

Chemical Safety Practices Recommendations

Doxorubicin (Adriamycin)

Exposure Hazards (1, 2)			
<p>Category 1B Danger</p>  <p>Carcinogenicity May Cause Cancer</p>	<p>Category 1B Danger</p>  <p>Germ Cell Mutagenicity May Cause Genetic Defects</p>	<p>Category 1B Danger</p>  <p>Toxic to Reproduction May Damage Fertility or the Unborn Child</p>	
<p>Category 4 Warning Toxic</p>  <p>Harmful If Swallowed</p>	<p>Category 2 Warning Toxic</p>  <p>May Cause Damage to Heart Through Prolonged or Repeated Exposure</p>	<p>Category 2 Warning Irritant</p>  <p>Causes Serious Eye Irritation. Causes Skin Irritation.</p>	
Response to Exposure			
Oral	Dermal	Inhalation	Injection
Rinse mouth; do not induce vomiting. Report to OHS.	Wash skin with soap and water for 15 minutes. Rinse eyes for 15 minutes. Report to OHS.	Leave area; go to clean air. Report to OHS.	Report to OHS.
Special Precautions	Pregnant women should be cautious when working with or around Doxorubicin.(3) Discard garments as hazardous if contaminated with Doxorubicin.		
Personal Protective Equipment	Gloves (Double glove) (Latex or Nitrile) Skin Protection (Suit or Scrubs or Lab Coat) Eye Protection (Safety-glasses or Goggles) Closed-toe shoes Use N100 respirator if engineering controls are not available.		
Engineering Controls	Doxorubicin powder- Chemical Fume Hood (CFH) (4) Doxorubicin solution- CFH or Biosafety Cabinet (Class II, B2 BSC if aerosolized) Animal waste and bedding until 7 day after last treatment- CFH or Class II, B2 BSC (5)		
Animal Handling	Avoid exposure to animal urine until 7 day after last treatment.		
Bedding Disposal	Dispose of bedding as hazardous material until 7 day after last treatment.		
Work Practices	Empty Doxorubicin containers and unused Doxorubicin must be disposed of as hazardous. Follow LASP SOP 4.003F		

References:

1. Doxorubicin HCl MSDS [Internet]. 2014 [cited 10/30/2014]. Available from: <http://www.sigmaaldrich.com/united-states.html>.
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3. NIOSH. NIOSH list of antineoplastic and other hazardous drugs in healthcare settings 2014. Cincinnati, OH: National Institute for Occupational Safety and Health, DHHS (NIOSH), U.S. Department of Health and Human Services CfDcAP; 2014 September 2014. Report No.: 2014-138 Contract No.: 2014-138.
4. National Research Council Committee on Prudent Practices in the L. The National Academies Collection: Reports funded by National Institutes of Health. Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards: Updated Version. Washington (DC): National Academies Press (US) National Academy of Sciences.; 2011.
5. ISOPP. ISOPP Standards of Practice: Safe Handling of Cytotoxics- Section 15 Waste Handling and Patient Excreta. Journal of Oncology Pharmacy Practice. 2007;13(66).

Questions or concerns: Please contact EHS, Ted Witte, theodore.witte@nih.gov or 301-846-5860
 Reviewed 03/03/2015 *These recommendations are not final and may be updated.*

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Doxorubicin (Adriamycin)

Doxorubicin is an antineoplastic drug produced by hydroxylation of Daunorubicin, a compound naturally synthesized by the soil bacteria *Streptomyces peucetius*. Daunorubicin and its derivatives intercalate with DNA and block the action of the enzyme Topoisomerase II, inducing DNA strand breaks and interrupting DNA replication.

Doxorubicin is mutagenic and genotoxic. The most serious toxicity associated with Doxorubicin is cardiomyopathy, caused by the tendency of Doxorubicin to accumulate in the membranes of the mitochondria. Doxorubicin is also potentially a hazard to the developing fetus though it does not efficiently pass the placenta.

Doxorubicin is excreted primarily in the feces but also in the urine. Due to enterohepatic recirculation the drug excretion continues for several days. At this time there is insufficient information to determine the point at which excretion becomes negligible in rodents. Therefore the 7 day guideline is based on human clinical practice. As a general rule, substances are cleared from the bodies of rats and mice more rapidly than from human patients. This recommendation will be updated as information becomes available.