

Benzoic acid

Botanical Source

Synonyms Benzenecarboxylic acid

IUPAC Name

CAS Reference 65-85-0

E Number E210

Food Legislation

Council of Europe (CoE)

Number	Comment
-	-

US Food and Drug Administration

Number	Comment
184.1021	Approved by the US FDA. FDA 21 CFR 184.1021

Joint FAO/WHO Expert Committee on Food Additives (JECFA)

Number	ADI	Comment
850	N/A	ADI 0-5 mg/kg bw (1996)
		Comments: No safety concern at current levels of intake when used as a flavouring agent. The 1996 group ADI of 0-5 mg/kg bw for benzoic acid, the benzoate salts (calcium, potassium and sodium), benzaldehyde, benzyl acetate, benzyl alcohol and benzyl benzoate, expressed as benzoic acid equivalents, was maintained at the fifty-seventh meeting (2001).

FEMA

FEMA No.	Comment
2131	Generally recognised as safe as a flavour ingredient:GRAS List Number 3

Natural Occurrence and Use in Food

Found in cinnamon, strawberry, tea, apple, beer, bread, cocoa, honey; used in baked goods, cheese, candy, chewing gum, condiment relish.

Estimated Intake from Food and Drink	
Daily Intake mg/kg/day	FEMA Possible Average Daily Intake mg
0.0045	0.03

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Tobacco Product Related Chemical and Biological Studies for Ingredients Added in a Mixture

Smoke Chemistry		
Published Source	Level Tested %	Comment
BAT	0.01400	At maximum application level this ingredient is not associated with significant increases in levels of Hoffmann analytes in smoke.

Ames Activity		
Published Source	Level Tested %	Comment
BAT	0.01400	Within the sensitivity and specificity of the system the Ames activity of the cigarette smoke condensate was not increased by the addition of the ingredient.

Micronucleus		
Published Source	Level Tested %	Comment
BAT	0.01400	Within the sensitivity of the in vitro micronucleus assay the activity of the cigarette smoke condensate was not increased by the addition of the ingredient.

Neutral Red		
Published Source	Level Tested %	Comment
BAT	0.01400	Within the sensitivity of the test system the in vitro cytotoxicity of the cigarette smoke condensate was not increased by the addition of the ingredient.

Inhalation		
Published Source	Level Tested %	Comment
BAT	0.01400	The results indicate that the addition of the ingredient had no discernible effect on the inhalation toxicity of mainstream smoke.

Mouse Skin Painting		
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Published Source	Level Tested %	Comment

References

Baker RR, Pereira da Silva JR, Smith G. The effect of tobacco ingredients on smoke chemistry. Part I: Flavourings and additives. Food Chem Toxicol. 2004; 42 Suppl:S3-37.

Baker RR, Pereira da Silva JR, Smith G. The effect of tobacco ingredients on smoke chemistry. Part II: casing ingredients. Food Chem Toxicol. 2004; 42 Suppl:S39-52.

Baker RR, Massey ED, Smith G. An overview of the effects of tobacco ingredients on smoke chemistry and toxicity. Food Chem Toxicol. 2004; 42 Suppl:S53-83.

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Tobacco Product Related Chemical and Biological Studies for Ingredients Tested Singly

References
Baker RR, Bishop LJ. The pyrolysis of tobacco ingredients. J. Anal. Appl. Pyrolysis 2004, 71, 223-311.

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Toxicological Data on the Unburnt Ingredient

[+ve, positive; -ve, negative; ?, equivocal; with, with metabolic activation; without, without metabolic activation]

In vivo

Species	Test conditions	Endpoint	Result	Reference
Rats	Single oral dose of up to 5 g/kg bw, or 5 g/kg bw/day for 5 days, bone marrow examined 6-48 hours after dose	Chromosome damage	-ve	IPCS, 2000 (citing FDRL, 1974)
Rats	No data given, bone marrow examined	Chromosome damage	-ve	Kawachi <i>et al.</i> 1980
Rats	Single oral dose of up to 5 g/kg bw, or 5 g/kg bw/day for 5 days, treated males mated with untreated females for several weeks, early foetal deaths monitored	Germ cell mutations Reported as -ve by IPCS, 1999, as +ve by IPCS, 2000, dismissed as irrelevant by JECFA, 1996	?	IPCS, 1999; IPCS, 2000; JECFA, 1996 (citing FDRL, 1974)

In vitro

Test system	Test conditions	Endpoint	Activation	Result	References
Rat and hamster cells	Tests with benzoic acid and sodium benzoate, up to 2 mg/ml	Chromosome damage	With and without	+ve	TNO BIBRA, 1989; JECFA, 1996 (citing: Abe & Sasaki, 1977; Ishidate & Odashima, 1977; Ishidate & Yoshikawa, 1980; Ishidate <i>et al.</i> 1984; Kawachi, 1975, Kawachi <i>et al.</i> 1980)
Human lymphocytes	Test with sodium benzoate, no details given in the expert review	Chromosome damage	With and without	-ve	TNO BIBRA, 1989 (citing Zhurkov, 1975)
Human lymphocytes and lymphoblastoid cells, and hamster ovary cells	1-30 mmol/l	Chromosome effects	Not disclosed in review	-ve	JECFA, 1996 (citing Jansson <i>et al.</i> 1988; Oikawa <i>et al.</i> 1980; Tohda <i>et al.</i> 1980)
Human and hamster cells	Tests with benzoic acid, no details given in the expert review	Transformation	Not disclosed	-ve	TNO BIBRA, 1989 (citing Purchase <i>et al.</i> 1978)
<i>Saccharomyces cerevisiae</i>	Benzoic acid, no details given in expert review	Mutations	Not disclosed	-ve	TNO BIBRA, 1989 (citing Cotruvo <i>et al.</i> 1977)

<i>Salmonella typhimurium</i> , various strains including TA92, TA94, TA97, TA98, TA100, TA1535, TA1538	Tests with benzoic acid and sodium benzoate, up to 10 mg/plate (toxicity was achieved in some studies)	Mutations	With and without S9	-ve	TNO BIBRA, 1989; JECFA, 1996 (citing Commoner, 1976; Cotruvo <i>et al.</i> 1977; Ishidate <i>et al.</i> 1984; Ishidate & Yoshikawa, 1980; Kawachi, 1975; Kawachi <i>et al.</i> 1980; Purchase <i>et al.</i> 1978; Rapson, 1980; Zeiger <i>et al.</i> 1988)
<i>Bacillus subtilis</i>	Benzoic acid and sodium benzoate, no details given in expert review	DNA damage (indicative assay)	Not disclosed	-ve for the acid, +ve and -ve for the sodium salt	TNO BIBRA, 1989 (citing Kawachi, 1975; Khoudokoromoff & Gist-Brocades, 1978; Morita <i>et al.</i> 1981)
Chinese hamster lung cells	Up to 2 mg/ml, incubation for 24 and 48 hours	Chromosome damage	Without	-ve	Ishidate <i>et al.</i> 1988
<i>Bacillus subtilis</i> H17 and M45	Tested at 2 mg/disk, rec assay (differential killing)	DNA damage (indicative test)	With and without S9	+ve	Ishidate <i>et al.</i> 1988

References

IPCS (1999). Benzoic acid and sodium benzoate. First draft. IPCS Concise International Chemical Assessment Document.

IPCS (2000). Benzoic acid and sodium benzoate. Concise International Chemical Assessment Document. Table of Contents and Executive Summary No. 26.

Ishidate M *et al.* (1988). Tokiskikoroji Foramu V11, P663 (paper in Japanese, key data translated).

JECFA (1996). Toxicological evaluation of certain food additives. Prepared by the forty-sixth meeting of the Joint FAO/WHO Expert Committee on Food Additives. WHO Fd Add. Ser. 37, P1.

Kawachi T. *et al.* (1980). Appl. Methods Oncol. 3, 253.

TNO BIBRA (1989). Benzoic acid and its common salts. TNO BIBRA Toxicity Profile, P283.