The WHO and EU approach to revise the EU air quality policies – current state and plans

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To provide the European Commission and its stakeholders with scientific evidence-based advice on health aspects of air pollution in support of the comprehensive review of air quality legislation of the European Union due in 2013, the REVIHAAP project was funded jointly by WHO and EC to the review of the latest scientific evidence on all pollutants regulated in Directive 2008/50/EC and 2004/107/EC. It is addressing a set of questions regarding health aspects of particulate matter, ground level ozone, nitrogen dioxide, and sulphur dioxide, as well as emissions to the air of As, Cd, Hg, Ni and PAH. In particular, it investigates the role of particles with various physical and chemical characteristics, including ultrafine particulate matter, looking at the new epidemiological, toxicological and experimental evidence on health effects of various size fractions of PM.

Groups of experts are currently reviewing the accumulated evidence and prepare draft response to each of the questions, as well as succinct summaries of the key evidence supporting the replies. After editing and experts discussion at the meeting to be convened in August 2012, the preliminary responses will be subject to the external review by invited experts and discussion at the WHO experts at the next expert group meeting in January 2013. The responses on the role of ultrafine particles in generating health effects will be available after that meeting.

Based on the evaluation of the new messages emerging from health research, the second stage of the project will formulate recommendations concerning a need for revisions of the EU air quality policy and/or WHO air quality guidelines, including a potential need to address components of PM of specific characteristics (e.g. ultrafines) in the revised legislation. Evaluation of the scope or feasibility of such new regulatory approaches, including methods of monitoring compliance with limits or targets for atmospheric levels of ultrafine particles or population exposure, will not be a task of WHO project as it requires additional inputs, beyond that provided by research on health aspects of air pollution. The WHO-EC REVIHAAP project will provide an input to further decision making process organized by the European Commission and deciding on future shape of EU policies on air quality.

Currently available WHO assessment of scientific evidence on health aspects of ultrafine particles is presented in WHO Air Quality Guidelines, published in 2006 (http://www.euro.who.int/__data/assets/pdf_file/0005/78638/E90038.pdf) (http://www.euro.who.int/__data/assets/pdf_file/0004/162535/e96541.pdf). It acknowledges that there is considerable toxicological evidence of potential detrimental

effects of ultrafine particles on human health. However, the existing body of epidemiological evidence is insufficient to reach a conclusion on the exposure–response relationship to ultrafine particles. Therefore no recommendations can be provided at present as to guideline concentrations of ultrafine particles.

The recent assessment of the health effects of black carbon, published by WHO in April 2012 (http://www.euro.who.int/__data/assets/pdf_file/0005/78638/E90038.pdf), concluded that there is **Sufficient evidence** on association of short-term (daily) variations in BC concentrations with short term changes in health and on associations of all cause and cardiopulmonary mortality with long-term average BC exposure. There is also s**uggestive evidence** for BC being a better indicator of harmful particulate substances from combustion sources - especially traffic - than undifferentiated PM mass but the evidence to allow of an evaluation of the qualitative differences between health effects of exposure to BC or to PM mass **is insufficient.** There is not enough clinical or toxicological studies to allow an evaluation of the qualitative differences between the health effects of exposure to BC or to PM mass, an evaluation of the quantitative comparison of the strength of the associations or identification of any distinctive mechanism of BC effects. BC (measured as EC) may not be a major directly toxic component of fine PM, but it may operate as a carrier of various (also combustion-derived) chemical constituents of varying toxicity to sensitive targets in the human body. While the use of PM2.5 as a primary approach in quantifying the human exposure to PM and its health effects is recommended, it is acknowledged that the reduction of exposure to PM2.5 containing BC should lead to reduction of health effects associated with PM. This is especially relevant in view of the recent decision of the International Agency for Research on Cancer of WHO to classify diesel engine exhaust as carcinogenic to human (Group 1) based on sufficient evidence that exposure is associated with an increased risk for lung cancer.

In conclusion, the WHO experiences indicate that comparison of the effects of various components of PM requires studies directly assessing the differences in effects. The conclusion about the causal role of various PM indicators / fractions in producing health effects requires systematic review of the epidemiological, toxicological and atmospheric science evidence. However addressing common source of various PM fractions, including ultrafine particles, may be a prudent risk management approach.

The WHO and EU approach to revise EU air quality policies

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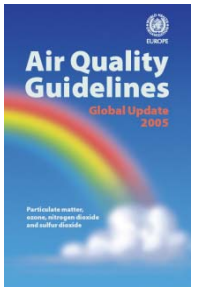
REGIONAL OFFICE FOR Europe

This presentation focus:

How to regulate ambient nanoparticles?

- What evidence exists to support policies?
- What is the evidence demonstrating that the regulations focussed on nanoparticles would result in additional health benefits as compared to policies regulating PM mass?

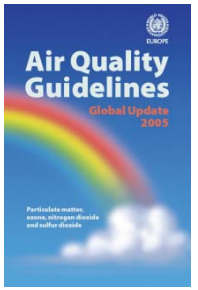
WHO AQG: Global update 2005: Summary of updated AQG values



AQG levels recommended to be achieved everywhere in order to significantly reduce the adverse health effects of pollution

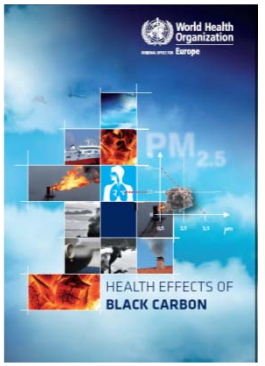
Pollutant	Averaging time	AQG value
Particulate matter		
$PM_{2.5}$	1 year	10 µg/m^3
	24 hour (99th percentile)	25 µg/m^3
PM_{10}	1 year	20 µg/m^3
	24 hour (99th percentile)	50 µg/m^3
Ozone, O_3	8 hour, daily maximum	100 µg/m^3
Nitrogen dioxide, NO_2	1 year	40 µg/m^3
	1 hour	200 µg/m^3
Sulfur dioxide, SO_2	24 hour	20 µg/m^3
	10 minute	500 µg/m^3

WHO AQG: Global update 2005: Ultrafine particles (<0.1 µm) (p. 279-80)



- There is considerable toxicological evidence of potential detrimental effects of ultrafine particles on human health.
- The existing body of epidemiological evidence is insufficient to reach a conclusion on the exposure–response relationship to ultrafine particles.
- No recommendations can be provided at present as to guideline concentrations of ultrafine particles.

WHO Review of health effects of BC



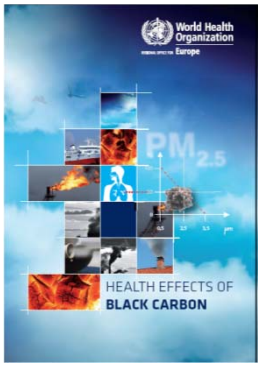
WHO 2012

- Systematic review of evidence on:
  - BC monitoring methods;
  - Population exposure to BC;
  - Epidemiological studies on health effects of BC and their comparison with effects of PM mass:
  - Evidence from toxicology, including human clinical studies
- Review / discussion at the 13th meeting of the WHO/Convention Task Force on Health

LRTAP
Long-range Transboundary Air Pollution

http://www.euro.who.int/__data/assets/pdf_file/0004/162535/e96541.pdf

Effects of PM2.5 and EC on mortality (% change per 1 µg/m3): time-series studies with PM2.5 and EC measured



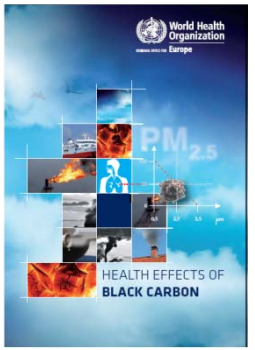
	PM2.5	EC
All causes	0.19 (0.03-0.35)	1.45 (1.32-1.57)
Cardiovascular	0.29 (0.07-0.50)	1.77 (1.08-3.08)

IQR PM2.5 / EC ~ 11

- Similar RRs per IQR for PM10 and BS
- Associations with BC more robust than with PM mass in 2 poll. models
- Evidence from long-term studies inconclusive

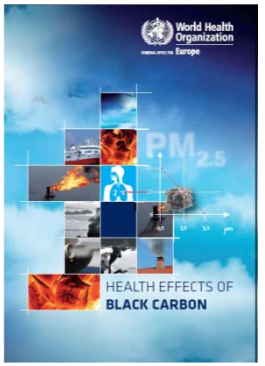
Janssen et al, EHP 2011

Comparison of black carbon and PM mass toxicity



- Not enough clinical or toxicological studies to allow
  - an evaluation of the qualitative differences between the health effects of exposure to BC or to PM mass;
  - an evaluation of the quantitative comparison of the strength of the associations;
  - identification of any distinctive mechanism of BC effects.
- BC (measured as EC) may not be a major directly toxic component of fine PM, but it may operate as a carrier of various (also combustion-derived) chemical constituents of varying toxicity to sensitive targets in the human body.

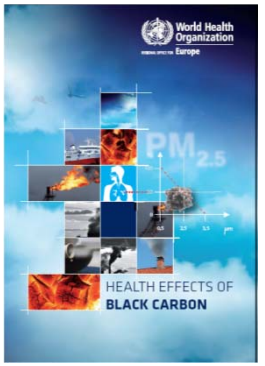
Review of health effects of BC – conclusions (1/2):



- **Sufficient evidence** on association of short-term (daily) variations in BC concentrations with short term changes in health and on associations of all cause and cardiopulmonary mortality with long-term average BC exposure.
- **Suggestive evidence** for BC being a better indicator of harmful particulate substances from combustion sources - especially traffic - than undifferentiated PM mass
- **Insufficient** evidence to allow of an evaluation of the qualitative differences between health effects of exposure to BC or to PM mass

http://www.euro.who.int/__data/assets/pdf_file/0004/162535/e96541.pdf

Review of health effects of BC – conclusions (2/2):



- The reduction of exposure to PM2.5 containing BC should lead to reduction of the health effects associated with PM;
- Continue use of PM2.5 as the primary approach in quantifying the human exposure to PM and its health effects;
- BC may be useful as an additional indicator in evaluation of local actions aimed at reduction of population exposure to combustion particles (e.g. from motorized traffic)

http://www.euro.who.int/__data/assets/pdf_file/0004/162535/e96541.pdf

WHO news

International Agency for Research on Cancer

World Health Organization

PRESS RELEASE
N° 213

12 June 2012

IARC: DIESEL ENGINE EXHAUST CARCINOGENIC

Lyon, France, June 12, 2012 -- After a week-long meeting of international experts, the International Agency for Research on Cancer (IARC), which is part of the World Health Organization (WHO), today classified diesel engine exhaust as **carcinogenic to humans (Group 1)**, based on sufficient evidence that exposure is associated with an increased risk for lung cancer.

WHO-EC project “Evidence on health aspects of air pollution to review EU policies – REVIHAAP”

OBJECTIVE:

To provide the European Commission and its stakeholders with scientific evidence- based advice on health aspects of air pollution in support of the comprehensive review of air quality legislation due in 2013.

TIME: Nov 2011 – April 2013

REVIHAAP key questions:

- 7 questions on PM
- 4 questions on ozone
- evidence of increased health effects linked to proximity to roads
- 3 questions on NO2
- new evidence on the health effects of air emissions of As, Cd, Hg, Pb, Ni (and their compounds), of SO2 and PAHs
- contribution of exposure to ambient air pollution to the total exposure of air pollutants covered by the regulations (vs. exposures from indoor environments, commuting and work places).

http://www.euro.who.int/en/what-we-do/health-topics/environment-and-health/air-quality/activities/evidence-on-health-aspects-of-air-pollution-to-review-eu-policies-the-revihaap-project

REVIHAAP Scientific Advisory Committee

- Hugh Ross Anderson, UK
- Bert Brunekreef, NL
- Aaron Cohen, US
- Klea Katsouyanni, GRE
- Daniel Krewski, CND
- Wolfgang G. Kreyling, GER
- Nino Künzli, SWI
- Xavier Querol, SPA

REVIHAAP question A2:

A2. What new health evidence is available on the role of other fractions/metrics of PM, **such as smaller fractions (ultra-fines), black carbon,** chemical constituents (metals, organics, in-organics, crustal material and PM of natural origin, primary/secondary) or source types (road traffic including non-tailpipe emissions, industry, waste processing …) or exposure times (e.g. individual or repeated short episodes of very high exposure, 1h, 24h, yearly)?

Answering REVIHAAP questions

- Groups of experts invited by WHO to:
  - Identify recent systematic reviews
  - Conduct systematic review of more recent literature
  - Draft replies and rationale (mid July 2012)
- WHO WG meeting to review / edit the replies (August 2012)
- External review (Sept-Nov 2012)
- WHO WG meeting - finalization of replies (Jan 2013)

Conclusions

- Comparison of the effects of various components of PM requires studies directly assessing the differences in effects;
- Systematic review of the epidemiological, toxicological and atmospheric science evidence is necessary to conclude about the relevance of various PM indicators / fractions;
- Addressing common source of various PM fractions may be a prudent risk management approach.

Thank you