



Memo

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To: Health care providers

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Topic: Chronic Airborne Benzene Exposure-Related Clinical Guidance and Follow-up

If there is concern about a patient's exposure to elevated levels of airborne benzene, then the clinician can conduct a thorough clinical assessment to assess the health risk and guide their clinical decision making. This memo is intended for clinicians who want to investigate any hematological malignancies associated with chronic airborne benzene exposure¹.

Chronic Benzene Exposure

- A Sarnia Area Environmental Health Project Air Exposure Review, prepared for the Ministry of the Environment, Conservation and Parks in March 2024, studied outdoor air pollution from local sources such as facilities, vehicles and wood stoves. (1) The study identified elevated levels of benzene in Sarnia and Aamjiwnaang First Nation due to industrial emissions, which has raised environmental health concerns.(2)
- Exposure to benzene has proven carcinogenic effects in humans. (3,4) Chronic airborne exposure to benzene can cause damage to blood and bone marrow leading to significant hematological problems, such as aplastic anemia, myelodysplastic syndrome (MDS) and acute myeloid leukemia (AML). (5,6) Other cancers associated with long-term benzene exposure include chronic myeloid leukemia, chronic lymphocytic leukemia, non-Hodgkin lymphoma, multiple myeloma, and lung cancer. (7,8)

For questions about benzene exposure, please refer to the "Q&A on Public Health Impacts on Benzene Exposure and What to Do if You are Exposed" document.

Population at Risk

Development of MDS or AML is a primary concern for individuals who have had long-term exposure to high concentrations of airborne benzene. Groups at risk of developing hematological cancers:

- Individuals with known or suspected long-term¹ exposure to airborne benzene.
- Individuals who reside, or previously resided, or work in areas and are consistently exposed to high concentration of benzene over a long period of time.

¹ Chronic (long-term) exposure refers to exposure of one year or more. (15)

Clinical monitoring for chronic airborne benzene exposures and patient education:

While there are no guidelines for chronic airborne benzene exposures and AML risk, clinicians may consider the following as part of their plan of care.

➤ **Complete blood count (CBC) to detect macrocytosis or abnormal blood count in this population.**

CBC is one of the initial tests used to inform diagnosis of hematological cancers. Based on clinical opinion, it may be medically appropriate to repeat CBC yearly for individuals with long-term exposure to benzene. (3,6,9) Yearly CBC retesting can be considered in this population for approximately 10 years after exposure to elevated levels of benzene. (10,11) Individuals concerned about chronic exposure can be supported by their primary care provider to conduct a CBC, when requested, or if they have any symptoms that might suggest a hematological malignancy (see below).

Education should be provided to patients about the benefits and limitations of the CBC test in addition to common signs and symptoms of hematological malignancies. Refer to Ontario Health (Cancer Care Ontario's) patient-facing handout, "Chronic benzene exposure: What you need to know."

Testing for benzene is not recommended as it is only detectable in the blood or urine following recent exposure. Most traces of benzene are metabolized within 48 hours of exposure, and therefore, may not be a reliable source of information about risk of adverse health events due to exposure. (12)

Abnormal CBC Results

Should the patient have a CBC with an abnormal result (macrocytosis or abnormal blood counts), the primary care provider may determine level of concern and appropriate subsequent actions by considering the patient's clinical symptoms and health history.

Abnormal results due to benzene exposure may be dependent on several factors, such as the dose, duration, timing of exposure, genetic susceptibility, and the presence of other medical conditions or infections. (13,14)

For mild or nonspecific abnormal results, the primary care provider should rerun the CBC testing and should do routine workup as per clinical guidelines. If abnormal results are persistent, consult with a hematologist or internal medicine specialist to discuss the need for further evaluation and/or monitoring.

Should a patient have a significant and/or persistent abnormal CBC result, the primary care provider could consider ordering additional blood tests including:

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| • albumin | • lactate dehydrogenase (LDH) |
| • blood smear | • liver enzymes |
| • calcium | • uric acid |
| • coagulation tests (aPTT, INR) | • phosphate |
| • creatinine | • thyroid stimulating hormone (TSH) |
| • electrolytes | • vitamin B12 |

Hematological Malignancies

Individuals with MDS or AML may present with any of the signs or symptoms listed below. These signs and symptoms are not exclusive to hematological malignancies and could derive from other causes. Please note that the signs and symptoms are listed alphabetically and not in order of diagnostic reliability. It is not intended to be an exhaustive list:

Myelodysplastic Syndrome (MDS)

- Bleeding
- Bruising
- Fatigue
- Pallor
- Petechiae
- Shortness of breath

Acute Myeloid Leukemia (AML)

- Bleeding
- Bruising
- Dizziness
- Fatigue
- Fever
- Pallor
- Recurring or frequent infections
- Shortness of breath
- Sores/wounds that don't heal
- Swelling of gums, lymph nodes, liver, spleen

Additional Resources

1. "Chronic benzene exposure: What you need to know" Patient Handout, Ontario Health (Cancer Care Ontario)
2. "Q&A on Public Health Impacts on Benzene Exposure and What to Do if You are Exposed," Ontario Ministry of Health
3. Centers for Disease Control and Prevention (CDC), National Institute for Occupational Safety and Health (NIOSH), [Pocket Guide to Chemical Hazards](#)

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