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
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.

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 (PM2.5, PM10, and ultrafine particles), black carbon (BC), nitrogen dioxide (NO2), and sulphur dioxide (SO2). 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

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

<table>
<thead>
<tr>
<th>TRAFFIC (SOURCE)</th>
<th>ENVIRONMENT</th>
<th>PERSON (RECEPTOR)</th>
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<tbody>
<tr>
<td>• Vehicle type</td>
<td>• General meteorological conditions</td>
<td>• Time spent in proximity to traffic</td>
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<td>• Fleet composition</td>
<td>• Localized wind patterns</td>
<td>• Transport mode</td>
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<td>• Fuel quality</td>
<td>• Built environment</td>
<td>• Activity level</td>
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<td>• Vehicle speed</td>
<td>• (dispersion vs. trapping)</td>
<td>• Physiological and social characteristics</td>
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<tr>
<td>• Vehicle volumes</td>
<td>• Distance between people</td>
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<tr>
<td>• Congestion level</td>
<td>and traffic</td>
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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.
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 PM$_{2.5}$, results are presented separately.

The highest annually averaged concentrations were observed in Vanderhoof (10.9 $\mu$g/m$^3$), followed by Courtenay, Port Alice and Smithers. Each of these communities exceeded the provincial annual average objective of 8 $\mu$g/m$^3$. Quesnel, Williams Lake and Vanderhoof also exceeded the three-year Canada-wide Standard (CWS) of 30 $\mu$g/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/m$^3$ at B.C. sites in 2012. Blue bars show data from TEOM monitors, and green bars show data from FEM monitors.
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.

### 2012 Ozone Levels in B.C.

![Ozone levels in ppb at B.C. sites, based on the fourth highest daily 8-hour maximum, averaged over 2010-2012.](image)

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.

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$_2$.
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.

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)
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 in annual mean PM$_{2.5}$ levels and NO$_2$ levels.

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.

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

Figure 7. Trends in annual mean NO$_2$ concentrations in Metro Vancouver (9 sites), Abbotsford, Victoria and Kelowna.
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.

Declining trends in annual mean \( \text{SO}_2 \) 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.
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.
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 SO2 Objectives
Metro Vancouver studied air quality in the Burrard Inlet area and concluded that sulphur dioxide (SO2) levels were higher than other areas in the Lower Fraser Valley, and that stringent World Health Organization air quality guidelines for SO2 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 SO2 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 SO2 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 (PM2.5). 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 BC 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.

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.
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.

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

BC MINISTRY OF ENVIRONMENT
www.bcairquality.ca

BC MINISTRY OF HEALTH
www.bcairquality.ca

BRITISH COLUMBIA HEALTH AUTHORITIES
Northern Health Authority
www.northernhealth.ca
Suite 600, 299 Victoria Street
Prince George, BC V2L 5B8
(250) 585-2649

Vancouver Island Health Authority
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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

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

FRASER VALLEY REGIONAL DISTRICT
www.fvrd.bc.ca
45950 Cheam Avenue
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B.C. MINISTRY OF HEALTH
www.bcairquality.ca

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BC MINISTRY OF ENVIRONMENT
www.bcairquality.ca

Environmental Standards Branch
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(250) 387-9932

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

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Suite 400, Central City Tower
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(604) 587-4600 or 1-877-935-5669

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Published June 2013

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