Benzo[g,h,i]perylene; CASRN 191-24-2

Human health assessment information on a chemical substance is included in the IRIS database only after a comprehensive review of toxicity data, as outlined in the IRIS assessment development process. Sections I (Health Hazard Assessments for Noncarcinogenic Effects) and II (Carcinogenicity Assessment for Lifetime Exposure) present the conclusions that were reached during the assessment development process. Supporting information and explanations of the methods used to derive the values given in IRIS are provided in the guidance documents located on the IRIS website.

STATUS OF DATA FOR Benzo[g,h,i]perylene

File First On-Line 12/01/1990

Category (section)	Assessment Available?	Last Revised
Oral RfD (I.A.)	not evaluated	
Inhalation RfC (I.B.)	not evaluated	
Carcinogenicity Assessment (II.)	yes	12/01/1990

I. Chronic Health Hazard Assessments for Noncarcinogenic Effects

I.A. Reference Dose for Chronic Oral Exposure (RfD)

Substance Name — Benzo[g,h,i]perylene
CASRN — 191-24-2

Not available at this time.

I.B. Reference Concentration for Chronic Inhalation Exposure (RfC)

Substance Name — Benzo[g,h,i]perylene
CASRN — 191-24-2

Not available at this time.

II. Carcinogenicity Assessment for Lifetime Exposure

Substance Name — Benzo[g,h,i]perylene
CASRN — 191-24-2
Last Revised — 12/01/1990

Section II provides information on three aspects of the carcinogenic assessment for the substance in question; the weight-of-evidence judgment of the likelihood that the substance is a human carcinogen, and quantitative estimates of risk from oral exposure and from inhalation exposure. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. The rationale and methods used to develop the carcinogenicity information in IRIS are described in The Risk Assessment Guidelines of 1986 (EPA/600/8-87/045) and in the IRIS Background Document. IRIS summaries developed since the publication of EPA's more recent Proposed Guidelines for Carcinogen Risk Assessment also utilize those Guidelines where indicated (Federal Register 61(79):17960-18011, April 23, 1996). Users are referred to Section I of this IRIS file for information on long-term toxic effects other than carcinogenicity.

II.A. Evidence for Human Carcinogenicity

II.A.1. Weight-of-Evidence Characterization

Classification — D; not classifiable as to human carcinogenicity

Basis — Based on no human data and inadequate animal data from lung implant, skin-painting and subcutaneous injection bioassays.

II.A.2. Human Carcinogenicity Data

None.

II.A.3. Animal Carcinogenicity Data

Inadequate. Benzo[g,h,i]perylene appeared to increase lung epidermoid tumors when administered with trioctanonin in a lung implant study (Deutsch- Wenzel et al., 1983). Benzo[g,h,i]perylene was tested for complete carcinogenic activity and initiating activity in mouse skin painting assays and did not produce positive results in either type of assay (Wynder and Hoffmann, 1959; Hoffmann and Wynder, 1966; Muller, 1968; Van Duuren et al., 1973). Benzo[g,h,i]perylene did not induce tumor formation when injected subcutaneously (Muller, 1968) and was tested as a cocarcinogen with benzo(a)pyrene (Van Duuren et al., 1973; Van Duuren and Goldschmidt, 1976).

In a lifetime implant study, 3-month-old female Osborne-Mendel rats (34 to 35/group) received a lung implant of benzo[g,h,i]perylene in 0.05 mL of a 1:1 (v:v) mixture of beeswax and trioctanonin (Deutsch-Wenzel et al., 1983). Rats received either 0.16 mg (0.65 mg/kg), 0.83 mg (3.4 mg/kg) or 4.15 mg (17 mg/kg). Controls consisted of an untreated group and a group receiving an implant of the vehicle. Median survival times (weeks) were: untreated controls, 118; vehicle implant controls, 104; 0.16 mg dose, 109; 0.83 mg dose, 114; and 4.15 mg dose, 106. Epidermoid carcinomas in the lung and thorax were observed at the following incidences: 0/35, 0/35, 0/35, 1/35 (3%), and 4/34 (12%) for the untreated controls, vehicle controls, low-, mid-, and high-dose groups, respectively. The apparent increased incidence of tumors was not statistically significant and no distant tumors were seen.

Benzo[g,h,i]perylene was tested as both a complete carcinogen and as a tumor initiator in female Ha/ICR/mil Swiss albino mice (Hoffmann and Wynder, 1966; Wynder and Hoffman, 1959). Two groups of 20 mice received dermal applications of 0.1 or 0.05% benzo[g,h,i]perylene 3 times/week for 1 year. The mice were observed for 3 additional months and then sacrificed. No tumorswere observed in the low-dose group and a papilloma was observed in the high-dose group in the tenth month. In a second part of the study, benzo[g,h,i]perylene was applied as an initiator to 30 mice. Ten separate applications of 0.1% each were given over a 2-day period; beginning 28 days later 2.5% croton oil was applied 3 times/week for the remainder of the year. These mice were observed for 3 additional months; 2/27 surviving mice had developed papillomas in this group. A control group of 30 mice received applications of 2.5% croton oil (3 times/week) without an initiator; no tumor or survival data were reported.

The ability of benzo[g,h,i]perylene to act as a cocarcinogen in female ICR/HA mice when combined with benzo[a]pyrene was examined in a series of experiments (Van Duuren et al., 1973; Van Duuren and Goldschmidt, 1976). The mice (50/group) were treated by dermal application with 21 ug benzo[g,h,i]perylene and 5 ug benzo[a]pyrene (in combination) 3 times/week for 1 year. At the end of the experiment, 20/37 mice had developed papillomas and 17/37 had developed squamous cell carcinomas. In the control group, which consisted of three

benzo[a]pyrene treatments (5 ug/week), 13/42 mice developed papillomas and 10/42 developed carcinomas (Van Duuren et al., 1973). In the second experiment two doses of benzo[g,h,i]perylene (7 and 21 ug) were applied along with 5 ug benzo[a]pyrene to groups of 50 mice 3 times/week for 368 days. In the low-dose group 19 mice developed papillomas and 10 carcinomas; in the high-dose group, 20 mice developed papillomas and 18 carcinomas. No papillomas or carcinomas developed when 21 ug benzo[g,h,i]perylene was applied alone. The individual animal data were not given for this experiment.

In a series of experiments, Muller (1968) investigated the carcinogenicity of benzo[g,h,i]perylene. In the first experiment groups of 50 NMRI mice (sex unspecified) received dermal applications (2 or 3 times/week) of one of a variety of concentrations of benzo[g,h,i]perylene in dichloromethane. A control group receving only 0.2 mL dichloromethane was also utilized. The study was terminated 675 days after the first application. Survival was approximately the same in all four groups (33%). No skin papillomas or carcinomas developed; however, both benign (0/18 low-, 2/14 mid- and 3/17 high-dose groups) and malignant (3/18 low-, 4/14 mid- and 1/17 high-dose groups) tumors in survivors did occur at other sites (types and sites not specified). In the control group, 3/17 mice developed benign tumors and 4/17 developed malignant tumors at other sites. Dichloromethane is classified B2, a probable human carcinogen.

In a second dermal application study, groups of 50 mice initially were untreated or treated with a single application of either 1 or 2 mg benzo[g,h,i]perylene. In each group repeated dermal applications of 0.2 mL of 0.5% croton oil (2 times/week) followed for 25 weeks. One mouse in the promoter control group and another in the high-dose group developed skin papillomas; 2/28 (0/28), 4/12 (1/12), and 2/21 (1/21) mice developed benign (malignant) tumors at other sites (unspecified) in the control, low- and high- dose groups, respectively. In the third part of the experiment three groups of 50 female NMRI mice received subcutaneous injections of 0 (control), 0.83 or 16.7 mg benzo[g,h,i]perylene suspended in 0.15 mL 10% aqueous gelatin once every 2 weeks for 6 months [total doses, 0, 10 and 200 mg/animal] and observed to sacrifice on day 675 after the first injection. At that time the survival rate was 36% in each group. No tumor was found at the site of injection in any of the animals. For the control, low- and high-dose groups, respectively, 4/50, 5/50, and 4/50 mice had tumors at other sites. In the final part of the experiment four groups of 20 NMRI mice (sex unspecified) were given subcutaneous injections of 0.15 mL 10% aqueous gelatin containing 0 (control), 0.1, 1, or 10 mg suspended benzo[g,h,i]perylene (total doses, 0, 10, or 100 mg/animal) once every 2 weeks for 20 weeks. The animals were observed until spontaneous death. Survival was not adversely affected by treatment with benzo[g,h,i]perylene (the last animal died 22 months after the start of the study). There is no information to indicate if enough animals survived long enough for tumors to be seen. No skin or subcutaneous tumors were found in mice treated with benzo[g,h,i]perylene or gelatin. Few tumors were found in other organs and the incidences in the benzo[g,h,i]perylene-

treated groups were not different from those in the gelatin controls. Earlier skin-painting studies are summarized in IARC (1983).

II.A.4. Supporting Data for Carcinogenicity

Benzo[g,h,i]perylene produced positive results in tests for reverse mutation in three strains of Salmonella typhimurium and for forward mutation in one strain (Andrews et al., 1978; Mossanda et al., 1979; Salamone et al., 1979; Sakai et al., 1985; Kaden et al., 1979). A test for DNA damage in Chinese hamster ovary cells also yielded positive results (Garrett and Lewtas, 1983).

II.B. Quantitative Estimate of Carcinogenic Risk from Oral Exposure

None.

II.C. Quantitative Estimate of Carcinogenic Risk from Inhalation Exposure

None.

II.D. EPA Documentation, Review, and Contacts (Carcinogenicity Assessment)

II.D.1. EPA Documentation

Source Document — U.S. EPA, 1990

The 1990 Drinking Water Criteria Document for Polycyclic Aromatic Hydrocarbons has received Agency and external review.

II.D.2. EPA Review (Carcinogenicity Assessment)

Agency Work Group Review — 02/07/1990

Verification Date — 02/07/1990

II.D.3. EPA Contacts (Carcinogenicity Assessment)

Please contact the IRIS Hotline for all questions concerning this assessment or IRIS, in general, at (202)566-1676 (phone), (202)566-1749 (FAX) or hotline.iris@epa.gov (internet address).

III. [reserved]
IV. [reserved]
V. [reserved]

VI. Bibliography

Substance Name — Benzo[g,h,i]perylene
CASRN — 191-24-2

VI.A. Oral RfD References

None

VI.B. Inhalation RfC References

None

VI.C. Carcinogenicity Assessment References

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Wynder, E.L. and D. Hoffmann. 1959. A study of tobacco carcinogenesis. VII. The role of higher polycyclic hydrocarbons. Cancer. 12: 1079-1086.

VII. Revision History

Substance Name — Benzo[g,h,i]perylene
CASRN — 191-24-2

Date	Section	Description
12/01/1990	II.	Carcinogen assessment on-line

VIII. Synonyms

Substance Name — Benzo[g,h,i]perylene
CASRN — 191-24-2
Last Revised — 12/01/1990

- 191-24-2
- Benzo(ghi)perylene
- benzo(ghi)perylene
- HSDB 6177
- NSC 89275
- 1,12-Benzoperylene
- 1,12-benzperylene