Celebrating the Clean Air Month of June

state of the air

2013

BC LUNG ASSOCIATION

FOREWORD

Our province is one of the most beautiful places to live. Air quality in B.C. is generally good, and improvements have been made as the data in this report shows; however, challenges remain. Our air quality is affected by myriad factors – natural and man-made, internal and external.

For this reason, this year we again train our lens on two air quality issues that we briefly touched on in last year's report: Traffic-Related Air Pollution (TRAP) and ultrafine particles. We also identify a remote source of smoke that impacted parts of B.C. last summer.

TRAP has been linked to various respiratory and cardiovascular illnesses, so several agencies recently came together to study ways to reduce exposure to it. The study is expected to recommend strategies and actions that will impact a wide range of fields, not just traffic management.

In a related move, Health Canada also conducted personal monitoring studies in major Canadian cities, including Vancouver, to better understand the health effects on commuters of traffic emissions exposure.

As for ultrafine particles: we have a comprehensive report on the 10th Air Quality and Health Workshop, which this year brought together a distinguished panel of international experts to provide a state-of-the-art overview of ultrafine particles.

Finally, we see how environmental events outside of B.C. affect our air quality. During the summer of 2012, smoke from distant wildfires was linked to elevated levels of air pollution in B.C.

In closing, I wish to acknowledge the tireless commitment, time and efforts of all the agencies and individuals involved in the 2013 State of the Air Report.

SCOTT MCDONALD
President and CEO, BC Lung Association

CONTENTS

What are you breathing on your daily commutes?

An overview of the Urban Transport Exposure Study

Traffic emissions have been linked to a number of acute and chronic health effects, including heart and lung disease. Canadians living in urban centres spend an average of 52 minutes a day commuting. Given their close proximity to traffic emissions during this time, this may make up a significant portion of their exposure to traffic-related pollutants for the day. Currently, little is known about the personal exposures of Canadian commuters.

In order to better understand commuters' exposures, Health Canada is carrying out personal monitoring studies in major cities across the country. The primary transit modes in Montreal, Ottawa, and Toronto were monitored in 2010-11, and monitoring is underway now in Metro Vancouver.

> Traffic emissions have been linked to a number of acute and chronic health effects,

To capture the variety of transit environments in Vancouver, technicians are monitoring pollutants on private cars, buses, and SkyTrains. For private cars, Health Canada is measuring pollution levels outside and inside the vehicle while driving a variety of arterial and city roads throughout Metro Vancouver. Two weeks of winter monitoring were completed in December of 2012 and another two weeks of monitoring will be taking place in June 2013.

To accurately represent commuters' exposures on buses and trains, technicians are monitoring levels while inside and also while waiting at the bus stops and SkyTrain station platforms. Monitored bus routes include the densely trafficked Broadway corridor and various trolley bus routes in Vancouver, the #135 servicing Simon Fraser University, as well as major bus routes servicing Richmond, New Westminster, Surrey, Delta, and White Rock. All three SkyTrain lines (Expo, Millennium, and Canada line) are being monitored to capture the variety in stations and settings, both underground and above ground. Buses and trains are being monitored in the winter and summer, with three weeks of monitoring in each season.

Various traffic-related air pollutants are of interest in the study, including particulate matter ($PM_{2.5}$, PM_{10}, and ultrafine particles), black carbon (BC), nitrogen dioxide (NO_2), and sulphur dioxide (SO_2). Particulate matter will also be analyzed for metal content, which is thought to be associated with some of the health effects of traffic emissions.

Combined with urban transport data collected in Toronto, Montreal and Ottawa, the results of this study will improve our understanding of the potential health effects of commuter exposures and may inform future policies to minimize exposures. Furthermore, measured levels will provide a benchmark to which future commuter exposure levels can be compared.

The winter monitoring session was completed in February and the summer session is beginning in June. If you're taking public transit in June and July, you might just run into Health Canada technicians! For more information on the study, contact Nina Dobbin of the Air Health Science Division of Health Canada. Phone: 604-666-0309 Email: nina.a.dobbin@hc-sc.gc.ca.

Beating the TRAP:

Reducing the Impact of Traffic-Related Air Pollution

> Gasoline or diesel-fuelled cars and trucks release a range of emissions, from gases to particles, into the air during operation. Due to the large percentage of Canadians exposed, TRAP is a public health concern.

If you live in an urban area, or near any busy road, you're probably familiar with TRAP, or Traffic-Related Air Pollution. Approximately one-third of all Canadians live within 100 metres of a major road or 500 metres of a highway. Nearly one-third of elementary schools in Canadian cities are located in high-traffic areas.

Gasoline or diesel-fuelled cars and trucks release a range of emissions, from gases to particles, into the air during operation. As a result, due to the large percentage of Canadians exposed to these emissions, TRAP is a public health concern.

In B.C., recent studies indicate strong links between proximity to traffic corridors that have higher volumes of traffic (e.g. major roadways, truck routes, major bus routes, and bus and freight terminals), and exposure to harmful air pollutants and adverse health impacts, including heart and lung, and immunological illnesses.

So, what factors determine an individual's exposure to TRAP, and the resulting health impacts? Key factors include the amount and type of vehicle traffic, the overall environment and the characteristics of the individual being exposed. Importantly, an understanding of these factors can help identify potential strategies for reducing exposure to these pollutants.

There are many ways to reduce TRAP, although no particular agency or level of government has the specific responsibility to reduce exposure to traffic emissions. Consequently, a collaborative study that included the B.C. Ministry of Environment, Metro Vancouver, TransLink, and many other municipal, regional and provincial environment and health agencies, including the BC Lung Association, was initiated to identify the most effective, practical and beneficial strategies to reduce resident exposure to TRAP.

To be completed in 2013, the study will recommend a range of actions for consideration by the various project partners, including strategies for land use, building design, transportation management, and education and outreach, in order to augment communities' existing strategies and plans for vibrant, compact communities.

Factors that influence your exposure to TRAP

TRAFFIC (SOURCE)	ENVIRONMENT	PERSON (RECEPTOR)
• Vehicle type • Fleet composition • Fuel quality • Vehicle speed • Vehicle volumes • Congestion level	• General meteorological conditions • Localized wind patterns • Built environment (dispersion vs. trapping) • Distance between people and traffic	• Time spent in proximity to traffic • Transport mode • Activity level • Physiological and social characteristics

POLLUTION LEVELS: How does BC measure up?

In 2012, air quality was generally good in most B.C. communities. However, there were times when a combination of emissions, and/or weather conditions resulted in high pollutant levels. In many cases, these events were due to local sources of air pollution. However, 2012 also brought reminders of how distant sources can affect the air we breathe. In the following, some of the major air quality highlights from 2012 are described. For detailed air quality summaries, see the technical appendix (www.bc.lung.ca/airquality/2013SOA/).

Fine Particulate Matter ($PM_{2.5}$)

FINE PARTICULATES ($PM_{2.5}$) refer to microscopic particles that are 2.5 micrometres and smaller in diameter. These particles are known to affect respiratory and cardiovascular health. $PM_{2.5}$ is emitted from natural sources (e.g. wildfires) and human activities (e.g. prescribed burning, wood stoves, industry and diesel vehicles).

Figure 1 shows annual average $PM_{2.5}$ levels for two different types of monitor: TEOM (shown by blue bars) and FEM (shown by green bars). Because these instruments use different methods to measure PM2.5, results are presented separately.

The highest annually averaged concentrations were observed in Vanderhoof (10.9 µg/m^3), followed by Courtenay, Port Alice and Smithers. Each of these communities exceeded the provincial annual average objective of 8 µg/m^3. Quesnel, Williams Lake and Vanderhoof also exceeded the three-year Canada-wide Standard (CWS) of 30 µg/m^3, with high levels in Quesnel and Williams Lake due to the influence of 2010 wildfires.

The highest daily $PM_{2.5}$ levels were observed during the fall/winter and summer months. The fall/winter events were largely a result of increased wood burning and stagnant weather conditions that contributed to the temporary build-up of smoke in valleys. High $PM_{2.5}$ levels during these periods triggered air quality advisories by the Ministry of Environment in a number of communities, including the Comox and Cowichan Valleys, Grand Forks, Williams Lake, Quesnel, Prince George, Smithers, Vanderhoof, Burns Lake, and Houston. Such advisories are used to notify the public of poor air quality, provide advice on reducing health risks and identify actions to reduce emissions.

High summertime $PM_{2.5}$ levels were a result of smoke from wildfires in B.C. and further abroad, including Alberta and Siberia (for more information, see P. 8). A large part of the B.C. interior was affected at some point, from Fort St. John in the north to Merritt in the south.

New Monitors, Same Air Quality.

Among outdoor air pollutants, fine particulates ($PM_{2.5}$) are the biggest concern from a public health perspective and the most challenging to measure. This is because individual particles vary in shape and size and are often a complex mixture of different solid and liquid substances. Until recently, the most common monitors used in B.C. heated the sample air to remove excess water, and in the process, lost part of the sample to evaporation. New monitors are being introduced that provide a more complete measure by accounting for the portion previously lost to evaporation. As a result, higher $PM_{2.5}$ measurements are likely with the new monitors, even though the actual air quality has not changed. The differences between old and new monitors will vary from site to site, depending on local conditions, with the largest changes expected for smoky areas during the winter. For more information on the new monitors, see: www.bcairquality.ca.

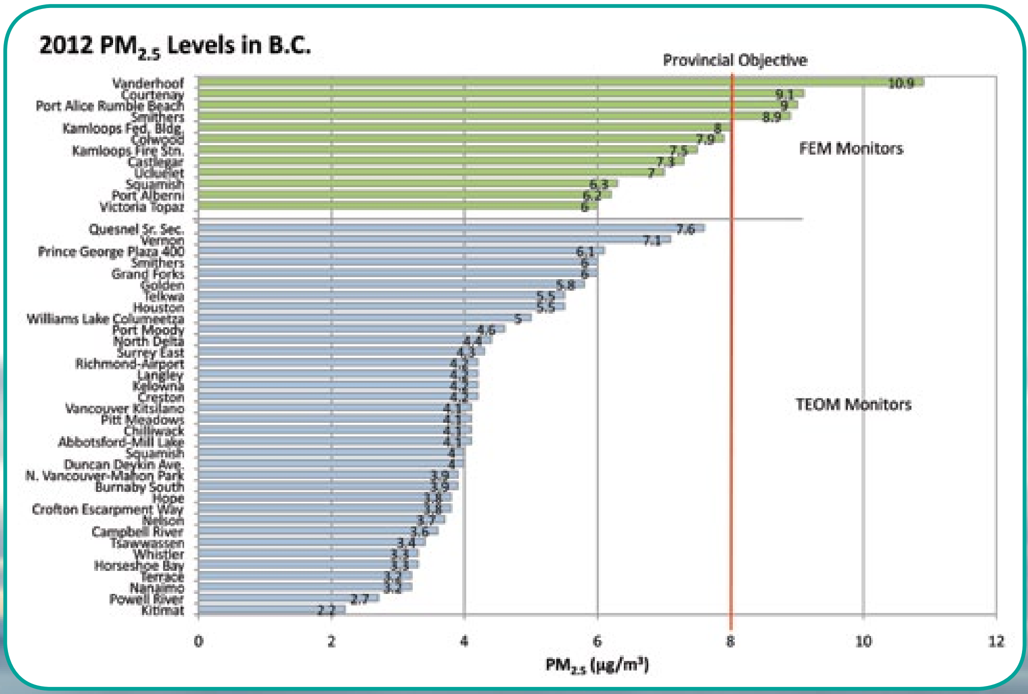

Figure 1. Annual average $PM_{2.5}$ levels in µg/m³ at B.C. sites in 2012. Blue bars show data from TEOM monitors, and green bars show data from FEM monitors.

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(Cont'd from p. 5—Pollution Levels...)

Ground-level Ozone (O_3)

GROUND-LEVEL OZONE is a gaseous pollutant typically formed by reactions involving volatile organic compounds (VOCs) and nitrogen oxides (NOx) in the presence of sunlight. Combustion sources (e.g. motor vehicles, biomass burning, etc.) are large sources of both VOCs and NOx. Ozone is known to irritate the lungs and worsen asthma and other lung diseases. Exposures to high concentrations are also linked to early deaths.

Ozone concentrations in 2012 (see Figure 2) were well below the 8-hour Canada-wide Standard of 65 ppb at all sites in the province. The highest 8-hour value was observed in Kelowna (59 ppb), followed by Hope (56 ppb).

Historically, the highest hourly ozone levels in B.C. have been observed in the eastern Lower Fraser Valley, when summertime high pressure systems bring warm, sunny skies, light winds, and stagnant conditions that contribute to the formation and build-up of ozone levels. However, during the summer of 2012, high hourly ozone levels in excess of the one-hour national objective of 82 ppb were reported in Kelowna, Quesnel and Williams Lake (data not shown). The highest one-hour value province-wide (96 ppb) was recorded in Kelowna. For the first time ever, the Ministry of Environment issued ozone-related advisories for Quesnel, Williams Lake (both Jul. 11) and Kelowna (Jul. 12). Siberian wildfire smoke is believed to have contributed to these events (see page 8). A further ozone advisory covering eastern Metro Vancouver and the Fraser Valley was issued by Metro Vancouver on Aug. 17, with peak concentrations reaching 88 ppb in Maple Ridge and 84 ppb in Chilliwack.

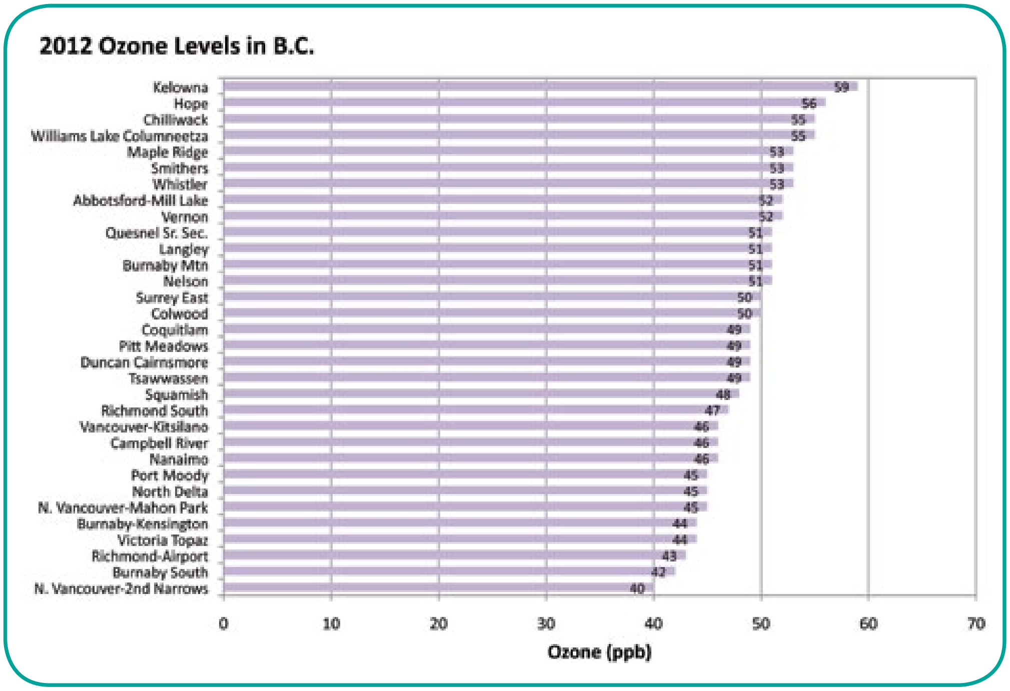


Figure 2. Ozone levels in ppb at B.C. sites, based on the fourth highest daily 8-hour maximum, averaged over 2010-2012.

Nitrogen Dioxide (NO_2)

NITROGEN DIOXIDE (NO_2) is a reddish-brown gas with a pungent odour. It is emitted from high-temperature combustion sources such as motor vehicles and industry. Exposure is linked to an aggravation of lung disease and increased susceptibility to respiratory infections. NO_2 also contributes to ozone and $PM_{2.5}$ formation in the atmosphere.

Annual average NO_2 concentrations were below national (~31 ppb) and Metro Vancouver objectives (~21 ppb) at all monitoring sites in B.C., as shown in Figure 3. The highest concentrations were observed in downtown Vancouver (19 ppb) and Vancouver Kitsilano (17 ppb), and generally those areas near major traffic corridors or transportation hubs.

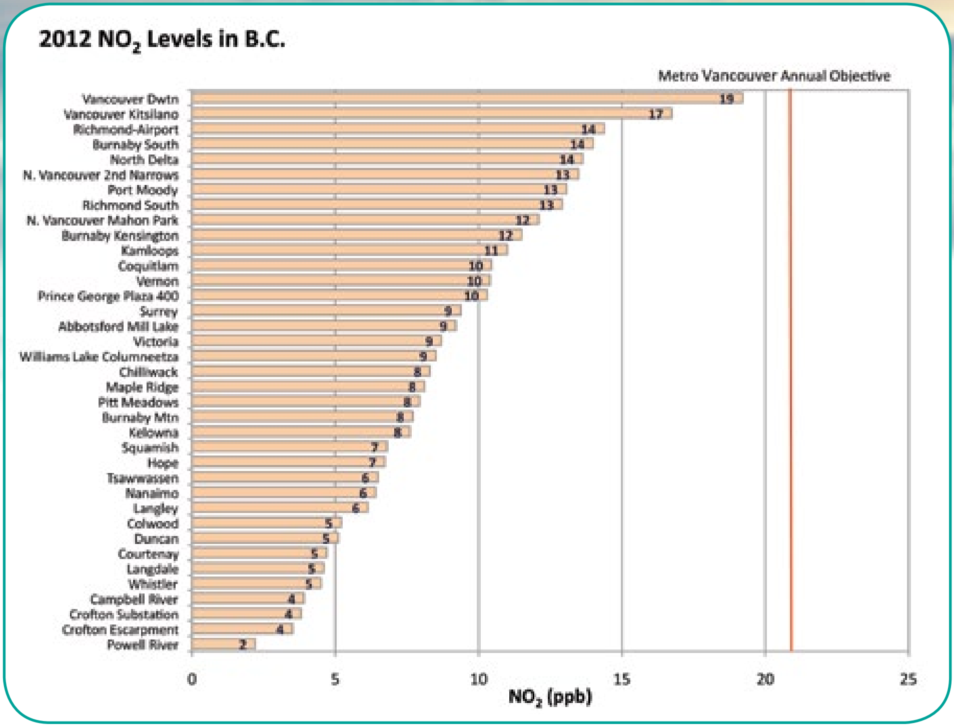


Figure 3. Annual average NO_2 levels in ppb at B.C. sites in 2012.

Sulphur dioxide (SO_2)

SULPHUR DIOXIDE (SO_2) is a colourless gas with a pungent odour. Exposure to elevated SO_2 levels can aggravate asthma and increase respiratory symptoms. Major sources of SO_2 in B.C. include the oil and gas industry, marine sources, the pulp and paper sector and metal smelting facilities.

Annual average SO_2 concentrations ranged from about 0.2 to 8.9 ppb, with the highest concentrations seen in the vicinity of Trail and Port Alice (see Figure 4). All of the sites shown were below the annual provincial objective of 9.4 ppb. Short-term exceedances of the provincial 1-hour objective (~170 ppb) were recorded in Trail, Port Alice and Prince George, near major industrial sources of SO_2.

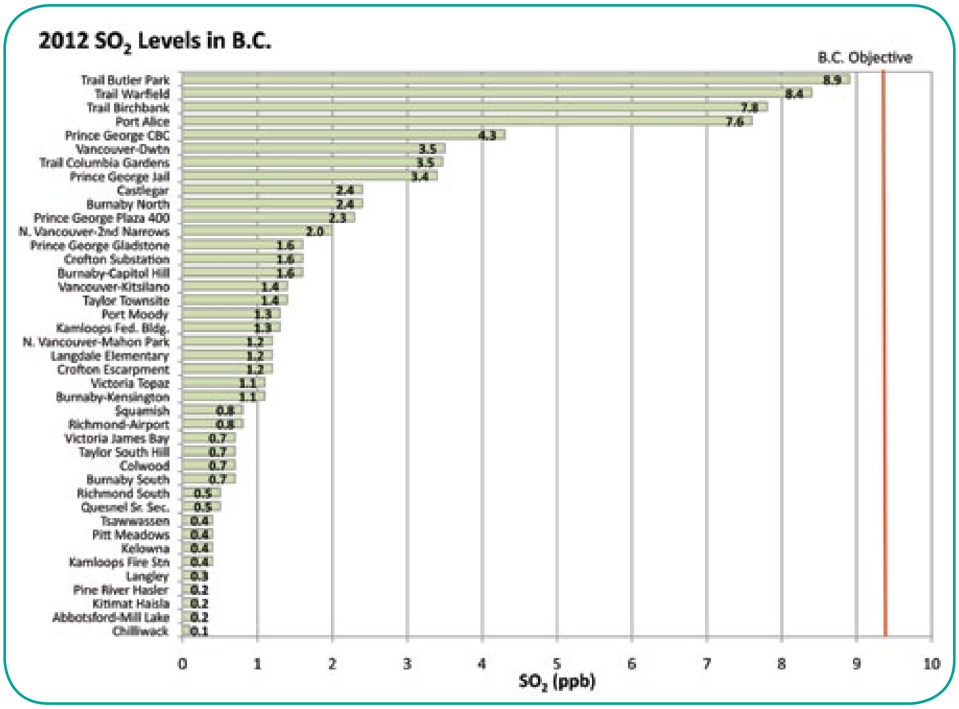


Figure 4. Annual average SO_2 levels in ppb at B.C. sites in 2012.

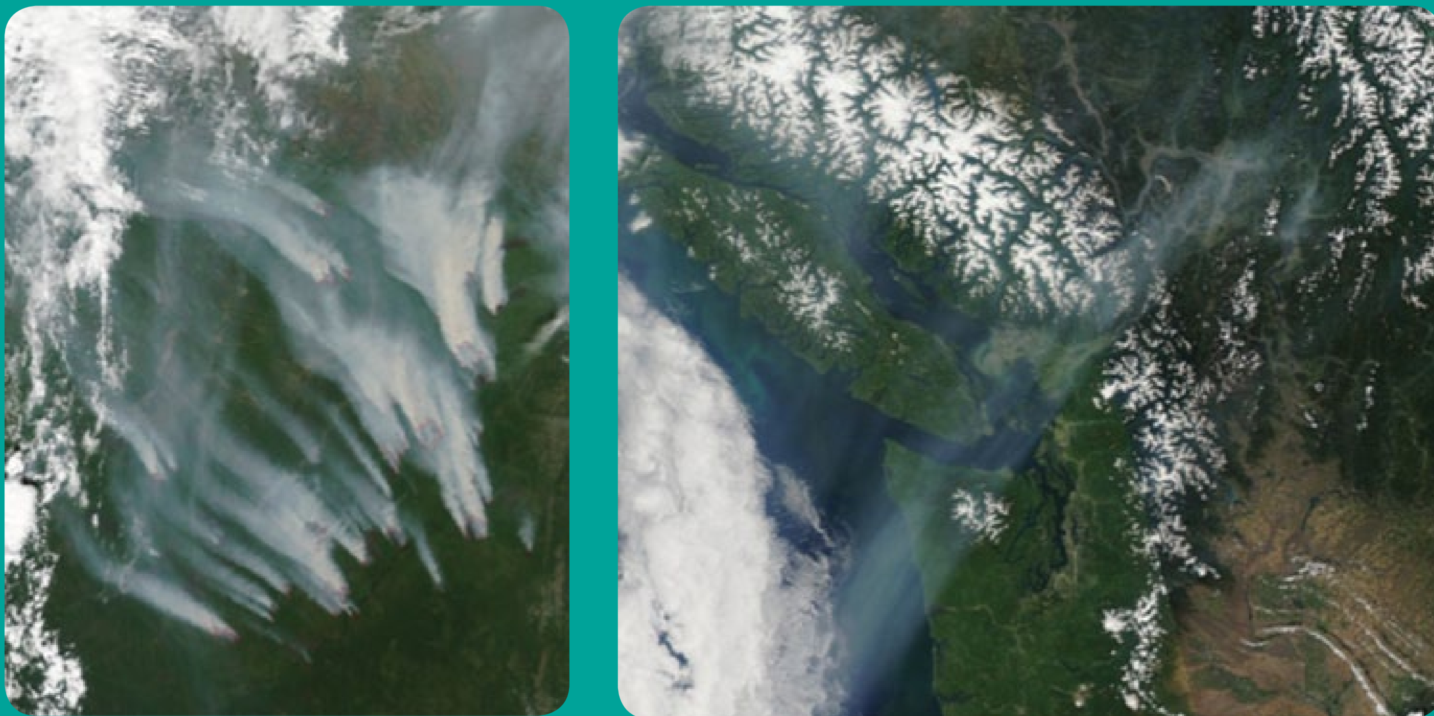


Figure 5. Satellite image of wildfires in Siberia (left) and of smoke plumes over British Columbia (right) on July 10, 2012. Source: Lance MODIS Rapid Response.

Smoke
from Siberian Wildfires

Through August 2012 more than 17,000 wildfires had burned more than 30 million hectares of land in Russia, with most of the fires located in central and eastern Siberia*, impacting several B.C. communities.

Wildfires are a common occurrence during B.C. summers, and a large source of fine particles and various gases. In early July, several B.C. communities experienced smoky skies in spite of little local wildfire activity. Satellite imagery and computer models traced the smoke plumes back across the north Pacific to their source: Siberian wildfires. Through August 2012, more than 17,000 wildfires had burned more than 30 million hectares of land in Russia, with most of these fires located in central and eastern Siberia. To put these numbers in perspective, during the B.C. wildfire season in 2010 (one of the worst in recent history), there was a total of 1,673 wildfires covering 0.3 million hectares.

The intense heat of the Siberian wildfires allowed the smoke plumes to be lofted high in the atmosphere, where the smoke was caught by high-level winds and pushed across the Pacific. Several B.C. communities saw elevated $PM_{2.5}$ concentrations during the first half of July due to smoke from these fires, and hazy conditions off and on during the rest of the summer as a result of local and distant wildfires. Record-setting ozone concentrations in places like Quesnel and Williams Lake have also been linked to Siberian wildfire smoke.

** Source: http://earthobservatory.nasa.gov/IOTD/view.php?id=79161)*

Ultrafine particles and their health impacts:

A Report from the 2013 Air Quality and Health Workshop.

Ultrafine particles are tiny particles that are 0.1 micrometres or smaller in diameter, i.e. over 700 times smaller than a human hair. While they contribute little mass, they are far more numerous than larger particles.

More than 130 representatives from air quality, environmental management, health sector and general public took part in the BC Lung Association's 10th Annual Air Quality and Health Workshop on February 20. The goal was to provide a state of the art overview of the evidence relating to ultrafine particles in air - sources, concentrations, measurement approaches, epidemiology, toxicology and potential regulatory efforts. Participants heard from a distinguished panel of international experts. All presentations are available at www.bc.lung.ca.

Dr. Günter Oberdörster of Rochester University gave the opening keynote presentation highlighting the unique properties of ultrafine particles and the characteristics that make them behave differently in the atmosphere and after inhalation, compared to other sizes of airborne particles. Dr. Oberdorster suggested that a general air quality standard targeting all ultrafine particles is not well-supported because of the source-specific differences in chemistry that lead to significant differences in toxicity.

Dr. Lidia Morawska from the Queensland University of Technology then discussed the behavior of ultrafine particles in the atmosphere and emphasized the importance of traffic as a major source in ambient air. She discussed examples of primary formation of ultrafine particles in local (traffic, biomass burning), regional (dust storms) and indoor (cooking) combustion processes, and their secondary formation as a result of atmospheric reactions of gases released both indoors and outdoors. Dr. Morawska suggested a need for more routine ultrafine particle measurements to support health effects studies, with particular emphasis on studies that differentiate the role of different sources, and the importance of secondary organic aerosols.

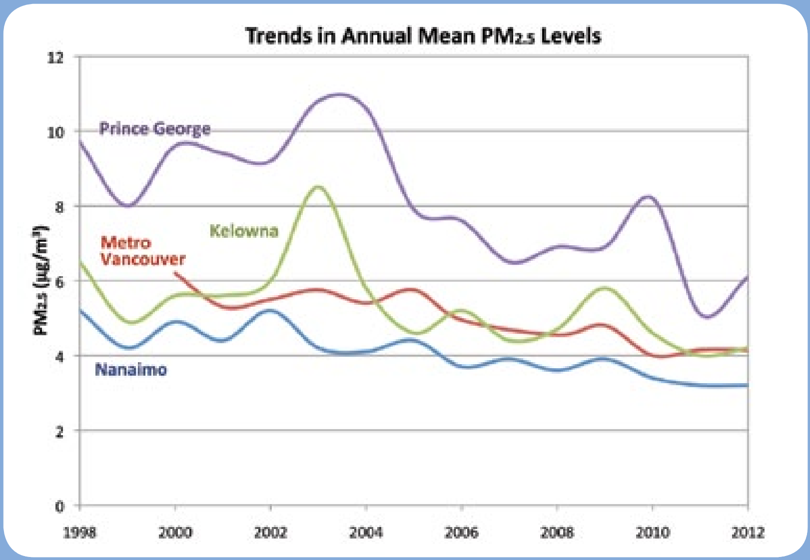
Dr. Phil Fine from the South Coast Air Quality Monitoring District in

(Cont'd on p. 15)

ULTRAFINE PARTICLES are emitted from local (traffic, biomass burning), regional (dust storms) and indoor (cooking) combustion processes, and formed in the atmosphere from reactions involving gases released both indoors and outdoors.

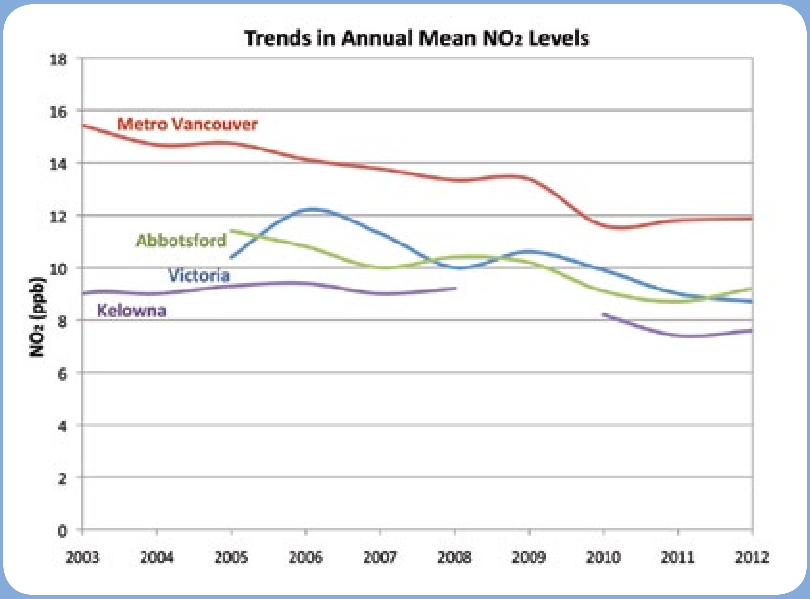
Air Pollution in B.C. through the Years

Tracking trends in air quality helps us to assess the benefits of current emission reduction programs and to predict whether additional actions may be necessary to protect future air quality. A number of factors contribute to the overall trends that we see, such as changes



Trends in annual mean $PM_{2.5}$ levels in Prince George, Kelowna, Metro Vancouver and Nanaimo are shown in Figure 6. Improvements are seen over the 15-year period, reflecting local restrictions on open burning and improved motor vehicle emission standards.

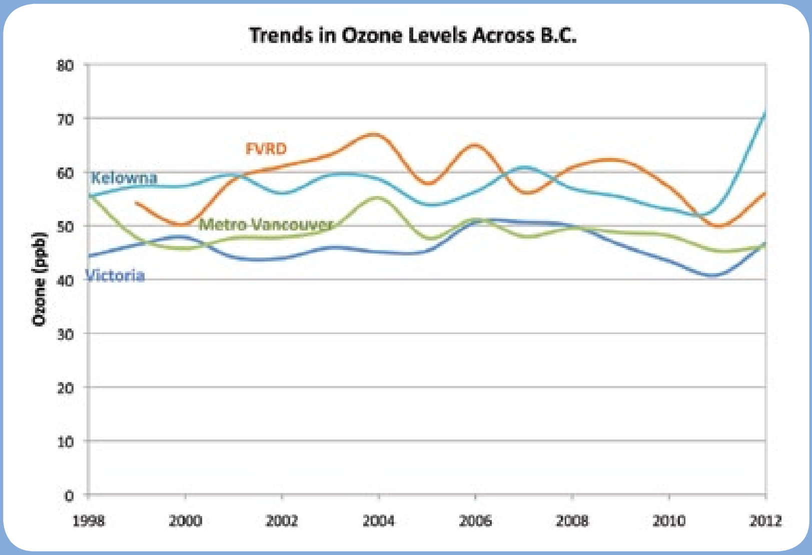
Figure 6. Trends in annual mean $PM_{2.5}$ concentrations in Prince George, Metro Vancouver (based on data from two sites), Kelowna and Nanaimo.



Downward trends in annual mean NO_2 levels (Figure 7) were observed in Metro Vancouver, Abbotsford, Victoria and Kelowna. Contributing factors include reduced emissions due to more stringent vehicle emission standards and the AirCare vehicle inspection and maintenance program in the Lower Fraser Valley.

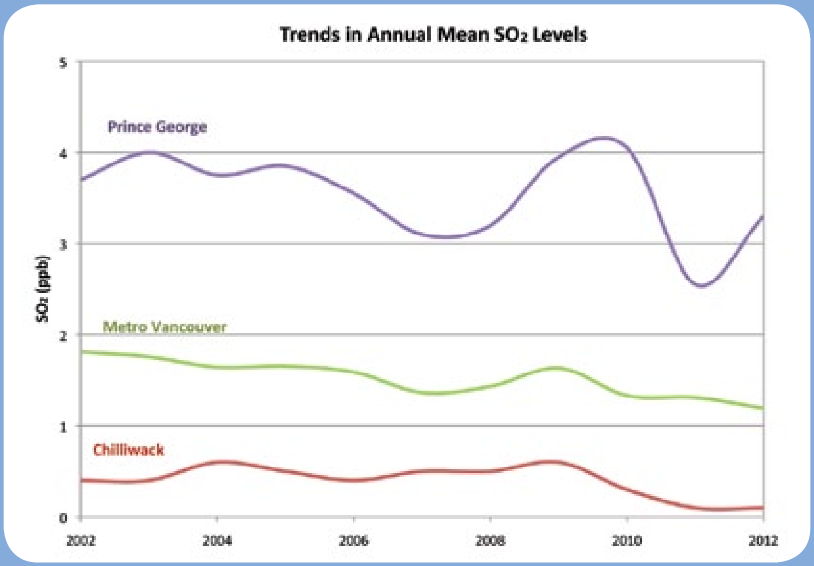
Figure 7. Trends in annual mean NO_2 concentrations in Metro Vancouver (9 sites), Abbotsford, Victoria and Kelowna.

to emissions from human activities, natural influences (e.g. wildfires) and year-to-year variations in the weather. The following represents a preliminary review of trends in selected areas of the province to 2012.



Similar improvements have not been seen for ground-level ozone (see Figure 8), despite local actions to reduce ozone-forming pollutants, particularly in Metro Vancouver. Increasing global background concentrations and reduced local nitrogen oxide emissions (that result in less local ozone removal) are two possible contributing factors. Metro Vancouver, FVRD and partners are working to develop a strategy to take action on ozone in the Lower Fraser Valley.

Figure 8. Trends in annual ozone concentrations, based on the 4th highest 8-hour maxima, in Kelowna, the FVRD (3 sites), Metro Vancouver (12 sites) and Victoria.



Declining trends in annual mean SO_2 levels are observed in Prince George, Metro Vancouver and Chilliwack (see Figure 9). A reduction in the sulphur content of gasoline and diesel contributed to these trends, as did reduced emissions from the petroleum products industry in Metro Vancouver.

Figure 9. Trends in annual SO_2 concentrations in Prince George (2 sites), Metro Vancouver (8 sites) and Chiliwack.

Environment Canada

As part of the National Air Pollution Surveillance (NAPS), BC is participating in the National Visibility Monitoring Initiative, aimed at developing Canadian visibility science to measure the impacts of visibility.

Trans-Pacific Transport of Air Pollutants at a Marine Boundary Layer Site on the West Coast of Canada was part of a larger national study involving the high elevation monitoring site at Whistler and a northern site at Little Fox Lake, Yukon. The study supports Clean Air Regulatory Agenda (CARA) efforts to characterize the impact of globally transported air pollution, as it relates to achievement of Canada Wide Standards and CARA emissions reduction.

A Mobile Platform is being developed to characterize VOCs (volatile organic compounds) involved in ozone and PM formation in the Lower Fraser Valley. Once completed, the mobile unit will be involved in a number of studies of VOCs within the Fraser Valley and potentially elsewhere in the country.

The 2011 Georgia Basin-Puget Sound Airshed Characterization Report is scheduled for release in fiscal year 13-14. It will feature a synthesis of the state of air quality science, new chapters on deposition, climate change and health impacts and implications for air quality management in this international airshed.

Health Canada

AQHI – Air Quality Health Index

Health Canada is in the planning stages of a study to evaluate the accuracy of the AQHI in predicting health risk in rural areas and smaller cities and towns. Rural areas of BC have a distinctly different mix of pollutants than urban areas where the majority of air pollution research has been carried out.

The Environmental Health Program at Health Canada continues to participate in promotional and awareness activities related to the AQHI. For current and forecasted AQHI in your region, visit: www.bcairquality.ca and for further information about the AQHI, visit: www.airhealth.ca.

Health Canada is collaborating with the BC CDC in a multi-year project to optimize health-based recommendations from forest fire smoke forecasts, including advice to affected populations and best practices for reducing exposure.

Transit

Health Canada has begun monitoring commuters' exposures to air pollutants on public transportation in Metro Vancouver. The study is described in more detail on page 6.

Indoor Air Quality

The Environmental Health Program continues to participate in provincial programs which raise awareness of radon's health risks, as well as testing and remediation of homes to reduce radon levels. The Environmental Health Program, together with the Indoor Air program of Health Canada in Ottawa, is supporting two projects related to the indoor environment and health. The first project, led by the BCCDC, is the development of a monitoring protocol for carbon monoxide in long-term care facilities and hospitals. The second project, led by Dr. Tim Takaro of Simon Fraser University, is a study of phthalate exposure in Canadian children during the first three years of life.

B.C. Ministry of Environment

The Ministry of Environment seeks to protect the environment and prevent pollution through monitoring, reporting, regulations and enforcement activities.

Wood Stove Exchange Program

An additional $200,000 was provided to support wood stove change-out programs in 14 communities or regional districts in 2013.

Air Monitoring in the Northeast

The ministry embarked on a three-year air monitoring and community engagement program in the Northeast, in collaboration with the oil and gas industry and other stakeholders, to respond to growth in the oil and gas industry and potential impacts on air quality. The monitoring study parallels a concurrent human health risk assessment by the Ministry of Health in the Northeast.

Regulatory Updates

Work continues on revisions to regulations governing wood stoves and open burning, which when complete, will reduce wood smoke in B.C. communities.

Modelling Smoke Impacts

The ministry is collaborating on a web-based tool that forecasts the smoke impacts from planned prescribed burns, based on the Western Canada BlueSky Smoke Forecasting System.

Metro Vancouver

New Vehicle Will Help Protect our Air Quality

Metro Vancouver has a new Mobile Air Monitoring Unit. Nicknamed MAMU, the new vehicle is an air quality monitoring station on wheels that will assess air quality throughout our region, measure the impact of emission sources in neighbourhoods, perform compliance or emergency monitoring, and be used for public education.

Review of SO_2 Objectives

Metro Vancouver studied air quality in the Burrard Inlet area and concluded that sulphur dioxide (SO_2) levels were higher than other areas in the Lower Fraser Valley, and that stringent World Health Organization air quality guidelines for SO_2 were exceeded for several days at most study locations in the Burrard Inlet area. Metro Vancouver is now working to establish a network of key SO_2 monitoring sites to assess the effectiveness of the new Emission Control Area for ships (which includes requirements for the use of cleaner marine fuels), and to review the SO_2 objectives for Metro Vancouver. This work will be initiated in 2013 in collaboration with Port Metro Vancouver and other partners.

Emissions from Heavy-Duty Diesel Trucks

Metro Vancouver, with the B.C. Ministry of Environment, FVRD, AirCare, Port Metro Vancouver and others, carried out a three-month air emissions testing program for heavy diesel trucks and buses. The study found that older trucks are dirtier than newer vehicles, and that every age category of trucks included "gross emitters", or trucks that emit many times more pollution than their same-age counterparts. The study partners will be working to develop policies and programs to address truck emissions over the next two years.

Caring for the Air

Check out our 2nd edition of Caring for the Air, Metro Vancouver's "state of the air" report for the Lower Mainland, available at www.metrovancouver.org/air.

(Cont'd on p. 14)

BC Centre for Disease Control

One primary mandate of the BC Centre for Disease Control is to support the regional health authorities through consultation and research on topics important to BC population. We have two ongoing projects that examine the relationships between outdoor air quality and health. The first study is specific to forest fire smoke, which is an episodic and unpredictable form of pollution that can lead to extremely high concentrations of fine particulate matter ($PM_{2.5}$). Our objective is to use changes in the number of emergency calls, doctor visits, and medications dispensed to communicate to Medical Health Officers in real time on how smoke episodes are affecting public health, allowing them to make better decisions about how to protect vulnerable people. The second study is specific to emissions from pulp mills, metal smelters, and oil refineries which are important sources of air pollution in many BC communities. Our objective is to understand how these sources affect the respiratory health of young children, and to evaluate whether data from air quality monitoring stations adequately reflect the risk for those whose lungs are still developing. Over the past year we have also consulted widely on questions related to road dust, sulfur dioxide, radon gas, and carbon monoxide.

Fraser Valley Regional District

Air Quality Monitoring Stations

The Fraser Valley Regional District has purchased two monitoring stations for installation in Mission and Agassiz with funding from Environment Canada and the B.C. Ministry of Environment. The stations will become part of a network of stations across the FVRD and Metro Vancouver. Metro Vancouver is a partner in the monitoring program.

Partnerships

FVRD works in partnership with other agencies, particularly with Metro Vancouver, on myriad projects aimed at developing sound policy for air quality protection and improvement. FVRD has participated in the Heavy-Duty Diesel Vehicle Remote Emissions Testing Study, the Reducing Exposure to Traffic Emissions program as well as other regional air quality partnerships.

COLLABORATIVE INITIATIVES

BC Visibility Coordinating Committee is a multi-agency effort on monitoring, modelling and communicating visual air quality in the Lower Fraser Valley and evaluating its economic benefits

NAPS Roadside Study in the Lower Fraser Valley is a project to assess near-roadside exposure issues to support a better understanding of the potential health effects of elevated near-road pollutants. This is undertaken by NAPS, University of Toronto, University of British Columbia and Environment Canada

Agricultural Air Quality Studies are part of a multi-agency effort to address the impact of the agricultural sector on the environment in the Lower Fraser Valley.

Lower Fraser Valley Ozone Strategy will set broad strategic directions for policy and emission reductions to reduce ozone in the Lower Fraser Valley.

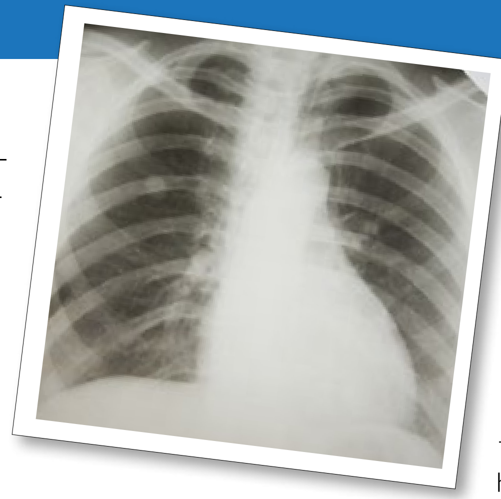
(Cont'd from p.9 - Ultrafine Particles and Their Health Impacts)

southern California spoke on the measurement and control of ultrafine particles. Dr. Fine provided a detailed overview of the many approaches to measure ultrafine particles and emphasized the need to standardize measurements and to align measurement approaches with specific research or policy objectives. With regard to control and management, he suggested a focus on regulation of emissions rather than ambient air quality standards and the need to control both particle emissions as well as low-volatility gaseous emissions that can lead to secondary particle formation.

Dr. Fine was followed by Dr. Michael Brauer from UBC who summarized sources of human exposure to ultrafine particles. He highlighted the importance of traffic emissions and proximity to traffic sources as a determinant of exposure. The high degree of spatial variability in ultrafine particle concentrations leads to challenges in accurately predicting concentrations and in estimating levels for studies of health effects of long-term exposure.

Dr. Nicholas Mills – cardiologist from the University of Edinburgh, opened the afternoon portion of the workshop which focused on human health impacts. He presented evidence on the ability of ultrafine particles to translocate from the lung into the systemic circulation as a potential mechanism to explain non-pulmonary impacts of particulate air pollution. While ultrafine particles penetrate deep into the lung and can evade particle clearance, their long-term fate post-inhalation is unclear. Translocation into the circulation does occur but only for a small proportion of inhaled particles. This translocation is greater for the smallest particles and can also be influenced by lung inflammation and permeability. Once in the circulation, ultrafine particles may increase blood clotting and accumulate at sites of blood vessel inflammation.

While ultrafine particles penetrate deep into the lung and can evade particle clearance, their long-term fate post-inhalation is unclear.



Dr. Mark Frampton of Rochester University followed with an overview of controlled animal and human studies of ultrafine particle exposure. The evidence that he summarized from a small number of human inhalation studies suggested somewhat inconsistent evidence for health impacts related to ultrafine particle exposure. In particular, the evidence was unclear regarding the extent to which ultrafine particles may lead to impacts that are dramatically different from those of fine particles ($PM_{2.5}$). However, available evidence did suggest that ultrafine particles may play an important role in health effects related to exposure to traffic emissions. Dr. Frampton also stressed that the impacts of long-term exposure to ultrafine particles on human health were unknown and highlighted these studies as a future research need.

Dr. Stefanie Ebelt Sarnat from Emory University echoed this research need in her review of human epidemiologic studies. Although a growing number of studies have suggested effects of short-term exposure to ultrafine particles, these studies have largely been unable to specifically attribute these effects to ultrafine particles vs. other co-pollutants.

Dr. Dan Costa, National Program Director for Air, Climate and Energy at the U.S. Environmental Protection Agency, provided an overview of the process and conclusions of the U.S. EPA consideration of ultrafine particles which concluded that available information to consider a distinct air quality standard for this size range was still too limited.

Visit or contact the following agencies **FOR MORE INFORMATION**

BC LUNG ASSOCIATION
www.bc.lung.ca
2675 Oak Street
Vancouver, B.C. V6H 2K2
(604) 731-5864 or toll-free at 1-800-665-5864 (in B.C. but outside the Lower Mainland)

ENVIRONMENT CANADA – PACIFIC AND YUKON REGION
www.pyr.ec.gc.ca
401 Burrard Street
Vancouver, B.C. V6C 3S5
(604) 664-9100

HEALTH CANADA ENVIRONMENTAL HEALTH PROGRAM – B.C. REGION
www.hc-sc.gc.ca/ewh-semt/air/index-eng.php
400-4595 Canada Way
Burnaby, B.C. V5G 1J9
(604) 666-2671

BC CENTRE FOR DISEASE CONTROL
www.bccdc.ca
655 West 12th Avenue
Vancouver, B.C. V5Z 4R4
(604) 707-2400

B.C. MINISTRY OF ENVIRONMENT
www.bcairquality.ca

Environmental Standards Branch
PO Box 9341, Stn Prov Govt
Victoria, B.C. V8W 9M1
(250) 387-9932

Ministry of Environment Regional Offices
www.env.gov.bc.ca/main/regions.html

METRO VANCOUVER
www.metrovancouver.org
4330 Kingsway
Burnaby, B.C. V5H 4G8
(604) 432-6200

FRASER VALLEY REGIONAL DISTRICT
www.fvrd.bc.ca
45950 Cheam Avenue
Chilliwack, B.C. V2P 1N6
(604) 702-5000 or
1-800-528-0061

B.C. MINISTRY OF HEALTH
www.bcairquality.ca

Health Protection Branch
1515 Blanshard Street, RBB 4-2
Victoria, B.C. V8W 3C8
(250) 952-1469

BRITISH COLUMBIA HEALTH AUTHORITIES

Northern Health Authority
www.northernhealth.ca
Suite 600, 299 Victoria Street
Prince George, BC V2L 5B8
(250) 565-2649

Vancouver Island Health Authority
www.viha.ca
1952 Bay Street
Victoria, B.C. V8R 1J8
(250) 370-8699

Vancouver Coastal Health Authority
www.vch.ca
11th Floor, 601 West Broadway
Vancouver, B.C. V5Z 4C2
(604) 736-2033 or
1-866-884-0888

Fraser Health Authority
www.fraserhealth.ca
Suite 400, Central City Tower
13450–102nd Avenue
Surrey, B.C. V3T 0H1
(604) 587-4600 or
1-877-935-5669

Interior Health Authority
www.interiorhealth.ca
220-1815 Kirschener Rd
Kelowna, B.C. V1Y 4N7
(250) 862-4200

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