

Evaluation of

***beta*-Pinene**

**For Use as an Ingredient in
Tobacco Products**

February 2009

INTRODUCTION

beta-Pinene (CAS # 127-91-3) is currently used worldwide at levels below **5 ppm** in selected brands of tobacco products manufactured and/or distributed by Philip Morris International, including cigarettes and fine-cut tobacco. This document is a review of the published toxicology information on *beta*-pinene abstracted from online toxicity databases.

Overview^a

The following information was generated from the MICROMEDEX database system <http://csi.micromedex.com> on February 9^h 2009, unless otherwise indicated.

beta-Pinene is isolated from american turpentine; also by conversion from *alpha*-pinene and has a characteristic turpentine odour; dry, woody or resinous aroma. *beta*-Pinene is commonly used as flavouring agent for baked goods and is common cosmetic ingredient.

As a food flavouring additive, the material has been assessed under the provisions of the *Federal Food, Drug and Cosmetic Act, section 201 (s)*, by the Expert Committee of the USA Flavour and Extract Manufacturers Association (FEMA), to be generally recognised as safe (GRAS) under current conditions of use.

The Joint FAO/WHO Expert Committee on Food Additives has assessed *beta*-pinene as presenting no safety concerns at current levels of intake when used as a flavouring agent^[1]. It has also been defined as a flavouring substance which may be used as foodstuffs by the *Council of Europe* Committee of Experts on Flavouring Substances at an upper level of 600 mg/kg in foods.

The use of *beta*-pinene on tobacco products is regulated in several countries worldwide. It is approved for use in tobacco products as an additive or flavouring in several countries with Tobacco Product Regulations, including e.g., Belgium, Croatia, Czech Republic, Egypt, Finland, France, Germany, Hungary, Lithuania, Macedonia, Romania, Slovak Republic, Spain and Switzerland. Apart from countries that approve its use, there is no country, regardless of the extent to which tobacco products are regulated therein, that affirmatively prohibits the use of this ingredient on tobacco products.

^a **Note:** Philip Morris International shares the concerns of regulators and the public health community about the proliferation of certain cigarette brands that have a predominantly candy-like or fruity flavour and are particularly appealing to minors, and we support legislation that would ban such cigarettes. However, there is currently no consistent terminology used by regulators and the public health community to describe such cigarettes. This can lead to confusion and potential for misinterpretation. In this document, any references to flavours or "smoke aroma" or flavour perceptions such as "sweet", "fruity", etc. are not meant to describe a flavour, taste or aroma that would dominate the taste of the final product, let alone dominate it in a way that is appealing to minors. Rather, such references are only used to explain the differences and nuances between the various flavours described in this and related documents.

TOXICITY DATA ON UNBURNT MATERIAL

The following information was generated from the HSDB – Hazardous Substances Data Bank (last revision November 2002), a database of MICROMEDEX Systems (<http://csi.micromedex.com>) on February 9th 2009.

Non-Human Toxicity Excerpts

1. Pinene has been found lethal toward conifer needle-chewing insects, causing leukemic changes in fowl plasma & deviations in avian plasma proteins accompanying erythroblastosis. /pinene/ [peer reviewed] [clayton, g. d. and f. e. clayton (eds.). patty's industrial hygiene and toxicology: volume 2a, 2b, 2c: toxicology. 3rd ed. new york: john wiley sons, 1981-1982., p. 3244]

Human Toxicity Excerpts

1. ...Irritant to skin & mucous membranes & and may cause dermal eruption & occasional benign tumors. absorption of large doses may result in delirium, ataxia, & kidney damage. inhalation may cause palpitation, dizziness, nervous disturbances, chest pain, bronchitis, & nephritis. /pinene/ [peer reviewed] [clayton, g. d. and f. e. clayton (eds.). patty's industrial hygiene and toxicology: volume 2a, 2b, 2c: toxicology. 3rd ed. new york: john wiley sons, 1981-1982., p. 3243]
2. About 150 ml may constitute a human oral fatal dose. /pinene/ [peer reviewed] [clayton, g. d. and f. e. clayton (eds.). patty's industrial hygiene and toxicology: volume 2a, 2b, 2c: toxicology. 3rd ed. new york: john wiley sons, 1981-1982., p. 3242]

Health Hazard Data

The following information was generated from the RTECS – Registry of Toxic Effects of Chemical Substances (last revision May 2008), a database of MICROMEDEX Systems (<http://csi.micromedex.com>) on February 9th 2009.

Acute toxicity

LD50/LC50 - LETHAL DOSE/CONC 50% KILL

Rat

LD50 - ROUTE: Oral; DOSE: 4700 mg/kg [Food and Cosmetics Toxicology. (London, UK) V.1-19, 1963-81. For publisher information, see FCTOD7. (16,859,1978)]

TOXIC EFFECTS:

Brain and Coverings - Recordings from specific arc-as of CNS

Behavioral - Somnolence (general depressed activity)

Lung, Thorax, or Respiration - Other changes

LD50 - ROUTE: Unreported; DOSE: 4700 mg/kg [Handbook of pesticide toxicology. Robert Krieger ed, Academic press, 2001 (1,826,2001)]

Mouse

LC50 - ROUTE: Inhalation; DOSE: 20000 mg/m³ ['Vrednie chemicheskcie veshestva. Prirodnie organicheskie soedinenia' (Hazardous substances. Nature products.) Volkova N.V. et al., Sankt-Peterburg, 1998. (-,285,1998)]

Irritation

SKIN - STANDARD DRAIZE TEST

Rabbit

ROUTE: Skin; DOSE: 500 mg/24H; REACTION: Moderate [Food and Cosmetics Toxicology. (London, UK) V.1-19, 1963-81. For publisher information, see FCTOD7. (16,859,1978)]

TOXICITY DATA ON BURNT MATERIAL

Data on the toxicity of *beta*-pinene as a cigarette ingredient has been evaluated in a series of studies. The results of these studies may be found in the following references:

Baker R.R. *et al.* 2004, "An overview of the effects of tobacco ingredients on smoke chemistry and toxicity", Food and Chemical Toxicology, 42S:53-83. **PEER REVIEWED**

Carmines E.L., 2002, "Evaluation of the Potential Effects of Ingredients Added to Cigarettes. Part I: Cigarette Design, Testing Approach and Review of Results," Food and Chemical Toxicology, 40:77-91. **PEER REVIEWED**

Rustemeier K. *et al.* 2002, "Evaluation of the Potential Effects of Ingredients Added to Cigarettes Part II. Chemical Smoke Composition," Food and Chemical Toxicology, 40:93-104. **PEER REVIEWED**

Roemer E. *et al.* 2002, "Evaluation of the Potential Effects of Flavor Ingredients Added to Cigarettes. Part 3. In Vitro Genotoxicity and Cytotoxicity," Food and Chemical Toxicology, 40:105-111. **PEER REVIEWED**

Vanscheeuwijck P.M. *et al.* 2002, "Toxicological Evaluation of Cigarettes without and with the Addition of Flavor Ingredients to the Tobacco. Part 4. Subchronic Inhalation Toxicity," Food and Chemical Toxicology, 40:113-131. **PEER REVIEWED**

CONCLUSION

Smoking causes lung cancer, heart disease, emphysema and other serious diseases in smokers. Smokers are far more likely to develop serious diseases, like lung cancer, than non-smokers. There is no "safe" cigarette. Government health warnings about smoking apply to all cigarettes, regardless of the ingredients added, including those containing only tobacco and paper.

While Philip Morris International has not conducted human studies on the health effects of ingredients used in cigarette manufacture, studies have been conducted by Philip Morris International and/or others using scientifically accepted *in vitro* and *in vivo* toxicity assays with various ingredient mixtures. These studies show there is no meaningful difference in the composition or toxicity of smoke when the smoke from cigarettes with the added ingredient is compared to the smoke from cigarettes without this added ingredient. Based on a review of current published toxicological information, it is our scientific judgement that the addition of *beta*-pinene as an ingredient, at the levels used in our brands, does not increase the overall toxicity of tobacco smoke.

References

1. JECFA. *WHO Food Additives Series:52. The Safety Evaluation of Natural Flavouring Complexes*. **2004**.