 \rightarrow 4)- α -D-glucan:(1 \rightarrow 4)- α -D-glucan 6- α -D-[(1 \rightarrow 4)- α -D-	Transfers a segment of a (1 \rightarrow 4)- α -D-glucan chain to a primary hydroxy group in a similar glucan chain	<i>Bacillus subtilis</i>	<i>Rhodothermus sp.</i>	TRS 956-JECFA 71/9	Compendium/FAO JECFA Monographs 7/3		CCFA 43 (AMFEP) JECFA 71
			<i>Geobacillus stearothermophilus</i>					

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
	glucano-transferase							
3.4.22.3 2 And 3.4.22.3 3	Bromelain Synonyms: pineapple stem bromelain and juice bromelain; ananase; bromelase; bromelin; extranase; juice bromelain; pinase; pineapple enzyme; traumanase; fruit bromelain FA2	Stem bromelain: Broad specificity for cleavage of proteins, but strong preference for Z-Arg-Arg-NHMec amongst small molecule substrates Fruit bromelain: Hydrolysis of proteins with broad specificity for peptide bonds. Bz-Phe-Val-Arg-NHMec is a good synthetic substrate, but there is no action on Z-Arg-Arg-NHMec (c.f. stem bromelain)	<i>Ananas comosus</i> <i>Ananas bracteatus</i>		NMRS50/TRS48 8-JECFA15/11 NMRS50/TRS48 8-JECFA15/11	FAS 2/NMRS 50B-JECFA 15/12; Compendium/FN P.52/221 FAS 2/NMRS 50B-JECFA 15/12; Compendium/FN P.52/221		1
3.2.xx.xx	Carbohydrases, mixed (pectinase, cellulases, and hemicellulases)	Hydrolysis of carbohydrates	<i>Aspergillus niger</i> <i>Bacillus licheniformis</i> <i>Bacillus subtilis</i> Malted barley or barley		FAS 1-JECFA 15/11 ; FAS 6/NMRS 54A-JECFA 18/124 FAS 20-JECFA 29/3 FAS 1/NMRS 50A-JECFA 15/9 NMRS50/TRS48 8-JECFA15/11	 FNP 34-JECFA 29/41; Compendium/FN P.53/363; FAO JECFA Monographs 1 vol.1/295 FAS 2/NMRS 50B-JECFA 15/23; Compendium/FN P.52/961 FAS 2/NMRS 50B-JECFA	The specifications were withdrawn in 2000. The evaluations do not mention a list of enzymes covered by the term 'carbohydrases' Covers only α -amylase Covers α -amylase and proteases Covers α -amylase and	CX/FAC 92/7 1, 6, 40,49,55

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
						15/14; Compendium/FN P.52/901	β-amylase	
			Rhizopus oryzae		NMRS50/TRS48 8-JECFA15/12	FAS 2/NMRS 50B-JECFA 15/28; Compendium/FN P52/365; FAO JECFA Monographs 1 vol.1/297	Covers α-amylase, glucoamylase and pectinase	
			Saccharomyces sp.		NMRS50/TRS48 8-JECFA15/11	FAS 2/NMRS 50B-JECFA 15/29; Compendium/FN P.52/367; FAO JECFA Monographs 1 vol.1/299	Covers invertase and lactase	
3.4.16.xx	Serine-type carboxypeptidase	Hydrolysis of C-terminal amino acids from proteins and peptides	<i>Aspergillus niger</i>	<i>Aspergillus niger</i>				
1.11.1.6	Catalase Synonyms: equilase; caperase; optidase; catalase-peroxidase; CAT; hydrogen-peroxide:hydrogen-peroxide oxidoreductase	$2 \text{ H}_2\text{O}_2 = \text{O}_2 + 2 \text{ H}_2\text{O}$	<i>Aspergillus niger</i>		FAS 1-JECFA 15/14 ; FAS 6/NMRS 54A-JECFA 18/129	FNP 19-JECFA 25/29; Compendium/FN P.52/693; FAO JECFA Monographs 1 vol.2/105	In combination with glucose oxidase	71.24,
			<i>Aspergillus niger</i>	<i>Aspergillus niger</i>				
			<i>Aspergillus oryzae</i>					
			Bovine liver		NMRS50/TRS48 8-JECFA15/11	FAS 2/NMRS 50B-JECFA 15/6; Compendium/FN P.52/411; FAO JECFA Monographs 1 vol.1/361		1
			Hog liver		NMRS50/TRS48 8-JECFA15/11			1
			<i>Micrococcus luteus</i>					7
			<i>Micrococcus lysodeiicticus</i>			FNP 19-JECFA 25/145;		

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
						Compendium/FNP 52/413; FAO JECFA Monographs 1 vol.1/363		
1.1.99.18	Cellulose dehydrogenase (acceptor) Synonyms: cellobiose dehydrogenase; cellobiose oxidoreductase; <i>Phanerochaete chrysosporium</i> cellobiose oxidoreductase; CBOR; cellobiose oxidase; cellobiose:oxygen 1-oxidoreductase; CDH; cellobiose:(acceptor) 1-oxidoreductase; cellobiose:acceptor 1-oxidoreductase	cellobiose + acceptor = cellobiono-1,5-lactone + reduced acceptor	<i>Fusarium venenatum</i>	<i>Microdochium</i> sp.				CCFA 40 (CRD14 AMFEP)
3.2.1.4	Cellulase Synonyms: endo-1,4-β-D-glucanase; β-1,4-glucanase; β-1,4-endoglucan hydrolase; cellulase A; cellulysin AP; endoglucanase D; alkali cellulase; cellulase A 3; celludextrinase; 9.5 cellulase; avicelase; pancellase SS; 1,4-(1,3;1,4)-β-D-glucan 4-glucanohydrolase; 4-β-D-glucan 4-glucanohydrolase	Endohydrolysis of (1→4)-β-D-glucosidic linkages in cellulose, lichenin and cereal β-D-glucans	<i>Aspergillus niger</i>				Evaluated as carbohydrase	6, 7,55
			<i>Aspergillus oryzae</i>					7
			<i>Disporotrichum dimorphosporum</i>					7
			<i>Humicola insolens</i>					
			<i>Penicillium funiculosum</i>			Compendium addendum 8/FNP 52 Add.8/43; FAO JECFA Monographs 1 vol.1/365	Also covers Endo-1,3(4)-beta-glucanase and Endo-1,4- beta-xylanase	
			<i>Rhizopus delemar</i>					7
			<i>Rhizopus oryzae</i>		NMRS50/TRS48 8-JECFA15/12			7
			<i>Streptomyces lividans</i>					
			<i>Talaromyces emersonii</i>					
			<i>Thielavia terrestris</i>					7
<i>Trichoderma longibrachiatum</i>			FAS 22-JECFA 31/31 ; FAS 30-JECFA 39/15	Compendium addendum 1/FNP 52 Add.1/35; FAO JECFA Monographs 1 vol.1/371 ; Compendium /FNP 52/417;	Also covers Exo-1,4-β-D-glucosidase, Exo-cellobiohydrolase and β-glucanase T.			

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
						FAO JECFA Monographs 1 vol.1/	<i>longibrachiatum</i> and <i>T. reesei</i> are identical	
			<i>Trichoderma longibrachiatum</i>	<i>Trichoderma longibrachiatum</i>				
			<i>Trichoderma viride</i>					
3.2.1.91	Cellulose 1,4-β-cellobiosidase (non-reducing end) Synonyms: exo-cellobiohydrolase; β-1,4-glucan cellobiohydrolase; β-1,4-glucan cellobiosylhydrolase; 1,4-β-glucan cellobiosidase; exoglucanase; avicelase; CBH 1; C ₁ cellulase; cellobiohydrolase I; cellobiohydrolase; exo-β-1,4-glucan cellobiohydrolase; 1,4-β-D-glucan cellobiohydrolase; cellobiosidase; 4-β-D-glucan cellobiohydrolase (non-reducing end)	Hydrolysis of (1→4)-β-D-glucosidic linkages in cellulose and cellotetraose, releasing cellobiose from the non-reducing ends of the chains	<i>Trichoderma longibrachiatum</i>		FAS 22-JECFA 31/31 ; FAS 30-JECFA 39/15	Compendium addendum 1/FNP 52 Add.1/35; FAO JECFA Monographs 1 vol.1/371 ; Compendium /FNP 52/417; FAO JECFA Monographs 1 vol.1/	As cellulase	
3.2.1.14	Chitinase Synonyms: chitodextrinase; 1,4-β-poly- <i>N</i> -acetylglucosaminidase; poly-β-glucosaminidase; β-1,4-poly- <i>N</i> -acetyl glucosaminidase; poly[1,4-(<i>N</i> -acetyl-β-D-glucosaminide)] glycanohydrolase; (1→4)-2-acetamido-2-deoxy-β-D-glucan glycanohydrolase	Random hydrolysis of <i>N</i> -acetyl-β-D-glucosaminide (1→4)-β-linkages in chitin and chitodextrins	<i>Streptomyces violaceoruber</i>	<i>Streptomyces sp.</i>				CCFA 43 (AMFEP)
3.4.23.4	Chymosin Synonyms: Rennin	Broad specificity similar to that of pepsin A. Clots milk by cleavage of a single Ser-Phe ¹⁰⁵ -Met-Ala bond in κ-chain of casein	<i>Aspergillus niger</i> var. <i>awamori</i>	Calf stomach	FAS 28-JECFA 37/98	Compendium Addendum 7/FNP 52 Add.7/19; FAO JECFA Monographs 1 vol.1/393	Chymosin B	CCFAC 23 (1991)
				Bovine stomach	NMRS50/TRS48 8-JECFA15/11	FAS 2/NMRS 50B-JECFA 15/10; Compendium/FNP 52/1259; FAO JECFA Monographs 1 vol.3/237	As rennet	
				Calf, kid or lamb abomasum	NMRS50/TRS48 8-JECFA15/11	FAS 2/NMRS 50B-JECFA	As rennet	1

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
						15/9; Compendium/FN P.52/1257; FAO JECFA Monographs 1 vol.3/235		
			<i>Escherichia coli K-12</i>	Calf stomach	FAS 28-JECFA 37/85	Compendium addendum 7/FNP 52 Add.7/17; FAO JECFA Monographs 1 vol.1/391	Chymosin A	CCFAC 23 (1991)
			<i>Kluyveromyces marxianus var. lactis</i>	Calf stomach	FAS 28-JECFA 37/91	Compendium addendum 7/FNP 52 Add.7/21; FAO JECFA Monographs 1 vol.1/395	Chymosin B	CCFAC 23 (1991)
3.4.22.6	Chymopapain Synonyms: chymopapain A; chymopapain B; chymopapain S	Similar reaction as papain	<i>Carica papaya</i>		NMRS50/TRS48 8-JECFA15/11	FAS 2/NMRS 50B-JECFA 15/15; Compendium/FN P.52/1033	As papain	
3.4.21.1 And 3.4.21.2	Chymotrypsin Synonyms: chymotrypsins A and B; α-chymar ophth; avazyme; chymar; chymotest; enzeon; quimar; quimotrase; α-chymar; α-chymotrypsin A; α-chymotrypsin and chymotrypsin C	Preferential cleavage chymotrypsin: Tyr ⁺ , Trp ⁺ , Phe ⁺ , Leu ⁺ Preferential cleavage chymotrypsin C: Leu ⁺ , Tyr ⁺ , Phe ⁺ , Met ⁺ , Trp ⁺ , Gln ⁺ , Asn ⁺	Bovine or porcine pancreas					
2.4.1.19	Cyclomaltodextrin glucanotransferase Synonyms: <i>Bacillus macerans</i> amylase; cyclodextrin glucanotransferase; α-cyclodextrin glucanotransferase; α-cyclodextrin glycosyltransferase; β-cyclodextrin glucanotransferase; β-cyclodextrin glycosyltransferase; γ-cyclodextrin glycosyltransferase; cyclodextrin glycosyltransferase; cyclomaltodextrin glucotransferase; cyclomaltodextrin	Cyclizes part of a (1→4)-α-D-glucan chain by formation of a (1→4)-α-D-glucosidic bond	<i>Bacillus licheniformis</i> <i>Bacillus macerans</i> <i>Bacillus stearothermophilus</i>	<i>Thermoanaerobacter</i>				CCFA 40 (CRD14 AMFEP)

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
	glycosyltransferase; konchizaimu; α -1,4-glucan 4-glycosyltransferase, cyclizing; BMA; CGTase; neutral-cyclodextrin glycosyltransferase; 1,4- α -D-glucan 4- α -D-(1,4- α -D-glucano)-transferase (cyclizing); (1 \rightarrow 4)- α -D-glucan:(1 \rightarrow 4)- α -D-glucan 4- α -D-[(1 \rightarrow 4)- α -D-glucano]-transferase (cyclizing)							
3.2.1.11	Dextranase Synonyms: dextran hydrolase; endodextranase; dextranase DL 2; DL 2; endo-dextranase; α -D-1,6-glucan-6-glucanohydrolase; 1,6- α -D-glucan 6-glucanohydrolase; 6- α -D-glucan 6-glucanohydrolase	Endohydrolysis of (1 \rightarrow 6)- α -D-glucosidic linkages in dextran	<i>Aspergillus ?</i> <i>Bacillus subtilis</i> <i>Chaetomium erraticum</i> <i>Chaetomium gracile</i> <i>Klebsiella pneumoniae</i> <i>Leuconostoc mesenteroides</i> <i>Penicillium funiculosum</i> <i>Penicillium lilacinum</i>					7 CCFA 41 (CRD12 AMFEP) 7 7
2.4.1.5	Dextranucrase Synonyms: sucrose 6-glucosyltransferase; SGE; CEP; sucrose-1,6- α -glucan glucosyltransferase; sucrose:1,6- α -D-glucan 6- α -D-glucosyltransferase; sucrose:(1 \rightarrow 6)- α -D-glucan 6- α -D-glucosyltransferase	sucrose + [(1 \rightarrow 6)- α -D-glucosyl] _n = D-fructose + [(1 \rightarrow 6)- α -D-glucosyl] _{n+1}	<i>Leuconostoc mesenteroides</i>					CCFA 43 (AMFEP)
	Endo beta glucanase ¹³							
3.1.1.1	Carboxylesterase Synonyms: ali-esterase; B-esterase; monobutyrase; cocaine esterase; procaine esterase; methylbutyrase; vitamin A esterase; butyryl esterase; carboxyesterase; carboxylate esterase; carboxylic esterase; methylbutyrate esterase; triacetin esterase; carboxyl ester hydrolase; butyrate esterase; methylbutyrase; α -carboxylesterase; propionyl esterase; nonspecific carboxylesterase; esterase D; esterase B; esterase A; serine esterase; carboxylic acid esterase; cocaine esterase; carboxylic-ester hydrolase	a carboxylic ester + H ₂ O = an alcohol + a carboxylate	<i>Aspergillus niger</i> <i>Rhizomucor miehei</i> <i>Trichoderma longibrachiatum</i>					from CX/FAC 92/7 55 7 55

¹³ See Endo-1,3(4)- β -glucanase (3.2.1.6)

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
3.2.1.20	Exo- α-Glucosidase Synonyms: maltase ; glucoinvertase; glucosidosucrase; maltase-glucoamylase; α -glucopyranosidase; glucosidoinvertase; α -D-glucosidase; α -glucoside hydrolase; α -1,4-glucosidase; α -D-glucoside glucohydrolase	Hydrolysis of terminal, non-reducing (1 \rightarrow 4)-linked α -D-glucose residues with release of D-glucose	<i>Aspergillus niger</i>				Evaluated as carbohydrase Also in immobilized form	7
			<i>Aspergillus oryzae</i>					7
			<i>Rhizopus oryzae</i>		NMRS50/TRS48 8-JECFA15/12			7
			<i>Trichoderma longibrachiatum</i>					
			<i>Trichoderma longibrachiatum</i>	<i>Aspergillus niger</i>				
3.4.22.3	Ficin Synonyms: ficin ; debricin; higueroxyl delabarre	Reaction similar to that of papain	<i>Ficus glabrata</i>		NMRS50/TRS48 8-JECFA15/11	FNP 19-JECFA 25/102 ; Compendium/FN P 52/661	No toxicological data	1, 3
3.1.1.73	Feruloyl esterase Synonyms: ferulic acid esterase , hydroxycinnamoyl esterase, hemicellulase accessory enzymes; FAE-III, cinnamoyl ester hydrolase, FAEA, cinnAE, FAE-I, FAE-II; 4-hydroxy-3-methoxycinnamoyl-sugar hydrolase	feruloyl-polysaccharide + H ₂ O = ferulate + polysaccharide	<i>Aspergillus niger</i>					CCFA 43 (AMFEP)
			<i>Streptomyces werraensis</i>					CCFA 40 (CRD14 AMFEP)
2.4.1.10 0	2,1-Fructan:2,1-fructan 1-fructosyltransferase Synonyms: 1,2- β -D-fructan 1 ^F -fructosyltransferase; fructan:fructan fructosyl transferase; FFT; 1,2- β -fructan 1 ^F -fructosyltransferase; 1,2- β -D-fructan:1,2- β -D-fructan 1 ^F - β -D-fructosyltransferase; fructan:fructan 1-fructosyl transferase; 2,1- β -D-fructan:2,1- β -D-fructan 1- β -D-fructosyltransferase; (2 \rightarrow 1)- β -D-fructan:(2 \rightarrow 1)- β -D-fructan 1- β -D-fructosyltransferase	$[\beta\text{-D-fructosyl-(2}\rightarrow\text{1)-}]_m + [\beta\text{-D-fructosyl-(2}\rightarrow\text{1)-}]_n = [\beta\text{-D-fructosyl-(2}\rightarrow\text{1)-}]_{m-1} + [\beta\text{-D-fructosyl-(2}\rightarrow\text{1)-}]_{n+1}$	<i>Aspergillus niger</i>					
	Glucanase ¹⁴							
3.2.1.3	Glucan 1,4-α-glucosidase Synonyms: glucoamylase ; amyloglucosidase ; γ -amylase; lysosomal α -glucosidase; acid maltase; exo-1,4-	Hydrolysis of terminal (1 \rightarrow 4)-linked α -D-glucose residues successively from non-reducing ends of the	<i>Aspergillus niger</i>		FAS 22-JECFA 31/11 ; TRS 789-JECFA35/15	Compendium addendum 10/FNP 52 Add.10/9: FAO JECFA		7, 9, 16, 49, 50

¹⁴ See Endo-1,3(4)- β -glucanase, 3.2.1.6

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed	
	α -glucosidase; glucose amylase; γ -1,4-glucan glucohydrolase; acid maltase; 1,4- α -D-glucan glucohydrolase; 4- α -D-glucan glucohydrolase	chains with release of β -D-glucose				Monographs 1 vol.1/93			
			<i>Aspergillus niger</i>	<i>Aspergillus niger</i>					
			<i>Aspergillus niger</i>	<i>Talaromyces emersonii</i>					
			<i>Aspergillus niger</i>	<i>Trametes cingulata</i>					
			<i>Aspergillus oryzae</i>		FAS 22-JECFA 31/5	Compendium addendum 8/FNP 52 Add.8/5; FAO JECFA Monographs 1 vol.1/81	In combination with α -amylase	7	
			<i>Penicillium funiculosum</i>						
			<i>Rhizopus delemar</i>					7	
			<i>Rhizopus niveus</i>					7	
			<i>Rhizopus oryzae</i>		NMRS50/TRS48 8-JECFA15/12	FAS 2/NMRS 50B-JECFA 15/28; Compendium/FNP 52/365; FAO JECFA Monographs 1 vol.1/297	Specifications as carbohydrase (together with α -amylase and pectinase)	7	
			<i>Trichoderma longibrachiatum</i>					7, 30	
<i>Trichoderma longibrachiatum</i>	<i>Trichoderma sp.</i>				CCFA 43 (AMFEP)				
<i>Trichoderma longibrachiatum</i>	<i>Trichoderma sp.</i>				modified gene CCFA 43 (AMFEP)				
3.2.1.60	Glucan 1,4- α -maltotetrahydrolase Synonyms: exo-maltotetraohydrolase; 1,4- α -D-glucan maltotetraohydrolase; 4- α -D-glucan maltotetraohydrolase	Hydrolysis of (1 \rightarrow 4)- α -D-glucosidic linkages in amylaceous polysaccharides, to remove successive maltotetraose residues from the non-reducing chain ends	<i>Bacillus licheniformis</i>	<i>Pseudomonas stutzeri</i>					
3.2.1.74	Glucan 1,4- β -glucosidase Synonyms: exo-1,4- β -glucosidase; exocellulase; exo- β -1,4-glucosidase; exo- β -1,4-glucanase; β -1,4- β -	Hydrolysis of (1 \rightarrow 4)-linkages in (1 \rightarrow 4)- β -D-glucans, to remove successive glucose units	<i>Trichoderma longibrachiatum</i>		FAS 22-JECFA 31/31 ; FAS 30-JECFA 39/15	Compendium addendum 1/FNP 52 Add.1/35; FAO JECFA	As cellulase		

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
						JECFA Monographs 1 vol.2/97		
			<i>Streptomyces olivochromogenes</i>		FAS 20-JECFA 29/23	FNP 31/2 ; JECFA 28/119 ; Compendium/FN P 52/687 ; FAO JECFA Monographs 1 vol.2/99	Immobilized form	12, 7
			<i>Streptomyces rubiginosus</i>		FAS 20-JECFA 29/27	FNP 34-JECFA 29/87 ; Compendium/FN P 52/689 ; FAO JECFA Monographs 1 vol.2/101		9,20,21
			<i>Streptomyces rubiginosus</i>	<i>Streptomyces sp</i>				CCFA 43 (AMFEP)
			<i>Streptomyces ?</i>					17
			<i>Streptomyces violaceoniger</i>		FAS 19-JECFA 28/67	FNP 31/2 ; JECFA 28/121 ; Compendium/FN P 52/691 ; FAO JECFA Monographs 1 vol.2/103		
1.1.3.4	Glucose oxidase Synonyms: glucose oxyhydrase; corylophyline; penatin; glucose aerodehydrogenase; microcid; β -D-glucose oxidase; D-glucose oxidase; D-glucose-1-oxidase; β -D-glucose:quinone oxidoreductase; glucose oxyhydrase; deoxin-1; GOD; β -D-glucose:oxygen 1-oxidoreductase	β -D-glucose + O ₂ = D-glucono-1,5-lactone + H ₂ O ₂	<i>Aspergillus niger</i>		FAS 1-JECFA 15/14 ; FAS 6/NMRS 54A-JECFA 18/129	FNP 19-JECFA 25/29 ; Compendium/FN P 52/693 ; FAO JECFA Monographs 1 vol.2/105	In combination with catalase	1, 6, 7
			<i>Aspergillus niger</i>	<i>Aspergillus niger</i>				
			<i>Aspergillus oryzae</i>	<i>Aspergillus niger</i>				
			<i>Penicillium chrysogenum</i>					
3.2.1.58	Glucan 1,3-β-glucosidase Synonyms: exo-1,3- β -glucosidase; β -1,3-glucan exo-hydrolase; exo (1 \rightarrow 3)-glucanohydrolase; 1,3- β -glucan glucohydrolase; 3- β -D-glucan glucohydrolase	Successive hydrolysis of β -D-glucose units from the non-reducing ends of (1 \rightarrow 3)- β -D-glucans, releasing α -glucose	<i>Penicillium funiculosum</i>					CCFA 40 (CRD14 AMFEP)
			<i>Trichoderma harzianum</i>		FAS 22-JECFA 31/25	Compendium addendum 8/FNP 52	Also covers Endo-1,3(4)- β -glucanase	CCFA 43 (AMFEP)

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed	
						Add.8/55; FAO JECFA Monographs 1 vol.2/89	(3.2.1.6)		
3.5.1.2	Glutaminase Synonyms: glutaminase I; L-glutaminase; glutamine aminohydrolase; L-glutamine amidohydrolase	L-glutamine + H ₂ O = L-glutamate + NH ₃	<i>Aspergillus niger</i> <i>Bacillus subtilis</i>					CCFA 43 (AMFEP)	
2.3.1.14 2	Glycoprotein O-fatty-acyltransferase Synonyms: protein acyltransferase Glycerophospholipid cholesterol acyltransferase	Palmitoyl-CoA + mucus glycoprotein = CoA + O-palmitoylglycoprotein	<i>Bacillus licheniformis</i>	<i>Aeromonas</i> sp.					
Not applicable. Enzyme complex	Hemicellulase	Degradation of hemicellulose	<i>Aspergillus niger</i>		FAS 22-JECFA 31/19 ; TRS 789-JECFA35/15	Compendium addendum 8/FNP 52 Add.8/59; FAO JECFA Monographs 1 vol.2/151			
			<i>Aspergillus oryzae</i>					7	
			<i>Bacillus lentus</i>						
			<i>Bacillus subtilis</i>						7
			<i>Bacillus subtilis</i>	<i>Bacillus</i> sp.					
			<i>Disporotrichum dimorphosporum</i>						7
			<i>Rhizopus delemar</i>						7
			<i>Rhizopus oryzae</i>				NMRS50/TRS48 8-JECFA15/12		7
			<i>Trichoderma longibrachiatum</i>					7,30	
1.1.3.5	Hexose oxidase Synonyms: D-hexose:oxygen 1-oxidoreductase	D-glucose + O ₂ = D-glucono-1,5-lactone + H ₂ O ₂	<i>Hansenula polymorpha</i>	<i>Chondrus crispus</i>	FAS 54-JECFA 63/37	Compendium addendum 12/FNP 52 Add.12/15; FAO JECFA Monographs 1 vol.2/169		CCFAC 38	
3.2.1.7	Inulinase Synonyms: inulase; indoinulinase; endo-inulinase; exoinulinase; 2,1-β-D-fructan fructanohydrolase;	Endohydrolysis of (2→1)-β-D-fructosidic linkages in inulin	<i>Aspergillus niger</i>				Evaluated as carbohydrate		
			<i>Aspergillus oryzae</i>	<i>Aspergillus</i> sp.				CCFA 41 (CRD12)	

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
	1-β-D-fructan fructanohydrolase		<i>Disporotrichum dimorphosporum</i>					AMFEP)
			<i>Kluyveromyces fragilis</i>					7
			<i>Streptomyces ?</i>					
3.2.1.26	β-Fructofuranosidase Synonyms: invertase; saccharase; glucosucrase; β-h-fructosidase; β-fructosidase; invertin; sucrose; maxinvert L 1000; fructosylinvertase; alkaline invertase; acid invertase; β-D-fructofuranoside fructohydrolase	Hydrolysis of terminal non-reducing β-D-fructofuranoside residues in β-D-fructofuranosides	<i>Aspergillus niger</i>				Evaluated as carbohydrase	
			<i>Bacillus subtilis</i>					
			<i>Kluyveromyces fragilis</i>					7
			<i>Saccharomyces carlsbergensis</i>		NMRS50/TRS48 8-JECFA15/11	FAS 2/NMRS 50B-JECFA 15/29; Compendium/FNP 52/367; FAO JECFA Monographs 1 vol.1/299	Specifications as carbohydrase.	7
			<i>Saccharomyces cerevisiae</i>		NMRS50/TRS48 8-JECFA15/11	Compendium addendum 9/FNP 52 Add.9/45; FAO JECFA Monographs 1 vol.2/217		7, 17
3.2.1.68	Isoamylase Synonyms: debranching enzyme; glycogen α-1,6-glycanohydrolase; glycogen 6-α-D-glycanohydrolase	Hydrolysis of (1→6)-α-D-glucosidic branch linkages in glycogen, amylopectin and their β-limit dextrins	<i>Bacillus cereus</i>					7
			<i>Pseudomonas amyloclavata</i>		FAS 59-JECFA 68/111	Compendium of food additive specifications FAO JECFA Monographs 4/21		CCFA 40
1.10.3.2	Laccase Synonyms: urushiol oxidase; urushiol oxidase; p-diphenol oxidase; benzenediol: oxygen oxidoreductase	4 benzenediol + O ₂ = 4 benzosemiquinone + 2 H ₂ O	<i>Aspergillus niger</i>					CCFA 43 (AMFEP)
			<i>Aspergillus oryzae</i>	<i>Myceliophthora thermophila</i>	FAS 52-JECFA 61/67	Compendium addendum 13/FNP 52 Add.13/25; FAO JECFA Monographs 1 vol.2/245		CCFAC 37

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
			<i>Aspergillus oryzae</i>	<i>Polyporus sp.</i>				CCFA 40 (CRD14 AMFEP)
			<i>Trametes hirsuta</i>					CCFA 40 (CRD14 AMFEP)
			<i>Trametes versicolour</i>					CCFA 40 (CRD14 AMFEP)
			<i>Trichoderma longibrachiatum</i>	<i>Thielavia sp.</i>				CCFA 40 (CRD14 AMFEP)
3.2.1.23	β-Galactosidase Synonyms: lactase (ambiguous); β-lactosidase; maxilact; hydrolact; β-D-lactosidase; S 2107; lactozym; trilactase; β-D-galactanase; oryzatym; sumiklat; β-D-galactoside galactohydrolase	Hydrolysis of terminal non-reducing β-D-galactose residues in β-D-galactosides	<i>Aspergillus niger</i>				Evaluated as carbohydrate	7
			<i>Aspergillus niger</i>	<i>Aspergillus oryzae</i>				7,10
			<i>Aspergillus oryzae</i>	<i>Aspergillus sp.</i>				CCFA 40 (CRD14 AMFEP)
			<i>Bacillus circulans</i>					CCFA 40 (CRD14 AMFEP)
			<i>Candida pseudotropicalis</i>					CX/FAC 92/7
			<i>Kluyveromyces fragilis</i>					
			<i>Kluyveromyces lactis</i>					
			<i>Kluyveromyces lactis</i>	<i>Kluyveromyces lactis</i>				
			<i>Saccharomyces species</i>		NMRS50/TRS48 8-JECFA15/11	FAS 2/NMRS 50B-JECFA 15/29 ; Compendium/FN P.52/367 ; FAO JECFA Monographs 1 vol.1/299	as carbohydrate	
	Lactoperoxidase ⁴⁶							
3.1.1.23	Acylglycerol lipase Synonyms: monoacylglycerol lipase;	Hydrolyses glycerol monoesters of long-chain fatty acids	<i>Penicillium camembertii</i>					CCFA 43 (AMFEP)

¹⁵ See Peroxidase

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
	monoacylglycerolipase; monoglyceride lipase; monoglyceride hydrolase; fatty acyl monoester lipase; monoacylglycerol hydrolase; monoglyceridylipase; monoglyceridase; glycerol-ester acylhydrolase							
3.1.1.3	Triacylglycerol lipase Synonyms: lipase (ambiguous); butyrylase; tributyrinase; Tween hydrolase; steapsin; triacetinase; tributyrin esterase; Tweenase; amno N-AP; Takedo 1969-4-9; Meito MY 30; Tweenesterase; GA 56; capalase L; triglyceride hydrolase; triolein hydrolase; tween-hydrolyzing esterase; amano CE; cacordase; triglyceridase; triacylglycerol ester hydrolase; amano P; amano AP; PPL; glycerol-ester hydrolase; GEH; meito Sangyo OF lipase; hepatic lipase; lipazin; post-heparin plasma protamine-resistant lipase; salt-resistant post-heparin lipase; heparin releasable hepatic lipase; amano CES; amano B; tributyrase; triglyceride lipase; liver lipase; hepatic monoacylglycerol acyltransferase; triacylglycerol acylhydrolase	triacylglycerol + H ₂ O = diacylglycerol + a carboxylate	origin?					CCFAC 25/ (1993) Malaysia
			<i>Aspergillus niger</i>					7
			<i>Aspergillus niger</i>	<i>Candida antarctica</i>				
			<i>Aspergillus niger</i>	<i>Fusarium sp.</i>				CCFA 41 (CRD12 AMFEP)
			<i>Aspergillus oryzae</i>		TRS557- JECFA18/20		Specification swithdrawn 2000	1,7
			<i>Aspergillus oryzae</i>	<i>Rhizomucor miehei</i>				
			<i>Aspergillus oryzae</i>	<i>Humicola lanuginosa</i>				
			<i>Aspergillus oryzae</i>	<i>Fusarium oxysporum</i>				
			<i>Aspergillus oryzae</i>	<i>Thermomyces sp.</i>				CCFA 40 (CRD14 AMFEP)
			<i>Bacillus licheniformis</i>	<i>Aeromonas sp.</i>				CCFA 43 (AMFEP)
			<i>Brevibacterium lineus</i>					46
			bovine stomach		NMRS50/TRS48 8-JECFA15/11			1, 3, 10,13
			Calf, kid or lamb salivary glands		NMRS50/TRS48 8-JECFA15/11			
			Calf, kid or lamb fore stomach		NMRS50/TRS48 8-JECFA15/11	FAS 2/NMRS 50B-JECFA 15/7; Compendium/FN P 52/853; FAO JECFA Monographs 1 vol.2/271		1, 3, 10,13
			<i>Candida cylindracea</i>					7
			<i>Candida lipolytica</i>					
			<i>Candida rugosa</i>					
			<i>Carica papaya</i>		NMRS50/TRS48 8-JECFA15/11			CCFA 43 (AMFEP)

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
			Hog or bovine pancreas		NMRS50/TRS48 8-JECFA15/11	FAS 2/NMRS 50B-JECFA 15/7 ; Compendium/FN P 52/853; FAO JECFA Monographs 1 vol.2/271		1, 3, 10,13
			<i>Kluyveromyces lactis</i>	Calf stomach				
			<i>Mucor javanicus</i>					7
			<i>Mucor pusillus</i>					
			<i>Penicillium roqueforti</i>					
			<i>Penicillium camembertii</i>					
			<i>Pseudomonas fluorescens</i>	<i>Pseudomonas fluorescens</i>				
			<i>Hansenula polymorpha</i>	<i>Fusarium sp.</i>				CCFA 43 (AMFEP)
			<i>Rhizomucor miehei</i>					7
			<i>Rhizopus nigrican</i>					7
			<i>Rhizopus niveus</i>					
			<i>Rhizopus oryzae</i>		NMRS50/TRS48 8-JECFA15/12			
1.13.11.12	Linoleate 13S-lipoxygenase Synonyms: 13-lipoxygenase; carotene oxidase; 13-lipoperoxidase; fat oxidase; 13-lipoxygenase; linoleate:O ₂ 13-oxidoreductase; linoleate:oxygen 13-oxidoreductase	linoleate + O ₂ = (9Z,11E,13S)-13-hydroperoxyoctadeca-9,11-dienoate	<i>Escherichia coli</i>	Pea				CCFA 40 (CRD14 AMFEP)
			Soya					55
3.1.1.5	Lysophospholipase Synonyms: lecithinase B; lysolecithinase; phospholipase B ; lysophosphatidase; lecitholipase; phosphatidase B; lysophosphatidylcholine hydrolase; lysophospholipase A1; lysophospholipase L2; lysophospholipase transacylase; neuropathy target esterase; NTE; NTE-LysoPLA; NTE-lysophospholipase; 2-lysophosphatidylcholine acylhydrolase	2-lysophosphatidylcholine + H ₂ O = glycerophosphocholine + a carboxylate	<i>Aspergillus niger</i>					23, CCFA 43 (AMFEP)
			<i>Aspergillus niger</i>	<i>Aspergillus niger</i>				CCFA 43 (AMFEP)
			<i>Trichoderma longibrachiatum</i>	<i>Aspergillus sp.</i>				CCFA 40 (CRD14 AMFEP)
3.2.1.17	Lysozyme Synonyms: muramidase; globulin G; mucopeptide glucohydrolase; globulin G1; N,O-	Hydrolysis of (1→4)-β-linkages between N-acetylmuramic acid and N-acetyl-D-glucosamine	Egg white		FAS 30-JECFA 39/25	Compendium Addendum 12/FNP 52 Add.12/67 (metal)		44, 48, 57

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
	diacetylmuramidase; lysozyme g; L-7001; 1,4- <i>N</i> -acetylmuramidase; mucopeptide <i>N</i> -acetylmuramoylhydrolase; PR1-lysozyme; peptidoglycan <i>N</i> -acetylmuramoylhydrolase	residues in a peptidoglycan and between <i>N</i> -acetyl-D-glucosamine residues in chitodextrins				limits); FAO JECFA Monographs 1 vol.2/283		
Not classified	Malolactic enzyme Synonyms: Malic acid decarboxylase	Decarboxylation of malic acid into lactic acid and CO ₂	<i>Oenococcus oeni</i>					7
	Maltase or alpha-glucosidase ¹⁶							
	Malt carbohydrases (alpha or beta amylase) ¹⁷							
3.2.1.133	Glucan 1,4- α -maltohydrolase Synonyms: maltogenic α-amylase ; 1,4- α -D-glucan α -maltohydrolase; 4- α -D-glucan α -maltohydrolase	Hydrolysis of (1 \rightarrow 4)- α -D-glucosidic linkages in polysaccharides so as to remove successive α -maltose residues from the non-reducing ends of the chains	<i>Bacillus licheniformis</i> <i>Bacillus subtilis</i>	<i>Bacillus stearothermophilus</i> <i>Bacillus stearothermophilus</i>	FAS 40-JECFA 49/91	Compendium addendum 7/FNP 52 Add.7/63; FAO JECFA Monographs 1 vol.2/333		CX/FAC 92/7
3.2.1.78	Mannan endo-1,4- β -mannosidase Synonyms: endo-1,4-β-mannanase ; endo- β -1,4-mannase; β -mannanase B; β -1, 4-mannan 4-mannanohydrolase; endo- β -mannanase; β -D-mannanase; 1,4- β -D-mannan mannanohydrolase; 4- β -D-mannan mannanohydrolase	Random hydrolysis of (1 \rightarrow 4)- β -D-mannosidic linkages in mannans, galactomannans and glucomannans	<i>Aspergillus niger</i> <i>Trichoderma longibrachiatum</i>	<i>Trichoderma sp.</i>			Evaluated as carbohydrase	CCFA 40 (CRD14 AMFEP) CCFA 40 (CRD14 AMFEP)
3.2.1.6 and 3.2.1.8	Mixed xylanase, β-glucanase enzyme preparation	See individual entries (xylanase and Endo-1,3(4)- β -glucanase)	<i>Humicola insolens</i>		FAS 52-JECFA 61/77	Compendium addendum 11/FNP 52 Add.11/41; FAO JECFA Monographs 1 vol.2/391		CCFAC 37
1.7.99.4	Nitrate reductase Synonyms: respiratory nitrate reductase; nitrate reductase (acceptor); nitrite:(acceptor) oxidoreductase; nitrite:acceptor oxidoreductase	nitrite + acceptor = nitrate + reduced acceptor	<i>Micrococcus violagabriella</i>					46
Not	Pancreatin		bovine or porcine				Contains α -	

¹⁶ See α -Glucosidase¹⁷ See carbohydrases

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed	
applicable. Enzyme complex			pancreas				amylase, lipase and protease		
3.4.22.2	Papain Synonyms: papayotin; summetrin; velardon; papaine; Papaya peptidase I	Hydrolysis of proteins with broad specificity for peptide bonds, but preference for an amino acid bearing a large hydrophobic side chain at the P2 position. Does not accept Val in P1'	<i>Carica papaya</i>		NMRS50/TRS488-JECFA15/11	FAS 2/NMRS 50B-JECFA 15/15; Compendium/FNP 52/1033	Also covers chymopapain		
4.2.2.2	Pectate lyase Synonyms: polygalacturonic transeliminase; pectic acid transeliminase; polygalacturonate lyase; endopectin methyltranseliminase; pectate transeliminase; endogalacturonate transeliminase; pectic acid lyase; pectic lyase; α -1,4-D-endopolygalacturonic acid lyase; PGA lyase; PPase-N; endo- α -1,4-polygalacturonic acid lyase; polygalacturonic acid lyase; pectin <i>trans</i> -eliminase; Polygalacturonic acid <i>trans</i> -eliminase; (1 \rightarrow 4)- α -D-galacturonan lyase	Eliminative cleavage of (1 \rightarrow 4)- α -D-galacturonan to give oligosaccharides with 4-deoxy- α -D-galact-4-enuronosyl groups at their non-reducing ends	<i>Bacillus subtilis</i>					CCFA 43 (AMFEP)	
3.2.1.15	Polygalacturonase Synonyms: pectin depolymerase; pectinase ; endopolygalacturonase; pectolase; pectin hydrolase; pectin polygalacturonase; endopolygalacturonase; poly- α -1,4-galacturonide glycanohydrolase; endogalacturonase; endo-D-galacturonase; poly(1,4- α -D-galacturonide) glycanohydrolase; (1 \rightarrow 4)- α -D-galacturonan glycanohydrolase	Random hydrolysis of (1 \rightarrow 4)- α -D-galactosiduronic linkages in pectate and other galacturonans	<i>Aspergillus niger</i>		FAS 22-JECFA 31/21 ; TRS 789-JECFA35/15	Compendium addendum 8/FNP 52 Add.8/85 ; FAO JECFA Monographs 1 vol.3/13	Also covers pectin lyase and pectineesterase	6, 7	
			<i>Aspergillus niger</i>	<i>Aspergillus niger</i>					
			<i>Aspergillus oryzae</i>						6, 7
			<i>Aspergillus oryzae</i>	<i>Aspergillus niger</i> var. <i>aculeatus</i>					
			<i>Aspergillus pulverulentus</i>						CCFA 40 (CRD14 AMFEP)
			<i>Penicillium funiculosum</i>						
			<i>Penicillium simplicissium</i>						7
			<i>Rhizopus oryzae</i>		NMRS50/TRS488-JECFA15/12	FAS 2/NMRS 50B-JECFA	Specifications as	7	

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
						15/28; Compendium/FN P_52/365; FAO JECFA Monographs 1 vol.1/297	carbohydrase (together with α -amylase and amyloglucosidase)	
			<i>Trichoderma longibrachiatum</i>					7, 30
			<i>Trichoderma longibrachiatum</i>	<i>Aspergillus sp.</i>				
4.2.2.10	Pectin lyase Synonyms: pectin <i>trans</i> -eliminase; endo-pectin lyase; polymethylgalacturonic transeliminase; pectin methyltranseliminase; pectolyase; PL; PNL; PMGL; (1 \rightarrow 4)-6-O-methyl- α -D-galacturonan lyase	Eliminative cleavage of (1 \rightarrow 4)- α -D-galacturonan methyl ester to give oligosaccharides with 4-deoxy-6-O-methyl- α -D-galact-4-enuronosyl groups at their non-reducing ends	<i>Aspergillus niger</i>		FAS 22-JECFA 31/21 ; TRS 789- JECFA35/15	Compendium addendum 8/FNP 52 Add.8/85 ; FAO JECFA Monographs 1 vol.3/13	As pectinase	20
			<i>Aspergillus niger</i>	<i>Aspergillus sp.</i>				CCFA 40 (CRD14 AMFEP)
			<i>Aspergillus sojae</i>					CCFA 40 (CRD14 AMFEP)
			<i>Penicillium funiculosum</i>					CCFA 40 (CRD14 AMFEP)
			<i>Rhizopus oryzae</i>		NMRS50/TRS48 8-JECFA15/12			CCFA 40 (CRD14 AMFEP)
			<i>Trichoderma longibrachiatum</i>	<i>Aspergillus sp.</i>				CCFA 40 (CRD14 AMFEP)
3.1.1.11	Pectinesterase Synonyms: pectin demethoxylase; pectin methoxylase; pectin methylesterase ; pectase; pectin methyl esterase; pectinoesterase; pectin pectylhydrolase	pectin + n H ₂ O = n methanol + pectate	<i>Aspergillus niger</i>		FAS 22-JECFA 31/21 ; TRS 789- JECFA35/15	Compendium addendum 8/FNP 52 Add.8/85 ; FAO JECFA Monographs 1 vol.3/13	As pectinase	20
			<i>Aspergillus niger</i>	<i>Aspergillus niger</i>				
			<i>Aspergillus oryzae</i>	<i>Aspergillus sp.</i>				CCFA 43 (AMFEP)
			<i>Aspergillus sojae</i>					CCFA 40 (CRD14

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed	
								AMFEP)	
			<i>Penicillium funiculosum</i>					CCFA 40 (CRD14 AMFEP)	
			<i>Rhizopus oryzae</i>					CCFA 40 (CRD14 AMFEP)	
			<i>Trichoderma longibrachiatum</i>	<i>Aspergillus sp.</i>				CCFA 40 (CRD14 AMFEP)	
Not applicable. Enzyme complex	Pentosanase	Hydrolysis of pentosans	<i>Aspergillus niger</i>				Evaluated as carbohydrate	CCFA 43 (AMFEP)	
			<i>Bacillus amyloliquefaciens</i>					CCFA 43 (AMFEP)	
			<i>Bacillus amyloliquefaciens</i>	<i>Bacillus sp.</i>					CCFA 43 (AMFEP)
			<i>Humicola insolens</i>						CCFA 43 (AMFEP)
			<i>Trichoderma longibrachiatum</i>						CCFA 43 (AMFEP)
1.11.1.7	Peroxidase Synonyms: lactoperoxidase; guaiacol peroxidase; plant peroxidase; Japanese radish peroxidase; horseradish peroxidase (HRP); soybean peroxidase (SBP); extensin peroxidase; heme peroxidase; oxypoxidase; protoheme peroxidase; pyrocatechol peroxidase; scopoletin peroxidase; <i>Coprinus cinereus</i> peroxidase; <i>Arthromyces ramosus</i> peroxidase; phenolic donor:hydrogen-peroxide oxidoreductase	2 phenolic donor + H ₂ O ₂ = 2 phenoxy radical of the donor + 2 H ₂ O	Origin?					47,57	
			<i>Aspergillus niger</i>	<i>Marasmius scorodonius</i>					CCFA 43 (AMFEP)
			Soya						
3.4.23.1	Pepsin A Synonyms: Pepsin; lactated pepsin; pepsin fortior; fundus-pepsin; elixir lactate of pepsin; P I; lactated pepsin elixir; P II; pepsin R; pepsin D;	Preferential cleavage of pepsin A: hydrophobic, preferably aromatic, residues in P1 and P1' positions. Cleaves Phe ¹ -Val, Gln ⁴ -His, Glu ¹³ -Ala, Ala ¹⁴ -Leu, Leu ¹⁵ -Tyr, Tyr ¹⁶ -Leu, Gly ²³ -Phe, Phe ²⁴ -Phe and Phe ²⁵ -Tyr bonds in the B chain of insulin	Hog stomach		NMRS50/TRS48 8-JECFA15/11	FAS 2/NMRS 50B-JECFA 15/8; Compendium/FN P 52/1069	Also covers Pepsin B and C	1	
			Poultry proventricum		NMRS50/TRS48 8-JECFA15/11	FAS 11/FNS 1B-JECFA 20/9; Compendium/FN P 52/167		41	
			Porcine pancreas		NMRS50/TRS48 8-JECFA15/11			55	

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
3.1.4.1	Phosphodiesterase I Synonyms: 5'-exonuclease; 5'-phosphodiesterase; 5'-nucleotide phosphodiesterase; oligonucleate 5'-nucleotidohydrolase; 5' nucleotide phosphodiesterase/alkaline phosphodiesterase I; 5'-NPDase; 5'-PDase; 5'-PDE; 5'NPDE; alkaline phosphodiesterase; nucleotide pyrophosphatase/phosphodiesterase I; orthophosphoric diester phosphohydrolase; PDE I; phosphodiesterase (ambiguous); exonuclease I; oligonucleotide 5'-nucleotidohydrolase	Hydrolytically removes 5'-nucleotides successively from the 3'-hydroxy termini of 3'-hydroxy-terminated oligonucleotides	<i>Leptographium procerum</i> <i>Penicillium citrinum</i>					
	Phospholipase ¹⁸							
3.1.1.32	Phospholipase A1 Synonyms: phosphatidylcholine 1-acylhydrolase	phosphatidylcholine + H ₂ O = 2-acylglycerophosphocholine + a carboxylate	<i>Aspergillus oryzae</i>	<i>Fusarium venenatum</i>	FAS 59-JECFA 68/119	Compendium addendum 13/FNP 52 Add. 13/31 FAO JECFA Monographs 4/		CCFA 40
3.1.1.4	Phospholipase A2 Synonyms: lecithinase A; phosphatidase; phosphatidolipase; phospholipase A; phosphatidylcholine 2-acylhydrolase	phosphatidylcholine + H ₂ O = 1-acylglycerophosphocholine + a carboxylate	<i>Aspergillus niger</i> <i>Aspergillus niger</i> <i>Aspergillus niger</i> <i>Bovine pancreas</i> <i>Porcine pancreas</i> <i>Streptomyces chromofuscus</i> <i>Streptomyces violaceoruber</i> <i>Streptomyces violaceoruber</i> <i>Trichoderma longibrachiatum</i> <i>Trichoderma longibrachiatum</i>	<i>Aspergillus sp.</i> <i>Aspergillus sp.</i> <i>porcine pancreas</i>				CCFA 43 (AMFEP) CCFA 40 (CRD14 AMFEP) CCFA 43 (AMFEP) CCFA 40 (CRD14 AMFEP) CCFA 43 (AMFEP) CCFA 40 (CRD14 AMFEP) CCFA 40 (CRD14 AMFEP)

¹⁸ See Phospholipase A2

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
	Phospholipase B¹⁹							AMFEP)
3.1.4.3	Phospholipase C Synonyms: lipophosphodiesterase I; lecithinase C; <i>Clostridium welchii</i> α-toxin; <i>Clostridium oedematiens</i> β- and γ-toxins; lipophosphodiesterase C; phosphatidase C; heat-labile hemolysin; α-toxin; phosphatidylcholine cholinephosphohydrolase	a phosphatidylcholine + H ₂ O = 1,2-diacyl- <i>sn</i> -glycerol + choline phosphate	<i>Pichia pastoris</i>	Soil sample	FAS 60-JECFA 69/107 ; TRS 952-JECFA 69/36	Compendium/FAO JECFA Monographs 5/61		CCFA 41 JECFA 69
3.1.4.4	Phospholipase D Synonyms: lipophosphodiesterase II; lecithinase D; choline phosphatase; phosphatidylcholine phosphatidohydrolase	a phosphatidylcholine + H ₂ O = choline + a phosphatidate	<i>Streptomyces cinnamomeus</i> <i>Streptomyces violaceoruber</i>	<i>Streptomyces sp.</i>				CCFA 43 (AMFEP)
3.1.3.8 and 3.1.3.26	3-Phytase and 4-Phytase Synonyms: 1-phytase; phytase; phytate 1-phosphatase; phytate 6-phosphatase; <i>myo</i> -inositol-hexakisphosphate 3-phosphohydrolase and 6-phytase (name based on 1L-numbering system and not 1D-numbering); phytase; phytate 6-phosphatase; <i>myo</i> -inositol-hexakisphosphate 6-phosphohydrolase (name based on 1L-numbering system and not 1D-numbering); <i>myo</i> -inositol-hexakisphosphate 4-phosphohydrolase	<i>myo</i> -inositol hexakisphosphate + H ₂ O = 1D- <i>myo</i> -inositol 1,2,4,5,6-pentakisphosphate or 1D- <i>myo</i> -inositol 1,2,3,5,6-pentakisphosphate + phosphate	<i>Aspergillus niger</i> <i>Aspergillus niger</i> <i>Aspergillus oryzae</i> <i>Trichoderma longibrachiatum</i> <i>Trichoderma longibrachiatum</i>	<i>Aspergillus niger</i> <i>Aspergillus niger</i> <i>Peniophora lycii</i> <i>Aspergillus sp.</i> <i>Buttiauxella sp.</i>	To be published	To be published		CX/FAC 92/7
	Polygalacturonase or pectinase ²⁰							
3.4.21 , 3.4.22 , 3.4.23 , 3.4.24 and 3.4.25	Endopeptidases Synonyms (non exhaustive list): Proteases (including milk clotting enzymes), Peptidases, Serine endopeptidases, Cysteine endopeptidases, Aspartic endopeptidases, Metalloendopeptidases, Threonine endopeptidases		<i>Actinidia chinensis</i> <i>Aspergillus melleus</i> <i>Aspergillus niger</i> <i>Aspergillus niger</i> <i>Aspergillus niger</i> <i>Aspergillus niger</i> <i>Aspergillus oryzae</i>	<i>Aspergillus niger</i> <i>Aspergillus niger</i> <i>Camel stomach</i>				CCFA 40 (CRD14 AMFEP) 7 7 CCFA 43 (AMFEP) 7
					FAS 22-JECFA 31/8	Compendium addendum 8/FNP 52 Add.8/91; FAO	Also covers aminopeptidases (3.4.11.x)	

¹⁹ See Lysophospholipase²⁰ See polygalacturonase

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
						JECFA Monographs 1 vol.3/203		
			<i>Aspergillus oryzae</i>	<i>Rhizomucor miehei</i>				
			<i>Aspergillus sojae</i>					CCFA 40 (CRD14 AMFEP)
			<i>Aspergillus sojae</i>	<i>Aspergillus sp.</i>				CCFA 43 (AMFEP)
			<i>Bacillus amyloliquefaciens</i>					CX/FAC 92/7
			<i>Bacillus amyloliquefaciens</i>	<i>Bacillus amyloliquefaciens</i>				
			<i>Bacillus cereus</i>			FNP 31/2 ; JECFA 28/5 ; Compendium/FN P.52/1261 ; FAO JECFA Monographs 1 vol.3/239	As rennet	7
			<i>Bacillus clausii</i>					CCFA 43 (AMFEP)
			<i>Bacillus licheniformis</i>					7
			<i>Bacillus licheniformis</i>	<i>Bacillus sp.</i>				CCFA 40 (CRD14 AMFEP)
			<i>Bacillus licheniformis</i>	<i>Nocardiopsis sp.</i>	To be published	To be published		CCFA 41 (CRD12 AMFEP)
			<i>Bacillus stearothermophilus</i>					
			<i>Bacillus subtilis</i>		FAS 1/NMRS 50A-JECFA 15/9	FAS 2/NMRS 50B-JECFA 15/23 ; Compendium/FN P.52/961	Mixed with carbohydrase (amylase)	1,7, CX/FAC 92/7
			<i>Bacillus subtilis</i>	<i>Bacillus amyloliquefaciens</i>				
			<i>Bacillus subtilis</i>	<i>Bacillus lentus</i>				
			<i>Bacillus subtilis</i>	<i>Thermus sp.</i>				CCFA 41 (CRD12 AMFEP)
			<i>Bacillus</i>					CCFA 40

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
			<i>thermoproteolyticus</i>					(CRD14 AMFEP)
			<i>Brevibacterium lineus</i>					46
			<i>Endothia parasitica</i>		FAS 1-JECFA 15/15 ; FAS 6/NMRS 54A-JECFA 18/131	Withdrawn 2000		1,7
			<i>Endothia parasitica</i>	<i>Endothia parasitica</i>				
			<i>Fusarium venenatum</i>	<i>Fusarium oxysporum</i>	To be published	To be published		CCFA 41 (CRD12 AMFEP)
			<i>Geobacillus caldoproteolyticus</i>					CCFA 43 (AMFEP)
			<i>Lactobacillus casei</i>		NMRS50/TRS48 8-JECFA15/11			46
			<i>Micrococcus caseolyticus</i>					56
			<i>Mucor pusillus</i> ²¹					
			<i>Penicillium citrinum</i>					CCFA 40 (CRD14 AMFEP)
			<i>Rhizomucor miehei</i>		FAS 1-JECFA 15/17 FAS 6/NMRS 54A-JECFA 18/133	Compendium addendum 8/FNP 52 Add.8/97: FAO JECFA Monographs 1 vol.3/241	As rennet	1,7
			<i>Rhizomucor pusillus</i>		FAS 1-JECFA 15/18 FAS 6/NMRS 54A-JECFA 18/137	Compendium addendum 8/FNP 52 Add.8/97: FAO JECFA Monographs 1 vol.3/241	As rennet	1,7
			<i>Rhizopus niveus</i>					
			<i>Rhizopus oryzae</i>		NMRS50/TRS48 8-JECFA15/12			
			<i>Streptococcus</i>		NMRS50/TRS48			46

²¹ See *Rizomucor pusillus*

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
			<i>cremoris</i>		8-JECFA15/12			
			<i>Streptococcus lactis</i>		NMRS50/TRS48 8-JECFA15/12			
			<i>Streptomyces fradiae</i>		FAS 17-JECFA 26/177	FNP 25-JECFA 26/190 ; Compendium/FN P 52/1235 ; FAO JECFA Monographs 1 vol.3/205	Insufficient toxicological data available, ADI withdrawn	23
			<i>Streptomyces violaceoruber</i>	<i>Streptomyces sp.</i>				
			<i>Trichoderma longibrachiatum</i>	<i>Trichoderma sp.</i>				CCFA 43 (AMFEP)
			<i>Trichoderma longibrachiatum</i>	<i>Bos Taurus</i>				CCFA 43 (AMFEP)
3.5.1.44	Protein-glutamine glutaminase Synonyms: peptidoglutaminase II; glutaminyl-peptide glutaminase; destabilase; peptidylglutaminase II; protein-L-glutamine amidohydrolase	protein L-glutamine + H ₂ O = protein L-glutamate + NH ₃	<i>Chryseobacterium proteolyticum</i>					CCFA 40 (CRD14 AMFEP)
3.2.1.41	Pullulanase Synonyms: limit dextrinase (erroneous); amylopectin 6-glucanohydrolase; bacterial debranching enzyme; debranching enzyme; α -dextrin endo-1,6- α -glucosidase; R-enzyme; pullulan α -1,6-glucanohydrolase; pullulan 6- α -glucanohydrolase	Hydrolysis of (1→6)- α -D-glucosidic linkages in pullulan, amylopectin and glycogen, and in the α - and β -limit dextrans of amylopectin and glycogen						CX/FAC 92/7
			<i>Bacillus acidopullulyticus</i>					30, 20
			<i>Bacillus brevis</i>					CCFA 40 (CRD14 AMFEP)
			<i>Bacillus circulans</i>					
			<i>Bacillus licheniformis</i>	<i>Bacillus deramificans</i>	TRS 966-JECFA 74/40 ; FAS 65-JECFA 74/117	Compendium/FAO JECFA Monographs 11/107		
			<i>Bacillus naganensis</i>					
			<i>Bacillus subtilis</i>					48, 49
			<i>Bacillus subtilis</i>	<i>Bacillus acidopullulyticus</i>				CCFA 40 (CRD14 AMFEP)
			<i>Bacillus subtilis</i>	<i>Bacillus naganensis</i>				
			<i>Bacillus subtilis</i>	<i>Bacillus deramificans</i>				
			<i>Klebsiella aerogenes</i>			FNP 19-JECFA 25/126 ; Compendium/FN		7

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
						P. 52/1237; FAO JECFA Monographs 1 vol.3/211		
			<i>Klebsiella planticola</i>					CCFA 40 (CRD14 AMFEP)
			<i>Klebsiella planticola</i>	<i>Bacillus planticola</i>				
			<i>Trichoderma longibrachiatum</i>	<i>Hormoconis sp.</i>				CCFA 40 (CRD14 AMFEP)
3.2.1.40	α-L-Rhamnosidase Synonyms: α-L-rhamnosidase T; α-L-rhamnosidase N; α-L-rhamnoside rhamnohydrolase	Hydrolysis of terminal non-reducing α-L-rhamnose residues in α-L-rhamnosides	<i>Penicillium decumbens</i> <i>Penicillium multicolour</i>					CCFA 40 (CRD14 AMFEP)
	Serine proteinase²²							
1.8.3.2	Thiol oxidase Synonyms: sulfhydryl oxidase ; thiol: oxygen oxidoreductase	$2 R'C(R)SH + O_2 = R'C(R)S-S(R)CR' + H_2O_2$	<i>Bacillus subtilis</i>	<i>Saccharomyces sp.</i>				CCFA 40 (CRD14 AMFEP)
3.1.1.20	Tannase Synonyms: tannase S; tannin acetylhydrolase; tannin acylhydrolase	digallate + H ₂ O = 2 gallate	<i>Aspergillus niger</i> <i>Aspergillus oryzae</i>					7 7
2.4.1.24	1,4-α-glucan 6-α-glucosyltransferase Synonyms: oligoglucan-branching glycosyltransferase; 1,4-α-D-glucan 6-α-D-glucosyltransferase; T-enzyme; D-glucosyltransferase; 1,4-α-D-glucan:1,4-α-D-glucan(D-glucose) 6-α-D-glucosyltransferase; (1→4)-α-D-glucan:(1→4)-α-D-glucan(D-glucose) 6-α-D-glucosyltransferase; Transglucosidase	Transfers an α-D-glucosyl residue in a (1→4)-α-D-glucan to the primary hydroxy group of glucose, free or combined in a (1→4)-α-D-glucan	<i>Aspergillus niger</i> <i>Trichoderma longibrachiatum</i> <i>Trichoderma longibrachiatum</i>	<i>Aspergillus sp.</i> <i>Trichoderma sp.</i>				CCFA 43 (AMFEP) CCFA 43 (AMFEP)
2.3.2.13	Protein-glutamine γ-glutamyltransferase Synonyms: transglutaminase ; Factor XIIIa; fibrinolygase; fibrin stabilizing factor; glutaminylpeptide γ-glutamyltransferase; polyamine transglutaminase; tissue transglutaminase; R-glutaminyl-peptide:amine γ-glutamyl transferase; protein-glutamine:amine γ-glutamyltransferase	protein glutamine + alkylamine = protein N ^ε -alkylglutamine + NH ₃	<i>Streptomyces mobaraensis</i>					
3.4.21.4	Trypsin	Preferential cleavage:	porcine or bovine		NMRS50/TRS48	FAS 2/NMRS		1

²² See endopeptidases

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
	Synonyms: α-trypsin; β-trypsin; cocoonase; parenzyme; parenzymol; tryptar; trypure; pseudotrypsin; tryptase; tripcellim; sperm receptor hydrolase	Arg ⁺ , Lys ⁺	pancreas		8-JECFA15/11	50B-JECFA 15/11; Compendium/FN P 52/1561		
3.5.1.5	Urease Synonyms: urea amidohydrolase	urea + H ₂ O = CO ₂ + 2 NH ₃	<i>Lactobacillus fermentum</i>		NMRS50/TRS48 8-JECFA15/11			
3.4.14.5	Dipeptidyl-peptidase IV Synonyms: dipeptidyl aminopeptidase IV; Xaa-Pro-dipeptidyl-aminopeptidase ; Gly-Pro naphthylamidase; postproline dipeptidyl aminopeptidase IV; lymphocyte antigen CD26; glycoprotein GP110; dipeptidyl peptidase IV; glycyproline aminopeptidase; glycyproline aminopeptidase; X-prolyl dipeptidyl aminopeptidase; pep X; leukocyte antigen CD26; glycyprolyl dipeptidylaminopeptidase; dipeptidyl-peptide hydrolase; glycyprolyl aminopeptidase; dipeptidyl-aminopeptidase IV; DPP IV/CD26; amino acyl-prolyl dipeptidyl aminopeptidase; T cell triggering molecule Tp103; X-PDAP	Release of an N-terminal dipeptide, Xaa-Yaa ⁺ Zaa ⁻ , from a polypeptide, preferentially when Yaa is Pro, provided Zaa is neither Pro nor hydroxyproline	<i>Lactococcus lactis</i>					CCFA 40 (CRD14 AMFEP)
3.2.1.8	Endo-1,4-β-xylanase Synonyms: endo-(1→4)-β-xylan 4-xylanohydrolase; endo-1,4-xylanase; xylanase ; β-1,4-xylanase; endo-1,4-xylanase; endo-β-1,4-xylanase; endo-1,4-β-D-xylanase; 1,4-β-xylan xylanohydrolase; β-xylanase; β-1,4-xylan xylanohydrolase; endo-1,4-β-xylanase; β-D-xylanase	Endohydrolysis of (1→4)-β-D-xylosidic linkages in xylans	<i>Aspergillus niger</i>				Evaluated as carbohydrase	7
			<i>Aspergillus niger</i>	<i>Aspergillus niger</i>				
			<i>Aspergillus niger</i>	<i>Talaromyces emersonii</i>				
			<i>Aspergillus oryzae</i>	<i>Aspergillus niger var. aculeatus</i>				
			<i>Aspergillus oryzae</i>	<i>Humicola lanuginosa</i>				
			<i>Aspergillus oryzae</i>	<i>Thermomyces sp.</i>				CCFA 40 (CRD14 AMFEP)
			<i>Bacillus amyloliquefaciens</i>					CCFA 40 (CRD14 AMFEP)
			<i>Bacillus licheniformis</i>	<i>Bacillus licheniformis</i>				
	<i>Bacillus subtilis</i>	<i>Bacillus subtilis</i>		FAS 54-JECFA 63/149	Compendium addendum 12/FNP 52 Add. 12/57- FAO JECFA		CCFAC 38	

Inventory of Substances used as Processing Aids (IPA) – Technological category: Food Enzymes

IUBMB number	Accepted IUBMB enzyme name and synonyms according to IUBMB	Functional use ⁹	Production organism ¹⁰	Donor organism (in case of genetic modification)	JECFA evaluation	JECFA specifications ¹¹	Comments	CCFA meeting when food enzyme was listed
						Monographs 1 vol.3/599		
			<i>Bacillus subtilis</i>	<i>Bacillus subtilis</i>	FAS 54-JECFA 63/149	Compendium addendum 12/FNP 52 Add. 12/59; FAO JECFA Monographs 1 vol.3/595	Modified gene	CCFAC 38
			<i>Bacillus subtilis</i>	<i>Pseudoalteromonas</i> sp.				CCFA 41 (CRD12 AMFEP)
			<i>Disporotrichum dimorphosporum</i>					7
			<i>Fusarium venenatum</i>	<i>Humicola lanuginosa</i>	FAS 52-JECFA 61/161	Compendium addendum 11/FNP 52 Add.11/87; FAO JECFA Monographs 1 vol.3/603		CCFAC 37
			<i>Humicola insolens</i>		FAS 52-JECFA 61/77	Compendium addendum 11/FNP 52 Add.11/41; FAO JECFA Monographs 1 vol.2/391	Mixed with beta-glucanase	
			<i>Penicillium funiculosum</i>			Compendium addendum 8/FNP 52 Add.8/43; FAO JECFA Monographs 1 vol.1/365	As cellulase	CCFA 40 (CRD14 AMFEP)
			<i>Streptomyces ?</i>					7
			<i>Talaromyces emersonii</i>					CCFA 43 (AMFEP)
			<i>Trichoderma longibrachiatum</i>					48
			<i>Trichoderma longibrachiatum</i>	<i>Thermopolyspora flexuosa</i>				
			<i>Trichoderma longibrachiatum</i>	<i>Trichoderma longibrachiatum</i>				

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			<i>Trichoderma viride</i>					CCFA 40 (CRD14 AMFEP)

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- 58- United States of America, letter (Crawford/Ronk), 9.12.89.
59. IOFI, letter (Grundschober/Ronk), 26.9.88.
60. France, letter (Martin/Ronk), 12.2.87.
61. Thailand, letter (Mekanontchai/Ronk), .3.89.

APPENDIX A**CODEX INVENTORY OF COMPOUNDS USED AS PROCESSING AIDS WHICH ALSO SERVE OTHER FUNCTIONS**

(excludes those substances already covered in the main IPA which were formerly annotated as (1.))

The substances are annotated according to the following system:

2. indicates those materials that are both food additives and processing aids (i.e. the substance functions as a processing aid in one food but may have a different function in another food).
3. indicates those compounds that because of carry-over residues, would seem to usually be considered only as food additives.
4. indicates those materials that might actually have simultaneous function as processing aids and functionality in the finished food.

Antifoam agents

- (2) Aluminum stearate
- (2) Butyl stearate
- (3) Butylated hydroxyanisole (as antioxidant in defoamers)
- (3) Butylated hydroxytoluene (as antioxidant in defoamers)
- (2) Calcium stearate
- (2) Dimethylpolysiloxane
- (2) Fatty acids
- (2) Hydroxylated lecithin
- (2) Magnesium stearate
- (3) Margarine
- (2) Mineral oil
- (2) Mono- and diglycerides of fatty acids
- (2) n-Butoxypolyoxyethylene polyoxypropylene glycol
- (2) Odourless light petroleum hydrocarbons
- (2) Oleic acid from tall oil fatty acids
- (2) Oxystearin
- (2) Petroleum wax
- (2) Petroleum wax (synthetic)
- (2) Petrolatum
- (2) Polyacrylic acid, sodium salt
- (2) Polydimethylpolysiloxane (fruit juices at 10mg/kg CCFAC 37)
- (2) Polyethylene glycol
- (2) Polyethylene glycol (400) dioleate
- (2) Polyethylene glycol (600) dioleate
- (2) Polyglycerol esters of fatty acids
- (2) Polyoxyethylene 40 monostearate
- (2) Polypropylene glycol
- (2) Polysorbate 60
- (2) Polysorbate 65
- (2) Polysorbate 80
- (2) Potassium stearate
- (2) Propylene glycol alginate
- (2) Propylene glycol mono- and di-esters of fats and fatty acids
- (2) Silicon dioxide
- (2) Sorbitan monolaurate
- (2) Sorbitan monostearate
- (2) Soybean oil fatty acids
- (2) Tallow
- (2) Tallow, hydrogenated, oxidized or sulphated
- (2) Tallow alcohol, hydrogenated
- (3) Vegetable oil

Catalysts

- (2) Ammonia

- (2) Ammonium bisulfite
- (2) Calcium chloride
- (2) Ferrous sulfate
- (2) Sodium chloride
- (2) Sodium hydroxide
- (2) Sodium metabisulfite
- (2) Sulfur dioxide

Clarifying agents/filtration aids

- (2) Acacia
- (2) Agar
- (2) Carbon dioxide
- (2) Carrageenan/Furcelleran
- (2) Casein
- (2) Cellulose
- (2) Cellulose powder
- Chloromethylated aminated styrene-divinylbenzene resin
- (2) Citric acid
- (1) Diatomaceous earth
- Divinylbenzene-ethylvinylbenzene copolymer
- Fuller's earth
- (2) Gelatin (edible)
- (2) Phosphoric acid
- Polyacrylamide/polysodium acrylate copolymer
- Polymaleic acid and sodium polymaleate
- (2) Polyvinylpyrrolidone
- (2) Polyvinylpolypyrrolidone
- (2) Potassium ferrocyanide
- (2) Silicon dioxide amorphous - silica hydrogel
- (2) Sodium alginate
- (2) Stabilized aqueous silica sol
- (2) Sulfur dioxide
- (2) Tannic acid
- (2) Wood flour/Sawdust

Colour stabilizers

- (2) Dextrose
- (2) Sodium acid pyrophosphate
- (2) Sulphur dioxide

Contact freezing and cooling agents

- (2) Brine (eg. salt brine)
- (2) Carbon dioxide
- Dichlorodifluoromethane
- (2) Glycerol

Desiccating agent/anticaking agents

- Aluminum stearate
- (2) Calcium aluminum silicate
- (2) Calcium silicate
- Calcium stearate
- (2) Magnesium carbonate, heavy
- (2) Magnesium carbonate, light
- (2) Magnesium oxide, heavy
- (2) Magnesium oxide, light
- (2) Magnesium silicate, synthetic
- Magnesium stearate
- (2) Magnesium trisilicate
- (2) Silicon dioxide
- (2) Silicon dioxide amorphous - silica gel
- (2) Sodium aluminum silicate
- Sodium calcium silicoaluminat

- (2) Tricalcium diorthophosphate

Enzyme immobilization agents and supports

- (2) Carrageenan (including Furcelleran)
- (2) Gelatin
- (2) Sodium alginate

Solvents (extraction and processing)

- (2) Ammonia in methanol/ethanol
- (2) Benzyl benzoate
- (2) Butan-2-ol
- (2) Butyl acetate
- (2) Carbon dioxide
- (2) Castor oil
- (2) Diethyl tartrate
- (2) Ethanol
- (2) Ethyl acetate
- (2) Ethyl lactate
- (2) Glycerol
- (2) Glycerol mono- di- and triacetate
- Isobutanol (2-methylpropan-1-ol)
- (2) Isopropyl alcohol
- (2) Methanol
- (2) Methyl acetate
- Methyl propanol-1
- (2) Nitric acid
- (2) Propane-2-ol (isopropyl alcohol)
- Trichlorofluoromethane
- (2) Water

Fat crystal modifiers

- (4) Lecithin
- (4) Oxystearin
- (4) Polyglycerol esters of fatty acids
- (4) Polysorbate 60
- (4) Sodium dodecylbenzene sulphonate
- (4) Sodium lauryl sulphate
- (4) Sorbitan monostearate
- (4) Sorbitan tristearate

Flocculating agents

- Acrylamide resins
- (2) Aluminum ammonium sulfate
- (2) Aluminum sulfate
- (2) Citric acid
- Dimethylamine-epichlorohydrin copolymer
- (2) Gelatin
- (2) Polyacrylic acid, sodium salt
- (2) Silica
- (2) Sodium alginate

Lubricants, release and anti-stick agents, moulding aids

- Acetic acid esters of fatty acid mono- and diglycerides
- (2) Acetylated monoglycerides
- (2) Beeswax
- (2) Butyl stearate
- (2) Carnauba wax
- (2) Calcium aluminum silicate
- (2) Calcium carbonate
- (2) Calcium phosphates
- (2) Calcium silicate
- (2) Calcium stearate

- (2) Castor oil
- (2) Edible bone phosphate
- (2) Ethoxylated mono- and diglycerides
- (2) Fats and waxes of vegetable and animal origin
- (2) Fatty acids of tallow and vegetable oils
- (2) Hydrogenated sperm oil
- (2) Lecithin
- (2) Magnesium carbonate
- (2) Magnesium oxide, light and heavy
- (2) Magnesium trisilicate
- (2) Mineral oil based greases (lubricants for pumps)
- (2) Mineral oil/Paraffin oil
- (2) Mineral oils and waxes
- Mono- and diglycerides of fatty acids
- (2) Oxidatively polymerised soya bean oil
- (2) Paraffin and paraffin oils
- (2) Partially hydrogenated vegetable oil
- (2) Polyglycerol esters of dimerised fatty acids of soya bean oil
- (2) Polyglycerol polylinoleate
- (2) Polyglycerol polyricinoleate
- Shellac
- Silicates (magnesium, potassium, sodium)
- (2) Silicon dioxide
- (2) Sodium aluminum silicate
- (2) Starches
- (2) Stearates (magnesium, calcium, and aluminum)
- Stearates (potassium and sodium)
- (2) Stearic acid
- (2) Stearins
- (2) Talc
- (2) Tetrasodium diphosphate
- (2) Tri-calcium phosphate
- (2) Vegetable triglycerides
- (2) Wax
- (2) Wax coatings

Micro-organism control agents

- (3) Disodium cyanodithioamidocarbonate
- Disodium ethylene bis dithiocarbamate
- Dimethyldicarbonate
- (3) Ethylenediamine
- (3) N-alkyl (C12-C16) dimethyl benzylchloride
- (2) Natamycin
- (2) Nitric acid
- (3) Potassium N-methyldithiocarbamate
- (3) Propylene oxide
- (3) Sodium chlorite
- Sodium dimethyldithiocarbamate
- (2) Sulfur dioxide

Propellant and packaging gases

- (2) Carbon dioxide
- (2) Dichlorodifluoromethane
- (2) Oxygen

Washing and peeling agents

- (2) Ammonium chloride
- Ammonium orthophosphate
- (2) Calcium chloride
- (2) Calcium hydroxide
- (2) Calcium oxide
- Diammonium orthophosphate

- Dithiocarbamate
- (2) Oleic acid
- Organophosphates
- (2) Sodium carbonate
- (2) Sodium hydroxide
- (2) Sodium hydroxide, 10%
- (2) Sodium hydroxide, 2%
- (2) Sodium tripolyphosphate
- (2) Sulfuric acid

Yeast nutrients

- (3) Ammonium chloride
- (3) Ammonium sulphate
- (3) Ammonium phosphates
- (3) B-Complex vitamins
- (3) Biotin
- (3) Calcium carbonate
- (3) Calcium phosphates
- (3) Calcium sulphate
- (3) Cupric sulphate
- (3) Ferrous ammonium sulphate
- (3) Ferrous sulphate
- (3) Inositol
- (3) Magnesium sulfate
- (3) Niacin
- (3) Pantothenic acid
- (3) Potassium carbonate
- (3) Potassium chloride
- (3) Potassium hydrogen carbonate
- (3) Yeast autolysates
- (3) Zinc sulphate

Other processing aids

- (2) Acetic acid
- Acrylic resin with primarily tertiary amino groups
- Alkylene oxide adduct
- (2) Allyl isothiocyanate
- (2) Ammonium bicarbonate
- (2) Amyl acetate
- (2) Benzyl alcohol
- (2) BHA
- (2) BHT
- (2) Calcium carbonate
- (2) Calcium chloride
- (2) Calcium citrate
- (2) Calcium hydroxide
- Calcium oxide
- (2) Calcium phosphates
- (2) Calcium sulfate
- (1) Calcium tartrate
- (2) Caramel flavoring
- Carbon dioxide
- (2) Citric acid
- (2) Coconut oil
- (2) Disodium hydrogen phosphate
- Ethylene oxide-propylene oxide copolymers
- (2) Fatty acids of soybean oil
- Fatty alcohol-glycol ether
- (2) Fractionated soybean oil
- (2) Fumaric acid
- (2) Glycerol tripropionate
- (2) Glycine

- (2) Hydrochloric acid
- (2) Hydrogenated soybean oil
- Hydrophilic fatty acyl esters, linked to a neutral carrier
- (2) Isopropyl alcohol
- (2) Lactic acid
- (2) Lactylated mono esters
- (2) Magnesium chloride
- (2) Magnesium citrate
- Magnesium oxide
- (2) Magnesium sulfate
- (2) Magnesium hydroxide
- (2) Magnesium phosphates
- alpha-Methyl glycoside water
- Methyl glycoside coconut oil ester
- (2) Methyl paraben (Methyl parahydroxybenzoate)
- (2) Mineral oil
- Mixture of ethylene and propylene oxides, copolymers and esters, castor oil and polyethylene glycol ester
- Mixture of naturally occurring and synthetic fatty acyl derivatives, with added emulgators
- Modified higher alcohol
- Mono- and diglycerides of fatty acids from feed fat (E471)
- Mono- and diglycerides of fatty acids from feed fat, esterified with acetic acid, lactic acid and citric acid
- Non-ionogenic alkylene oxide adduct with emulgator
- (2) Oxalic acid
- (2) Paraffin
- (2) Phosphoric acid
- Polyalkylene oxide, in combination with special fatty alcohols
- Polyethoxylated alcohol, modified
- Polyacrylate
- Polyacrylate with carboxyl groups
- Polyethylene glycol
- Polyglycol copolymer
- Polyphosphate
- Polypropylene-polyethylene block polymer
- (2) Polyvinylpyrrolidone
- (2) Potassium carbonate
- (2) Potassium chloride
- (2) Potassium citrate
- (2) Potassium nitrate
- (2) Potassium phosphates
- (2) Potassium sulfate
- (2) Potassium tartrate
- (2) Propyl gallate
- (2) Propan-1-ol
- (2) Propane-1,2-diol
- (2) Shellac
- (2) Sandarac gum
- (2) Sodium chloride
- (2) Sodium aluminosilicate
- (2) Sodium bisulfite
- (2) Sodium bicarbonate
- (2) Sodium carbonate
- (2) Sodium citrate
- (2) Sodium hexametaphosphate
- (2) Sodium hydroxide
- (2) Sodium metabisulfite
- (2) Sodium phosphate monobasic
- (2) Sodium phosphate dibasic
- (2) Sodium phosphate tribasic
- Sodium polyacrylate
- Sodium polyacrylate-acrylamide resin
- (2) Sodium sulfate

- Sodium sulfite
- (2) Sodium tartrate
- Solution of: anhyd. polyphosphate, polycarboxylic acid salt, polyalkylene glycol, sodium hydroxide
- Sorbitan-fatty acyl esters and polyoxyethylene-20-sorbitan fatty acyl esters
- (2) Soy lecithin
- (2) Sulfuric acid
- (2) Sulphur dioxide
- Sulphonated copolymer of styrene and divinylbenzene
- Surface-active esters with neutral carriers
- Tannic acid with quebracho extract
- (2) Tartaric acid
- (2) TBHQ
- Vegetable fatty acid esters
- Vegetable fatty acyl (hydrophilic)
- (2) Xylose