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the **Alberta Oil Sands Community
Exposure & Health Effects
Assessment Program**



**YOUR
air
YOUR
health**

A MAJOR NEW STUDY TESTS THE QUALITY OF AIR AND HUMAN HEALTH IN FORT McMURRAY

JUNE 2000

INTRODUCTION

The quality of the air we breathe affects our quality of life – and it affects our health. In 1994, the Alberta Energy and Utilities Board recommended that a study be done on the quality of the air in the community of Fort McMurray, and its potential impact on human health.

Working together, local and provincial health officials, First Nations, environmental groups, oil sands companies, scientists and others wanted to see if a measurable connection could be made between human health and regional industrial activity in the region.

For over a year, and through every season, a team of scientists worked with 300 volunteer participants to test their health, measure the quality of the air they breathed and test the air in Fort McMurray. Today, the results of this study provide a detailed picture of community health, and give us the ability to measure changes over time.

AN INDEPENDENT THIRD-PARTY RESEARCH TEAM

A local and international team of 23 scientists designed the health study, conducted the research and wrote the report. Members of the team came from a wide range of organizations – with an advisory committee to oversee the project, and a science team to conduct the research and analyze the data.

SCIENCE TEAM

- Alberta Health and Wellness
- Alberta Research Council
- Centre for Toxicology
- University of Alberta
- University of Calgary

SCIENCE ADVISORY COMMITTEE

- Harvard School of Public Health
- George Washington University
- World Health Organization
- Health Canada



HOW THE STUDY WORKED...

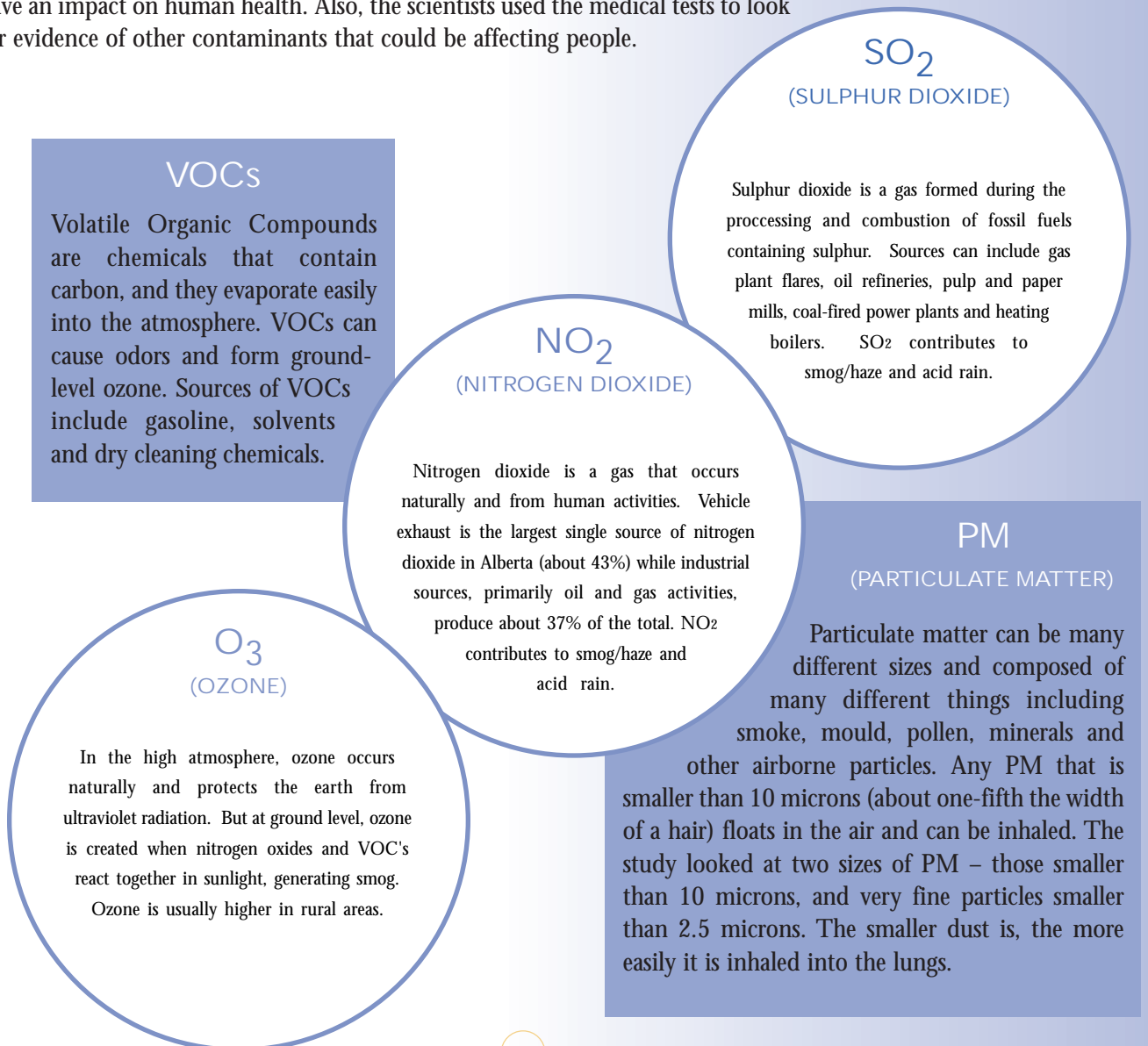
Working together, the science team developed a comprehensive research program. Technology developed by the Alberta Research Council and Calgary's Centre for Toxicology let researchers consider many factors when looking at the relationship between air quality and human health. Research included:

- 300 volunteers who kept diaries of their activities and wore Personal Exposure Monitors – small badges and air samplers – for up to five days at a time to measure the air they breathed during work, leisure and home time,

- Comparison to a “control group” of volunteers in Lethbridge – a community with little industrial development – to see if any health differences could be found,
- Three types of air monitors – inside and outside the participants’ homes, and in the ambient air in Fort McMurray – to measure how air quality changes in each location,
- Special “active” samplers that collected dust in the air – which was studied using electron microscopes, and
- Assessment of local health through blood and urine samples, detailed medical tests and questionnaires, review of regional health information and the volunteers’ activity diaries.

UNDERSTANDING OUR AIR: COMMON CONTAMINANTS

The study looked for five main types of contaminants that can affect our air quality, and that are known to have an impact on human health. Also, the scientists used the medical tests to look for evidence of other contaminants that could be affecting people.



THE BIG PICTURE: QUALITY AIR AND A HEALTHY COMMUNITY

After detailed study, the big picture is clear: Fort McMurray residents are breathing good quality air. The study showed that ambient levels of airborne contaminants are low compared to provincial, national and international guidelines, and that personal exposure is low.

In addition to air quality, the study examined both volunteer participant and community health records, and concluded that air emissions from industrial development have produced no measurable negative impact on overall health.

To be more certain, Fort McMurray's volunteers were compared with a group from Lethbridge, where there is little industrial development. No significant differences were found – people showed similar rates of illness, disease, chronic conditions, lung function, neurocognitive function, exposure to contaminants, and death.

THE DETAILS

The volunteers in the study wore badges that measured the contaminants in air they breathed – giving us a picture of their personal exposure to contaminants whether they were at work, outside or at home. The study showed that the average volunteer's personal exposure to contaminants was very low.

HOW MUCH IS SAFE?

The contaminants looked at in this study – SO₂, NO₂, VOCs, O₃, and dust – are found in the air everyone breathes. At low levels, they don't create a risk to our health. But when we are exposed to high levels of any contaminant, the result can be unpleasant and unhealthy.

To determine what is safe, scientists working for the provincial and federal governments establish guidelines. Guidelines change depending on how long you are exposed to contaminants in the air, and usually the amount that is safe for a short period (like one hour, or one day) is higher than what we should be exposed to for a month or a year. For some contaminants there are no guidelines at all.

In this study, indoor air, outdoor air and the air the volunteers were personally exposed to were all tested, and measured against available guidelines. Because the technology to measure personal exposure is new, there are currently no provincial or federal guidelines.

Comparison of SULPHUR DIOXIDE Levels

SO₂
units: micrograms/cubic meter

PARAMETER	Fort McMurray Median	Lethbridge Median	Guideline/Reference Level
Personal	0.87	0.21	N/A
Indoor	0.41	0.16	50 (long term) ¹ 1000 (5 min.)
Outdoor	1.6	1.1	157 (day) ²
Ambient Station	2.0	N/A	445 (hour) ³ 157 (day) 26 (year)

- **SULPHUR DIOXIDE:** The study showed that ambient (outdoor) exposures to sulphur dioxide were much lower than the provincial guideline – 1.6 micrograms per cubic metre of air compared to a provincial daily guideline of 157 micrograms per cubic metre.

The average personal exposure level for Fort McMurray residents was 0.87 micrograms per cubic meter of air, compared to the Lethbridge average of 0.21 micrograms per cubic meter of air. Although the level is higher in Fort McMurray, the exposure level in both communities is very small.

Comparison of NITROGEN DIOXIDE Levels

NO₂
units: micrograms/cubic meter

PARAMETER	Fort McMurray Median	Lethbridge Median	Guideline/Reference Level
Personal	15.9	17.7	N/A
Indoor	8.6	9.8	100 (long term) ¹ 480 (hour)
Outdoor	9.5	13.8	206 (day) ²
Ambient Station	10.8	N/A	394 (hour) ³ 206 (day) 56 (year)

- **NITROGEN DIOXIDE:** The median level of nitrogen dioxide at the ambient stations was 10.8 micrograms per cubic meter of ambient air compared to daily guidelines of 206.0 micrograms per cubic meter.

The average personal exposure level for Fort McMurray residents was 15.9 micrograms per cubic meter of air, compared to the Lethbridge average of 17.7 micrograms per cubic meter of air.

Comparison of OZONE Levels

O₃
units: micrograms/cubic meter

PARAMETER	Fort McMurray Median	Lethbridge Median	Guideline/Reference Level
Personal	3.3	4.9	N/A
Indoor	2.4	2.4	240 (hour) ¹
Outdoor	39	57	N/A ²
Ambient Station	50	N/A	50 (day) ³

- **OZONE:** The median level of ozone recorded at the ambient stations was equal to the Alberta Environment guideline of 50 micrograms per cubic meter.

The average personal exposure level for Fort McMurray residents was 3.3 micrograms per cubic meter of air, compared to the Lethbridge average of 4.9 micrograms per cubic meter of air. For most participants, ozone exposure fell below detectable levels.

FOOTNOTES:

1. Health Canada 1989 Exposure Guidelines for Residential Indoor Air Quality: A Report of the Federal-Provincial Advisory Committee on Environmental and Occupational Health.
2. Alberta Environment Guidelines
3. Alberta Environment Guidelines

VOCs

- Volatile Organic Compounds (VOCs): The study showed ambient VOC level in Fort McMurray were low and comparable to levels reported for rural areas in Canada.

In addition, the levels of personal exposure of Fort McMurray residents to VOCs was 2.8 micrograms per cubic metre compared to Lethbridge residents who had exposure of 2.1 micrograms per cubic metre.

P M

- Particulate Matter (dust, smoke, mould, pollen, and other airborne particles):

Average levels of PM_{2.5} (particles smaller than 2.5 microns or about 0.0001 inches) for Fort McMurray residents were 25 micrograms per cubic meter compared to 22.3 micrograms per cubic meter for Lethbridge residents.

Average levels of PM₁₀ (particles smaller than 10 microns) for Fort McMurray residents were 57.3 micrograms per cubic meter compared to 33.9 micrograms per cubic meter for Lethbridge residents.

The study also used electron microscopes to examine the contents of dust particles. Outdoors, particles were made up mostly of pollen; indoors, mould, hair and fibers dominated, and in each location, sand-like minerals (like silica and calcium) were common. The analysis of minerals in Fort McMurray's air was similar to other samples taken in rural Alberta.

“For the residents of Fort McMurray, this study shows that their exposure to airborne contaminants is very low, and within even the most stringent guidelines.”

Dr. Stephan Gabos

RECOMMENDATIONS

There are recommendations in the study that will be of interest to the community, air monitoring networks, governments, industry and others. The science team is recommending to government:

- Although this study did not find evidence of significantly elevated personal exposure to airborne contaminants from the oil sands industry, there should on-going community monitoring of personal exposure levels to air contaminants to measure whether any of the contaminants produced by industrial development increase over time compared to the baseline established by this study,
- There should be continued emphasis on finding and using innovative testing technologies to measure personal exposure levels, and
- Similar community exposure studies should be conducted in other regions, and comparing the results from Fort McMurray with these regions.

DID YOU KNOW?

In addition to the health information, the study also collected some interesting facts about the people in Fort McMurray. Did you know that:

- The average age of the volunteers in Fort McMurray was 40 – and 94% of the region's population is under 55.
- We are more likely to smoke – in the Northern Lights Health Region 33% smoke daily, compared to 25% nationally. Of the volunteers, 45% used to be daily smokers, while only 16% currently smoke.
- Activity levels are lower, and body mass is higher. Volunteers from Fort McMurray averaged 4.5 hours of physical activity a week, compared to 7.1 hours for the group from Lethbridge. As you might expect, 7% of the Fort McMurray participants were slightly overweight, and 44% had a body mass index over 27 (20-25 is healthy, 25-27 slightly overweight, and over 27 indicates an increased risk of health problems).

