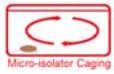


Chemical Safety Practices Recommendations

N-Nitrosodiethylamine (NDEA, Diethylnitrosamine, DEN)

Exposure Hazards (1, 2)			
<p>Category 1B Danger</p>  <p>Carcinogenicity May cause cancer.</p>	<p>Category 2 Warning</p>  <p>Toxic to Reproduction</p> <p>Suspected of damaging fertility or the unborn child. May cause harm to breast-fed children.(3)</p>	<p>Category 3 Danger Toxic</p>  <p>Toxic if swallowed.</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	<p>DEN is volatile and combustible. HEPA filters will not prevent exposure. Pregnant women should exercise additional caution when working with or around DEN.</p>		
Personal Protective Equipment	<p>Gloves (Double gloves, latex or nitrile) (Butyl Rubber or Silvershield when working with concentrated DEN) Skin Protection (Suit or Scrubs or Lab Coat) Eye Protection (Safety-glasses or Goggles) Closed-toe shoes Respirator with Organic Vapor + P100 cartridges (3M #60926) if engineering controls are not available. Supplied air or SCBA systems should be used in the event of chemical spills.</p>		
Engineering Controls	<p>DEN may not be used in a system which recirculates air. DEN must be used in a 100% exhausted CFH or Class II, B2 BSC.(2) Animals, waste, and bedding until 1 day after last treatment- CFH or Class II, B2 BSC</p>		
Animal Handling	<p>Avoid exposure to animal waste until 1 day after last treatment. (4, 5) Animals may exhale or excrete DEN for up to 1 day. Treat animals as hazardous.</p>		
Bedding Disposal	<p>Dispose of bedding as hazardous material until 1 day after last treatment. Seal bags.</p>		
Work Practices	<p>Empty DEN containers and unused DEN must be disposed of as hazardous. Seal containers for disposal tightly to prevent evaporation. Follow LASP SOPs for preparation, handling, dosing, and disposal of DEN.</p>		

References:

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3. Schoental R, Gough TA, Webb KS. Carcinogens in rat milk. Transfer of ingested diethylnitrosamine into milk by lactating rats. Br J Cancer. 1974;30(3):238-40.
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5. Rogers AE, Wishnok JS, Archer MC. Effect of diet on DEN clearance and carcinogenesis in rats. British Journal of Cancer. 1975;31(6):693-5.
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Questions or concerns: Please contact EHS, Ted Witte, theodore.witte@nih.gov or 301-846-5860
 Reviewed 01/21/2015 *These recommendations are not final and may be updated.*

Chemical Safety Practices Recommendations

N-Nitrosodiethylamine (NDEA, Diethylnitrosamine, DEN)

Diethylnitrosamine (DEN) is found as a naturally occurring contaminant in meat and cheese, tobacco, whiskey, cosmetics, and a variety of other environmental sources. There is some association between cancer in human populations and environmental exposure to DEN.

In the research setting it is used to induce liver and esophageal cancer in animals. The action of Cytochrome P450s (2E1) which are highly expressed in the liver result in the production of the active metabolite - ethyldiazonium (similar to the active metabolite of azoxymethane, methyldiazonium). Ethyldiazonium causes DNA alkylation and therefore damage and mutation. (6)

In rats DEN is rapidly metabolized and cleared from the bloodstream completely within 4 hours while a very small fraction of DEN is excreted in the urine. When the metabolism of DEN is inhibited more than 10% of DEN may be excreted in the urine and may take up to 24 hours to clear the body.

When manipulating pure DEN certain extra precautions should be taken. DEN attacks nitrile rubber and should only be handled with butyl rubber or SilverShield gloves. DEN is also a volatile liquid and therefore particle filtration does not effectively prevent exposure. It must be handled in a fully exhausted cabinet or hood and Organic Vapor respirators should be used when handling the animals or their waste during the 24 hour hazard period. DEN may pass through the placenta and cause defects or death in developing fetuses and can also be transmitted through breast milk for several days if a lactating mother is exposed to significant quantities of DEN.