OBJECTIVE

Alberta clinicians will have a systematic approach to addressing patient complaints and clinical presentations that may be associated with odors and emissions from oil and gas development and operation activity.

TARGET POPULATION

Everyone

EXCLUSIONS

Exposures occurring in occupational settings and/or the home environment

RECOMMENDATIONS

ASSESSMENT

See Algorithm in Appendix A.

- ✓ Actively listen and respect the concerns of the patient.

Table 1: Possible scenarios when the patient presents with complaints of an environmental exposure

Scenario	Assessment	Lab/Other Tests	Treatment
To the primary care physician's (PCP) knowledge, the Zone Medical Officer of Health (MOH) is not aware of, nor has informed the local physicians of any environmental exposure in the area.	✓ Determine if any relevant environmental emissions exposures have occurred by identifying any red flags. ✓ Contact the respective Zone MOH if any red flags are identified: http://www.albertahealthservices.ca/assets/info/hp/phys/if-hp-phys-clin-moh-contact-list.pdf. ✓ If the situation is more urgent, contact the MOH on-call: http://www.albertahealthservices.ca/assets/info/hp/phys/if-hp-phys-clin-moh-on-call-contact-information.pdf . ✓ Obtain consent from the patient and provide their information to the MOH (patient information required will be determined by the MOH at the time of the consult).	As requested by MOH.	Treat symptoms as per usual care or as directed by a toxicology expert* if/ when involved.

Scenario	Assessment	Lab/Other Tests	Treatment
The PCP recalls a notice from the Zone MOH informing of an environmental exposure risk in the area.	✓ Review MOH *Communication to Physicians* notifications at: http://www.albertahealthservices.ca/medstaff/Page7082.aspx ✓ Contact the Zone MOH if the patient presents with one or more red flags.	As above	As above
For all scenarios	✓ Consider contacting a toxicology expert for further assessment guidance. Options: ✓ Contact Poison and Drug Information Services (PADIS) http://www.albertahealthservices.ca/assets/healthinfo/Padis/hi-padis-med-tox-clinic-intro-letter.pdf ✓ Alternatively, for discussion and/or patient referral see list of Toxicology Experts in Alberta. ✓ Arrange for patient to complete any detailed assessment or questionnaire requested by PADIS or other toxicology expert and forward the required and any other relevant information. ✓ Contact the respective Zone MOH to discuss, if the patient presents with red flags (suggesting a recent environmental exposure) see Zone MOH contact list at: http://www.albertahealthservices.ca/assets/info/hp/phys/if-hp-phys-clin-moh-contact-list.pdf.	As requested by specialist.	Treat symptoms as per usual care or per toxicology expert* advice.
*Toxicology expert is a physician in Alberta with expertise in medical toxicology or environmental exposures and has agreed to assist primary care physicians in the clinical management of their patients (see Appendix B for names and details).			

Table 2: Environmental Red Flags

Environmental Red Flags Checklist
The patient presents with any of the following: ✓ New/unusual odors detected outside and/or coming into their living space. ✓ Symptoms that improve when leaving/not in their neighborhood/community. ✓ Symptoms that return and/or get worse when returning to the neighborhood/community. ✓ The complaint is due to recent heavy oil and gas operators practice changes in the area. ✓ The patient has already contacted the Alberta Energy Regulator/Alberta Environmental health Hotline, Health Link or PADIS, and was told to visit their family physician. ✓ The complaint IS NOT related to an occupational exposure or an exposure source within the interior home/personal living space.

Investigations for Environmental Toxins (all scenarios)

✓ Do inform the patient that, in most cases, there are no evidence-based test(s) to directly link symptoms to an environmental exposure.

✓ Do explain the limited value and/or possible trustworthiness of lab results associated with lab tests and other tests carried out in other countries and/or unaccredited facilities.

✓ Discourage patient from seeking lab tests from other alternative health providers and/or from unaccredited and/or non-Canadian laboratories (see Table 3).

Table 3: Quality Control Issues with Lab Tests from Unaccredited Facilities

Scenarios
Test results may be or are: • Inaccurate – wrong result is given. • Imprecise – result is too high or too low. • Not repeatable – different results for the same sample every time. • Insensitive – high number of false positive results. • Nonspecific – high number of false negative results.

X DO NOT use lab tests or other tests presented by the patient to diagnose the patient. This includes tests performed in another country and/or an unaccredited laboratory and/or ordered by a non-physician.

DIAGNOSIS

(All scenarios)

- ✓ A definitive diagnosis attributable to exposure is not likely possible in the short term and even in the long term.

MANAGEMENT

(All scenarios)

- ✓ Consider providing links to credible sources of information regarding Alberta oil and gas activity if the patient requests such information and/or if relevant to the discussion with the patient.
  - Credible public sources include (see Table 4 in Background for details):
    - FracFocus at: www.fracfocus.ca
    - U.S. Environmental Protection Agency (EPA) Human Health Risk: https://www.epa.gov/risk
    - Alberta Environmental Health: http://www.health.alberta.ca/newsroom/pub-environmental-health.html
- ✓ Ensure patients:
  - Understand roles and responsibilities of health care providers involved in their care including:
    - Primary care physicians (PCPs)/medical specialists address health-related symptoms, rule out other medical causes of symptoms, treat and manage the overall health of the patient, and refer to a specialist when appropriate.
    - PCPs/medical specialists are not able to, nor responsible for directly investigating/addressing the cause of the environmental contamination complaints with industry or government.
    - PCPs/medical specialists communicate environmental exposure complaints to the local MOH.
    - MOHs investigate and provide direction regarding environmental health issues by discussing with PCPs/medical specialists, and Alberta Health.
  - Understand that the Alberta Energy Regulator at: http://aer.ca is the primary source of information and the appropriate contact for any public concerns related to oil and gas activity in Alberta
  - Are encouraged to make their own decisions regarding actions to address environmental exposures in their community
  - Share with patient and discuss the environmental exposure system pathway to explain the different roles and responsibilities. (See Appendix C: Health System Wide Pathway of Roles and Responsibilities.)

Follow-up (all scenarios)

- X DO NOT argue with patient or contest perceived causation of symptoms/complaints.
- ✓ Actively listen, empathize and be honest about the limitations of knowledge in this area of medicine. This can be very helpful for the patient when there are no definitive answers for their questions and concerns.
- ✓ Ensure the patient has adequate follow-up for symptom management and ask if they are satisfied with actions taken even if there is no resolution to the environmental exposure complaint at the present time.
- ✓ Keep the patient informed on any reports from the investigation within a reasonable time frame (e.g., within six months) regarding any actions underway, ongoing investigations or even if findings are inconclusive.

Additional Considerations

Pregnancy

- ✓ Contact a specialist with expertise in reproductive and developmental health related to environmental exposures, to address the symptom management and care of these patients. (See Appendix B: Toxicology Experts – Contacts in Alberta.)

Children

- ✓ Contact a specialist with expertise in pediatric environmental exposures to address the symptom management and care of these patients. (See Appendix B: Toxicology Experts – Contacts in Alberta).

Background

Preamble:

This clinical practice guideline responds to the Alberta Energy Regulator (AER) Recommendations following the Three Creeks Inquiry in 2013. The Three Creeks Inquiry was held to address the concerns of residents in the Three Creeks and Reno areas regarding hydrocarbon emissions related to cold heavy oil production. In the report, the AER recommended: *Alberta Health ensure that appropriate avenues exist to link local physicians with specialists in environmental health to assist in diagnosing symptoms associated with odours and emissions from heavy oil operations and to enable physicians to provide appropriate treatment to residents. In addition, the suggested approach may be applicable for addressing other environmental exposure complaints.*

One of the major challenges addressing the AER recommendations is the paucity of evidence e.g., existing guidelines, systematic reviews and other high quality studies, to definitively diagnose symptoms and directly link symptom cause and effect to short and long term oil and gas activity exposure in local areas/communities.

While it may not be possible to recommend specific treatment or prevention for short and long term health effects from these environmental exposures, it is possible for primary care physicians to:

1. Manage any/all health symptoms regardless of the source of symptoms.
2. Receive advice and support from several environmental toxicology specialists in Alberta.
3. Approach these patients in the spirit of empathy, collaboration and partnership so they can feel supported and be empowered to make decisions about their living situation and what they need to do.

Evidence Limitations

The challenge with determining which specific toxic agents may present health risks to humans can be attributed to the challenges with the epidemiological study methodology itself. Namely, large study cohorts are required for sufficient power to determine adverse outcomes of a specific toxicant on human health.[1] Furthermore, such studies are limited by confounding factors e.g., age, other exposures during personal/recreational activities, general health, medication, smoking, alcohol, home environment and long lag time for many outcomes of concern e.g., cancers. As a result, human epidemiology studies are rare and if available likely have study design and recall bias limitations, and therefore are not very useful for assessing potential hazard a certain toxicant or exposure scenario. At this time many/most studies are typically extrapolations from animal data.[2]

Addressing Medically Unexplained Physical Symptoms (MUPS)

If a patient's physical symptoms cannot be medically explained despite a thorough medical evaluation, these symptoms are referred to as MUPS-medically unexplained physical symptoms.[3] Even though MUPS cannot be medically explained it is still important to address these symptoms as they are strongly and consistently linked with inability to function, psychosocial problems, and treatable anxiety and depressive disorders.[4,5,6]

Epidemiologic studies report MUPS commonly occur following events involving environmental exposures, particularly if they are noticeable and worrisome.[7] Individuals often search for causes and are convinced the MUPS are linked to such exposures despite the best scientific evidence to the contrary.

The reason for highlighting MUPS is to raise awareness of the potential for patient–provider disagreement, also referred to as "contested causation," that often ensues because of the enigmatic nature of MUPS. In the absence of findings on physical examination or clinical testing, providers may conclude that MUPS are less serious than when symptoms are associated with an identifiable disease.[7] In the patient-provider relationship, the provider may reject or even directly dispute the patient's beliefs regarding cause of these symptoms.[8] Furthermore, if providers consider MUPS a result of an underlying psychological problem, most patients would consider a psychological explanation disparaging.[7] Therefore, it is best to avoid "contested causation" as it can only adversely affect care in any medical setting and will just distract from the fundamental goal of improving the patient's quality of life.[7]

Assessing Environmental Health Risk from Environmental Exposures

The U.S. Environmental Protection Agency (EPA) describes a framework for assessing health risks. This framework is a good summation of the basic process and highlights the complexity and challenges involved. According to the EPA a human health risk assessment is meant to estimate the nature and probability of adverse health effects in humans who may be exposed to chemicals in contaminated environmental media, now or in the future. The process includes:

1. Hazard Identification
2. Dose-Response Assessment
3. Exposure Assessment
4. Risk Characterization [9]

A similar approach is described by the American College of Occupational and Environmental Medicine (ACOEM) in their guidance document aimed at physicians and occupational health professionals managing reproductive and developmental risks and uncertainties in the workplace.[2] While the guidance is specific to reproductive and developmental health risks associated with workplace exposures, the process for conducting the health risk assessment is common and can be applied to any environmental exposure, by any individual in any location. The ACOEM describes the necessary components and process for conducting a risk assessment.[2]

A Multidisciplinary Team

It is suggested that conducting an environmental health risk assessment ideally requires a multidisciplinary team of health professionals from several disciplines that may include but not limited to: occupational medical specialists, toxicologists, other relevant clinical specialists and exposure assessment specialists e.g., industrial hygienists, and other allied health professionals.

Chemical Specifications

The chemical specifications must be available for review plus any subset of agents identified that might pose hazards at some dose (unfortunately this information is not always available given the limitations in toxicology databases). In addition, there should be a regular review of any new scientific study information from toxicity studies to allow for timely updates of risk characterizations.

Detailed History Taking

The environmental exposure experts in Alberta who take patient referrals for environmental exposures will require detailed information about that patient therefore they will provide a questionnaire or consultation form to be completed prior to consulting with the patient. The environment expert may ask the referring physician to provide the information they obtained from the patient or they may have the patient complete the information prior to the patient consultation or some other process. Regardless, in all cases, background information is important and necessary.

According to Meyer et al 2016, the following medical/surgical, social/personal and exposure histories are important for the investigation of risks:

- A routine past medical and surgical history; family history; prescription and over-the-counter medication and supplement history, diet history and a thorough health history should be carried out.
- Pertinent social and personal history, such as alcohol use, smoking, exercise, hobbies, or use of other (recreational) drugs, personal care products, and cleaning agents that may also affect health outcomes should be documented, in addition to medical conditions, and medical history.
- A detailed exposure history of chemical, physical and biological agents (active and inert ingredients) to which the individual is potentially exposed in the home, at work, in the community.
- You may wish to use the mnemonic CH2OPD2 for taking an environmental exposure history – available in Table 1 from this article:[10] http://www.cmaj.ca/content/166/8/1049.full

THE PROCESS

Mayer et al, 2016 describes the various and typical evaluations conducted to investigate environmental hazard risks for reproductive and developmental health. This approach is also described on the United States Environmental Protection Agency (EPA) website.

HAZARD EVALUATION

A hazard evaluation of the agents to which an individual is exposed in a given location must be completed to identify which agents may pose risks. The industry in the area can assist by providing information on the chemicals used although the information may be incomplete given patent protection laws, and may vary in quality and detail reflecting the resources and capabilities of those providing the information. Often there is limited or no information regarding the potential toxicity of the chemicals used therefore industry information is not always useful and can't be relied on as a sole source of information for hazard evaluation.

EXPOSURE ASSESSMENT

Exposure assessment involves the extent of an individual's exposure to any chemicals identified as hazardous. This requires estimating the frequency, duration and route(s) of exposure; as well as the concentration or intensity obtained for each agent that may cause ill effects. Exposure control measures should be in place and any exposure monitoring or ambient exposure measurement results should be collected and reviewed. Industrial hygienists are often employed to conduct an evaluation of a local area.

RISK CHARACTERIZATION

Risk characterization involves collecting all the gathered data on toxicity and exposure to determine whether the individual's estimated levels of exposure to the chemicals, that have been identified as potential hazards, pose a health risk. The individual's estimated exposure levels should be compared with levels that have been demonstrated or strongly suspected to cause adverse effects in epidemiological studies or animal studies. When attempting to determine safe or unsafe levels of exposure to humans by extrapolating from the results of animal studies, a safety or uncertainty factor is generally applied to relevant dose levels observed in the animal studies, such as the NOAEL

(no observed adverse effect level) or LOAEL (lowest observed adverse effect level). If an individual is exposed to an agent above or near levels associated with adverse effects, then there is considered to be a significant risk. However, in reality most hazard identification and hazard exposure data is incomplete resulting in recommendations that must be based on this limited and/or non-available information.

RISK COMMUNICATION

This is considered a critical step in which the affected individual is provided with the information they need to make informed decisions about the health risks of their exposures. It is important that all questions are answered and the best available information is provided, including a candid discussion of the limitations of that information.

RISK MANAGEMENT

The final step in the evaluation is managing the risk. It requires that everyone be actively involved (community, health care providers, government and industry) working together in their respective roles and responsibilities, to decrease or eliminate any potential risks that were identified.

Although exposure reduction or elimination is the most desirable outcome, this may not be feasible or possible. As a result, the affected individuals may be required to make the difficult decision of removing him/herself/family from the area completely or continue to live in a situation that poses a potential health risk. Permanent removal from the area is likely the least desirable action so it is important that all other possible options are considered and any uncertainties that might still exist. The decision to move forward with an option should be based upon an assessment of potential risks and upon the characteristics of the population at risk.[2]

ENVIRONMENTAL HEALTH EDUCATION AND INFORMATION SOURCES FOR THE PUBLIC

When the public searches the internet on this topic they will have access to hundreds of websites (many from the U.S.) that offer copious reports, data analyses, presentations and other types of information that may be provided by legitimate or dubious sources. Information is provided by environmental scientists, lobbyists, activists, special interest individuals/groups as well as government or government- agency websites. While government-generated information is trustworthy and can educate the public, it should be noted that all websites have some degree of content bias so the information provided may be selective or limited, and the information available may be too complex and detailed for the lay person therefore requiring further interpretation by content experts.

The following websites are suggested resources for additional information:

Table 4: Reputable Websites for Patient Information

Website	Target Users	Why this website might be useful/limitations of the content
FracFocus www.fracfocus.ca	Public, legal, industry, government	• Includes enhanced reporting requirements for fluids used in hydraulic fracturing operations, a general description of fracking process, other related links,

		contact information, FAQs etc., • It is relatively easy to navigate and is primarily targeted at the public or layperson. • Although the user can locate the chemical (codes) and quantities emitted from a specific well site in Alberta, there is no information on the potential health effects of these various chemicals.
The Alberta Energy Regulator(AER) website *www.aer.ca*	Public, other stakeholders	• Provides oil and gas regulatory information, other technical information e.g. data and statistical reports, for industry, legal and other stakeholders. • It is probably the most useful website for Albertans providing and explaining the rules that govern the oil and gas industry as well as the contact information for reporting a concern. • There are promotional videos and other easy-to-understand videos. • The website also has a page of external links that include the websites provided in this table. There is also a link to the Alberta Environment and Parks Environmental Impact Assessment (EIA) webpage: http://esrd.alberta.ca/lands-forests/land-industrial/programs-and-services/environmental-assessment/default.aspx The AER is responsible for conducting all Environmental Impact Assessments (EIAs) since 2014.
U.S. Environmental Protection Agency (EPA) https://www.epa.gov	Public, professionals, technical specialists, other stakeholders	• There are many databases on this site and available in the public domain. • The EPA website is probably the most extensive comprehensive information resource available. • The content is somewhat overwhelming and the site is difficult to navigate for the layperson. • It may be hard to locate specific information and if information is located, it is very technical and requires interpretation. • The database results are likely too technical and complex for the layperson to interpret or understand but there is substantial general information for the public.
Alberta Environmental Health http://www.health.alberta.ca/newsroom/pub-environmental-health.html	Public	• Alberta Health communications regarding all environmental health issues past and present

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SUGGESTED CITATION

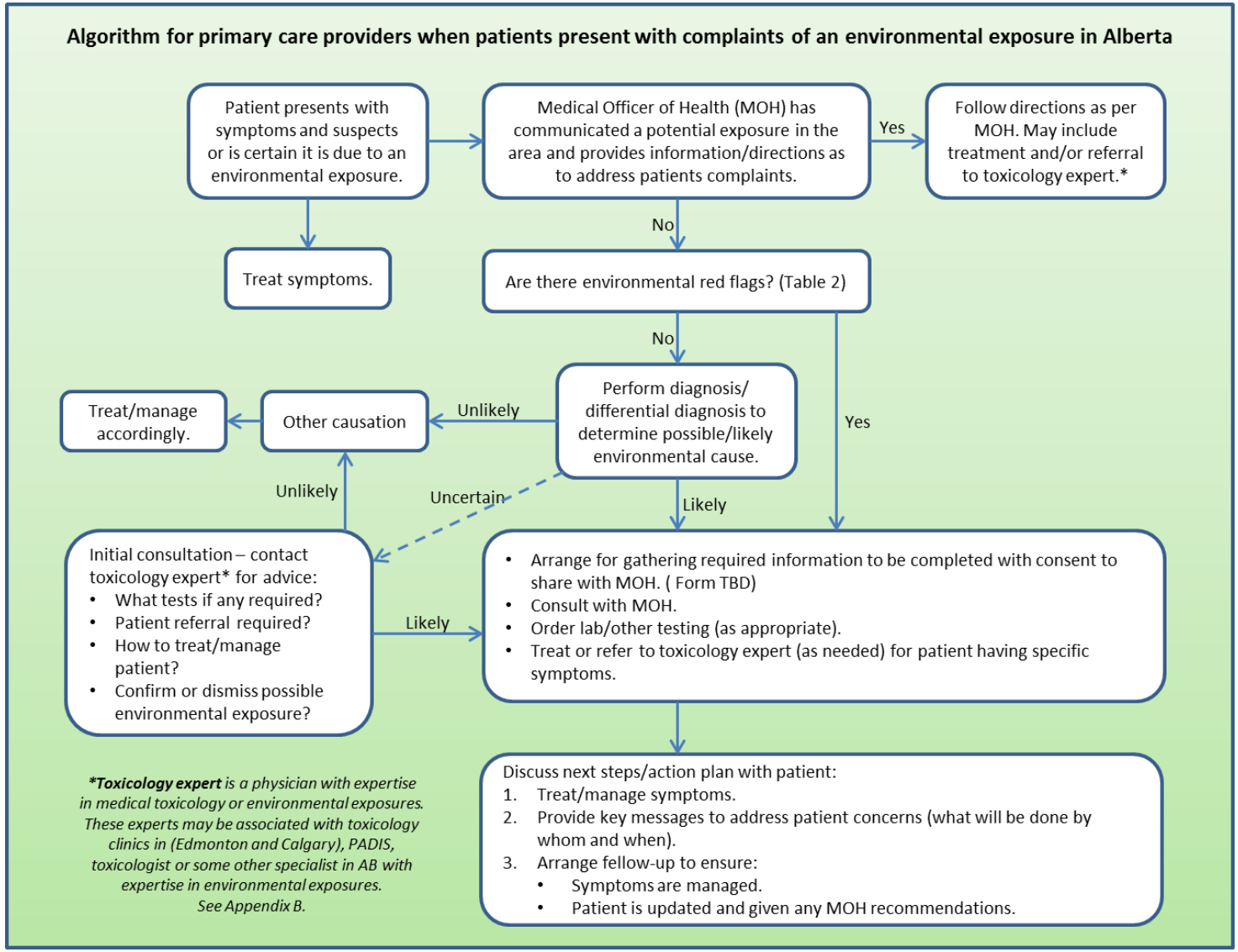
Toward Optimized Practice (TOP) Environmental Exposures from Oil and Gas Emissions CPG Committee 2016 Dec. Environmental exposures from oil and gas emissions clinical practice guideline. Edmonton, AB: Toward Optimized Practice. Available from: http://www.topalbertadoctors.org.

GUIDELINE COMMITTEE

The committee consisted of representatives of primary care, medical officers of health, toxicology, pediatrics and occupational medicine.

March 2017

APPENDIX A


Algorithm for primary care providers when patients present with complaints of an environmental exposure in Alberta
Patient presents with symptoms and suspects or is certain it is due to an environmental exposure.
Medical Officer of Health (MOH) has communicated a potential exposure in the area and provides information/directions as to address patients complaints.
Yes
Follow directions as per MOH. May include treatment and/or referral to toxicology expert.*
No
Treat symptoms.
Are there environmental red flags? (Table 2)
No
Yes
Perform diagnosis/ differential diagnosis to determine possible/likely environmental cause.
Unlikely
Other causation
Treat/manage accordingly.
Unlikely
Uncertain
Likely
Initial consultation – contact toxicology expert* for advice:
• What tests if any required?
• Patient referral required?
• How to treat/manage patient?
• Confirm or dismiss possible environmental exposure?
Likely
• Arrange for gathering required information to be completed with consent to share with MOH. (Form TBD)
• Consult with MOH.
• Order lab/other testing (as appropriate).
• Treat or refer to toxicology expert (as needed) for patient having specific symptoms.
Discuss next steps/action plan with patient:
1. Treat/manage symptoms.
2. Provide key messages to address patient concerns (what will be done by whom and when).
3. Arrange fellow-up to ensure:
• Symptoms are managed.
• Patient is updated and given any MOH recommendations.
*Toxicology expert is a physician with expertise in medical toxicology or environmental exposures. These experts may be associated with toxicology clinics in (Edmonton and Calgary), PADIS, toxicologist or some other specialist in AB with expertise in environmental exposures. See Appendix B.

APPENDIX B

LIST OF ENVIRONMENTAL EXPOSURE EXPERTS IN ALBERTA

Name	Area of Expertise	Contact Information
Irena Buka, MD, FRCPC Clinical Professor of Paediatrics, University of Alberta Director of Children's Environmental Health Clinic (ChEHC)	Child health as well as families, pregnant women	Child Health Clinic Mother Rosalie Health Services Centre 231-16930 87 Avenue NW Edmonton AB T5R 4H5 Tel: 780 735 9495 Fax: 780 735 2794 Email: ibuka@ualberta.ca or ChEHC@albertahealthservices.ca Website: www.ChEHC.ualberta.ca
Harold Hoffman, MD, FRCPC Occupational and Environmental Medicine Clinic	Adult occupational and environmental exposures	Meadowlark Place Professional Centre 410- 8708 155 St. Edmonton AB T5R 1W2 Tel: 780.439.9491 Fax: 780.439 9091 Email: Harold@DrHoffman.ca Administrative Assistant: oeclinic@ualberta.ca
Poison and Drug Information Service	Using state-of-the-art resources, the team at PADIS will extract, interpret and summarize the latest research to aid with patient specific, clinical situations.	Poison and Drug Information Service (open 24 hours): 1.800.332.1414, choose option 1
PADIS Medical Toxicology Clinic (Calgary)	PADIS has an outpatient medical toxicology clinic at the Rockyview General Hospital.	For more information including: Introductory letter, Referral form, and Section of Clinical Pharmacology and Toxicology Goals and Objectives see: http://www.albertahealthservices.ca/topics/Page11979.aspx

APPENDIX C

HEALTH SYSTEM WIDE PATHWAY OF ROLES AND RESPONSIBILITIES