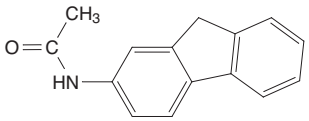
2-Acetylaminofluorene

CAS No. 53-96-3

Reasonably anticipated to be a human carcinogen

First listed in the *Second Annual Report on Carcinogens* (1981)

Also known as 2-acetamidofluorene, *N*-2-fluorenylacetamide, or *N*-fluoren-2-yl-acetamide



Carcinogenicity

2-Acetylaminofluorene is *reasonably anticipated to be a human carcinogen* based on sufficient evidence of carcinogenicity from studies in experimental animals.

Cancer Studies in Experimental Animals

Oral exposure to 2-acetylaminofluorene caused tumors at several different tissue sites in mice and rats. Dietary administration of 2-acetylaminofluorene caused cancer of the liver (hepatocellular carcinoma) and urinary bladder (transitional-cell carcinoma) in female mice (Staffa and Mehlman 1980) and in rats of both sexes (Wilson *et al.* 1941). In rats, it also caused skin cancer (carcinoma, possibly arising from the auditory canal).

Since 2-acetylaminofluorene was listed in the *Second Annual Report on Carcinogens,* additional studies in experimental animals have been identified. In female mice, dietary administration of 2-acetylaminofluorene caused mammary-gland cancer (adenocarcinoma), as well as urinary-bladder cancer (transitional-cell carcinoma) (Greenman *et al.* 1987). In rats, dietary administration of 2-acetylaminofluorene caused liver cancer (hepatocellular carcinoma or cholangiocarcinoma) in both sexes, mammary-gland cancer (adenocarcinoma) in females, and tumors of the testes (mesothelioma of the tunica vaginalis) and Zymbal gland in males (Weisburger *et al.* 1981, Cabral and Neal 1983). A single subcutaneous injection of 2-acetylaminofluorene caused liver tumors (hepatocellular tumors) in newborn male mice (Fujii 1991). Liver tumors were also observed following dietary administration of 2-acetylaminofluorene to male dogs (Allison *et al.* 1950) and to fish of both sexes (hepatocellular tumors or cholangiocarcinoma) (Pliss and Khudoley 1975) and following addition of 2-acetylaminofluorene to the tank water of fish of unspecified sex (hepatocellular adenoma or carcinoma) (James *et al.* 1994). In hamsters of both sexes, intratracheal instillation of 2-acetylaminofluorene caused urinary-bladder cancer (transitional-cell carcinoma) (Oyasu *et al.* 1973). Intraperitoneal injection of 2-acetylaminofluorene in newborn hamsters until weaning, followed by dietary administration, caused cancer of the urinary bladder (carcinoma) and liver (cholangiocarcinoma) and benign stomach tumors (squamous-cell papilloma) (Oyasu *et al.* 1972, Matsumoto *et al.* 1976).

Cancer Studies in Humans

No epidemiological studies were identified that evaluated the relationship between human cancer and exposure specifically to 2-acetylaminofluorene.

Properties

2-Acetylaminofluorene is an aromatic amine that occurs as a tan crystalline powder at room temperature (Akron 2009). It is practically insoluble in water, but is soluble in glycols, alcohols, ether, acetic acid, and fat solvents (HSDB 2009). 2-Acetylaminofluorene is stable at normal temperatures and pressures, but when heated to decomposition, it produces irritating or toxic gases (e.g., nitrogen oxides, carbon monoxide, carbon dioxide, hydrogen fluoride) (Akron 2009). Physical and chemical properties of 2-acetylaminofluorene are listed in the following table.

Property	Information
Molecular weight	223.3[a]
Density	1.27 g/cm^3[b]
Melting point	194°C[a]
Boiling point	303°C[c]
Log K_{ow}	3.22[a]
Water solubility	144 mg/L at 25°C[a]
Vapor pressure	9.44×10^{-8} mm Hg at 25°C[c]

Sources: [a]HSDB 2009, [b]Akron 2009, [c]ChemIDplus 2009.

Use

2-Acetylaminofluorene is used as a research tool, primarily as a positive control in studies of the carcinogenicity and mutagenicity of other chemicals (HSDB 2009). 2-Acetylaminofluorene was intended for use as a pesticide, but it was never marketed, because of its carcinogenicity in experimental animals.

Production

2-Acetylaminofluorene is not currently produced in commercial quantities in the United States or anywhere else in the world (SRI 2009). One U.S. producer of 2-acetylaminofluorene was reported in 1977, but production volume was not reported (TSCA 1979). In 2009, 2-acetylaminofluorene was distributed by 17 specialty chemical companies, including 11 in the United States (ChemSources 2009). These distributors typically sell 2-acetylaminofluorene in small quantities, and total estimated U.S. usage is low.

Exposure

The routes of potential human exposure to 2-acetylaminofluorene are inhalation, ingestion, and dermal contact (HSDB 2009). According to the U.S. Environmental Protection Agency's Toxics Release Inventory, environmental releases of 2-acetylaminofluorene increased from 9,800 lb in 1998 to 81,000 lb in 2001, declined to a low of 255 lb in 2003, and have remained below 1,000 lb since 2003. Most of the releases were to hazardous-waste landfills. In 2007, one facility released about 500 lb of 2-acetylaminofluorene to a hazardous-waste landfill and about 250 lb to air (TRI 2009). The risk of occupational exposure to 2-acetylaminofluorene is greatest for chemists, chemical stockroom workers, and biomedical researchers. The National Occupational Exposure Survey (conducted from 1981 to 1983) estimated that 373 workers potentially were exposed to 2-acetylaminofluorene (NIOSH 1990).

Regulations

Environmental Protection Agency (EPA)

Clean Air Act

National Emission Standards for Hazardous Air Pollutants: Listed as a hazardous air pollutant.

Comprehensive Environmental Response, Compensation, and Liability Act

Reportable quantity (RQ) = 1 lb.

Emergency Planning and Community Right-To-Know Act

Toxics Release Inventory: Listed substance subject to reporting requirements.

Resource Conservation and Recovery Act

Listed Hazardous Waste: Waste code for which the listing is based wholly or partly on the presence of 2-acetylaminofluorene = U005.

Listed as a hazardous constituent of waste.

Mine Safety and Health Administration (MSHA, Dept. of Labor)

To control airborne exposure, 2-acetylaminofluorene shall not be used or stored except by competent persons under laboratory conditions approved by a nationally recognized agency acceptable to the Secretary.

Occupational Safety and Health Administration (OSHA, Dept. of Labor)

Potential occupational carcinogen: Engineering controls, work practices, and personal protective equipment are required.

Guidelines

National Institute for Occupational Safety and Health (NIOSH, CDC, HHS)

Listed as a potential occupational carcinogen.

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