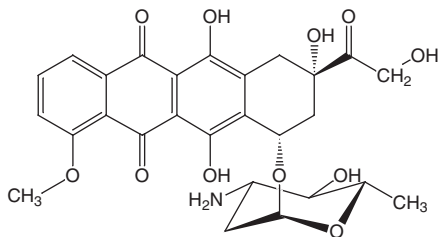


Adriamycin® (Doxorubicin Hydrochloride)

CAS No. 23214-92-8

Reasonably anticipated to be a human carcinogen
First Listed in the *Fourth Annual Report on Carcinogens* (1985)



Carcinogenicity

Adriamycin® is *reasonably anticipated to be a human carcinogen* based on sufficient evidence of carcinogenicity in experimental animals (IARC 1976, 1982). A single intravenous injection of Adriamycin® induced mammary tumors in female rats. Intravesicular instillation of Adriamycin® in rats resulted in a low incidence of bladder papillomas and enhanced the incidence of urinary bladder tumors induced by *N*-nitroso-*N*-(4-hydroxybutyl)-*N*-butylamine. Single or repeated subcutaneous injections induced local sarcomas in rats.

There is inadequate evidence for the carcinogenicity of Adriamycin® in humans (IARC 1976, 1982, 1987). No epidemiological study of Adriamycin® alone was available for review. However, in one study of cancer patients receiving Adriamycin® in combination with alkylating agents and radiotherapy, the patients developed leukemia and bone cancer (IARC 1982).

Properties

Adriamycin® is the hydrochloride of doxorubicin (14-hydroxydaunomycin). It is a red, crystalline solid with a melting point of 204°C. It is soluble in water and aqueous alcohols, moderately soluble in anhydrous methanol, and insoluble in nonpolar organic solvents. Neutral aqueous solutions of Adriamycin® are stable when stored at 5°C (IARC 1976). When heated to decomposition, Adriamycin® emits toxic fumes of nitrogen oxides and hydrogen chloride.

Use

Adriamycin® is a cytotoxic, anthracycline antibiotic used in antimitotic chemotherapy. It is infused intravenously to treat neoplastic diseases such as acute lymphoblastic leukemia, Wilm's tumor, soft tissue and osteogenic sarcomas, Hodgkin's disease, non-Hodgkin's lymphomas, Ewing's sarcoma, and bronchogenic, genitourinary, breast, and thyroid carcinoma (IARC 1976).

Production

Adriamycin® is produced domestically by one U.S. manufacturer (PDR 2001). It is also imported from Italy, however, no import volumes were available. Chem Sources (2001) listed three U.S. suppliers of the compound.

Exposure

The primary routes of potential human exposure to Adriamycin® are injection, dermal contact, and inhalation. The recommended dosage schedule for adult patients is 60 to 75 mg/m² body surface as a single intravenous infusion at 21-day intervals until a total of 550 mg/m² is given (IARC 1976). Health professionals such as pharmacists, nurses, and physicians may be exposed during drug preparation,

administration, or cleanup. Potential occupational exposure may also occur through inhalation and dermal contact for workers involved in manufacturing Adriamycin®. The National Occupational Exposure Survey (1981-1983) estimated that a total of 17,133 workers, including 11,918 women, potentially were exposed to Adriamycin® (NIOSH 1984). Although Adriamycin® is used in relatively small quantities, there is a small pollution problem relative to hospital wastes. However, the risks can be avoided through use of appropriate containment equipment and work practices (Zimmerman *et al.* 1981).

Regulations

FDA

Adriamycin® is a prescription drug subject to labeling and other requirements.

REFERENCES

- ChemSources. 2001. Chemical Sources International, Inc. <http://www.chemsources.com>.
- IARC. 1976. Some Naturally Occurring Substances. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Humans, vol. 10. Lyon, France: International Agency for Research on Cancer. 353 pp.
- IARC. 1982. Chemicals, Industrial Processes and Industries Associated with Cancer in Humans. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Humans, Supplement 4. Lyon, France: International Agency for Research on Cancer. 292 pp.
- IARC. 1987. Overall Evaluations of Carcinogenicity. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Humans, Supplement 7. Lyon, France: International Agency for Research on Cancer. 440 pp.
- NIOSH. 1984. National Occupational Exposure Survey (1981-83). Cincinnati, OH: U. S. Department of Health and Human Services. <http://www.cdc.gov/noes/noes3/empl0003.html>.
- PDR. 2001. Adriamycin. In Physicians' Desk Reference, 55th ed. Montvale, NJ: Medical Economics Co. p. 2565-2567.
- Zimmerman, P. F., R. K. Larsen, E. W. Barkley and J. F. Gallelli. 1981. Recommendations for the safe handling of injectable antineoplastic drug products. *Am J Hosp Pharm* 38(11): 1693-5.