URBAN AIR QUALITY:
THE CHALLENGE OF NON-EXHAUST ROAD TRANSPORT EMISSIONS

July, 11th and 12th, 2013
"B-Debate strives to help position Barcelona as a benchmark in generating knowledge and Catalonia as a country of scientific excellence"

B-Debate is an initiative of Biocat with support from “la Caixa” Foundation which aims to drive top-notch international scientific events to foster debate, collaboration and open exchange of knowledge among experts of renowned national and international prestige. The debates are focused on the integration of diverse disciplines of science in order to tackle major scientific and societal challenges.
URBAN AIR QUALITY: 
THE CHALLENGE OF NON-EXHAUST ROAD TRANSPORT EMISSIONS

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URBAN AIR QUALITY: THE CHALLENGE OF NON-EXHAUST ROAD TRANSPORT EMISSIONS

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WELCOME

Dear Invited Speakers and Participants,

It is our pleasure to welcome you to the International Workshop “Urban Air Quality: the Challenge of Non-Exhaust Traffic Emissions”, co-organised by B-Debate International Center for Scientific Debate Barcelona, an initiative of Biocat with the support of “la Caixa” Foundation, and the Institute of Environmental Assessment and Water Research (IDAEA) of the Spanish National Research Council (CSIC).

About 430,000 premature adult deaths attributable to air pollution occur each year in the European Region. Emissions from road traffic account for a significant share of this burden. The World Health Organization (WHO) indicates that reducing levels of particulate matter (PM) could decrease mortality in polluted cities by as much as 15% every year. While important technological improvements have been made for reducing PM emissions from vehicle motor exhausts, no actions are currently taken to mitigate the non-exhaust part of emissions such as brake wear, road wear, tire wear and road dust resuspension. These non-exhaust sources contribute as much as the tailpipe exhaust to the PM concentrations in cities, and their burden is destined to increase in the future.

The little action taken so far can be partially explained with the lack of knowledge about these sources: emission estimates, impact, health effects and mitigation measures. Therefore it is aim of this Workshop to foster dialogue and debate on the current state of knowledge and remaining gaps in order to drive future research as support and guidance for air quality management.

On behalf of the IDAEA-CSIC and B-Debate, we thank you for your effort of joining us in this event and for your support. We trust these two days will be interesting and fruitful. We encourage you to participate actively.

Sincerely,

Fulvio Amato (Scientific Leader) and B-Debate
PROGRAM

Thursday, July 11th, 2013

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PROGRAM

Thursday, July, 11th, 2013

16:15  SESSION 3: MITIGATION AND POLICY
      Air Quality Plan in the Metropolitan Area of Barcelona. Current gaps
      Xavier Guinart, Government of Catalonia, Spain

16:45  CMA, an Important Contribution to Improve Air Quality in the City of Klagenfurt in Austria
      Wolfgang Hafner, City of Klagenfurt, Austria

17:15  Open Debate Session 3
      Chair: Xavier Querol, IDAEA-CSIC, Spain

17:45  Bus to CosmoCaixa

18:00  Visit to CosmoCaixa and 3D Planetarium

19:45  Dinner at CosmoCaixa

Friday, July, 12th, 2013

9:30  SESSION 4: HEALTH EFFECTS
      Exhaust Versus Non-Exhaust PM Toxicity: the London Experience
      Frank Kelly, King’s College, UK

10:10  How Hazardous are Wear Particles?
      Flemming Cassee, RIVM, Netherlands

10:50  Coffee break

11:20  Health Effects of Non-Exhaust Road Transport Emissions
      Jordi Sunyer, CREAL, Spain

12:00  Open Debate Session 4
      Chair: Martijn Schaap, TNO, Netherlands

12:30  Conclusions and closing remarks
      Fulvio Amato, IDAEA-CSIC, Spain

12:45  Lunch

14:00  AIRUSE Project Meeting (for project partners)
**SCIENTIFIC COMMITTEE**

**Fulvio Amato**, Researcher at the Institute of Environmental Assessment and Water Research (IDAea) Spanish Research Council (CSIC), Barcelona, Spain

Scientific Leader of the meeting

Fulvio Amato, Ph.D., has co-authored over 40 publications between peer-reviewed articles, book chapters, and books and participated in more than 40 national and international research projects on atmospheric pollution. He has specialized in Atmospheric Modelling at the Center for Air Resources Engineering and Sciences (NY-USA, 2008) and at TNO, Dutch Organization for Applied Research (The Netherlands, 2011-2013). His research focuses on atmospheric pollution, with special interest on urban air quality and road transport emissions. The main goal is the understanding of sources of atmospheric particulate matter (PM) and nitrogen oxides (NOx), chemical and physical processes, impact on air quality, health effects and possible mitigation. Among PM sources, particular attention is given to non-exhaust emissions from road traffic (such as brake-tire-road wear and road dust resuspension) since their burden on air quality is expected to increase in the near future and dominate PM emissions in cities.

Fulvio Amato has served as national and international advisor for environmental agencies, scientific committees, and authorities. He is a member of the EU drafting committee for a European standardised Receptor Models Technical Protocol and of the Referee pool of the new U.S.-Environmental Protection Agency (US EPA) receptor model.

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**Xavier Querol**, Research Professor at the Department of Geosciences of the Institute of Environmental Assessment and Water Research (IDAea) of the Spanish Research Council (CSIC), Barcelona, Spain.

Xavier Querol research focuses mainly on environmental geochemistry, mostly on air quality. He has participated in and/or directed several projects funded by the EC, Spanish Ministries of Education and Science, Environment and several regional governments and companies. Co-author of around 300 scientific articles on environmental sciences. Active researcher in the assessment and remediation Aznalcollar mining accident, in the environmental and health assessments of industrial areas of Huelva and Gibraltar (required by the Spanish and Andalusian Parliament) and the design of air quality plans of the ceramic industrial estate of Castelló and L’Alacantí. Also assessing the Ministry of the Environment on the National Air Quality Program, and the Generalitat de Catalonia on the Metropolitan Barcelona’s Air Quality Plan. He has served on the advisory committee of the Clean Air for Europe program (CAPE) of DG Environment of the EC, UN-ECE and WHO, as a member of various groups of experts to assess the air quality directives. Vice-Chairman of the Scientific Bureau of EMEP (UNECE) for the transboundary air pollution. Environment Award of Catalonia 2009.

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**Teresa Moreno**, Researcher at the Institute of Environmental Assessment and Water Research (IDAea) Spanish Research Council (CSIC), Barcelona, Spain

Teresa Moreno has a degree (1992) and an MSc (1993) in Geology from the Universidad Complutense of Madrid. She worked in the Spanish Geological Survey (1993-1995) before completing her PhD in Geology at the University of Cardiff (UK, 1999). Dr Moreno has completed post-doctoral studies in the University of Colgate (U.S. Fulbright, 2000), and branched into mineralogy and geochemistry of airborne particulate matter while a Research Associate at the University of Cardiff (2001-2004) working for the British Medical Council. Since 2004 she has brought her expertise on air pollution back to Spain, first as a Ramón & Cajal researcher and then as a tenured Junior Researcher in the ID/EA-CSIC institute where she was promoted to Senior Researcher in 2007. Her main research is based on the evaluation of levels, chemical composition and sources of atmospheric pollutants, especially those involving toxic metals. The practical applications of her research relate mainly to the impact of air pollutants on human health and the consequent need to devise contamination abatement strategies.
**Martijn Schaar**, Senior Researcher at the department “Climate, Air and Sustainability” of the Dutch Organization for Applied Research (TNO), The Netherlands

Martijn Schaar, author of over fifty peer reviewed scientific papers, has been working in the field of air pollution for 13 years, presently at TNO dealing with regional air pollution and its characteristics. He coordinates the development of the LOTOS-EUROS air quality model. In the last years he has performed and coordinated projects on the assimilation of ground based measurements (PM, O3) as well as satellite data (AOD) into the air quality model. Furthermore, there is a strong emphasis on the evaluation and subsequent improvement of emission data in his research. He has participated and participates in several EU projects: DAEDALUS, AIR4EU, EUCAARI, PROMOTE, MACC, PASODOBLE, TRANSPHORM, MEGAPOLI and ENERGEO. He is actively involved in EURODELTA, AQMEII and FAIRMODE. He has co-ordinated (inter) national projects on air quality modelling over Europe. Currently he coordinates the EU FP7 project ENERGEO. Member of the steering groups of AQMEII and FAIRMODE. His main interests are aerosol composition and physical characteristics, atmospheric chemistry, regional air quality modeling and data analysis. Starting 1-1-2009 he coordinates the regional modelling group at TNO.
Magdalena Jozwicka, Researcher at Climate, Air and Sustainability Department at TNO, the Netherlands

She has more than 5 years of experience in environmental research on air pollution and greenhouse gases, including a policy-supporting research. Magdalena Jozwicka is an emission inventory expert. Her field of expertise includes: compilation of Dutch and international greenhouse gas (GHG) and air pollutants emission inventories. During her work she also applies emission inventories for a broad range of both policy and scientific studies. She is working on the projects that evaluate and support emission reporting activities of Member States, amongst others in a project on streamlining emission reporting obligations within the European Union or developing GHG emission projection guidelines for the EU Member States. Emissions to air are her main expertise but she is also experienced in making inventories of emissions to water. Magdalena Jozwicka has master degrees in Environmental Engineering-Environmental Protection and Recultivation from Warsaw School of Life Science (Poland) and in Environmental Sciences - Environmental Systems Analysis from Wageningen University (The Netherlands). She also has a BSc in International Economics from Warsaw School of Economics (Poland).

The Art of Non-exhaust Emission inventoring

Emission Inventories (EI) are being compiled for a broad range of applications by an increasing number of institutions and scientists as they constitute the basic information that is needed for any study on the environmental issues of air pollution and climate change. EI tend to be large sets of numbers describing the contributions of many individual sources to the emissions of certain pollutants at certain locations or areas at a certain point in time. There are emission reporting requirements which obliged Member States (MS) to report their emissions. One of it is the Convention on Long Range Transboundary Air Pollution (CLRTAP) which asks parties to report air pollutants from many sources including automobile tyre and break wear and automobile road abrasion. National experts in EU MS can use the EMEP/EEA air pollutant emission inventory guidebook to estimate pollutant emissions from all anthropogenic sources as well as from traffic non-exhaust PM emissions. The methods proposed in the Guidebook are relatively simple and should be further improved but it is a good starting point for more complete and consistent national inventory. However, the uncertainties of traffic wear emissions are big and the quality of data is often questionable. The reasons for that are: properties of the sector, missing policies and measures addressing wear emissions, insufficient emission information, lack of representative measurement protocols, etc. During her presentation Magdalena Jozwicka will present highlights of the compilation of emission inventories. She will focus further on officially reported wear emission data and on resuspension of road dust calculated by Lotos-Euros model.

Mats Gustafsson, Researcher at the Swedish National Road and Transport Research Institute (VTI), Sweden

Mats Gustafsson has a doctor’s degree in Physical Geography from Gothenburg University with a thesis on “Marine Aerosols in Southern Sweden”. His research at VTI mainly concerns transport related particulate pollution with an emphasis on non-exhaust particles. Since 2000 he has been the project leader of a large number of research projects dealing with particle emissions, properties, how material properties influence particle emissions and how to mitigate emissions. Research concerns road as well as railroad pollution. Except for the particle research Dr Gustafsson is involved in road pollution to water and soil and also has an interest in landscape and infrastructure research. He is a reviewer for several scientific journals and has been chairing the scientific board of the Dutch IPL research program. He has been the faculty opponent of three Ph.D. students and is a member of the Nordic Road Dust Group (NKG) and the FEHRL task force air quality. He is also a frequent speaker at scientific conferences and stakeholder/end user seminars concerning traffic and environment and holds an annual recurring course on traffic related particulate air pollution, addressing consultants, authorities and municipalities.
Non-exhaust Particles from Road Traffic – the Nordic Experience

Non-exhaust particle research in the Nordic countries has been, and still is, focusing on the contribution from road wear and winter road operation measures to PM10 and PM2.5 concentrations and how to mitigate these emissions. These sources are exceptionally strong due to use of studded tyres and the cold Nordic winters. A dry, cold spring often leads to numerous exceedances of the EU limit values in city street environments. Even though the sources are mainly identified, mitigation measures show variable effects. On-going work focus on studies of emissions, abatement techniques and strategies as well as modelling suitable for environments with high road dust contribution, to be able to produce knowledge essential for optimizing mitigation of particulate air pollution. The presentation gives an overview of the Nordic PM situation as well as of current knowledge and on-going research.

Martijn Schaap  (See his CV at Scientific Committee Section)

Capturing Road Dust in a Regional Model – Experiences with LOTOS-EUROS and Challenges

Crustal material makes up 5-20% of the ambient PM10 mass. Despite the importance of crustal material in total PM10 mass, the sources are still poorly understood and not well-represented in emission inventories or air quality models. We have implemented a simple scheme to assess the importance of road dust emissions across Europe, which will be presented at the meeting. To check first order estimates of the various dust source strengths we have also implemented simple and therefore transparent emission functions for agricultural land management, wind erosion as well as boundary conditions for desert dust. First results indicate that the emissions as a result from agricultural land management contribute most to the total modelled mineral dust concentration followed by those from traffic. The total mineral dust concentration is underestimated by the present model approaches. The large uncertainties involved in the modelling of mineral dust are discussed with special emphasis on road dust and possibilities to further improve of validate the model approaches.

Robert Gehrig, Deputy-head of the Laboratory for Air Pollution/Environmental Technology at EMPA, Switzerland

Robert Gehrig has a PhD in chemistry and is the deputy-head of the Laboratory for Air Pollution/Environmental Technology at EMPA, the Swiss Federal Laboratory for Materials Science and Technology (www.empa.ch). From 1979 to 1989 he was responsible for the planning, installation and operation of the Swiss National Monitoring Network for Air Pollutants (NABEL). Later he was the leader of the project "Air Pollution at forest sites" within the Swiss National Research Programme "Forest damages and Air Pollution". During the nineties his activities focused on research projects in the field of indoor air pollution, namely the emissions of VOC from building materials. Currently he is the head of the analytical laboratory and the leader of various research projects on fine particles in the atmosphere with a special focus on emission of particles from traffic. He is member of the Swiss Federal Commission on Air Hygiene advising politicians and public authorities in the field of environmental politics and measures against air pollution. In addition he represents Switzerland in the European Monitoring and Evaluation Programme within the UNECE Convention on Long Range Transport of Air Pollution and is member of various CEN working groups.

Wear and Resuspension Particles from Road Traffic - Sources and Emission Factors

Numerous studies show clear contributions of non-exhaust emissions to the traffic related PM10 load of the ambient air. These emissions consist of particles produced by abrasion from brakes, road wear, tire wear, as well as vehicle induced resuspension of deposited road dust. The main scope of a Swiss research project presented in this presentation was to identify and quantify the non-exhaust fraction of traffic related PM10 for two roadside locations in Switzerland with different traffic regimes. The two investigated locations, an urban street canyon with heavily congested traffic and an interurban motorway, are considered as being typical for wide parts of Central Europe. Mass-relevant contributions from abrasion particles and resuspended road dust mainly originated from particles in the size range 1 to10 μm. The results show a major influence of vehicle induced resuspension of road dust. In the street canyon, the traffic related PM10 emissions were assigned to 21% brake wear, 38% resuspended road dust and 41% exhaust emissions. Along the freeway the respective contributions were 3% brake wear, 56% resuspended road dust and 41% exhaust emissions. However, specific differentiation between PM10 emissions due to direct abrasion and resuspension from road pavement was not possible from data of the field campaigns. Therefore, Mobile Load Simulators were used to estimate PM10 emission factors for pavement abrasion and resuspension on different pavement types for light and heavy duty vehicles. From the experiments it was derived that particle emissions from direct abrasion from pavements in good condition are quite low if quantifiable at all. Considerable abrasion emissions, however, can occur from damaged pavements. Resuspension of deposited dust can cause high and extremely variable particle emissions depending strongly on the dirt load of the road surface.
**Xavier Querol** (See his CV at Scientific Committee Section)

**Urban Air Quality: From Ultrafine to Coarse Particles**

A review of source origins of ultrafine and coarse particles in urban areas is shown with the aim of highlighting the relevance of these parameters for the current air quality policy review. Atmospheric processes and anthropogenic non-exhaust emissions play a key role in the variability of these pollutants that should be taken into account. Exposure to this pollutant during commuting is also a relevant issue in large cities.

**André Prévôt**, Head of the Gasphase and Aerosol Chemistry Group in the Laboratory for Atmospheric Chemistry at the **Paul Scherrer Institute**, Switzerland

André Prévôt, Ph.D., has been working in the field of atmospheric science more than 20 years. Since 2000 he is leading a research group with currently more than 20 members. The research foci include: 1) Characterization of the pollution and sources in the troposphere. The advanced instrumentation includes aerosol mass spectrometry, proton transfer reaction mass spectrometry, rotating drum / synchrotron x-ray fluorescence and 14C analyses by accelerator mass spectrometry in collaboration with the University of Berne. 2) Study of secondary organic aerosol formation from various exhausts and individual molecules in mobile and stationary smog chambers and oxidation flowtubes. 3) Regional modelling of particulate matter and ozone chemistry on European Scale. He has co-authored more than 160 peer-review journal articles which include more than 5000 citations. His h-index is currently 38. He has been involved in more than 50 national and international projects. Relevant for the topic of the meeting are statistical analyses of monitoring data including the evaluation of trends and meteorological influences. The combination of rotating drum and synchrotron x-ray fluorescence has allowed the assessment of the coarse chemical composition at hourly resolution to derive the non-exhaust contribution of traffic and other sources.

**Examples of Using PM10/PM2.5 Monitoring and RDI-Synchrotron-XRF Data to Assess Coarse PM Sources**

Long-term measurements of PM2.5 and PM10 offer the opportunities to study the time trends of the coarse mode particulate mass. The weekend effect with additional assumptions might be a way to assess the contribution of non-exhaust emissions from traffic. Analyses in Switzerland indicate that the weekend effect is stronger for coarse than for fine particles and that the contribution of traffic is estimated to be around 70% of the total measure coarse mass. High time-resolution synchrotron-XRF data can be used to apportion the non-exhaust sources and provide chemical composition of the sources. The analysis of data can include the use of the diurnal, weekly pattern as well as positive matrix factorization. The use of concurrent data in street canyons and urban background allow for estimations of the road increment. Data obtained in Zurich, Switzerland and in London in the United Kingdom will be discussed.

**Roy Harrison**, Queen Elizabeth II Birmingham Centenary Professor of Environmental Health at the **University of Birmingham**, UK

Roy Harrison, Ph.D., has recently been appointed as Distinguished Adjunct Professor at King Abdulaziz University, Saudi Arabia. Roy’s research interests are in air pollution, especially airborne particulate matter. This includes studies of particles from emissions, through atmospheric transformations to human exposure and effects upon human health. In recognition of his government advisory work, he was appointed an Officer of the Order of the British Empire (OBE) in the 2004 New Year Honours List. He is author of over 400 papers in the peer-reviewed literature, has an H-index of 59 and is listed by ISI as a Highly Cited Researcher.

**Approaches to the Quantification of Non-Exhaust Emissions from Road Traffic**

The on-road emissions of road vehicles can be separated from background pollution by using a twin-site sampling approach in which measurements are made at a roadside and a nearby urban background location with the traffic increment being determined by difference. Non-exhaust emissions from road vehicles can be distinguished from exhaust emissions by their different chemical composition and size distribution. Work based upon these principles will be described in which chemical tracers have been developed to distinguish brake wear, tyre wear and resuspension emissions and measures of particle size distribution have allowed the identification of brake wear and resuspension emissions with excellent separation from exhaust emissions. Approaches to estimation of emission factors are also discussed.

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Xavier Guinart, Head of the Air Monitoring and Control Service at the Directorate General of Environmental Quality, Ministry of Territory and Sustainability, Government of Catalonia, Spain

Xavier Guinart, Industrial and Chemical Engineer, is carrying out functions of assessment and management of ambient air quality at the Catalan Ministry of the Environment, mainly related to the Atmospheric Pollution Monitoring Network of Catalonia. He is also working in the area of atmospheric emission control, both in the area of prevention as well as in control and inspection of industrial air emissions. In 1996, with the approval of the new framework legislation on air quality in Europe, he worked in the design of the first wide scale plan to improve air quality in the metropolitan area of Barcelona. That plan was approved in 2007 and it included actions to be taken with the aim to achieve the air quality limit values for nitrogen dioxide (NO2) and particulate matter PM10 in 40 municipalities in this metropolitan area, including the city of Barcelona. At present he is working in the update of the former air quality plan. This revision includes new measures that involve the main polluting sectors such as road transport, maritime transport, airport, industrial and domestic emissions. The implementation of these new actions should result on reaching the air quality limits for NO2 and PM10 in 2015. At present he is working in the update of the former air quality plan. This revision includes new measures that involve the main polluting sectors such as road transport, maritime transport, airport, industrial and domestic emissions. The implementation of these new actions should result on reaching the air quality limits for NO2 and PM10 in 2015.

Air Quality Plan in the Metropolitan Area of Barcelona. Current Gaps

The Metropolitan Area of Barcelona comprises 40 municipalities with a total population of 4 million. The major sources of nitrogen dioxide and particulate matter are road transport and industry. The density of vehicles in Barcelona is among the highest in Europe and there are many roads with a high burden of traffic. Studies and the presentation of the measurements and modelling results in maps help to identify the polluted areas and the sources of emissions. In 2006 Special Protection Zones for particulate matter and nitrogen dioxide were established in the Metropolitan Area of Barcelona and an Air Quality Plan was approved. Nowadays the updated Air Quality Plan is being implemented. The adoption of these new actions should result on reaching the air quality limit values for these pollutants in 2015. Emission inventories together with atmospheric modelling are important tools that help us to determine the causes of a particular problem of air quality and, therefore, provide information on where to act to solve the problem. The Plan includes 34 measures in 7 different activity areas, from road transport to public awareness including port, airport and industrial measures. There are also 4 measures for environmental pollution episodes.

Wolfgang Hafner, Head of the Department of Environmental Protection, Municipality of the City of Klagenfurt on Lake Wörthersee, Austria

Wolfgang Hafner, Ph.D., studied Biology and Chemistry at Graz Karl-Franzens-University and subsequently Environmental Engineering at Graz University of Technology. Since 2002 he has been Head of the Department of Environmental Protection of the City of Klagenfurt on Lake Wörthersee, responsible for the monitoring and inspection of industrial plants and of SMEs, for nature protection, air and water monitoring, noise, ambient air quality, climate protection and sustainable energy planning. Furthermore, he is project manager of the EU-Projects KAPA GS (2004-2007), SPAS (2006-2009), CMA+ (2009-2012), since 2010 of CEMOBIL, REZIPE, PMinter and since 2012 project partner of SEAP_Alps and CoP.

CMA, an Important Contribution to Improve Air Quality in the City of Klagenfurt in Austria

In the context of the EU Project KAPA GS (2004-2007), evidence was provided for the first time that re-suspension of particulate matter caused by road traffic accounts for about 20% of the total PM pollution. This has spurred the EU Project CMA+. Since 2009, Klagenfurt, Lienz and Bruneck/Brunico have been working on improving an innovative method to bind dust by applying liquid CMA onto roads and on demonstrating the efficiency of this method. Once it had been established that traffic safety is not compromised by the application of 10g/m2 CMA, the test area was extended to the entire city area (164 km in length) in the winter season 2011/2012. As a result: PM pollution can be reduced by CMA by about 10% on average during a winter season. Applied onto unpaved surfaces, a reduction potential of up to 50% is achievable. CMA also suggests itself for preventive application as a de-icing agent in pedestrian zones and sensitive areas. A mixture of CMA / KF enhances the effect for both finedust binding and de-icing. An instruction manual is available for potential CMA users.
INVITED SPEAKERS

Friday, July, 12th, 2013

Frank J. Kelly, Chair on Environmental Health and Director of the Environmental Research Group and Deputy Director of the MRC-PHE Centre for Environment & Health at King’s College London, UK

Professor Frank Kelly, Bsc, Ph.D., main research interest is the impact of atmospheric pollution on human health and he has published over 250 papers on the toxicology and health effects of ozone, nitrogen dioxide and particulate pollution. When addressing the mechanisms underlying air pollution related lung injury he has focused on events occurring within the respiratory tract lining fluid (RTLF) compartment of the lung. He has proposed that oxidant/antioxidant events occurring in RTLF are pivotal to understanding the impact of air pollution on the lung and has employed this knowledge to develop a model system to access the oxidative potential of ambient particulate matter. He has participated in a number of EU projects, coordinated a MRC Cooperative Group investigating the mechanistic basis of particulate air pollution toxicity and is Assistant Director of the MRC PHE Centre for Environment and Health. Frank led two major Health Effects Institute (HEI) projects, which examined the potential health benefits of the Congestion Charging Scheme (CCS) and Low Emission Zone (LEZ) in London. In addition to his academic work Professor Kelly provides policy support advice to a number of expert bodies. He has advised the World Health Organisation Air Pollution Advisory Board on PM10, O3 and NO2 and participated in the WHO air quality guideline global update in 2005, indoor AQ guidelines (2009) and review of evidence of health effects of air pollutants (2012/3). Frank has served as a member of EPAQS—the UK Expert Panel on Air Quality Standards, chaired the Air Pollution Research in London (APRIL) Health committee and was a panel member on the HEI’s Critical Review of Health Effects of Traffic-Related Air Pollution and is currently chair of the Department of Health’s expert Committee on the Medical Effects of Air Pollution (COMEAP).

Exhaust Versus non Exhaust PM Toxicity: the London Experience

Although the contribution of non-exhaust PM to ambient air at roadside locations is widely acknowledged, their contribution to the toxicity of ambient PM is unclear. The capacity of PM to elicit inflammation in a function of its oxidative potential: the ability to elicit reactive oxygen species generation in the lung. Oxidative potential reflects particulate laden catalytic transition metals and organic material. We have developed a model of the respiratory tract-lining fluid (RTLF), which is the aqueous compartment that particles first enter in the lungs. The capacity of ambient PM to deplete RTLF antioxidants provides a physiologically relevant measure of PM oxidative potential. Using this assay we have shown that PM oxidative potential at roadside is higher than that at urban background, reflecting differing concentrations of bioavailable metals. Ba, Cu, and Mo concentrations were higher in PM10 samples from roadside locations compared with urban background sites, a similar pattern was not apparent in PM2.5. The higher concentrations of Ba, Cu, and Mo in PM10 reflects their presence in the coarse fraction (PM2.5–10). These metals reflect non-exhaust motor-vehicle sources, such as brake and tire wear or the resuspension of road dust. These data indicate that a proportion of PM oxidative potential appears in the coarse mode and as this is related to non exhaust emissions such as brake wear raises important issues regarding the nature of traffic management schemes.

Flemming R. Cassee, Head of the Department of Inhalation Toxicology at the RIVM, The Netherlands

Flemming R. Cassee, Ph.D., works at the National Institute for Public Health and the Environment, Bilthoven, the Netherlands, and also has a position as professor in inhalation toxicology at the Institute of Risk Assessment Sciences of the University of Utrecht, the Netherlands. He has been active in toxicology for more than 20 years with a prime interest in the adverse health effects of air pollutants and inhaled nanomaterials. He is the editor-in-chief of Particle and Fibre Toxicology and scientific advisor of amongst other the Dutch Ministry of Environment, WHO-Europe, EU and US EPA.
How Hazardous are Wear Particles?

There is very little information published on the toxicity of wear particles that become airborne as a result of road traffic movements. Toxicity can be assessed using cell cultures (in vitro), whole organs (ex vivo) or whole animal (in vivo) studies, whereas nowadays the oxidative potential (redox activity) of particles are frequently used as a proxy for toxicity. Wear particles hazard assessment will be discussed and be put into perspective of the toxicity of particles from other sources such as engine exhaust. For example, acute pulmonary toxicity of particles released from tires could be related to the presence of water soluble zinc and copper. Likewise, barium and copper, source tracers for brake wear, were correlated with oxidative stress and lung inflammation in vivo. Brake pad particles showed remarkable high activities in assays that assess the oxidative potential. At high concentrations these metals may induce cardiac oxidative stress.

Jordi Sunyer, Co-Director of the Centre for Research in Environmental Epidemiology (CREAL) and Professor of Preventive Medicine and Public Health, Universitat Pompeu Fabra (UPF), Barcelona, Spain

Jordi Sunyer, Ph.D., is the coordinator of the research program in respiratory health, air pollution and childhood development of the Sea Hospital Institute for Medical Research (IMIM). In 1984 he coordinated a study of an epidemic of asthma that had occurred in Barcelona. Urban air pollution was not found to be involved in the origin of the asthma epidemic but they did find a short-term effect of urban pollution, at levels previously considered to be safe, in patients with a respiratory exacerbation. These investigations had a great public health impact with accompanying editorials advocating for increased research and revision of the safety standards for air pollution. Subsequently, he had taken part in a series of European consortium studies of air pollution. He established a new line of research on the effects of environmental hazards on neurodevelopment and in particular an interest in research on the effects of early-life exposures to persistent pollutants on these outcomes. His first study in 2003 of high levels of hexachlorobenzene (HCB) in the air surrounding an electrochemical plant provided his first opportunity to study the neurodevelopment effects in newborns. This had become a highly productive line of research, and since 2003 he published 32 articles on the effects of environmental exposures on neurodevelopment outcomes including breastfeeding and DDT, smoking, HCB, NO2, and PBDE. These studies have led to the inclusion of both HCB and DDT assessments by the International Program Chemical Safety to establish WHO guideline values for these chemicals and his participation in their advisory board. In addition we have started the study the role of gene-environment interactions on neurodevelopment. He has developed an interest and new initiatives to investigate the prenatal and postnatal origins of neurodevelopment and functional disorders in children resulting from early life exposures to environmental exposures. Jordi Sunyer participated on the building of a network of birth cohorts in Spain, named INMA which has become a highly productive structured platform for etiological research on children’s development and has already generated more than 150 scientific publications.

Health Effects of Non-Exhaust Road Transport Emissions

A review of the epidemiological methodology to assess the acute and chronic health effects of air pollution will be covered. The short term and long term effects of air pollution on respiratory, cardio-vascular and neurological effects are going to be reviewed as well as the health benefits following air pollution interventions. Current studies conducted at CREAL and IDAEA with elements and sources in the Mediterranean area will be presented as well as studies on carotid thickness in adults and in children on reproductive and neurodevelopmental outcomes. The role of non-Exhaust Road Transport Emissions potential remediation is going to be discussed.
ADDITIONAL INFORMATION

Suggested Reading


“Air Quality in Europe 2012 report EEA”
Technical report No 4/2012

“The contribution of transport to air quality-TERM 2012. Transport indicators tracking progress towards environmental targets in Europe”
EEA Report No 10/2012

WHO/SDE/PHE/OEH/06.02
http://whqlibdoc.who.int/hq/2006/WHO_SDE_PHE_OEH_06.02_eng.pdf

OUTCOMES

B·Debateca

On the website of B·Debate, you will find all the information related with the celebration of the meeting that includes reports, conclusions, scientific documents, interviews with the experts, speaker’s CVs, presentations, videos, images, press documentation and other related materials. We invite you to visit the section B·Debateca on www.bdebate.org!

Contents of the meeting “URBAN AIR QUALITY: THE CHALLENGE OF NON-EXHAUST ROAD TRANSPORT EMISSIONS”: www.bdebate.org/en/debate?title=2603&tipo=all&tematica=all&fecha=all

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PRACTICAL INFORMATION

Debates venue

Cotxeres del Palau Robert
Passeig de Gràcia, 107
08008 Barcelona, Spain
www.gencat.cat/palaurobert

Speakers’ hotel

Hotel Balmoral Barcelona
Via Augusta, 5
08006 Barcelona, Spain
Phone: +34 932178700
http://www.hotelbalmoral.com/

Dinner, July, 11th

CosmoCaixa Barcelona
C/ Isaac Newton, 26  08022 Barcelona, Spain
http://obra.soortal.lacaixa.es/LaCaixaFoundation/home_en.html

Contact person during the event

Laia Arnal
Project Director
larnal@biocat.cat | Phone: +34 662 315 529 | +34 93 310 33 30

Teresa Moreno
Researcher
teresa.moreno@idaea.csic.es | Phone: +3493 400 61 23

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B-Debate International Center for Scientific Debate Barcelona is a Biocat initiative with support from “la Caixa” Foundation. It drives first-rate international scientific debates, to foster dialogue, collaboration and open exchange of knowledge with prestigious national and international experts, to approach complex challenges of high social interest in life sciences. B-Debate sees debate as a powerful, effective way to generate knowledge and strives to help position Barcelona as a benchmark in generating knowledge and Catalonia as a country of scientific excellence.

More information: www.bdebate.org

IDAIA-CSIC is the Institute of Environmental Assessment and Water Research (IDAE) of the Spanish National Research Council (CSIC). The mission of IDAEA-CSIC is investigating the natural and anthropogenic changes occurring in ecosystems, by means of chemical and geochemical techniques, principally those changes that increase toxicity in humans and organisms. IDAEA-CSIC is founded on the basis of the researchers experience in environmental sciences, including analytical chemistry, geochemistry, hydrology and biotechnology. IDAEA researchers have outstanding trajectories in publishing in top-score journals, leading Spanish and International funded projects, participating in remediation of severe environmental problems, and climate and global change studies.

More information: www.idaea.csic.es
The AIRUSE project ("Testing and Development of air quality mitigation measures in Southern Europe") expects to achieve a reduction of PM10 and PM2.5 levels, by applying effective air mitigation strategies appropriate for Southern Europe. The mitigation strategies developed will be appropriate for Southern Europe but they could also be adapted by other regions in Europe that can not meet the EU limit values concerning PM concentration levels.


MCV, SA is a Spanish company dedicated to the development, manufacturing, distribution, installation and maintenance of equipment, stations and atmospheric pollution monitoring and meteorology networks.
