

Glutaraldehyde Toxicology & Management of Risk

Dr. Christie Forrester, NIOSH

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Glutaraldehyde Toxicology & Management of Risk

Hosted by Paul Webber
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Overview

- About NIOSH
- Risk management refresher
- Hazard vs. Risk
- Glutaraldehyde & Risk management



National Institute for Occupational Safety and Health (NIOSH)

- Created by the Occupational Safety and Health Act of 1970
- Part of the Centers for Disease Control and Prevention (CDC) within the Department of Health and Human Services
- Our mission: To provide leadership in research to prevent work related illness, injury, disability, and death



Christy L. Forrester
Epidemiologist

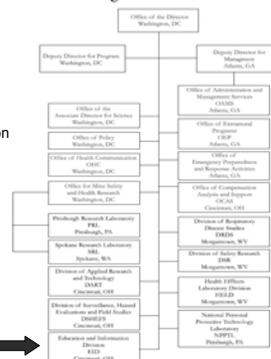
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National Institute for Occupational Safety and Health

Organizational Chart



Why assess risk? *

- Creates awareness of workplace hazards and associated risk
- Identifies the population at risk
- Identifies if existing measures are adequate or if more work needs to be done
- Ensures that risk controls are proportionate to risk
- Can iron out risks at the design stage in processes which give rise to risks (i.e., machinery)
- Helps prioritize risk control measures

*Adapted from <http://www.hse.gov.uk/risk/faq.htm>. Health and Safety Executive (HSE), United Kingdom



Goal of Risk Management

Identify HAZARDS and manage RISKS associated with an occupational exposure to prevent work-related illness and/or injury and promote safe and healthful workplaces

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Hazard vs. Risk

- A **hazard** is a substance or activity with the potential to cause harm
- A **risk** is the probability or likelihood that a hazard will cause harm
- Hazards = possibility
- Risk = probability

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Risk Management

- Hazard Identification
- Dose Response
- Exposure Assessment
- Risk Characterization

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Hazard Identification

- What are the potential effects on human health?
 - Acute (accidental over exposure)?
 - Sub-chronic (repeated exposure over short time)?
 - Chronic (exposure to low levels over lifetime)?
- Chemical & physical properties
- Reproductive, teratology, neurobehavioral effects
- Toxicology studies in animals
- Epidemiology studies in humans

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Dose-Response

- How much does it take to cause a harmful effect?
 - Vitamin A in too large a dose can lead to birth defects, yet smaller doses are essential for good health
 - "All substances are poisons; there is none which is not a poison. The right dose differentiates a poison and a remedy." -- Paracelsus (1493-1541)
- What is a safe dose?
 - No observed adverse effect level (NOAEL)
 - Lowest observed adverse effect level (LOAEL)

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Exposure Assessment

How might people or the environment come in contact the substance?

- Qualitative vs. Quantitative Assessment?
 - Observation of process
 - Identification of exposure groups or tasks
 - Is there are need for quantitative assessment?
- Is the exposure significant?
 - How long does the exposure last?
 - How concentrated is the substance?
 - What is the route? (i.e., inhalation, ingestion, dermal contact)
- Methods to determine exposure
 - Direct or indirect measurement
 - Modeling methods

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Risk Characterization

The integration of information:

- Is there a known hazard?
- Dose-response?
- Is exposure possible or likely?

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Glutaraldehyde Health Hazards

- Nasal, eye, upper respiratory irritation
- Conjunctivitis
- Allergic contact dermatitis
- Skin sensitization
- Asthma inducing agent
- Respiratory sensitization (probable)

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Irritation/Toxicity Studies

- Hazards
 - Dermal irritation at glutaraldehyde concentrations $\geq 1\%$
 - Upper respiratory tract irritation from acute-chronic exposures
- Risk
 - Dermal/upper respiratory tract irritation poses a real risk under normal use conditions
 - Requires careful risk management strategies to minimize the probability of the hazard to cause injury or illness

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Dermal Sensitization Studies

- Hazards
 - Contact sensitization at glutaraldehyde concentrations of $\geq 0.5\%$
- Risk
 - Dermal sensitization poses a real risk under normal use conditions
 - Requires careful risk management strategies to minimize the probability of the hazard to cause illness or injury

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Respiratory Sensitization & Occupational Asthma Studies

- Hazards
 - Multiple case reports document an association between glutaraldehyde exposure and the development of occupational asthma
 - Some evidence for respiratory sensitization
- Risk
 - Occupationally-induced asthma poses a real risk under normal use conditions
 - Respiratory sensitization is a probable risk under normal use conditions
 - Careful risk management strategies are recommended to minimize the probability of the hazard to cause illness or injury

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Risk Management Reducing dermal irritation/sensitization risk

Personal Protective Equipment (PPE)

- Gloves
 - Proper size, length, type, and quality of glove required
 - Material
 - Nitrile rubber and butyl rubber
 - Any concentration of glutaraldehyde, up to 50%
 - Latex
 - Not recommended for protection against chemical exposure
 - Neoprene and polyvinyl chloride (PVC) gloves
 - Not recommended for use with any concentration of glutaraldehyde
 - Absorb and retain glutaraldehyde
 - Size and length
 - Snug fit
 - Extend up forearm

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Risk Management Reducing dermal irritation/sensitization risk

(glove use continued)

- Precautions
 - Inspect for tears and holes prior to use
 - Never use an imperfect glove
 - Never reuse an old pair of gloves
 - Occluded skin in contact with glutaraldehyde is more likely to become irritated
- If skin contact occurs,
 - Remove the glove immediately
 - Wash the area thoroughly
 - Put on a new pair of gloves
- Lab coats, aprons, or gowns

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Risk Management
Reducing eye irritation risk

Complete eye protection

- Splash proof goggles
- Safety glasses with side shields together with a wrap-around full-face shield

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Risk Management
Reducing respiratory irritation/sensitization risk

- Comply with occupational exposure limits (OELs)
 - ACGIH TLV for glutaraldehyde is .05 ppm ceiling
- Engineering controls and equipment
 - General room and local (fume hood) ventilation
 - Process automation and isolation
- Control Banding Hazard Guidance
- Respiratory protection
 - "last line of defense"
 - NIOSH-approved respirator
 - National Personal Protective Technology Laboratory (NPPTL)

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Risk Management
Reducing the risk due to spills

- Routine safe handling
 - Always keep lids on containers
 - Cap containers with unused solution tightly to minimize risk of spilling
- Spill management
 - Restrict access to area
 - Don appropriate personal protective equipment
 - Clean up spills using appropriate spill kit or contact EH&S resource for assistance

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NIOSH Resources

- Glutaraldehyde: Occupational Hazards in Hospitals (educational brochure) <http://www.cdc.gov/niosh/2001-115.html>
- Control banding topic page <http://www.cdc.gov/niosh/topics/ctrlbanding/>
- Ongoing document development
 - Glutaraldehyde Criteria Document Update
 - Occupational Hazards in Hospitals -- Chapter: Glutaraldehyde
- NIOSH Health Hazard Evaluations (HHE) Database <http://www.cdc.gov/niosh/hhe/>
- NIOSH Web Page <http://www.cdc.gov/niosh/homepage.html>
- NIOSH Inquiry Information Service **1-800-35- NIOSH (1-800-356-4674)**

Free Teleclass

WHO Guidelines for Hand Hygiene in Health Care

Professor Didier Pittet, University of Geneva

October 19, 2005
Live Teleclass 1:30pm EST
Live French Teleclass 9:30am EST

October 20, 2005
UK Rebroadcast 1:30pm GMT

World Alliance for Patient Safety

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