

Michigan Department of Community Health

Chemical Illness Response: Guidelines for Public Health Investigations of Acute Onset Illness Clusters of Chemical Etiology

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Revised: September 28, 2007

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List of Acronyms

ATSDR – Agency for Toxic Substances and Disease Registry
CDC – Centers for Disease Control and Prevention
CHECC – Community Health Emergency Coordination Center
CHEMTREC – Chemical Transportation Emergency Center
CNS – Central nervous system
DOE – Department of Energy (US)
DOJ – Department of Justice (US)
EPA – Environmental Protection Agency
EPC – Emergency Preparedness Coordinator
FBI – Federal Bureau of Investigation
FDA – Food and Drug Administration
GI – Gastrointestinal
ICS – Incident command system
JIC – Joint Information Center
LHD – Local health department
MDA – Michigan Department of Agriculture
MDA F&D – Michigan Department of Agriculture Food and Dairy
MDA PPM – Michigan Department of Agriculture Plant and Pesticide Management
MDCH – Michigan Department of Community Health
MDCH CD – Michigan Department of Community Health Communicable Disease
MDCH DEH – Michigan Department of Community Health Division of Environmental Health
MDEQ – Michigan Department of Environmental Quality
MDEQ PEAS – Michigan Department of Environment Quality Pollution Emergency Alert System
MDLEG – Michigan Department of Labor and Economic Growth
MIHAN – Michigan Health Alert Network
MIOSHA – Michigan Occupational Safety and Health Administration
MSP – Michigan State Police
MSU – Michigan State University
NCEH – National Center for Environmental Health
NIOSH – National Institute for Occupational Safety and Health
NRC – National Response Center
OPHP – Office of Public Health Preparedness
PCC – Poison Control Center
PIO – Public information officer
USDA – United States Department of Agriculture
WISER – Wireless Information System for Emergency Responders

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Introduction

Purpose: This document provides local and state public health professionals with a set of guidelines for public health response to reports of illness clusters where the cause of the illness is a chemical exposure. These guidelines address illnesses with acute onset. They do not address chronic or long-latency diseases,¹ environmental exposure concerns in the absence of disease,² or illnesses from radiation exposure. The guidelines apply to chemical associated illnesses from all exposure sources (e.g., contaminated food, toxins, water, consumer products, air) and routes of exposure -- ingestion, inhalation, and dermal.

Organization of the Guidelines: Section 1 provides information and resources to assist in identifying the possible chemical causes of the illness cluster.

Section 2 outlines the steps for the epidemiologic and environmental evaluations of the reported cluster. This section is summarized in Appendix 1 as a one-page flow chart, which can be posted as a quick reference guide. The flow chart includes key contact information on the reverse side.

Section 3 provides information about state laboratories and links to more detailed information. A one-page chart, also in Appendix 1, provides quick reference and contact information about the four state laboratories available to support the investigation.

Background and rationale: An illness cluster is defined as an event where there are a number of individuals with similar symptoms or the same disease and where the illnesses have occurred close together in time or space, in both time and space, or within the same demographic group. Illness clusters that are outbreaks of infectious disease are usually identifiable by the clinical presentation of the cases and the person/time/place characteristics of the outbreak event. In some cases, however, there are illness clusters that do not present as infectious in origin. Some examples that have occurred in Michigan include:

- Rapid onset of nausea and vomiting, plus burning sensation in mouth, after eating ground beef.
- Rapid onset of vomiting at a banquet, just after attendees began eating.
- Nausea and fainting among school children over a two-day period.

Clusters are usually reported to the communicable disease epidemiology staff of local health departments (LHD). This staff is well versed in the management of infectious disease outbreaks, but rarely has to address non-infectious disease clusters. Although the same outbreak investigation principles apply, such clusters present additional complexities and uncertainties both regarding the organization of the investigation, including agencies that should be involved, and the technical knowledge base needed for decision-making (e.g., exposure assessment, medical toxicology, environmental transport and fate of chemicals, regulatory standards for

¹ The MDCH Division of Environmental Health (DEH) has a set of guidelines for addressing reports of cancer clusters. These guidelines can be applied to investigations of reported clusters of any/all long-latency or chronic diseases. Contact DEH for more information: 517-335-8350.

² DEH Toxicology and Response Section (TARS) responds to concerns about the potential health effects of environmental contamination. TARS works closely with the Michigan Department of Environmental Quality on these issues. Contact TARS for more information: 517-335-8350.

chemical exposures and clean-up). In addition, vigilance is needed to assess whether the cluster could be due to an intentional, malevolent act. Table 1 summarizes some of the characteristics of chemical cluster investigations that distinguish them from typical communicable disease outbreak investigations.

Table1. Characteristics of chemical cluster investigations
Source of disease report - Non-standard channels: e.g., poison control, environmental health
Case definitions - <i>Case Definitions for Chemical Poisonings</i> (CDC, 2004) limited number of chemicals
Disease presentation - Atypical symptoms and/or disease progression
Medical subject matter experts - Medical toxicologist; occupational/environmental medicine
Lead public health investigation - Environmental health
Federal agency support - CDC: National Centers for Environmental Health, ATSDR, NIOSH; EPA
Epidemiologic data collection - None standardized; prototype available from MDCH environmental health
Lab support - MDCH (human specimens); MDEQ, MDA, EPA, private labs (environmental samples)
Disease containment - Facility remediation, physical/engineering controls, product embargo/recall

The guidelines have been developed based on the following assumptions:

- The Incident Command System (ICS) may be implemented in response to a chemical illness.
- The LHD is usually the lead investigator, with MDCH providing support and coordination as needed. However, MDCH may take the lead in complex, multi-jurisdictional investigations with concurrence from involved LHDs.
- MDCH Division of Environmental Health (DEH) coordinates the MDCH response until the event becomes large enough that the MDCH Community Health Emergency Coordination Center (CHECC) is activated, or the cluster is determined not to be caused by chemical exposure.
- Procedures are well-established to handle infectious disease outbreaks, including those associated with food (International Association for Food Protection, 1999) and water contamination (International Association for Food Protection, 2002). Many of these procedures are applicable to investigations of non-infectious disease clusters.
- The state laboratories: MDCH, Michigan Department of Environmental Quality (MDEQ), and Michigan Department of Agriculture (MDA) are critical resources for any cluster investigation. The Michigan State University (MSU) animal diagnostic lab may also be utilized to provide support.
- Federal agencies can also provide assistance. The extent that these resources can be utilized will be determined on a case-by-case basis.
- Based on established relationships and understandings, the local health department will notify law enforcement under appropriate circumstances. (In some jurisdictions, this may take place very early in the investigation, but in others, early notification may not be practical.) Local law enforcement is responsible for notifying state and federal law enforcement agencies.
- Depending on the type and duration of exposure to the chemical, public health agencies may need to collaborate with HazMat and emergency management agencies

Section 1: Guidelines for assessing whether an illness cluster is due to chemical exposure

Covert chemical poisonings, whether intentional or accidental, are difficult to identify because they are rare events and the symptoms are usually non-specific. The epidemiologic and clinical presentations of chemical associated illness clusters provide valuable guidance for recognition and determination of their non-infectious origin (Schier, 2006) (Patel, 2006). These features are discussed below and summarized in Tables 2 and 3.

1. Epidemiologic clues for recognition of chemical poisoning: The following table lists the epidemiologic clues that may point to a chemical in a reported disease cluster and includes examples and explanations.

Table 2. Epidemiologic clues to recognition of chemical associated illness
<ul style="list-style-type: none">• Rapid onset of symptoms following exposure: e.g., Nausea, vomiting, headache, burning sensations and/or paralysis within minutes of eating.• Unusual groupings or pairings of symptoms: e.g., Gastrointestinal symptoms and neurologic effects in the same patient or a clinical presentation of acidosis and altered mental status.• Failure to respond to usual therapy: Severity or prognosis of illness differs from the course of an apparently common illness (e.g., Non-resolving viral GI illness or abdominal cramping progressing to multi-organ system failure).• Higher morbidity or mortality than expected with common illness• Altered taste/appearance of contaminated medium: e.g., Reports of food with a metallic or burning taste; discolored or odorous drinking or recreation waters.• Environmental considerations: e.g., Unusual pattern of death or illness among plants or animals. Unusual or distinctive odors or discoloration observed and reported.

2. Recognition of syndromes related to various classes of chemicals: Chemical exposures often present as a set of recognizable syndromes. Patel, Schier and Belson have established a set of clinical syndromes specific to chemical exposures (Patel, 2006). Table 3 has adapted the syndromes presented by Patel, Schier and Belson to add information regarding specific plant and animal toxins capable of producing related symptoms. It must be emphasized that it is not a comprehensive list. There are thousands of chemicals and chemical compounds in existence capable of producing a variety of clinical presentations depending on dose and route of exposure (ingestion, inhalation, or dermal exposure). Additionally, the health effects of some chemicals can be delayed for hours, weeks or months after exposure (e.g., organic mercury intoxication and CNS effects).

Table 3. Clinical Syndromes and Potential Chemical Etiologies

Clinical Syndrome	Signs and Symptoms	Potential Chemical Etiologies
Cholinergic crisis	Salivation, diarrhea, lacrimation, bronchorrhea, diaphoresis, urination, bradycardia, hypotension	Nicotine Organophosphate insecticides – Decreased acetylcholinesterase activity Muscarine poisoning (e.g., Clitocybe and Inocybe mushrooms)
	Miosis, fasciculations, weakness, bradycardia or tachycardia, hypotension or hypertension, altered mental status, seizures	Carbamate insecticides Medical carbamates (e.g., Physostigmine)
Cellular hypoxia	Airway toxicity Cough, hoarseness, dyspnea, chest tightness, hemoptysis, dizziness, wheezing or rales, cyanosis, hypoxemia, pulmonary edema	Phosgene, Ricin, Ammonia, Chlorine Phosphine – Mitochondrial toxicity Nitrogen oxides Organofluorine (Teflon) pyrolysis
	Hemoglobin toxicity with cyanosis Nausea, headache, dizziness, dyspnea, confusion, coma, convulsions	Methemoglobinemia-causing agents (e.g., sodium nitrite)
	Hemoglobin toxicity without cyanosis Nausea, vomiting, headache, dizziness, weakness, dyspnea, confusion, syncope, coma, convulsions, dysrhythmias, cardiovascular collapse	Carbon monoxide
	Mitochondrial toxicity Mild (nausea, vomiting, headache) Severe (altered mental status, dyspnea, hypotension, seizures, metabolic acidosis)	Sodium monofluoroacetate – Hypocalcemia, hypokalemia Cyanide, Carbon monoxide, Hydrogen sulfide, Sodium azide Phosphine – Respiratory tract irritant
Severe gastrointestinal illness, dehydration	Abdominal pain, vomiting, profuse diarrhea (possibly bloody), hypotension, possibly followed by multisystem organ failure	Arsenic, Colchicine Ricin – Inhalation of an additional route of exposure; severe respiratory illness possible Barium – Hypokalemia, arrhythmias, and paresis common Cyclopeptide poisoning (e.g., Amanita and Galerina mushrooms) Monomethylhydrazine poisoning (eg, Gyromitra mushrooms) Shigatoxin (e.g., ground beef, raw vegetables) Ciguatoxin poisoning (e.g., tropical reef fish) – Associated sweating, headache, and muscle aches Amnesic shellfish poisoning (e.g., mussels) – Associated headache, disorientation, permanent short term memory loss, seizures, paralysis in severe cases

Peripheral neuropathy and/or neurocognitive effects

Peripheral neuropathy including, muscle weakness, atrophy, "glove and stocking" sensory loss, depressed or absent deep tendon reflexes

Neurocognitive effects including, memory loss, delirium, ataxia, encephalopathy

Methyl bormide (fumigant, toxic gas)
– Encephalopathy, ocular disturbances, respiratory tract irritation

Mercury (organic) – Visual disturbances, paresthesia, ataxia

Arsenic (inorganic) – Delirium, peripheral neuropathy

Thallium – Delirium, peripheral neuropathy

Lead – Encephalopathy

Hexane - Peripheral neuropathy

Acrylamide – Encephalopathy, peripheral neuropathy

Paresthesias of face or mouth/arms/legs, headache, dizziness, nausea and muscle incoordination

Paralytic shellfish poisoning (e.g., "red tide" associated mussels, cockles, clams, oysters, crabs, lobsters)

Tetrodotoxin (e.g., pufferfish) - Paralysis, loss of consciousness and respiratory failure

Neurotoxic shellfish poisoning (e.g., oysters, clams, mussels)

Diffuse weakness; proximal > distal dysphagia, dysarthria, ptosis, extra-ocular muscle weakness

Botulism toxin (e.g., home canned foods, garlic in oil)

Inebriation, hallucinations, manic behavior, delirium, deep sleep

Ibotenic acid-musimol poisoning (e.g., Amanita and Tricholoma mushrooms)

Psilocybin poisoning (e.g., Psilocybe and other mushrooms)

Generalized muscle rigidity

Seizure-like, generalize muscle contractions, painful spasms (neck and limbs); tachycardia and hypertension are common

Strychnine – Intact sensorium

Convulsions

Convulsions are a predominant or a primary feature of poisoning with these agents (i.e., a direct CNS effect and not as a secondary effect such as cellular hypoxia)

Tetramine (Du-shu-quiang), Hydrazine, Camphor, Organochlorides (e.g., Lindane), Picrotoxin, Pyrethrin and pyrethroids, Plants (e.g., water hemlock)

Oralpharyngeal pain and ulcerations

Lip, mouth, and pharyngeal ulcerations and burning pain

Diquat, Caustics (acids and alkalis), Metal salts, Mustards (e.g., sulfur)
Paraquat – Dyspnea and hemoptysis secondary to pulmonary edema or hemorrhage; can progress to pulmonary fibrosis over days to weeks

Nonimmune-mediated hemolysis

Symptoms caused by massive hemolysis: malaise, dyspnea, hemoglobinuria (reddish, heme-positive urine that is often acellular), bronze discoloration of skin

Arsine (toxic industrial gas), Dinitrophenols, Chlorates and bromates, Acetic acid

Copper sulfate – Severe gastrointestinal illness is the predominant presentation

Histamine release

Rash, diarrhea, flushing, sweating, headache, vomiting

Scrombotoxic fish poisoning (e.g., tuna, mackerel, bonito)

Section 2: Guidelines for investigating a suspect chemical associated illness cluster

Note: In accordance with the ICS, the public health professional that takes the initial case report(s) is lead of the public health investigation until he/she transfers command.

A. Initial Assessment and Investigation: Chemical Illness Response Summary (Appendix 1) summarizes the following investigation steps.

1. Assess the situation: The reported illnesses appear to be a cluster (e.g., links in symptoms, time, place), but based on the guidance in Section I the cluster has unusual features that suggest a chemical etiology.
 - Corroborate the reported illnesses by confirmation from a reliable source.
 - Utilize medical toxicologists at the Poison Control Centers (PCC) (1-800-222-1222 available 24/7), toxicologists at MDCH DEH, an on-line tool WISER,³ and the guidance in Section I above to assist in narrowing or identifying the etiology.
 - Ensure preservation of suspected contaminated items (e.g., food and food containers) and clinical samples related to the exposure and illness.
2. Interim control measures: Take immediate, reasonable interim control measures when there is a possibility of exposure to others based on the initial hypotheses (e.g., closing a building, sequestering food).
3. Notifications: Determination that a reported cluster may be chemical-related may be made by communicable disease staff at the local or state level. Alternatively, it may first be identified by some other part of MDCH, including the DEH. A number of notifications should be made, some of which are dependent on the initial working hypothesis(es) regarding cause. Contact information for state and federal agencies is in Appendices 1 and 2. (In most cases, contact with federal agencies should be made through the corresponding state agencies when possible.)

Initial Notifications

- LHD, MDCH CD, and MDCH DEH should all be notified of the initial event.

Additional Notifications

MDCH may notify:

- MDCH administration
- Regional epidemiologist(s)
- MDCH OPHP
- MDCH press office/public information officer
- Food related – MDA Food and Dairy (MDA may contact FDA or USDA)
- Pesticide related – MDA Pesticide and Plant Management
- Water related – MDEQ Water Bureau
- Work related – MIOSHA
- Spills and releases – CDC, NCEH, ATSDR and MDEQ Pollution Emergency Alerting System (PEAS).

³ Wireless Information System for Emergency Responders: <http://webwiser.nlm.nih.gov>

LHD may notify:

- ❑ Law enforcement – When appropriate, the local health department notifies local law enforcement. (The regional FBI coordinator is notified by local law enforcement. The MDCH OPHP may also choose to notify the FBI’s Michigan Weapons of Mass Destruction coordinator.)
- ❑ Poison Control Center – If not yet involved, notify the appropriate regional center.
- ❑ Michigan Health Alert Network (MIHAN) – It may be advisable to send an electronic MIHAN alert, particularly to determine if the cluster is more widely spread than initial reports suggest. This should be done collaboratively between MDCH and local health department.

4. Initial investigation actions

4.1. Identify all involved agencies.

- ❑ MDCH - DEH and CD
- ❑ Other state agencies
- ❑ LHD (health officer, medical director, CD epidemiologist, environmental health director or their designees, EPC)
- ❑ Tribal authority
- ❑ PCC (medical toxicologist)
- ❑ Impacted business/agency/government officials
- ❑ Local emergency management and responders
- ❑ Involved health care facilities and laboratories

4.2. Convene conference call with identified agencies to:

- ❑ Compile a synopsis of the knowns and unknowns in the event.
- ❑ Agree on an initial hypothesis or set of alternative hypotheses, based on reported symptoms and circumstances.
- ❑ Develop a working case definition. *NOTE: CDC has published a list of chemical poisoning case definitions for a limited number of chemicals based upon their accessibility, lethality, and potential to cause social disruption (CDC, 2004).*
- ❑ Establish an action plan including:
 - The epidemiology, environmental, and laboratory investigation objectives.
 - Interim control measures to be taken to contain illness and/or reduce hypothesized exposure.

- Define roles and responsibilities:
 - The lead investigator
 - The supervisors for the epidemiologic and environmental investigations
 - Epi Group and Environmental Group members
 - The Public Information Officer or Joint Information Center
 - Supporting agencies and their roles
 - A coordinator for group e-mail communications, conference calls, preparing meeting minutes, writing the action plan, and updating progress (DEH unless otherwise designated).
- Define ground rules for information sharing in the working group (e.g., frequency of conference calls within team) and points of contact for involved agencies.
- Activate involved agencies' risk communication plans. Agree on procedures to coordinate releases of messages to the public.
- Discuss notification of federal agencies.

4.3. After the conference call:

- The coordinator prepares action plan utilizing the objectives, priorities, work assignments, and responsibilities identified during the conference call.
- The coordinator distributes the action plan to involved agencies following approval of lead investigator.

B. Epidemiologic and Environmental Health Investigations

Case finding and follow-up activities are generally coordinated by the local health department. Local health department CD staff is experienced in conducting case interviews. MDCH, including the environmental epidemiologist and regional epidemiologist(s) assigned to the involved local health department(s), can provide support for development of interview tools, reviewing medical records, completing interviews, and providing data summaries and interpretation.

The lead for the environmental investigation is the environmental health director in the local health department. The MDCH DEH has a staff of toxicologists who can advise on human health effects of exposures, and can provide contacts within the federal ATSDR to obtain additional toxicology assistance.

1. Initial epidemiologic investigation:

- Define minimal information needed for initial investigation.

- Compile a line listing to summarize initial case reports.
 - Contact initial cases, reporting source, and/or facility to obtain additional information as needed.
 - Verify diagnoses by obtaining medical records and clinical lab test results of initial cases.
 - Tell the involved laboratories not to discard specimens until further notified.
 - Research plausibility of suspect causative agent(s) including: toxicity, physical characteristics, and previous outbreaks.
 - Refine or revise the initial case definition.
 - Discuss results with the team to confirm or reject existence of cluster. If confirmed, modify exposure hypothesis and incident action plan as needed and proceed with full epidemiologic and environmental investigations.
2. Full epidemiologic investigation: *(Note: Be familiar with legal authorities of health department in case legal action is necessary to obtain data).*
- Initiate active surveillance for finding additional cases.
 - Establish and maintain lists of others potentially at risk due to common source associated with the reported cluster (e.g., family members; others present at an event, worksite, building, geographic location).
 - Contact hospital emergency departments, infection control practitioners and local health care providers.
 - Review existing surveillance systems for additional suspect cases (e.g., poison control, syndromic surveillance, medical examiners, vital records).
 - Modify line listing to include: unique case number, name and contact information, reported symptoms, date of onset, dates of contact, dates medical records and specimens obtained.
 - Develop case interview form (existing forms which can be used or modified include Michigan Gastrointestinal Illness Complaint Interview Form⁴ and MDCH Chemical Event Epidemiologic Data Collection Form⁵) and corresponding data management system (preferably in Excel, Access, or Epi Info).
 - If not already done during initial evaluation, identify type(s) of patient specimens for lab testing, in consultation with the laboratory (see Section 3 or Appendix 1) or PCC.

⁴ Michigan Gastrointestinal Illness Complaint Interview Form:
http://www.mi.gov/documents/emergingdiseases/GIcomplaintform_205163_7.doc

⁵ MDCH Chemical Event Epidemiologic Data Collection Form:
http://www.michigan.gov/michiganprepares/0,1607,7-232-42878_42887_42981-151321--,00.html

- Establish and implement procedures to obtain, ship, and analyze specimens at appropriate lab (see Section 3).
 - Utilize chain of custody (form provided in Appendix 3) throughout the collection and shipping process.
- Determine study design, case control or cohort, and method of statistical analysis.
 - See the *Foodborne Illness Response Strategy for Michigan (F.I.R.St.)* (MDCH and MDA, 2001), *Procedures to Investigate Foodborne Illness* (International Association for Food Protection, 1999), and *Procedures to Investigate Waterborne Illness* (International Association for Food Protection, 2002).
- Complete case interviews
 - Request permission to review medical records. (Note: public health does not need written patient consent to obtain and review medical records when conducting public health surveillance.)
 - Coordinate additional specimen collection as needed.
 - Conduct data entry as interviews are completed.
- Request/review medical records from provider or hospital, including laboratory results, and have them reviewed by the physician assigned to the investigation. Identify and/or verify diagnoses and any alternate/differential diagnoses.
- Enter and analyze data in collaboration with environmental assessment information.

3. Environmental investigation:

3.1. Immediate activities:

- Take needed, additional actions to prevent additional cases and/or reduce exposure (e.g., sequester food, issue drinking water advisory, product recall, evacuation) based on initial hypothesis.

3.2. Develop an investigation plan, including site assessment and sampling procedures.

- If the suspect agent is foodborne, follow the procedures described in Module 3 of the F.I.R.St. manual, focusing on non-infectious sources of contamination (MDCH and MDA, 2001).
 - Collecting samples of food actually eaten by ill individuals for laboratory analysis is critical.
- If the suspect agent is waterborne, follow the *Procedures to Investigate Waterborne Illness* (International Association for Food Protection, 2002).

- If there is uncertainty about the source of the contaminant, conduct a broad site evaluation, including air handling and quality, food preparation, food storage, and storage of hazardous substances (e.g., cleaning products, medicinals).
- Identify who will go to the suspect site(s), if the event is associated with one or more specific buildings or geographic sites. The lead epidemiologist and other collaborating agencies may want to be part of this group.
 - Identify potential hazards to investigators and ensure that investigators have appropriate personal protective equipment. If needed, contact Hazmat operators to investigate and collect samples
- Review available illness cluster information.
- Review available facility/site information, including construction history, previously reported contamination problems, inspection history regarding the suspect media (food, air, water, soil), and previously conducted environmental sampling.
- Review scientific literature on suspected agent(s) including: sources, physical and chemical characteristics, and toxic effects.
- Identify appropriate environmental samples and sampling methods for lab testing (See Section 3).
- Establish procedures with the state laboratory that will be doing sample analysis or obtain guidance from state laboratory to identify an outside contractor for sampling.

3.3. Implement investigation plan

- Meet with the facility/site representative, concerned public or other responsible/concerned party to explain purpose and scope of investigation.
- Gather information from documents at the site (e.g., invoices, inventories of chemicals/products, employee illness/injury logs, Material Safety Data Sheets, rosters of attendees/employees/visitors others potentially exposed, maps).
- Conduct an environmental health inspection of the site/facility.
 - Walk around the site observing operations, ventilation systems, unusual odors/colors etc., based on initial hypothesis.
 - Collect environmental samples or ensure contractor access to collect samples. Ensure that chain of custody is maintained (see Appendix 3), assuming that there may be legal action.
 - Conduct closing conference with facility/site representative or other responsible parties to share initial impression and request implementation of any interim control measures until final investigation results are available.

3.4. Prepare environmental assessment report. A preliminary report may be necessary if laboratory results are not expected immediately.

- ❑ Construct diagrams and visual summaries (e.g., floor plans, topographical maps, process-flow charts)
- ❑ Review and interpret laboratory findings.
- ❑ Share findings and recommendations with investigation team before releasing final report to ensure uniformity and consistency with epidemiologic findings and laboratory results.

C. Closing the Investigation

1. Ensure that actions are in place to control and prevent additional illness.
2. Notify involved parties of investigation results, recommendations, and closure.
3. Issue press release and other public communications as appropriate.
4. Issue final report including: investigation summary, final case definition, EPI and EH data summaries (to be completed by local health department), conclusions, and recommendations.
5. Report to federal agencies as appropriate using agency forms.
 - ❑ Foodborne outbreak – CDC Form 52.13 *Investigation of a Foodborne Outbreak*⁶
 - ❑ Waterborne outbreak – CDC Form 52.12 *Waterborne Diseases Outbreak Report*⁷
6. Notify labs to discard specimens.
7. Convene all involved parties to conduct an After-Action review of the incident and response.
8. Revisit the site as necessary to ensure that control and preventive actions are in place and effective.

⁶ Centers for Disease Control and Prevention. Investigation of a Foodborne Outbreak: http://www.cdc.gov/foodborneoutbreaks/documents/ob_Form5213.pdf

⁷ Centers for Disease Control and Prevention. Investigation of a Waterborne Outbreak: http://www.cdc.gov/healthyswimming/downloads/cdc_5212_waterborne.pdf

Section 3: Laboratory Resources

Laboratory confirmation of a suspected contaminant in a human specimen and/or environmental sample is a critical component to confirming an exposure hypothesis and successfully mitigating the hazard. The type of testing to be conducted for any event will be specific to the suspected contaminant and the type of sample to be analyzed. It is not possible to discuss in detail all of the testing options available at local, state, private, and federal labs. MDCH and/or the medical toxicologists from the Poison Center will assist with determining what samples and tests will be necessary to identify suspected contaminants. If the state laboratories are unable to provide needed tests, they will provide information for other laboratories (private or federal) where services can be obtained.

1. Summary of State Laboratory Capabilities and Procedures:

- MDCH: Bureau of Laboratories
 - Tests for infectious agents and select chemical agents⁸ in human specimens.
 - Tests for a small number of chemicals in environmental samples.
- MDEQ: Drinking Water Laboratory and Environmental Laboratory
 - Drinking Water Laboratory analyzes drinking, pool, beach, and spa water for bacteriologic and chemical contamination.
 - Environmental Laboratory analyzes soil, water, air, oil, hazardous waste, sewage, and other matrices for organic and inorganic analytes.
- MDA: Geagley Laboratory
 - Analyzes food products and beverages for drug residues, pathogens, pesticide residues, and toxic substances.
- MIOSHA: Occupational Health Laboratory
 - Accredited for the analysis of industrial hygiene samples including indoor air quality and bulk and airborne asbestos samples.

2. For information about capacities in state laboratories, including lists of analytes, forms, lab submission and specimen collection procedures for state laboratories see Appendix 1, Chemical Illness Laboratory Quick Reference Guide.

⁸ Laboratory tests for terrorism-related agents require special handling. MDCH Laboratory Services: http://www.michigan.gov/michiganprepares/0,1607,7-232-42878_42887_42983---,00.html

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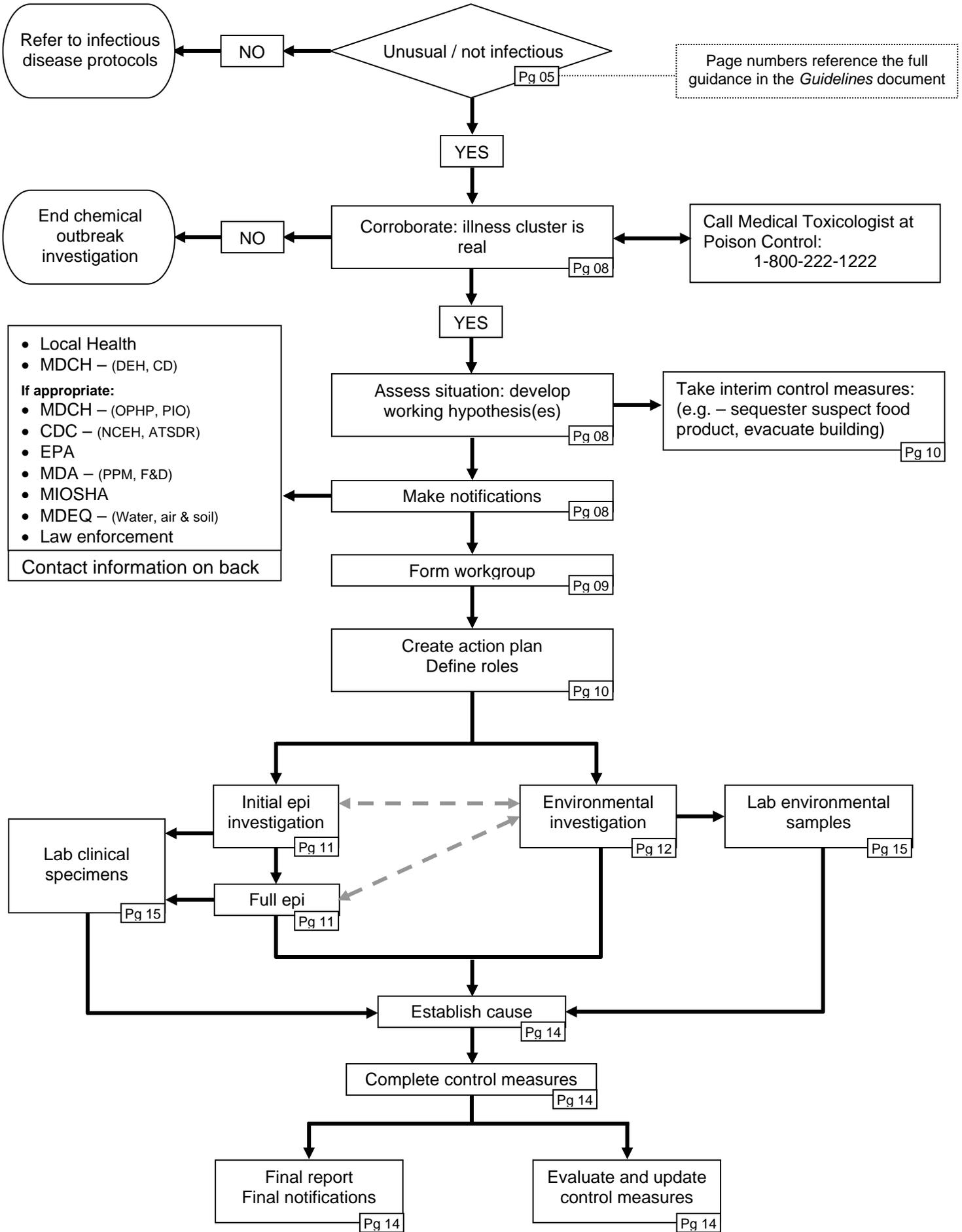
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State Agency Contacts

Michigan Department of Community Health (MDCH) Office of Public Health Preparedness (OPHP) Division of Communicable Disease (CD) Division of Environmental Health (DEH)	After Hours: 517-335-9030 Business Hours: 517-335-8150 Business Hours: 517-335-8165 Business Hours: 800-648-6942 517-335-8350
Bureau of Laboratories	Business Hours: 517-335-8063
Michigan State Police (MSP) Emergency Management and Homeland Security Division	Emergency (24/7): 517-366-6604 Business Hours: 517-332-2521
Michigan Department of Agriculture (MDA) Emergency Management Program Food and Dairy Division Geagley Laboratory	General Information: 800-292-3939 Emergency (24/7): 517-373-0440 Business Hours: 517-373-1104 Business Hours: 517-373-1060 Business Hours: 517-337-5040
Michigan Department of Environmental Quality (MDEQ) Environmental Assistance Center Environmental Emergency Contacts/ Michigan Pollution Emergency Alerting System Laboratory Services	General Information: 800-662-9278 In Michigan (24/7): 800-292-4706 Outside MI (24/7): 517-373-7660 Business Hours: 517-335-9800
Michigan Department of Labor & Economic Growth Michigan Occupational Safety and Health Administration (MIOSHA) Occupational Health Laboratory	Business Hours: 517-322-1814 Business Hours: 517-322-3094
Poison Control Centers Children's Hospital Regional Poison Control Center DeVos Children's Hospital Regional Poison Center	Emergency (24/7): 800-222-1222

Federal Contacts

National Response Center (NRC)	Emergency (24/7): 800-424-8802
Department of Agriculture (USDA) Office of Food Defense & Emergency Response	Emergency (24/7): 866-395-9701 Business Hours: 202-720-5643
Department of Energy (DOE) Office of Emergency Response	Business Hours: 630-252-2761
Centers for Disease Control and Prevention (CDC) Main number for state health departments: Agency for Toxic Substances and Disease Registry (ATSDR)	Business Hours: 404-639-3311 24/7: 770-488-7100 Emergency (24/7): 404-498-0120
Department of Justice Federal Bureau of Investigations (FBI)	Detroit Field Office: 586-412-4844
Environmental Protection Agency (EPA) Region 5	Emergency (24/7): 312-353-2318 Business Hours: 312-353-2000
Chemical Transportation Emergency Center (CHEMTREC)	Emergency (24/7): 800-424-9300

<p style="text-align: center;">Clinical Specimens MDCH Lab</p> <p>Chemistry and Toxicology Main Line: 517/335-9490</p> <p>Specimens: blood, urine, and environmental wipes (limited)</p> <p>Analyses: blood - organochlorine pesticides, PCB, PBB, PBDE, Lead, Hg and other metals (if specified), cyanide; urine – Hg and other metals, nerve agent metabolites, sulfur and nitrogen mustard metabolites, ricinine; environmental – lead</p> <p>http://www.michigan.gov/mdchlab</p>	<p style="text-align: center;">Environmental Samples MDEQ Lab</p> <p>Environmental Lab Main Line: 517/335-9800</p> <p>Samples: water, sediment/soil, oil, waste water, and air</p> <p>Analyses: volatile organics, PCB, semivolatile organics base/neutral/acids, BTEX/MTBE/TMB volatiles, pesticides and chlorinated hydrocarbons, polynuclear aromatic hydrocarbons, semivolatile organics base/neutral, phenols, non-metals, metals, aldehydes (not all analyses are available for all specimen types)</p> <p>http://www.michigan.gov/deq/0,1607,7-135-3307_4131---,00.html</p>	
<p style="text-align: center;">Food and Beverage Samples MDA Lab</p> <p>Geagley Laboratory Main Line: 517/337-5040</p> <p>Samples: food, dairy, feed, fertilizer, crop plants, water, soil, seed, fuel, animal blood and urine, alcoholic beverages, and others</p> <p>Analyses: microbiological in food and dairy, food and dairy chemistry, unknown chemical substance identification, meat species ID, chemical toxins, pesticide residue, plant pathogen testing, adulterations of feed, food and other commodities, metals, mycotoxins and more.</p> <p>http://www.michigan.gov/mda/0,1607,7-125-1572_2875_31950---,00.html</p>	<p>Chemical Illness Laboratory Quick Reference Guide</p> <p>For additional specimen collection and submission guidelines please refer to the appropriate lab or to Section 3 (page 15) of the Chemical Illness Guidance Document.</p>	<p style="text-align: center;">Industrial Hygiene Sampling MIOSHA Lab</p> <p>Occupational Health Laboratory Main Line: 517/322-3094</p> <p>Sample media: air, and surfaces (environmental wipe samples)</p> <p>Analyses: volatile compounds, organic analysis, isocyanates, formaldehyde, inorganic and organic cation, silica, quartz, cristobalite, tridymite, hexavalent chromium, hydrogen peroxides, inorganics, cyanide, fluorides, asbestos, carbon black, coal tar pitch, volatiles, nuisance dust, oil mists, wood dusts, and metals</p> <p>http://michigan.gov/cis/0,1607,7-154-11407_40217--,00.html</p>
<p style="text-align: center;">Other Specimens/Samples/Tests Private and Federal Labs</p> <p>Specimens and Samples: Private labs are available to test all types of samples excluding those related to WMD or terrorism events/agents.</p> <p>Analyses: The type of analysis required will dictate which lab would need to be contacted. If the appropriate state lab is unable to provide the necessary testing it will provide information or coordinate testing with an appropriate private or federal laboratory.</p>		

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State of Michigan Agency Emergency Contacts

Prepared by the Michigan Department of Community Health: Chemical Terrorism and Emergencies Preparedness Section

This list provides contact information for key state agencies involved in a chemical emergency.

Agency	Program	Program Function	More Information
Michigan Department of Community Health (MDCH)	Office of Public Health Preparedness (OPHP)	OPHP is charged with protecting the health of Michigan citizens against chemical, biological and radiological threats. OPHP focuses on minimizing the threat to health from terrorist acts, accidents and other incidents; provides oversight of the State Health Operations Center to coordinate public health response to an incident; collaborates with public health, medical, and other health care professionals to provide technical assistance; provides oversight of the Strategic National Stockpile.	<p style="text-align: center;">Business Hours: 517-335-8150 After Hours: 517-335-9030</p> <p style="text-align: center;">http://www.michigan.gov/ophp</p>
	Division of Communicable Disease	The Communicable Disease Division collects and analyzes data on communicable diseases and provides support and consultation to local health departments and other health care professionals. The Division also develops programs and strategies to control communicable diseases rates in Michigan, engages in special studies related to the control of communicable diseases, and acts as the liaison with CDC on issues related to communicable diseases.	<p style="text-align: center;">Business Hours: 517-335-8165 After Hours: 517-335-9030</p> <p style="text-align: center;">http://www.michigan.gov/mdch/0,1607,7-132--12219--,00.html</p>

MDCH, cont.	Division of Environmental Health	<p>The Division of Environmental Health is the lead unit in MDCH for response to chemical events. DEH staff provide professional consultation to individuals, local health departments, and organizations that have concerns about the health effects of exposures to toxic substances. DEH also partners with universities and other governmental organizations in related research and service activities. The Division is comprised of four organizational units: the Toxicology and Response Section, the Chemical Terrorism and Emergencies Preparedness Section, the Epidemiology and Surveillance Section, and the Healthy Homes Section.</p>	<p>Business Hours: 1-800-648-6942 After Hours: 517-335-9030</p> <p>http://www.michigan.gov/mdch-toxics</p>
	Division of Immunizations	<p>The Division of Immunization coordinates programs to promote high immunization levels for children and adults; provide vaccines through a network of public and private healthcare providers; facilitate the development, use, and maintenance of immunization information systems; support disease surveillance and outbreak control activities; provide educational services and technical consultation for public and private health care providers; promote the development of private and public partnerships to improve immunization levels across the state; and to promote provider and consumer awareness of immunization issues.</p>	<p>Business Hours: 517-335-8159 After Hours: 517-335-9030</p> <p>http://www.michigan.gov/mdch/0,1607,7-132-2942_4911_4914---.00.html</p>

MDCH, cont.	Bureau of Laboratories	The MDCH Bureau of Laboratories provides diagnostic and analytical services to support public health initiatives related to the surveillance and control of communicable diseases and supports activities related to environmental concerns. The Bureau provides training and educational opportunities for laboratorians to support state, national and international public health policies. This mission is accomplished through a public health laboratory system that is comprised of a central public health laboratory with regional county and city public health laboratories.	<p>Business Hours: 517-335-8063 After Hours: 517-335-9030</p> <p>http://www.michigan.gov/mdchlab</p>
Michigan State Police (MSP)	Emergency Management and Homeland Security Division	EMHSD oversees programs for homeland security, training, hazard mitigation, emergency planning, emergency and disaster exercising, and public information. The Division is responsible for responding to all emergencies that exceed local capacity. The Division is also responsible for the development and continuous update of the Michigan Emergency Management Plan, which details emergency and disaster response policy, and operating procedures for state agencies for all types of disasters.	<p>Business Hours: 517-332-2521</p> <p>Emergency Number (24/7) 517-336-6604</p> <p>http://www.michigan.gov/msp/1,1607,7-123-1593_3507---,00.html</p>

Michigan Department of Agriculture (MDA)	Emergency Management	MDA works to protect, promote and preserve the food, agricultural, environmental and economic interests of the people of Michigan. MDA also responds to reportable animal disease outbreaks, chemical contamination, accidental nuclear contamination/leaks, or any other emergency potentially affecting the food supply.	<p>General Information for MDA Business Hours: 517-373-1104 800-292-3939</p> <p>Emergency Number (24/7) 517-373-0440</p> <p>www.michigan.gov/mda</p>
	Food and Dairy Division	The Food and Dairy Division (FDD) protects public health by ensuring a safe and wholesome food supply, while working to maintain a viable food and dairy industry. Food safety is the division's top priority.	<p>Business Hours: 517-373-1060</p> <p>http://michigan.gov/mda/0,1607,7-125-1572_2875_31948---,00.html</p>
	Geagley Laboratory	The Laboratory analyzes food products and beverages for drug residues, pathogens, pesticide residues, and toxic substances	<p>Business Hours: 517-337-5040</p> <p>http://www.michigan.gov/mda/0,1607,7-125-1572_2875_31950---,00.html</p>
Michigan Dept. of Environmental Quality (MDEQ)	Michigan Pollution Emergency Alerting System (PEAS)	The PEAS hotline should be used to report environmental pollution emergencies such as tanker accidents, pipeline breaks, and releases of reportable quantities of hazardous substances as required.	<p>Emergency Number From within MI (24/7): 1-800-292-4706 From outside MI (24/7): 517-373-7660</p> <p>http://www.michigan.gov/deq/0,1607,7-135-9936--,00.html</p>

MDEQ, cont.	Environmental Emergency Contacts	MDEQ supports the appropriate participation of its employees in emergency response activities for the purpose of protecting public health and the environment. In general, MDEQ employees do not serve as “first responder” personnel. Rather, MDEQ staff serve as technical consultants and coordinate their activity with an on-scene incident commander. Staff may serve as technical consultants either on or offsite. MDEQ staff may also employ an environmental response contractor to perform certain emergency response functions.	<p>MDEQ Environmental Assistance Center 1-800-662-9278</p> <p>During daytime hours, contact the appropriate district office, http://www.michigan.gov/deq/0,1607,7-135-3306_3329-12306--,00.html</p>
	Laboratory Services (for drinking water and environmental samples)	<p>Laboratory services are provided for a variety of environmental programs throughout the state, including drinking water, bathing beaches, public swimming pools, air quality, hazardous waste management, land and water management, geological survey, law, and many others.</p> <p>The Environmental Laboratory analyzes soil, water, air, oil, hazardous waste, sewage, and other matrices for organic and inorganic analytes.</p> <p>The Drinking Water Analysis Laboratory analyzes drinking, pool, beach, and spa water for bacteriologic and chemical contamination.</p>	<p>After hours emergencies, call the PEAS hotline:</p> <p>From within MI: 1-800-292-4706 From outside MI: 517-373-7660</p> <p>Business Hours: 517-335-9800 http://www.michigan.gov/deq/0,1607,7-135-3307_4131_4154---,00.html</p> <p>Business Hours: 517-335-8184 http://www.michigan.gov/deq/0,1607,7-135-3307_4131_4155---,00.html</p>

Michigan Dept of Labor & Economic Growth (DLEG)	Michigan Occupational Safety and Health Administration (MIOSHA)	The mission of MIOSHA is to help assure the safety and health of workers. MIOSHA helps develop standards, keep statistics on workplace accidents and injuries, provides consultations and training, conducts investigations and enforces existing workplace safety regulations. MIOSHA also offers a "Workplace Security Guide," which includes sections on chemical terrorism.	<p>Business Hours: 517-322-1814</p> <p>Fatality or Catastrophe Hotline for reporting worksite deaths or catastrophes 1-800-858-0397</p> <p>http://www.michigan.gov/miosha</p>
	Occupational Health Laboratory	The OHL provides validated sampling methods, sampling media, and analytical services to the Michigan Occupational Safety and Health Administration and other State of Michigan agencies including the departments of Environmental Quality, Community Health, Natural Resources, Agriculture, and State Police. Validated analyses include industrial hygiene samples, indoor air quality, and bulk and airborne asbestos samples.	<p>Business Hours: 517-322-3094</p> <p>http://www.michigan.gov/cis/0,1607,7-154-11407_40217-147508--,00.html</p>
Poison Control Centers	Children's Hospital Regional Poison Control Center (Detroit)	Part of Detroit Medical Center, Children's Hospital of Michigan houses one of two regional poison control centers in the state and covers the Southeastern part of Michigan. The PCCs provides immediate advice on possible poisoning, toxic substance or any other environmental hazard for human and animal exposures. http://www.chmkids.org/?id=747&sid=1	<p>Poison emergencies (24/7): 1-800-222-1222</p> <p>Callers are automatically directed to the local Poison Control Center</p>
	DeVos Children's Hospital Regional Poison Center (Grand Rapids)	DeVos Children's Hospital poison center provides regional coverage for the rest of Michigan. http://devoschildrens.org/?s=1&hospID=36D00930453745378A180CE81B08FB00&nid=AE9B23640ADB4179B38518FC473435F7	

Federal Agency Emergency Agency Contacts

Prepared by the Michigan Department of Community Health: Chemical Terrorism and Emergencies Preparedness Section

This list provides contact information for key federal agencies involved in a chemical emergency.

Agency	Program	Program Function	Contact Information
National Response Center (NRC)	Interagency program maintained by the Coast Guard	Sole federal contact to report oil and chemical spills 24/7. The Center coordinates 16 federal agencies to bring in federal support as appropriate/needed.	<p style="text-align: center;">Emergency Number (24/7):</p> <p style="text-align: center;">800-424-8802 or 202-267-2675</p> <p style="text-align: center;">http://www.nrc.uscg.mil/nrchp.html</p>
Department of Agriculture (USDA)	Office of Food Defense & Emergency Response	Office of Food Defense and Emergency Response (OFDER) develops and coordinates all FSIS activities to prevent, prepare for, respond to, and recover from non-routine emergencies resulting from intentional and non-intentional contamination affecting meat, poultry, and egg products. OFDER serves as the agency's central office for homeland security issues and ensures coordination of its activities with the USDA Homeland Security Office, the Department of Homeland Security (DHS), the Food and Drug Administration (FDA), and other Federal and State government agencies with food-related responsibilities, and industry.	<p style="text-align: center;">Business Hours: 202-720-5643</p> <p style="text-align: center;">Emergency Number (24/7) 866-395-9701</p> <p style="text-align: center;">http://www.fsis.usda.gov/About FSIS/OFDER/index.asp</p>

Department of Energy (DoE)	Office of Emergency Response	The Office of Emergency Response (Environmental Management Program) implements the Transportation Emergency Preparedness Program (TEPP) to address preparedness issues for non-classified/non-weapons radioactive material shipments.	<p>Business Hours: 630-252-2761</p> <p>Michigan State Police (24/7) 517-336-6100</p> <p>http://www.em.doe.gov/Transportation/TEPP_Home.aspx</p>
Centers for Disease Control and Prevention (CDC)	Main portal for entry into CDC by state health departments - 24/7; goes directly into the CDC Emergency Operations Center	Working with states and other partners, CDC provides a system of health surveillance to monitor and prevent disease outbreaks (including bioterrorism), implement disease prevention strategies, and maintain national health statistics.	<p>Business Hours: 404-639-3311</p> <p>Emergency Number (24/7): 770-488-7100</p> <p>or if no answer: 800-232-0124</p> <p>http://www.cdc.gov/</p>
	Agency for Toxic Substances and Disease Registry (ATSDR)	ATSDR Emergency Response Teams are available 24 hours a day, and are comprised of toxicologists, physicians, and other scientists available to assist during an emergency that involves a release of hazardous substances into the environment.	<p>Use CDC main numbers noted above</p> <p>http://www.atsdr.cdc.gov</p>

CDC, cont.	National Center for Environmental Health (NCEH)	NCEH conducts research in the laboratory and in the field to investigate the effects of the environment on health. Tracks and evaluates environment-related health problems through surveillance systems. Also helps domestic and international agencies and organizations prepare for and respond to natural, technologic, humanitarian, and terrorism-related environmental emergencies.	<p>Use CDC main numbers noted above</p> <p>http://www.cdc.gov/nceh/information/about.htm</p>
Department of Justice (DoJ)	Federal Bureau of Investigations (FBI)	The FBI partners with law enforcement, intelligence, military, and diplomatic circles to enforce the criminal laws in the U.S. and to neutralize terrorist cells and operatives in the U.S. and worldwide.	<p>Mark Davidson, Michigan WMD Coordinator Available 24/7</p> <p>Office: 586-412-4844 Pager: 586-974-1637</p>
Environmental Protection Agency (EPA)	Region 5	The U.S. EPA's Emergency Response Program coordinates and implements a wide range of activities to ensure that adequate and timely response measures are taken in communities affected by hazardous substances and oil releases where state and local first responder capabilities have been exceeded or where additional support is needed. EPA Region 5 covers MI, MN, WI, IL, IN, OH.	<p>Business Hours: 312-353-2000 24/7: 312-353-2318</p> <p>Duty officer will call Grosse Isle office if needed.</p> <p>Jason El Zein, Chief Emergency Response Section, Grosse Isle office, Business Hours: 734-692-7661</p> <p>http://www.epa.gov/R5Super/eerb.html</p>

CHEMTREC	Chemical Transportation Emergency Center	CHEMTREC, part of the American Chemical Council, maintains a 24/7 public service hotline for emergency responders to obtain information and assistance for emergency incidents involving chemicals and hazardous materials. CHEMTREC has physicians on call.	24/7: 800-424-9300 http://www.chemtrec.org/Chemtrec/
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Submitting Agency:	Phone:
	Fax:
Person Initiating Chain of Custody:	
Outbreak Name (if applicable):	

Sample Identification:

Collection Location:	
Item Number	Description of Sample (Container / Collection Method / Condition / Volume)

Additional room for miscellaneous comments on back of form

Transfer of Sample:

Date mm/dd/yyyy	Item Number(s)	Sample Released by	Sample Received by	Reason for Transfer
		Signature	Signature	
		Name (printed)	Name (printed)	
		Signature	Signature	
		Name (printed)	Name (printed)	
		Signature	Signature	
		Name (printed)	Name (printed)	
		Signature	Signature	
		Name (printed)	Name (printed)	
		Signature	Signature	
		Name (printed)	Name (printed)	
		Signature	Signature	
		Name (printed)	Name (printed)	

Sample Chain of Custody Form

Chain of Custody Instructions

The Chain of Custody form is initiated by the person collecting the sample. The purpose is to have a record of everyone who had access to the sample at any time; an unbroken chain of names from collection to final disposal. Each agency handling the sample must maintain their own portion of the chain.

Submitter Information

- ✓ Filled out by collecting person or agency

Sample Identification

- ✓ Filled out by collecting person or agency
- ✓ May use same form for more than one sample
- ✓ Number the items 1, 2, 3 etc., corresponding to the total number of samples
- ✓ Describe the sample briefly. Include: condition of sample, the amount or volume collected, and container if applicable.
- ✓ Describe how the sample was collected and how much of the sample was collected.
- ✓ Provide as much **specific** information about the location where the sample(s) were collected as possible including: name of building, street address, room number or name, city, and other contact information if known.

Transfer Log

- ✓ Filled out by the collecting person or agency when the sample is handed over to another person. Each time the sample changes hands for **any** reason, it must also be transferred on paper from person to person.
- ✓ Must list which items are being transferred in the item number column. (This will most likely be ALL).
- ✓ Reason for transfer must be given (e.g., transport to lab, testing, etc.).
- ✓ If a sample is transferred externally to another agency (MDA, MDCH, MDEQ, etc.), it is important to make (or keep) a copy of this form to retain for your records. The original form (or top copy) must accompany the sample to the receiving agency.
- ✓ If a sample is destroyed or discarded, the person who destroys/discards the sample must sign the transfer log. If it is the same person who last signed the transfer log, make a final note under Reason for Transfer “Destroyed on Date __/__/____”.

Miscellaneous Comments
