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IARC MONOGRAPHS



## ASPARTAME, METHYLEUGENOL, AND ISOEUGENOL

VOLUME 134

IARC MONOGRAPHS  
ON THE IDENTIFICATION  
OF CARCINOGENIC HAZARDS  
TO HUMANS

International Agency for Research on Cancer



World Health  
Organization

# ASPARTAME, METHYLEUGENOL, AND ISOEUGENOL

VOLUME 134

This publication represents the views and expert opinions of an IARC Working Group on the Identification of Carcinogenic Hazards to Humans, which met in Lyon, France, 6–13 June 2023

LYON, FRANCE - 2024

IARC MONOGRAPHS  
ON THE IDENTIFICATION  
OF CARCINOGENIC HAZARDS  
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## IARC MONOGRAPHS

In 1969, the International Agency for Research on Cancer (IARC) initiated a programme on the evaluation of the carcinogenic hazard of chemicals to humans, involving the production of critically evaluated monographs on individual chemicals. The programme was subsequently expanded to include evaluations of carcinogenic hazards associated with exposures to complex mixtures, lifestyle factors and biological and physical agents, as well as those in specific occupations. The objective of the programme is to elaborate and publish in the form of monographs critical reviews of data on carcinogenicity for agents to which humans are known to be exposed and on specific exposure situations; to evaluate these data in terms of cancer hazard to humans with the help of international working groups of experts in carcinogenesis and related fields; and to identify gaps in evidence. The lists of IARC evaluations are regularly updated and are available on the internet at <https://monographs.iarc.who.int/>.

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The *IARC Monographs* Working Group alone is responsible for the views expressed in this publication.



About the cover: A wide range of beverages and food products sweetened with aspartame is available to the consumer.  
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The IARC *Monographs* Working Group and Secretariat for Volume 134, Aspartame, methyleugenol, and isoeugenol, which met in Lyon, France, on 6–13 June 2023.



This volume of the *IARC Monographs* provides evaluations of the carcinogenicity of three agents: aspartame, methyleugenol, and isoeugenol.

Aspartame is a low-calorie artificial sweetener that has been widely used in foods and beverages since the 1980s. Historically, artificially sweetened beverages have been the major source of exposure to aspartame, but to a lesser extent at present since aspartame is typically used in mixtures with other sweeteners. The highest concentrations of aspartame are found in tabletop sweeteners, chewing gums, and food supplements. Other sources include cosmetics and medicines.

Methyleugenol is a flavour and fragrance compound that occurs naturally in essential oils of various plants. It is used in cosmetics and personal care products and as an insect attractant. Although its use as a flavouring agent is prohibited in the European Union and the USA, it is still present in various foods and consumer products due to its natural occurrence in herbs and spices. The general population is ubiquitously exposed through the ingestion of food or use of personal care products.

Isoeugenol is a fragrance and flavour compound that occurs in many plant species and in wood smoke. It is used in food, cosmetics, household products, animal feed, and veterinary medicines. Firefighters and workers involved in isoeugenol synthesis or handling isoeugenol-containing products may be exposed.

An *IARC Monographs Working Group* reviewed evidence from epidemiological studies, cancer bioassays in experimental animals, and mechanistic studies to assess the carcinogenic hazard to humans of exposure to these agents and concluded that:

- Aspartame and isoeugenol are *possibly carcinogenic to humans (Group 2B)*;
- Methyleugenol is *probably carcinogenic to humans (Group 2A)*.

