

Nonanal

Botanical Source

Synonyms ALDEHYDE C-9
PELARGONIC ALDEHYDE
NONANALDEHYDE

IUPAC Name

CAS Reference 124-19-6

E Number

Food Legislation

Council of Europe (CoE)

Number	Comment
114	Listed by the Council of Europe as acceptable for use in food.

US Food and Drug Administration

Number	Comment
172.515	Approved by the US FDA. FDA 21 CFR 172.515

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

Number	ADI	Comment
101	ADI 0-0.1 MG/KG BW	No safety concern at current levels of intake when used as a flavouring agent.

FEMA

FEMA No.	Comment
2782	Generally recognised as safe as a flavour ingredient:GRAS List Number 3

Natural Occurrence and Use in Food

Found in apricot, asparagus, beef, blackberry, wheat bread, cantaloupe, cocoa; used in baked goods.

Estimated Intake from Food and Drink

Daily Intake mg/kg/day	FEMA Possible Average Daily Intake mg
0.0002824	0.356

Nonanal

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

Smoke Chemistry		
Published Source	Level Tested %	Comment
BAT	0.00100	At maximum application level this ingredient is not associated with significant increases in levels of Hoffmann analytes in smoke.
Philip Morris	0.00010	An overall assessment of the data suggests that this ingredient did not add to the toxicity of smoke.

Ames Activity		
Published Source	Level Tested %	Comment
BAT	0.00100	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.
Philip Morris	0.00010	Within the sensitivity and specificity of the system the Ames activity of the cigarette smoke was not increased by the addition of the ingredient.

Micronucleus		
Published Source	Level Tested %	Comment
BAT	0.00100	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	0.00100	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.
Philip Morris	0.00010	Within the sensitivity of the test system the in vitro cytotoxicity of the cigarette smoke was not increased by the addition of the ingredient.

Inhalation		
Published Source	Level Tested %	Comment
BAT	0.00100	The results indicate that the addition of the ingredient had no discernible effect on the inhalation toxicity of mainstream smoke.
Philip Morris	0.00010	The data indicate that the addition of the ingredient, when added with one of three groups, did not increase the inhalation toxicity of the smoke.

Mouse Skin Painting		
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.
Carmines EL. Evaluation of the potential effects of ingredients added to cigarettes. Part 1: cigarette design, testing approach, and review of results. Food Chem Toxicol. 2002; 40(1): 77-91.
Rustemeier K, Stabbert R, Haussmann HJ, Roemer E, Carmines EL. Evaluation of the potential effects of ingredients added to cigarettes. Part 2: chemical composition of mainstream smoke. Food Chem Toxicol. 2002; 40(1): 93-104.
Roemer E, Tewes FJ, Meisgen TJ, Veltel DJ, Carmines EL. Evaluation of the potential effects of ingredients added to cigarettes. Part 3: in vitro genotoxicity and cytotoxicity. Food Chem Toxicol. 2002; 40(1): 105-111.
Vanscheeuwijck PM, Teredesai A, Terpstra PM, Verbeeck J, Kuhl P, Gerstenberg B, Gebel S, Carmines EL. Evaluation of the potential effects of ingredients added to cigarettes. Part 4: subchronic inhalation toxicity. Food Chem Toxicol. 2002; 40(1): 113-131.

Nonanal

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.

Nonanal

Toxicological Data on the Unburnt Ingredient

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

In vitro

Test system	Test conditions	Endpoint	Activation status	Results	Reference
Mouse L5178Y (TK+/TK-) cells	Cells treated with 0.013-0.031 ul/ml without activation, and 0.10-0.14 ul/ml with activation. Incubation time not specified in the expert reference source that cites the study.	Mutation	With and without S9	-ve [probably a good quality study]	NCI
Chinese hamster lung (V79) cells	Cells treated with 0.1-0.3 mM. No further details given in the expert reference source that cites the study.	Mutation	Without	+ve	Brambilla et al. 1989
Human and rat hepatocytes	Cells treated for 20 hours with up to 30 mmol/l and examined for unscheduled DNA synthesis.	DNA damage	Not applicable	-ve	Martelli et al. 1994
Rat (female, Fischer 344) hepatocytes	Cells treated for 3 hr with 0.1-100 uM and examined for micronuclei or	Chromosome damage	Without	-ve	Eckl et al. 1993

	chromosomal aberrations.				
Rat (female, Fischer 344) hepatocytes	Cells treated for 3 hr with 0.1-100 uM and examined for micronuclei or chromosomal aberrations.	Chromosome damage	Without	-ve	Esterbauer et al. 1990
Rat (female, Fischer 344) hepatocytes	Cells treated for 3 hr with 0.1-100 uM and examined for sister chromatid exchanges.	Chromosome effects	Without	+ve [although apparently no dose-response was observed]	Eckl et al. 1993
<i>Salmonella typhimurium</i> , strains TA98, TA100, TA1535, TA1537, TA1538	Ames assay using standard plate method. Tested up to 300 ug/plate with activation or 200 ug/plate without activation.	Mutation	With and without S9 (S9 derived from rat and hamster liver)	-ve [probably a good quality study]	NCI
<i>Salmonella typhimurium</i> , strains TA98, TA100, UTH8414, UTH8413	Ames assay using standard plate method. Tested up to 2 mg/plate.	Mutation	With and without S9	-ve	Connor et al. 1985
<i>Salmonella typhimurium</i> , strains TA98, TA100, TA1535, TA1537	Ames (spot) test with 3 umol/plate [about 420 ug/plate].	Mutation	With and without	-ve [a spot test is only a limited assay]	Florin et al. 1980

<i>Salmonella typhimurium</i> , strains TA98, TA100, TA1535	Ames preincubation assay. Tested up to 670 ug/plate.	Mutation	With S9	-ve	Mortelmans et al. 1986
<i>Salmonella typhimurium</i> , strains TA102, TA104	Ames preincubation assay. Tested at 1 mg/plate	Mutation	Without	-ve [limited assay, only 2 strains used]	Marnett et al. 1985

References

Brambilla G et al. (1989). Mutagenicity in V79 Chinese hamster cells of N-alkanals produced by lipid peroxidation. *Mutagenesis* 4, 277-279 (cited in CCRIS, 2003).

Conor T H et al. (1985). Genotoxicity of organic chemicals frequently found in the air of mobile homes. *Toxicology Letters* 25, 33-40 (cited in CCRIS, 2003).

Eckl P M et al. (1993). Genotoxic properties of 4-hydroxyalkenals and analogous aldehydes. *Mutation Research* 290, 183-192.

Esterbauer H et al. (1990). Possible mutagens derived from lipids and lipid precursors. *Mutation Research* 238, 223-233.

Florin I et al. (1980). Screening of tobacco smoke constituents for mutagenicity using the Ames' test. *Toxicology* 15, 219-232.

Marnett L J et al. (1985). Naturally occurring carbonyl compounds are mutagens in *Salmonella* tester strain TA104. *Mutation Research* 148, 25-34.

Martelli A et al. (1994). Cytotoxic and genotoxic effects of five N-alkanals in primary cultures of rat and human hepatocytes. *Mutation Research* 323, 121-126.

Mortelmans K et al. (1986). *Salmonella* mutagenicity tests. 2. Results from the testing of 270 chemicals. *Environmental Mutagenesis* 8 (suppl. 7), 1-119.

NCI (undated). Short-term test program sponsored by the division of cancer etiology, National Cancer Institute, Dr David Longfellow, Project Officer, pY85 (cited in CCRIS, 2003).