



Clinical Evaluation of Formaldehyde Exposures During Deployments

FACT SHEET 64-019-0212

PURPOSE: To provide guidance to deployed clinical providers evaluating patient(s) with known or potential exposures to formaldehyde vapors. *This information was developed in response to recent field questions posed to USAPHC environmental physicians and industrial hygienists. See PHC Fact Sheet 55-012-1011: Formaldehyde – Deployment Occupational and Environmental Health Concerns for additional details regarding the assessment of exposures sources and levels.*

SOURCES OF EXPOSURE: At room temperature, formaldehyde is a colorless, pungent-smelling gas. In liquid form formaldehyde is commonly used as a preservative in medical laboratories and mortuaries. It is used widely by industry to manufacture building materials and numerous household products (e.g., plastics, carpets, disinfectants, tobacco products, and many every day personal use products). It is also a by-product of combustion. Formaldehyde is in so many products and building materials that most people are frequently exposed to low levels that off-gas into indoor air. In deployment settings, U.S. personnel may be exposed to off-gassing formaldehyde vapors inside structures that are built with or contain materials from non-U.S. regulated supplies. Though these exposures may be higher (more noticeable) than those in U.S. homes or commercial buildings, these exposures are significantly lower than a formaldehyde exposure encountered in an industrial or medical laboratory workplace that involves use of formaldehyde.

INDIVIDUAL EXPOSURE ASSESSMENT: Symptoms commonly reported by affected deployed personnel include odors, eye and respiratory tract irritation, headaches, and dizziness. Odor adaptation may occur. **Symptoms associated with exposures evaluated thus far have been in the mild to moderate range, have not required treatment, and have been temporary (cease after exposure is mitigated).** However, more significant exposures or symptoms may be possible. Clinical providers in deployed settings are therefore advised to critically evaluate patients presenting with symptoms and/or signs consistent with exposure to formaldehyde exposures to determine if conditions warrant specific diagnostic tests, treatment, or follow on evaluation. **It is important that any evaluation is properly documented – including the rationale for specific tests. This documentation is required and provides the basis for determination of post deployment medical decision-making.**

INDIVIDUAL CONSIDERATIONS: Odor is a poor indicator of the presence and/or concentration of formaldehyde vapor, since the odor threshold can vary from person to person (0.03 to 1.0 parts per million) and odor adaptation can also occur.

Persons with certain underlying conditions (asthma, allergies) could experience more severe effects. Inhalation of high concentrations of formaldehyde vapors can produce narrowing of the bronchi and, in severe cases, result in an accumulation of fluid in the lungs (pulmonary edema). This has not been seen in any deployed personnel. Exposure through ingestion of formaldehyde or formalin has been associated with systemic effects. This is primarily due to its metabolic conversion to formate. Ingestion is not an anticipated route of exposure in deployment settings.

Individuals may have concerns about the more serious effects of formaldehyde, such as a higher risk of cancer or significant neurological symptoms. However, these effects would more likely be encountered with occupational exposures and are not anticipated to be a concern in incidental or acute exposures encountered in the operational setting. In sensitized persons, formaldehyde can cause or exacerbate asthma/RAD and contact dermatitis/eczema. Persistent adverse effects on the central nervous system such as increased prevalence of headache, depression, mood changes, insomnia, irritability, attention deficit, and impairment of dexterity, memory, and equilibrium have been associated with long-term exposure.

CLINICAL EVALUATION: Recommended formaldehyde exposure questions and exam criteria are provided below:

Formaldehyde Exposure Questions:

1. What symptoms have you been having?
 - a. Do you have them now?
 - b. Describe the severity of your symptoms
2. Do you know when & where your symptoms occur or began?
 - a. Describe location, activities, visual, or odor indicators.
 - b. Describe how often and how long you experience symptoms
 - c. Select best description of magnitude of your exposure:
 - Low: mild temporary irritation and effects during exposure, with or without mild-moderate odor, effects slightly bothersome
 - Medium: moderate symptoms, fairly bothersome, with or without mild-moderate odor
 - High: severe symptoms, extremely bothersome that prevented normal activity, and/or symptoms that persisted > hour after leaving affected area
 - d. Describe how long it takes for symptoms to begin after entering affected area(s).
 - e. Describe how long you continue to experience these symptoms after you leave affected area(s).
3. Have you been informed of exposure or sampling data or reports associated with the exposures?
4. What makes symptoms worst and what makes them better?
5. Describe any other known or suspected chemical exposures (including solvents and pesticides, now or in past)
 - a. Describe type and character of symptoms, if any, in response to that exposure.
 - b. Was there any evaluation or treatment by a clinician?
6. Describe other potentially relevant exposures and/or medical conditions:
 - a. What are your job activities (while deployed); How long have you been deployed?
 - b. Do you smoke?
 - c. Do you have any allergies?
 - d. Do you have asthma?
 - e. Other?

Medical History, History of Present Illness, Review of Systems relevant to formaldehyde:

General: Headache, depression, mood changes, insomnia, irritability, attention deficit, numbness or tingling, and impairment of dexterity, memory, and equilibrium. Sensitivity to odors, solvents, perfumes, or other chemicals

Eyes: Pain, burning, itching, h/o eye surgery, contact lens use, recent eye infections, blurry vision, any change in vision

Nose: Any pain, burning, itching, bleeding, seasonal or chronic allergies or rhinitis; nasal spray use, such as topical steroids

Mouth and throat: Redness, irritation, difficulty swallowing, throat tightness, smokeless tobacco use

Lungs/chest: Any wheezing, persistent coughing, coughing up blood, difficulty breathing, chest tightness, chest pain, h/o asthma/RAD, h/o bronchitis, pneumonia, tuberculosis or +PPD, h/o of inhaler use (bronchodilators, steroids), tobacco/smoking history and current use.

Skin: Redness, rashes, sores, h/o eczema, h/o psoriasis, h/o atopic dermatitis or other dermatitis, h/o topical medication use, including OTC creams/lotions/ointments.

Physical Exam: The following address the target systems/organs potentially affected by formaldehyde:

Eyes: Redness, discharge, corneal damage (rare)

Nose: Redness, discharge, edema, mucosal damage, bleeding

Mouth and throat: Redness, discharge, edema, mucosal damage, ulcerations, exudates redness, irritation, difficulty swallowing, throat tightness

Chest/Lungs: Any wheezing, rhonchi, rales, decreased lung sounds

Skin: Redness, rashes, sores, papules, pustules, blisters, cuts, burns, etc.

General Neurological: Cranial Nerves, reflexes, muscle strength, gait, balance, etc.

ASSESSMENT: Based on the patient's responses to the questions on the previous page, the medical history, review of systems and physical exam, one should be able to determine if formaldehyde exposure is a reasonable cause of the individuals' condition (as opposed to another type of exposure or condition). The condition may also be considered aggravated by the exposure (e.g., someone with previous history of asthma). This is important to document (see below).

DIAGNOSTIC TESTS: As in any clinical setting, conducting tests that do not provide information that is specifically relevant or useful to address the individual's immediate or long term health care should be avoided. ***Single or occasional formaldehyde exposures resulting in mild to moderate acute effects generally do not warrant any specific diagnostic tests.*** However, for individuals with unique conditions or those with very significant acute signs/symptoms, some tests may be clinically indicated to assess, document, and treat the individual's physical condition. The following considerations are provided as general guidance:

- Pulse oximetry, a pulmonary function test, and/or chest x-ray if patient is having significant lower airway signs and symptoms.
- Blood work: Testing for formaldehyde in the blood is not useful since the presence or absence of formaldehyde or antibodies to formaldehyde-bound proteins in blood, urine, or body tissues is not a reliable indicator of exposure levels or health effects. Other routine laboratory diagnostic studies, such as CBC, glucose, electrolytes, and liver enzymes, would not generally be obtained for the types of inhalation exposures typically found in deployment settings. Such tests should be considered only if clinically indicated.
- Urinalysis: This diagnostic test would not generally be obtained for the types of inhalation exposures typically found in deployment settings. This test should be considered only if clinically indicated.

TREATMENT: There is no antidote for formaldehyde exposure, so treatment consists of supportive care and reassurance. Particularly given the low level exposures experienced in deployment settings, minimal treatment, if any, is anticipated to be needed. If the formaldehyde vapor cannot be reduced, eliminated, or otherwise remediated, individuals should limit their time in these areas to the extent feasible.

DOCUMENTATION: While the diagnostic tests and treatment determined necessary to address the patient's condition may be irrelevant to the determination that formaldehyde exposure was a causal factor: the exposure should be documented as a cause for the assessment/diagnosis/treatment in the individual's medical record. Specifically, current policy requires that the code "**987 Toxic effects of other gases, fumes, vapors**" be noted in medical records of personnel in deployments who are treated for exposures to chemicals and in the Central Command area this should be identified as a reportable medical event (RME). Documentation should include any information regarding the formaldehyde exposure levels, frequency, and duration.

FOLLOW-UP: Patient should be advised to:

- Avoid repeat exposure to formaldehyde
- Follow-up for additional medical evaluation immediately if symptoms significantly worsen or in 7-10 days if his/her symptoms still persist

Key References:

- PHC FS 55-012-1011; *Formaldehyde – Deployment Occupational and Environmental Health Concerns*
- Central Command (CENTCOM) Force Health Protection (FHP) Regulation 220-1, February 2010 (Appendix H, RME guidance)
- Agency for Toxic Substances and Disease Registry (<http://www.atsdr.cdc.gov/>)

If you need additional information please contact:

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