Food and Agriculture Organization of the United Nations

World Health Organization

JOINT FAO/WHO EXPERT COMMITTEE ON FOOD ADDITIVES
Seventy-sixth meeting
Geneva, 5–14 June 2012

SUMMARY AND CONCLUSIONS

Issued 29 June 2012

A meeting of the Joint FAO/WHO Expert Committee on Food Additives (JECFA) was held in Geneva, Switzerland, from 5 to 14 June 2012. The purpose of the meeting was to evaluate certain food additives, including flavouring agents.

Dr A. Mattia, Center for Food Safety and Applied Nutrition, United States Food and Drug Administration, served as Chairperson, and Mrs I. Meyland, Denmark, served as Vice-Chairperson.

Dr R. Ellis, Nutrition and Consumer Protection Division, Food and Agriculture Organization of the United Nations, and Dr A. Tritscher, Department of Food Safety and Zoonoses, World Health Organization, served as Joint Secretaries.

The present meeting was the seventy-sixth in a series of similar meetings. The tasks before the Committee were (a) to elaborate principles governing the evaluation of food additives, (b) to evaluate certain food additives and (c) to review and prepare specifications for selected food additives.

The report of the meeting will be published in the WHO Technical Report Series. Its presentation will be similar to that of previous reports—namely, general considerations, comments on specific substances, and recommendations for future work. An annex will include detailed tables (similar to the tables in this report) summarizing the main conclusions of the Committee in terms of acceptable or tolerable daily intakes and other toxicological and safety recommendations. Information on the specifications for the identity and purity of certain food additives examined by the Committee will also be included.

The participants in the meeting are listed in Annex 1. Further information required or desired is listed in Annex 2. Items of a general nature that the Committee would like to disseminate quickly are included in Annex 3.

Toxicological and dietary exposure monographs on most of the substances that were considered will be published in WHO Food Additives Series No. 67. New and revised specifications for the identity and purity of the compounds will be published in FAO JECFA Monographs 13.

More information on the work of JECFA is available at:

http://www.fao.org/food/food-safety-quality/scientific-advice/jecfa/en/

and

http://www.who.int/foodsafety/chem/jecfa/en/index.html

Toxicological information and information on specifications

Food additives considered for specifications only

Food additive	Specifications[a]
Ethyl cellulose	R
Mineral oil (medium viscosity)	N[b]
Modified starches	R
Titanium dioxide	R

[a] N, new specifications; R, existing specifications revised.
[b] The existing specifications for mineral oil (medium and low viscosity) were withdrawn (see below).

Food additives evaluated toxicologically and assessed for dietary exposure

Food additive	Specifications[a]	Acceptable or tolerable daily intakes and other toxicological recommendations
Magnesium dihydrogen diphosphate	N	Although an acceptable daily intake (ADI) "not specified"[b] has been established for a number of magnesium salts used as food additives, the estimated chronic dietary exposures to magnesium (960 mg/day for a 60 kg adult at the 95th percentile) from the proposed uses of magnesium dihydrogen diphosphate are up to twice the background exposures from food previously noted by the Committee (180–480 mg/day) and in the region of the minimum laxative effective dose of approximately 1000 mg of magnesium when taken as a single dose. The estimates of dietary exposure to phosphorus from the proposed uses of magnesium dihydrogen diphosphate were in the region of, or slightly exceeded, the maximum tolerable daily intake (MTDI) of 70 mg/kg body weight (bw) for phosphate salts, expressed as phosphorus, from this source alone. Thus, the MTDI is further exceeded when other sources of phosphate in the diet are taken into account. **The Committee therefore concluded that the proposed use levels and food categories result in an estimated dietary exposure to magnesium dihydrogen diphosphate that is of potential concern.** **The Committee emphasized that in evaluating individual phosphate-containing food additives, there is a need for assessment of total dietary exposure to phosphorus.** **The Committee recommended that total dietary exposure to magnesium from food additives and other sources in the diet should be assessed.** The information submitted to the Committee and in the scientific literature did not indicate that the MTDI of 70 mg/kg bw for phosphate salts, expressed as phosphorus, is insufficiently health protective. On the contrary, because the basis for its derivation might not be relevant to humans, it could be overly conservative. Therefore, **the Committee recommended that the toxicological basis of the MTDI for phosphate salts expressed as phosphorus be reviewed.**

Food additive	Specifications[a]	Acceptable or tolerable daily intakes and other toxicological recommendations
Mineral oil (medium and low viscosity) classes II and III	W	**The Committee concluded that the newly submitted data did not adequately address its previous requests for information** on the relevance to humans of the response of F344 and Sprague-Dawley rats to mineral oil (medium and low viscosity) classes II and III. The studies were conducted with a single administration, and it was not possible to predict the concentration in the target organ (liver) at steady state, or the potential for accumulation, in humans. Information requested at the forty-fourth meeting on compositional factors of mineral oils that influence absorption and toxicity had not been provided for materials meeting the criteria of mineral oil (medium and low viscosity) classes II and III. The Committee noted that hydrocarbon deposits with carbon numbers consistent with mineral oils, including those of classes II and III, and associated lesions have been reported in human tissues, demonstrating the potential relevance to humans of the effects in the F344 rat. Because all blood levels were below the limit of detection in the single-dose human toxicokinetic study, it was not possible to reach conclusions on the rate of elimination of mineral oils in humans or on the concentration in the liver at steady state following prolonged exposure. Therefore, the new data did not provide information that would allow an ADI to be established based on internal exposure. Similarly, it was not possible to establish an ADI based on external dose in the absence of information on the relative accumulation potential of classes II and III mineral oils in humans compared with rats. The Committee noted that the temporary group ADI for mineral oil (medium and low viscosity) classes II and III had been established in 1995 and extended on a number of occasions. As data supporting the establishment of a full ADI had not been made available, **the previously established temporary group ADI was withdrawn.**
3-Phytase from *Aspergillus niger* expressed in *Aspergillus niger*	N	Comparing the conservative exposure estimate with the no-observed-adverse-effect level (NOAEL) from the 13-week study of oral toxicity in rats, the margin of exposure is approximately 250. **The Committee allocated an ADI "not specified"[b] for 3-phytase enzyme preparation from *A. niger* expressed in *A. niger* used in the applications specified and in accordance with good manufacturing practice.**
Serine protease (chymotrypsin) from *Nocardiopsis prasina* expressed in *Bacillus licheniformis*	N	Comparing the exposure estimate with the NOAEL from the 13-week study of oral toxicity in rats, the margin of exposure is approximately 350. **The Committee allocated an ADI "not specified"[b] for serine protease (chymotrypsin) enzyme preparation from *N. prasina* expressed in the production strain *B. licheniformis*, used in the applications specified and in accordance with good manufacturing practice.**

Food additive	Specifications[a]	Acceptable or tolerable daily intakes and other toxicological recommendations
Serine protease (trypsin) from *Fusarium oxysporum* expressed in *Fusarium venenatum*	N	Comparing the dietary exposure estimate with the NOAEL from the 13-week study of oral toxicity in rats, the margin of exposure is approximately 1200. **The Committee allocated an ADI "not specified"[b] for serine protease (trypsin) enzyme preparation from *F. oxysporum* expressed in the production strain *F. venenatum*, used in the applications specified and in accordance with good manufacturing practice.**

[a] N, new specifications; W, existing specifications withdrawn.

[b] ADI "not specified" is used to refer to a food substance of very low toxicity that, on the basis of the available data (chemical, biochemical, toxicological and other) and the total dietary exposure to the substance arising from its use at the levels necessary to achieve the desired effects and from its acceptable background levels in food, does not, in the opinion of the Committee, represent a hazard to health. For that reason, and for the reasons stated in the individual evaluations, the establishment of an ADI expressed in numerical form is not deemed necessary. An additive meeting this criterion must be used within the bounds of good manufacturing practice—i.e. it should be technologically efficacious and should be used at the lowest level necessary to achieve this effect, it should not conceal food of inferior quality or adulterated food, and it should not create a nutritional imbalance.

Flavouring agents evaluated by the Procedure for the Safety Evaluation of Flavouring Agents[1]

A. Aliphatic and aromatic amines and amides

Flavouring agent	No.	Specifications[a]	Conclusion based on current estimated dietary exposure
Structural class I			
2-Aminoacetophenone	2043	N	No safety concern
Structural class III			
(2*E*,6*E*/*Z*,8*E*)-*N*-(2-Methylpropyl)-2,6,8-decatrienamide	2077	N	No safety concern
(2*S*,5*R*)-*N*-[4-(2-Amino-2-oxoethyl)phenyl]-5-methyl-2-(propan-2-yl)cyclohexanecarboxamide	2078	N	No safety concern
(1*R*,2*S*,5*R*)-*N*-(4-Methoxyphenyl)-5-methyl-2-(1-methylethyl)cyclohexanecarboxamide	2079	N	No safety concern
N-Cyclopropyl-5-methyl-2-isopropylcyclohexanecarboxamide	2080	N	No safety concern

[1] The flavouring agent **2-phenyl-2-methyl-2-hexenal (No. 2069)** was submitted for evaluation in the group of aliphatic linear α,β-unsaturated aldehydes, acids and related alcohols, acetals and esters; the Committee considered that it did not belong to this group of flavouring agents, and therefore it was not further considered. The safety of the submitted substance **(3*R*)-4-[[(1*S*)-1-benzyl-2-methoxy-2-oxo-ethyl]amino]-3-[3-(3-hydroxy-4-methoxy-phenyl)propylamino]-4-oxo-butanoic acid hydrate (Advantame, No. 2124)** in the group of amino acids and related substances was not assessed; the Committee decided that it would not be appropriate to evaluate this substance as a flavouring agent, because it is a low-calorie intense sweetener. The safety of the two submitted substances **rebaudioside C (No. 2168)** and **rebaudioside A (No. 2169)** in the group of phenol and phenol derivatives was not assessed; the Committee decided that it would not be appropriate to evaluate these substances as flavouring agents, as they had already been evaluated as food additives (sweeteners).

Flavouring agent	No.	Specifications[a]	Conclusion based on current estimated dietary exposure
N-(2-Methylcyclohexyl)-2,3,4,5,6-pentafluorobenzamide	2081	N	No safety concern
3[(4-Amino-2,2-dioxido-1H-2,1,3-benzothiadiazin-5-yl)oxy]-2,2-dimethyl-*N*-propylpropanamide	2082	N	No safety concern

[a] N, new specifications.

B. Aliphatic and aromatic ethers

Flavouring agent	No.	Specifications[a]	Conclusion based on current estimated dietary exposure
Structural class II			
3,6-Dimethyl-2,3,3a,4,5,7a-hexahydrobenzofuran	2133	N	No safety concern
Ethyl linalyl ether	2134	N	No safety concern
Linalool oxide pyranoid	2135	N	No safety concern
Nerolidol oxide	2137	N	**Additional data required to complete evaluation**
Methyl hexyl ether	2138	N	No safety concern
Myrcenyl methyl ether	2139	N	No safety concern
Digeranyl ether	2142	N	No safety concern
Structural class III			
Isoamyl phenethyl ether	2136	N	No safety concern
5-Isopropyl-2,6-diethyl-2-methyltetrahydro-2H-pyran	2140	N	No safety concern
Butyl β-naphthyl ether	2141	N	No safety concern

[a] N, new specifications.

C. Aliphatic hydrocarbons, alcohols, aldehydes, ketones, carboxylic acids and related esters, sulfides, disulfides and ethers containing furan substitution

The Committee concluded that the Procedure could not be applied to this group because of unresolved toxicological concerns. Studies that could assist in the safety evaluation include investigations of the influence of the nature and position of furan ring substitutions on metabolism and covalent binding to macromolecules, demonstration of the ring opening and reactivity of the resulting products. Depending on the findings, additional genotoxicity or other studies might be needed.

Flavouring agent	No.	Specifications[a]
2-Pentylfuran	1491	M
2-Heptylfuran	1492	M
2-Decylfuran	1493	M
3-Methyl-2-(3-methylbut-2-enyl)-furan	1494	M
3-(2-Furyl)acrolein	1497	M
3-(5-Methyl-2-furyl)prop-2-enal	1499	M
2-Furyl methyl ketone	1503	M
2-Acetyl-5-methylfuran	1504	M

Flavouring agent	No.	Specifications[a]
2-Acetyl-3,5-dimethylfuran	1505	M
2-Butyrylfuran	1507	M
(2-Furyl)-2-propanone	1508	M
2-Pentanoylfuran	1509	M
1-(2-Furyl)butan-3-one	1510	M
4-(2-Furyl)-3-buten-2-one	1511	M
Ethyl 3-(2-furyl)propanoate	1513	M
Isobutyl 3-(2-furan)propionate	1514	M
Isoamyl 3-(2-furan)propionate	1515	M
Isoamyl 4-(2-furan)butyrate	1516	M
Phenethyl 2-furoate	1517	M
Furfuryl methyl ether	1520	M
Ethyl furfuryl ether	1521	M
Difurfuryl ether	1522	M
2,5-Dimethyl-3-furanthiol acetate	1523	M
Furfuryl 2-methyl-3-furyl disulfide	1524	M
3-[(2-Methyl-3-furyl)thio]-2-butanone	1525	M
O-Ethyl S-(2-furylmethyl)thiocarbonate	1526	M
2,3-Dimethylbenzofuran	1495	M
2,4-Difurfurylfuran	1496	M
2-Methyl-3(2-furyl)acrolein	1498	M
3-(5-Methyl-2-furyl)-butanal	1500	M
2-Furfurylidene-butyraldehyde	1501	M
2-Phenyl-3-(2-furyl)prop-2-enal	1502	M
3-Acetyl-2,5-dimethylfuran	1506	M
Pentyl 2-furyl ketone	1512	M
Propyl 2-furanacrylate	1518	M
2,5-Dimethyl-3-oxo-(2H)-fur-4-yl butyrate	1519	M
(*E*)-Ethyl 3-(2-furyl)acrylate	2103	N
Di-2-furylmethane	2104	N
2-Methylbenzofuran	2105	N

[a] M, specifications maintained; N, new specifications.

D. Aliphatic linear α,β-unsaturated aldehydes, acids and related alcohols, acetals and esters

Flavouring agent	No.	Specifications[a]	Conclusion based on current estimated dietary exposure
Structural class I			
trans-2-Nonenyl acetate	2163	N	No safety concern
Propyl sorbate	2164	N	No safety concern
cis-2-Octenol	2165	N	No safety concern
trans-2-Tridecenol	2166	N	No safety concern
Ethyl 2-hexenoate (mixture of isomers)	2167	N	No safety concern

[a] N, new specifications.

E. Amino acids and related substances

Flavouring agent	No.	Specifications[a]	Conclusion based on current estimated dietary exposure
Structural class I			
L-Ornithine (as the monochlorohydrate)	2120	N	No safety concern
L-Alanyl-L-glutamine	2121	N	No safety concern
L-Methionylglycine	2122	N	No safety concern
Glutamyl-valyl-glycine	2123	N	No safety concern

[a] N, new specifications.

The Committee considered that the use of the Procedure for the Safety Evaluation of Flavouring Agents was inappropriate for two members of this group—namely, L-isoleucine (No. 2118) and L-threonine (No. 2119). In view of the fact that these substances are macronutrients and normal components of protein, the Committee concluded that the use of these substances as flavouring agents would not raise any safety concerns at current estimated dietary exposures.

Flavouring agent	No.	Specifications[a]
L-Isoleucine	2118	N
L-Threonine	2119	N

[a] N, new specifications.

F. Epoxides

Flavouring agent	No.	Specifications[a]	Conclusion based on current estimated dietary exposure
Structural class III			
Ethyl α-ethyl-β-methyl-β-phenylglycidate	2143	N	No safety concern
Methyl β-phenylglycidate	2144	N	No safety concern
d-8-*p*-Menthene-1,2-epoxide	2145	N	No safety concern
l-8-*p*-Menthene-1,2-epoxide	2146	N	No safety concern
2,3-Epoxyoctanal	2147	N	**Additional data required to complete evaluation**
2,3-Epoxyheptanal	2148	N	**Additional data required to complete evaluation**
2,3-Epoxydecanal	2149	N	**Additional data required to complete evaluation**

[a] N, new specifications.

G. Furfuryl alcohol and related substances

New in vitro and in vivo studies raise concerns regarding the potential genotoxicity of furfuryl alcohol and derivatives that can be metabolized to furfuryl alcohol (e.g. furfuryl esters). The Committee concluded that this group of flavouring agents could not be evaluated according to the Procedure because of the unresolved concerns regarding genotoxicity. In addition, the group ADI previously established by the Committee will need to be reconsidered at a future meeting.

Flavouring agent	No.	Specifications[a]
5-Methylfurfuryl alcohol	2099	N
Furfural propyleneglycol acetal	2100	N
Furfuryl formate	2101	N
Furfuryl decanoate	2102	N

[a] N, new specifications.

H. Linear and branched-chain aliphatic, unsaturated, unconjugated alcohols, aldehydes, acids and related esters

Flavouring agent	No.	Specifications[a]	Conclusion based on current estimated dietary exposure
Structural class I			
cis-3-Nonen-1-ol	2177	N	No safety concern
trans-3-Nonen-1-ol	2178	N	No safety concern
cis,*cis*-3,6-Nonadienyl acetate	2179	N	No safety concern
trans-3-Hexenyl acetate	2180	N	No safety concern
cis-3-Hexenoic acid	2181	N	No safety concern
cis-3-Nonenyl acetate	2182	N	No safety concern
cis-6-Nonenyl acetate	2183	N	No safety concern
(*Z*)-5-Octenyl acetate	2184	N	No safety concern
(*E*)-4-Undecenal	2185	N	No safety concern

[a] N, new specifications.

I. Miscellaneous nitrogen-containing compounds

Flavouring agent	No.	Specifications[a]	Conclusion based on current estimated dietary exposure
Structural class II			
3-(1-((3,5-Dimethylisoxazol-4-yl)methyl)-1H-pyrazol-4-yl)-1-(3-hydroxybenzyl)-imidazolidine-2,4-dione	2161	N	No safety concern
3-(1-((3,5-Dimethylisoxazol-4-yl)methyl)-1H-pyrazol-4-yl)-1-(3-hydroxybenzyl)-5,5-dimethylimidazolidine-2,4-dione	2162	N	No safety concern

[a] N, new specifications.

J. Phenol and phenol derivatives

Flavouring agent	No.	Specifications[a]	Conclusion based on current estimated dietary exposure
Structural class III			
3′,7-Dihydroxy-4′-methoxyflavan	2170	N	No safety concern
Trilobatin	2171	N	No safety concern
(±)-Eriodictyol	2172	N	No safety concern

[a] N, new specifications.

K. Pyrazine derivatives

Flavouring agent	No.	Specifications[a]	Conclusion based on current estimated dietary exposure
Structural class II			
Isopropenylpyrazine	2125	N	No safety concern
5-Ethyl-2,3-dimethylpyrazine	2126	N	No safety concern
2-Methyl-5-vinylpyrazine	2127	N	No safety concern
A mixture of 2,5-dimethyl-6,7-dihydro-5H-cyclopentapyrazine and 2,7-dimethyl-6,7-dihydro-5H-cyclopentapyrazine	2128	N	No safety concern
2-Ethoxy-3-isopropylpyrazine	2065	N	No safety concern
Structural class III			
3,5- and 3,6-Dimethyl-2-isobutylpyrazine	2130	N	No safety concern
2-Ethoxy-3-ethylpyrazine	2131	N	No safety concern
2-Ethyl-3-methylthiopyrazine	2132	N	No safety concern

[a] N, new specifications.

L. Pyridine, pyrrole and quinoline and related N-heterocyclic derivatives

Flavouring agent	No.	Specifications[a]	Conclusion based on current estimated dietary exposure
Structural class II			
1-Ethyl-2-pyrrolecarboxaldehyde	2150	N	**Additional data required to complete evaluation**
2,4-Dimethylpyridine	2151	N	No safety concern (temporary)[b]
1-Methyl-1H-pyrrole-2-carboxaldehyde	2152	N	**Additional data required to complete evaluation**
Structural class III			
2-Acetyl-4-isopropenylpyridine	2153	T	No safety concern
4-Acetyl-2-isopropenylpyridine	2154	T	No safety concern
2-Acetyl-4-isopropylpyridine	2155	N	No safety concern
2-Methoxypyridine	2156	N	**Additional data required to complete evaluation**
6-Methoxyquinoline	2157	N	No safety concern
1-(2-Hydroxyphenyl)-3-(pyridine-4-yl)propan-1-one	2158	N	**Additional data required to complete evaluation**
1-(2-Hydroxy-4-isobutoxyphenyl)-3-(pyridine-2-yl)propan-1-one	2159	N	**Additional data required to complete evaluation**
1-(2-Hydroxy-4-methoxyphenyl)-3-(pyridine-2-yl)propan-1-one	2160	N	**Additional data required to complete evaluation**

[a] N, new specifications; T, tentative specifications.
[b] The evaluation for No. 2151 is temporary pending receipt of additional toxicological data.

M. Saturated aliphatic acyclic branched-chain primary alcohols, aldehydes and acids

Flavouring agent	No.	Specifications[a]	Conclusion based on current estimated dietary exposure
Structural class I			
3-Methylhexanal	2173	N	No safety concern
6-Methylheptanal	2174	N	No safety concern
6-Methyloctanal	2175	N	No safety concern
3,7-Dimethyloctanal	2176	N	No safety concern

[a] N, new specifications.

N. Simple aliphatic and aromatic sulfides and thiols

Flavouring agent	No.	Specifications[a]	Conclusion based on current estimated dietary exposure
Subgroup ii: Acyclic sulfides with oxidized side-chains			
Structural class I			
1-(Methylthio)-3-octanone	2086	N	No safety concern
Subgroup iii: Cyclic sulfides			
Structural class III			
4-Methyl-2-propyl-1,3-oxathiane	2089	N	No safety concern
Subgroup iv: Simple thiols			
Structural class I			
3-Pentanethiol	2083	N	No safety concern
Subgroup v: Thiols with oxidized side-chains			
Structural class I			
4-Mercapto-3-methyl-2-butanol	2084	N	No safety concern
Ethyl 2-mercapto-2-methylpropionate	2085	N	No safety concern
Subgroup vi: Dithiols			
Structural class III			
1,1-Propanedithiol	2087	N	No safety concern
Subgroup viii: Disulfides with oxidized side-chains			
Structural class III			
1-Methyldithio-2-propanone	2088	N	No safety concern

[a] N, new specifications.

O. Sulfur-containing heterocyclic compounds

Flavouring agent	No.	Specifications[a]	Conclusion based on current estimated dietary exposure
Structural class II			
2-Pentylthiophene	2106	N	No safety concern
2-Acetyl-5-methylthiophene	2107	N	No safety concern

Flavouring agent	No.	Specifications[a]	Conclusion based on current estimated dietary exposure
2-Pentylthiazole	2108	N	No safety concern
4,5-Dimethyl-2-isobutylthiazole	2109	N	No safety concern
Structural class III			
3,4-Dimethylthiophene	2110	N	No safety concern
2-Thienylmethanol	2111	N	No safety concern
1-(2-Thienyl)ethanethiol	2112	N	No safety concern
5-Ethyl-2-methylthiazole	2113	N	No safety concern
2-Ethyl-2,5-dihydro-4-methylthiazole	2114	N	No safety concern
4-Methyl-3-thiazoline	2115	N	No safety concern
2-Ethyl-4,6-dimethyldihydro-1,3,5-dithiazine	2116	N	No safety concern
4-Amino-5,6-dimethylthieno[2,3-d]pyrimidin-2(1H)-one hydrochloride	2117	N	No safety concern

[a] N, new specifications.

P. Sulfur-substituted furan derivatives

Flavouring agent	No.	Specifications[a]	Conclusion based on current estimated dietary exposure
Structural class III			
5-Methylfurfuryl mercaptan	2090	N	No safety concern
2-Methyl-3-furyl methylthiomethyl disulfide	2091	N	No safety concern
2-Methyl-3-furyl 2-methyl-3-tetrahydrofuryl disulfide	2092	N	No safety concern
2-Tetrahydrofurfuryl 2-mercaptopropionate	2093	N	**Additional data required to complete evaluation**
Methyl 3-(furfurylthio)propionate	2094	N	No safety concern
3-[(2-Methyl-3-furyl)thio]butanal	2095	N	No safety concern
1-(2-Furfurylthio)-propanone	2096	N	No safety concern
2-Methyl-4,5-dihydrofuran-3-thiol	2097	N	No safety concern
2-Methyltetrahydrofuran-3-thiol acetate	2098	N	No safety concern

[a] N, new specifications.

Annex 1

Seventy-sixth meeting of the Joint FAO/WHO Expert Committee on Food Additives

Geneva, 5–14 June 2012

Members

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Annex 2

Further information required or desired

Paprika extract
For the revision of the specification for paprika extract, no data were received. Based on the commitment by the sponsor to provide data for a future meeting, this evaluation was postponed.

Specifications for flavouring agents
The specifications for Nos 2153 (2-acetyl-4-isopropenylpyridine) and 2154 (4-acetyl-2-isopropenylpyridine) were made tentative at the current meeting because the submitted information was insufficient. The two flavouring agents are positional isomers, and the Committee concluded that the current specifications would not allow for differentiation between the two substances. Information that could be used to differentiate the two substances (e.g. optical [specific] rotation) is requested.

Aliphatic hydrocarbons, alcohols, aldehydes, ketones, carboxylic acids and related esters, sulfides, disulfides and ethers containing furan substitution
The Committee concluded that the Procedure could not be applied to this group because of unresolved toxicological concerns. Studies that could assist in the safety evaluation include investigations of the influence of the nature and position of furan ring substitutions on metabolism and covalent binding to macromolecules, demonstration of the ring opening and reactivity of the resulting products. Depending on the findings, additional genotoxicity or other studies might be needed.

Furfuryl alcohol and related substances
New in vitro and in vivo studies raise concerns regarding the potential genotoxicity of furfuryl alcohol and derivatives that can be metabolized to furfuryl alcohol (e.g. furfuryl esters). The Committee concluded that this group of flavouring agents could not be evaluated according to the Procedure because of the unresolved concerns regarding genotoxicity. In addition, the group ADI previously established by the Committee will need to be reconsidered at a future meeting.

Pyridine, pyrrole and quinoline derivatives
For 2,4-dimethylpyridine (No. 2151), the safety evaluation was made temporary, pending the submission of the full report of the critical study for the next JECFA meeting at which flavouring agents are evaluated.

Additional data required to complete the evaluation according to the Procedure for the Safety Evaluation of Flavouring Agents
Additional data are required to complete the toxicological evaluations of 11 flavouring agents (Nos 2093, 2137, 2147–2150, 2152, 2156 and 2158–2160).

Annex 3

General considerations

An edited version of this section will appear in the report of the seventy-sixth meeting of the Joint FAO/WHO Expert Committee on Food Additives (JECFA). It is reproduced here so that the information can be disseminated quickly. This draft will be subject to editing.

Statement on the inclusion of secondary additives in a specifications monograph

Some food additives may require the addition of one or more secondary additives to ensure their stability and effective use in foods. Examples may include, but are not limited to, the use of antioxidants or preservatives to promote the stability of a primary additive or anti-caking agents, diluents or emulsifiers to ensure its technological function. In cases where the Committee has considered the use of a secondary additive or class of additives with a particular technological purpose to be appropriate, a short statement allowing for the addition of secondary additives will be included in the definition section of the specifications monograph.

Accordingly, any secondary additive must have been determined to be safe for use in food by the Committee. They should be of food-grade quality and used at the minimum level required to achieve the intended technological function.

Analytical method for the determination of phosphorus as phosphorus pentoxide

The Committee at its current meeting noted that the titrimetric and gravimetric methods in the *Combined Compendium of Food Additive Specifications*, Volume 4 (FAO JECFA Monographs 1, 2006), are not reliable for the determination of phosphorus as phosphorus pentoxide. The Committee may consider replacing corresponding methods for other diphosphate additives at a future meeting.

Food additives containing aluminium and/or silicon

The Committee, while reviewing the specifications of food additives containing aluminium and silicon, considered it relevant to update the test methods for the determination of aluminium oxide and silicon dioxide. Some of the test methods for certain of these food additives use potentially corrosive or hazardous reagents that are not always permitted in current laboratory practices because of safety concerns. The Committee also noted that the specifications for some additives were rather old or tentative and that it requires additional information to revise the specifications. Consequently, the Committee recommends placing these additives on the agenda for re-evaluation.

Test methods for modified starches

In addition to revising the specific test for degree of substitution of starch sodium octenylsuccinate (INS No. 1450) in the specifications monograph of modified starches, the Committee considered that it would be necessary to align the description of the test to be consistent with the end product specifications at a future meeting. In addition, the Committee considered that it would also be necessary to revise the specifications for all the modified starches, including test methods.

Improvements to the submission of specifications data for flavouring agents

The Committee at its current meeting made recommendations to improve the quality of data submitted for flavouring agents. These include submission of raw data (e.g. spectra, molecular structure, composition of isomers, physical and chemical properties, and method for determination of minimum assay) used to establish the specifications for each flavouring agent at submission. In addition, tabulated summary data (e.g. spreadsheet) for all the flavouring agents should be provided. It is strongly recommended that for each flavouring agent, the following spectra, with detailed experimental conditions, be provided: nuclear magnetic resonance spectrometry, Fourier-transform infrared spectroscopy and mass spectrometry. Spectra should be of such quality that they can be used for identification purposes. Data provided should be consistent with the product in commerce. The data should be provided in a timely manner that permits the Committee to perform a thorough review. All data should receive a thorough quality control review by the sponsor before submission to the Committee.

Improvements to the presentation of specifications data for flavouring agents

The Committee recommends that the chemical structures for the flavouring agents be included as part of the specifications presented online. In addition, an annotation of the method used to determine the minimum assay value of the flavouring agent should be included. The Committee also noted that it would be more useful to separate the current specification for “Physical Form/Odour” into two separate entries. It was also recommended that a separate entry for melting point be included in the specifications for flavouring agents.

Evaluation of flavour modifiers

A number of the flavouring agents submitted to the present meeting (Nos 2077, 2080–2082, 2119, 2121, 2123, 2158–2162 and 2170–2172) modify the flavour of other dietary components. At the present meeting, the Committee has adopted the term *flavour modifier* for all agents that alter or mask the flavours of flavouring agents or other dietary components.

The Committee noted that the chemical structures of some flavour modifiers (e.g. Nos 2081, 2082, 2161, 2162 and 2170–2172) have characteristics that have not been found in previously evaluated flavouring agents. The flavour modifiers evaluated at the present meeting had low estimated dietary exposures and could be evaluated using the Procedure for the Safety Evaluation of Flavouring Agents. The Committee agreed that flavour modifiers would be identified in evaluations of flavouring agents. The Committee emphasized that the safety evaluations undertaken on flavouring agents and flavour modifiers relate to the use levels submitted to the Committee for evaluation.