# NEWSLETTER

WHO COLLABORATING CENTRE FOR AIR QUALITY MANAGEMENT AND AIR POLLUTION CONTROL

at the

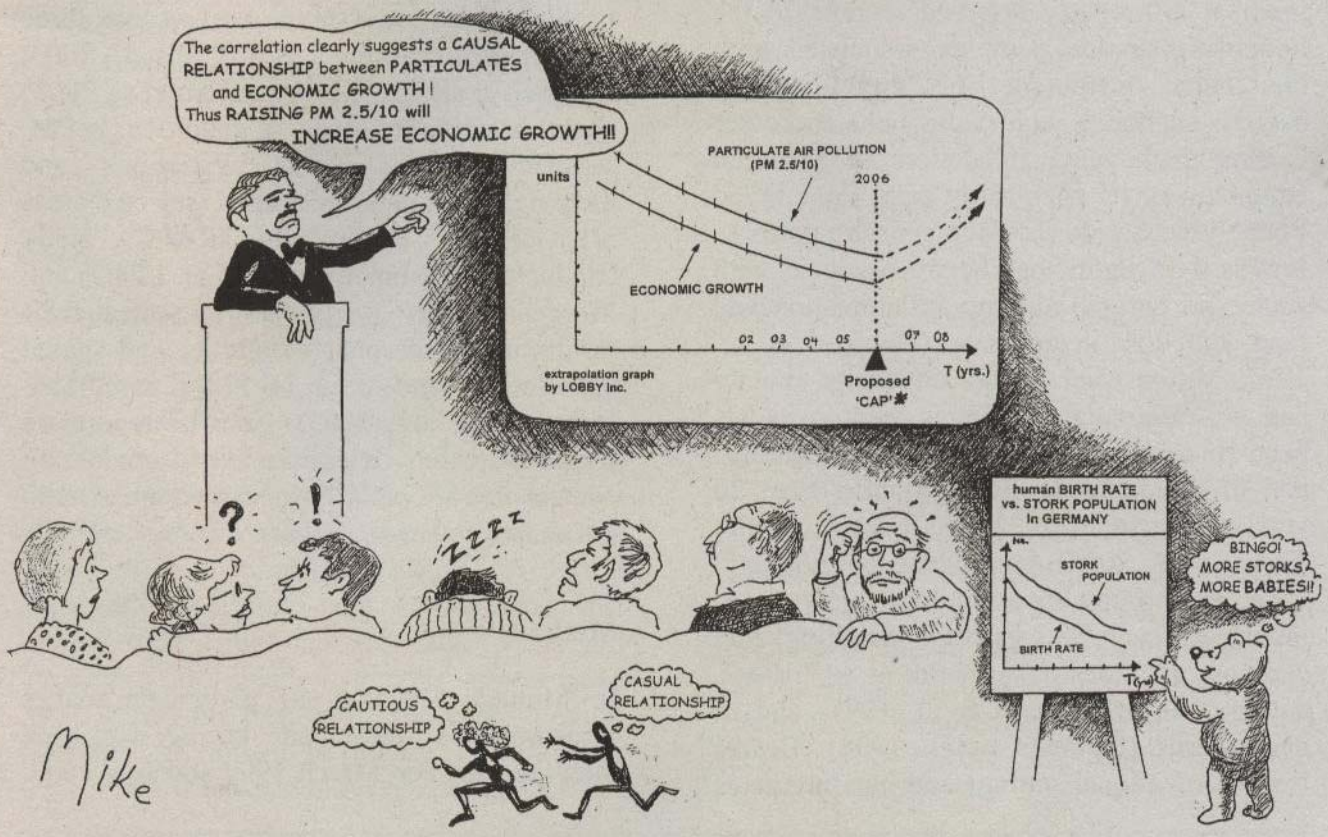
FEDERAL ENVIRONMENTAL AGENCY
GERMANY

No. 36 December 2005

## CONTENTS



## OOPS – am I in the WRONG FILM ??




* **'CAP'**: Commission proposal for **PM 2.5** (25 µg/m³) translates into an annual **PM 10** limit of about (40 µg/m³)!! Comment: **"Mind the CAP!!"**

# ENDOTOXIN CONTENT IN AMBIENT PARTICULATE MATTER IN GERMANY

Verena Morgenstern, Wolfgang Bischof and Joachim Heinrich

## Introduction

Studies on health effects of exposure to ambient particulate matter (PM) have focused on particle mass concentration and the physical properties, e.g. particle number concentration or surface size, and chemical composition of ambient particles and bioaerosols. The exact constituents of air pollution that cause diseases and the precise mechanisms involved are complex. Several studies have been conducted to determine which components of PM may contribute to airway inflammation and irritation (Donaldson et al. 2001; Monn et al. 1999; Ning et al. 2000; Soukup et al. 2001). Bacterial endotoxin is one such biologically active constituent of PM that has been shown to trigger a complex inflammatory response in humans (Rylander 2002).

Although the term endotoxin is occasionally used to refer to any cell-associated bacterial toxin, it is properly reserved to refer to the lipopolysaccharide complex associated with the outer membrane of Gram-negative bacteria such as E. coli, Salmonella and other leading pathogens. Inhalation of bacterial endotoxin or its chemically pure form called lipopolysaccharide (LPS) in concentrations as low as 4-15 ng/m$^3$ has been associated with acute and chronic airways inflammation and lung function decrements (Douwes et al. 1997; Milton et al. 1996). Given its toxicity and pro-inflammatory effects, endotoxin has been studied in specific occupational settings and in settled house dust for more than 30 years (Douwes et al. 2000; Rylander 2002; Thorne et al. 2005). High levels of endotoxin have been found in agriculture and related industries such as garbage handling and compost facilities (Sigsgaard et al. 1994), cotton mills (Christiani et al. 1993) and in dairy barns (Kullman et al. 1998). Beside from occupational settings and measurements in the vicinity to certain animal farms as well as wood, paper and cotton processing industries as major sources, ambient concentration to endotoxin, however, has not well been characterized.

At present only three studies have measured systematically endotoxin concentrations in ambient particles (Carty et al. 2003; Heinrich et al. 2003; Morgenstern et al. 2005; Mueller-Anneling et al. 2004). The study of Mueller-Anneling et al. (2004), which is the only study not conducted in Germany, provides a characterization of endotoxin concentration across a large metropolitan area in the US, but only in relation to $PM_{10}$. They reported that the desert and mountain communities had the highest endotoxin levels, whereas samples collected in rural areas had mid-range endotoxin levels. The city of Los Angeles itself had the lowest endotoxin content in $PM_{10}$.

In the present newsletter we resume three existing publications (Carty et al. 2003; Heinrich et al. 2003; Morgenstern et al. 2005) about the different levels of endotoxin in PM, seasonal and spatial variation and meteorological determinants in (selected areas of) Germany. Within the TRAPCA study conducted in Munich Carty et al. (2003) and Morgenstern et al. (2005) presented their results about seasonal variability and spatial variation of endotoxin in $PM_{2.5}$ and $PM_{10}$. Heinrich et al. (2003) gave a report on temporo-spatial variation of endotoxin content in $PM_{2.5}$ and $PM_{10}$ in two areas ~100 km apart (Hettstedt, Zerbst).

## Methods

In Munich, Bavaria, all particulate matter measurements were made during two-week intervals between March 1999 and July 2000. Sampling periods were approximately

fourteen days, during which air was sampled for 15 minutes every two hours for a total of approximately 42 hours each sampling period. Four measurements were taken at each of the 40 sites for a total of 158 measurements. Particles were collected on Anderson Teflon membrane filters (37 mm diameter, pore size of 2.0 µm) using Harvard Impactors (Air Diagnostics & Engineering, Inc., Naples, ME). In Hettstedt and Zerbst, Saxony-Anhaltina, samples of suspended particulate matter were simultaneously collected weekly in both towns for a period of time ranging between 123 and 193 hours. The sampling period was between 15 January 2002 and 18 June 2002. Two Graseby Anderson Dichotomous, Samplers Series 240 and Anderson Teflon membrane filters were used.

**Level of Endotoxin in PM**

Table 1 shows the geometric means for $PM_{2.5}$ and $PM_{10}$ for Munich, Hettstedt and Zerbst. The geometric mean (GM) endotoxin concentrations per $PM_{2.5}$ in Munich were 0.015 EU/$m^3$ (95% confidence interval: 0.013 – 0.018), 0.006 EU/$m^3$ (95% confidence interval: 0.004 – 0.008) for Hettstedt and 0.008 EU/$m^3$ (95% confidence interval: 0.006-0.011) for Zerbst (see Table 1).

Endotoxin content levels in $PM_{10}$ were quite similar at all three locations. Slightly higher $PM_{2.5}$ and $PM_{10}$ mean levels were measured for the Zerbst site. $PM_{2.5}$ and $PM_{10}$ were highly correlated for Hettstedt and Zerbst, (r=0.74 and r=0.81, respectively).

**Table 1:** Endotoxin content in $PM_{2.5}$ and $PM_{10}$ sampled in Munich (Carty et al. 2003, Morgenstern et al. 2005), Hettstedt and Zerbst (Heinrich et al. 2003).
* Data recalculated from the endotoxin content in $PM_{2.5}$ and $PM_{10-2.5}$ (coarse).

| Author | Area | Sampling Period | N | Endotoxin in $PM_{2.5}$ (EU/$m^3$) GM (95% CI) | Endotoxin in $PM_{10}$ (EU/$m^3$) GM (95% CI) |
|---|---|---|---|---|---|
| Carty et al. | Munich | 16/03/1999 – 21/07/2000 | 158 | 0.015 (0.013 – 0.018) | |
| Morgenstern et al. | Munich | 16/03/1999 – 21/07/2000 | 158 | 0.015 (0.013 – 0.018) | 0.070 (0.06 – 0.09) |
| Heinrich et al. | Hettstedt | 15/01/2002 – 18/06/2002 | 42 | 0.006 (0.004 – 0.008) | 0.069 (0.048 – 0.010) * |
| Heinrich et al. | Zerbst | 15/01/2002 – 18/06/2002 | 42 | 0.008 (0.006 – 0.011) | 0.080 (0.061 – 0.105) * |

**Seasonal and spatial variation**

Endotoxin levels for the different monitoring sites across Munich were averaged for each season. Since the study period extended from March 1999 to July 2000, some seasonal geometric means reflect measurements during two years. The mean sampling period temperature during each season and $ln_e$-transformed endotoxin seasonal means are presented in Figure 1. Levels appeared to peak during the late spring and early summer months. As shown in Figure 1, endotoxin levels and mean sampling temperatures were similar during spring and summer and also during winter and fall. For endotoxin expressed per $m^3$ $PM_{2.5}$, levels during winter were significantly lower than during spring ($p<0.0001$) and summer ($p<0.0001$), but were not significantly different during fall ($p=0.574$ and $p=0.582$, respectively). Based on the ranges of endotoxin levels at the different sites, we found very little spatial variation in ambient endotoxin concentrations across the metropolitan area of Munich using Inverse Distance Weighting (IDW) methods ($R^2=0.013$ for EU/mg $PM_{2.5}$ and $R^2=0.020$ for EU/$m^3$ $PM_{2.5}$). The time series for fine

particle masses in Hettstedt and Zerbst showed the same level and followed a similar pattern in both areas. Airborne endotoxin concentrations showed a strong seasonality both for $PM_{2.5}$ (Figure 2).

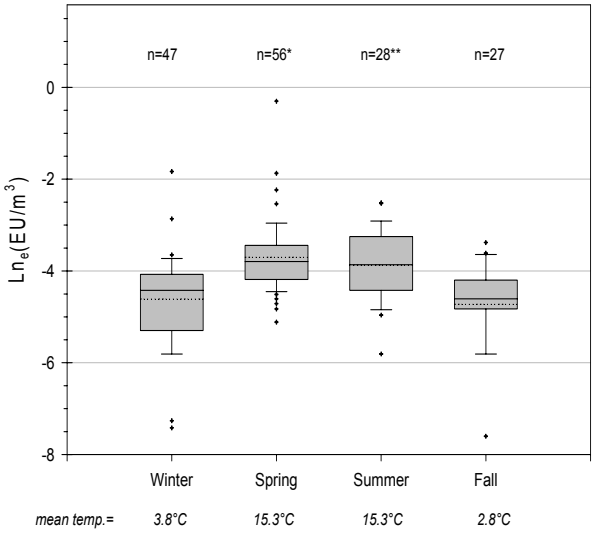



**Figure 1:** Seasonal levels of $Ln_e$ (endotoxin) in fine ($PM_{2.5}$) mass in Munich. Lower and upper lines of boxes indicate the 25th and 75th percentiles, respectively. The centre line within the box marks the median and the dotted line, the mean. Outliers are shown as crosses (Carty et al. 2003).

While the endotoxin fine particle mass concentrations were low in winter and early spring time (February through April), the levels increased in May and June. For July until the end of the year, a decrease of endotoxin, similar to Figure 1, is expected.

### Meteorological determinants

In addition, for the Munich area daily meteorological data were available from the German Weather Service. Although they do not explain the majority of the variability in endotoxin levels, ambient temperature and relative humidity were statistically significant predictors ($p<0.0001$) of endotoxin (Table 2). The mean sampling period temperature was found to be a stronger predictor of endotoxin expressed per $m^3$ ($r=0.570$) than was percent relative humidity ($r=-0.382$) (figure not shown). Means ratios (MR) were calculated to determine the association between endotoxin level and mean temperature and relative humidity (Table 2). Endotoxin MR for increases in mean temperature of 1°C was 1.084 and for increases in relative humidity (per 1%) was 0.930. Inter-quartile range means ratio (IQR MR), shown in Table 2, were also calculated to present the relative strength of the association of explanatory variables with endotoxin.

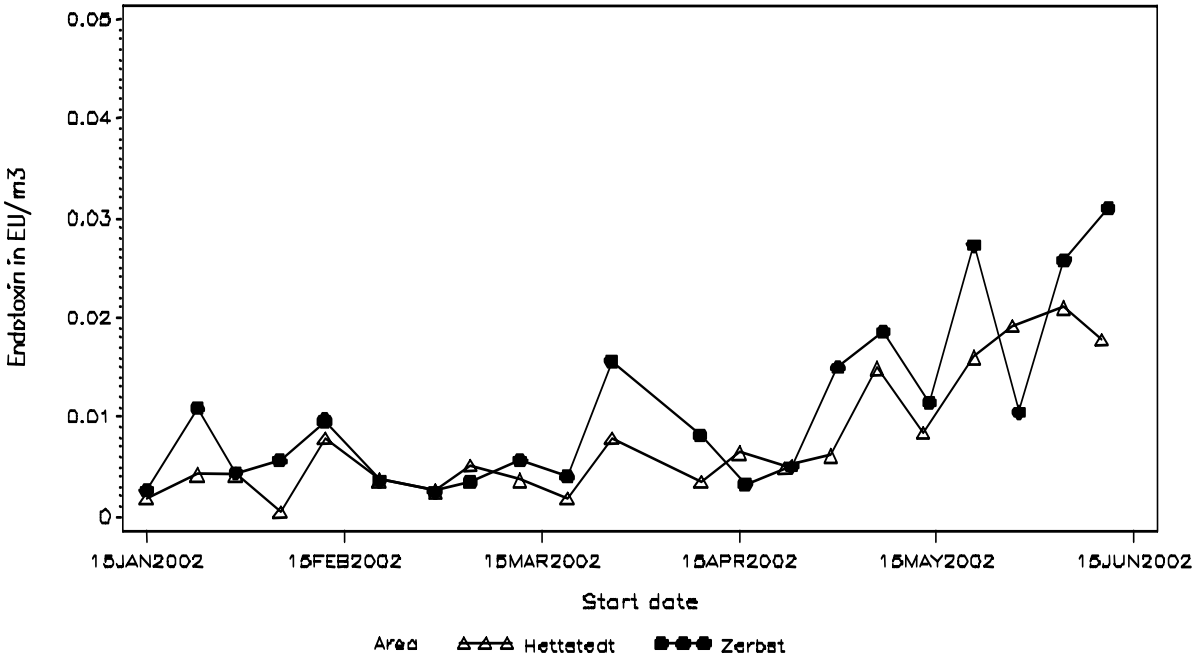



**Figure 2:** Endotoxin concentration in fine particle mass ($PM_{2.5}$) in Hettstedt and Zerbst (Heinrich et al. 2003).

Temperature (IQR MR=2.393 for EU/$m^3$) has a stronger effect on endotoxin level than does percent relative humidity (IQR MR=0.642 EU/$m^3$). Seasonal data were also expressed in means ratios (Table 2).

Endotoxin levels were 2-3-fold higher during spring and summer than during winter. Fall endotoxin levels were not significantly different than winter levels.

**Table 2:** Linear regression models using $ln_e$-transformed endotoxin: effect of temperature, relative humidity and season, N=158 (Carty et al. 2003).

| | $Le_n$(EU/$m^3$) | | |
|---|---|---|---|
| | Parameter Estimate | Means Ratio | 95% Confidence Interval |
| Mean temperature per IQR of 10.8°C | 0.081 | 2.393 | 1.979-2.894 |
| Mean relative humidity per IQR of 6.1% | -0.073 | 0.642 | 0.544-0.759 |
| Season | | | |
| Spring vs. Winter | 0.911 | 2.487 | 1.797-3.442 |
| Summer vs. Winter | 0.742 | 2.101 | 1.420-3.110 |
| Fall vs. Winter | -0.112 | 0.894 | 0.602-1.330 |

**Summary and Conclusion**

Microbial compounds such as endotoxin are thought to play an important role in the inflammatory response to PM. Although the sampling scheme used in such studies was originally designed for the measurement of PM, we were able to detect endotoxin in $PM_{2.5}$ and $PM_{10}$ from aged filters.

Although it can be challenging to compare study results in the literature given the different sampling methods, populations and measured health effects, the proposed no-effect-level for airways inflammation from endotoxin guideline is an inhalation exposure of no more than 10 ng endotoxin per $m^3$ (approximately 100 EU/$m^3$) (Rylander 2002). The geometric mean endotoxin level in $PM_{2.5}$ measured in Munich (0.015 EU/$m^3$) is considerably less than the proposed guideline. However, maximum levels per filter were 0.740 EU/$m^3$ in $PM_{2.5}$ and 0.251 EU/$m^3$ in $PM_{10}$ and thus do not propose an effect. Carty et al. (2003) found that endotoxin levels in Munich were significantly related to ambient temperature and relative humidity. Endotoxin levels were significantly higher during the warmer seasons of spring and summer than during winter. Morgenstern et al. (2005) found very little spatial variation in ambient endotoxin concentrations across the metropolitan area of Munich.

Heinrich et al. (2003) collected fine and coarse fractions of particles in the two small German towns of Hettstedt and Zerbst, which are approximately 100 km apart. The average endotoxin levels were not significantly different between the two towns, but endotoxin content in $PM_{10}$ was approximately 10-fold higher than the $PM_{2.5}$ content at both locations. All in all, there was no spatial variation neither at a low (within the City of Munich) nor at a medium (Hettstedt and Zerbst) scale. Although the health effects of indoor exposure to endotoxin have been examined, health consequences of short-term exposure to ambient endotoxin are unclear. Further investigations are needed to determine the role of endotoxin in outdoor air with regard to adverse health effects, alone and in combination with other pollutants.

## References

Carty,C.L., Gehring,U., Cyrys,J., Bischof,W., and Heinrich,J., 2003. Seasonal variability of endotoxin in ambient fine particulate matter. Journal of Environmental Monitoring 5, 953-958.

Christiani,D.C., Wegman,D.H., Eisen,E.A., Ye,T.T., Lu,P.L., and Olenchock,S.A., 1993. Cotton dust and gram-negative bacterial endotoxin correlations in two cotton textile mills. American Journal of Industrial Medicine 23, 333-342.

Donaldson,K. and Macnee,W., 2001. Potential mechanisms of adverse pulmonary and cardiovascular effects of particulate air pollution ($PM_{10}$). International Journal of Hygiene and Environmental Health 203, 411-415.

Douwes,J. and Heederik,D., 1997. Epidemiologic Investigations of Endotoxins. International Journal of Occupational and Environmental Health Supplement 3, 26-31.

Douwes,J., Zuidhof,A., Doekes,G., van Der,Z.E.E., Wouters,I., Marike,B.H., and Brunekreef,B., 2000. (1--> 3)-beta-D-Glucan and Endotoxin in House Dust and Peak Flow Variability in Children. American Journal of Respiratory and Critical Care Medicine 162, 1348-1354.

Heinrich,J., Pitz,M., Bischof,W., Krug,N., and Borm,P.J.A., 2003. Endotoxin in fine (PM2.5) and coarse (PM2.5-10) particle mass of ambient aerosols. A temporo-spatial analysis. Atmospheric Environment 37, 3659-3667.

Kullman,G.J., Thorne,P.S., Waldron,P.F., Marx,J.J., Ault,B., Lewis,D.M., Siegel,P.D., Olenchock,S.A., and Merchant,J.A., 1998. Organic dust exposures from work in dairy barns. American Industrial Hygiene Association Journal 59, 403-413.

Milton,D.K., Wypij,D., Kriebel,D., Walters,M.D., Hammond,S.K., and Evans,J.S., 1996. Endotoxin exposure-response in a fiberglass manufacturing facility. American Journal of Industrial Medicine 29, 3-13.

Monn,C. and Becker,S., 1999. Cytotoxicity and induction of proinflammatory cytokines from human monocytes exposed to fine (PM2.5) and coarse particles (PM10-2.5) in outdoor and indoor air. Toxicology and Applied Pharmacology 155, 245-252.

Morgenstern,V., Carty,C., Gehring,U., Cyrys,J., Bischof,W., and Heinrich,J., 2005. Lack of spatial Variation of Endotoxin in Ambient Particulate Matter across a German Metropolitan area. Atmospheric Environment in Press

Mueller-Anneling,L., Avol,E., Peters,J.M., and Thorne,P.S., 2004. Ambient Endotoxin Concentrations in PM10 from Southern California. Environmental Health Perspectives 112, 583-588.

Ning,Y., Imrich,A., Goldsmith,C.A., Qin,G., and Kobzik,L., 2000. Alveolar macrophage cytokine production in response to air particles in vitro: role of endotoxin. Journal of Toxicology and Environmental Health 59, 165-180.

Rylander,R., 2002. Endotoxin in the environment--exposure and effects. Journal of Endotoxin Research 8, 241-252.

Sigsgaard,T., Abel,A., Donbaek,L., and Malmros,P., 1994. Lung function changes among recycling workers exposed to organic dust. American Journal of Industrial Medicine 25, 69-72.

Soukup,J.M. and Becker,S., 2001. Human Alveolar Macrophage Responses to Air Pollution Particulates Are Associated with Insoluble Components of Coarse Material, Including Particulate Endotoxin. Toxicology and Applied Pharmacology 171, 20-26.

Thorne,P.S., Kulhankova,K., Yin,M., Cohn,R., Arbes Jr,S.J., and Zeldin,D.C., 2005. Endotoxin Exposure is a Risk Factor for Asthma: The National Survey of Endotoxin in U.S. Housing. American Journal of Respiratory and Critical Care Medicine

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# FROM RESEARCH TO POLICY – THE EUROPEAN ENVIRONMENT AND HEALTH COMMITTEE (EEHC) LOOKS AT AIR QUALITY

Viv Taylor Gee

## What is the EEHC?

The European Environment and Health Committee (EEHC) is a unique coalition that brings together representatives from health ministries, environment ministries, intergovernmental organizations and civil-society organizations. The EEHC meets every six months and the WHO Regional Office for Europe provides the secretariat. The EEHC's overall role is to support countries as they try to reduce environmental hazards affecting human health. It oversees the coordination and follow-up of the outcomes of the Environment and Health process in the European Region, and helps to promote and ensure reporting back on the implementation of the commitments made at the Fourth Ministerial Conference on Environment and Health, which took place in Budapest in June 2004 under the theme of "The future for our children". These commitments are set out in the Budapest Conference Declaration and the Children's Environment and Health Action Plan for Europe, known as CEHAPE.

## Introduction

What has happened since the Budapest Conference? The newly elected EEHC under the chairmanship of Professor William Dab from France, in its quest to answer this question and support and inform countries on environment and health, decided to give its meetings a new structure and dynamism. Non-member European countries and international organizations have always attended EEHC meetings by special invitation, but they are now positively encouraged to come and provide a wider forum, so that every Member State can contribute and benefit from the exchange of science, ideas and information on work in progress. The timetable is tight, as all Member States will report back in 2007 at a high-level "mid-term" review meeting, and also in 2009 at the next ministerial conference, due to be held in Italy. Every EEHC meeting therefore, as well as its normal business, will have a special subject focus on implementation of one of the four CEHAPE Regional Priority Goals agreed in Budapest, to facilitate some assessment of the progress made in the year since the Conference. The 19th meeting in June 2005 focused on air quality and on Regional Priority Goal III, which aims to prevent and reduce respiratory disease caused by indoor and outdoor air pollution. All 52 Member States of the WHO European Region were invited to take part in a review of new scientific evidence at this meeting, and the policy response by countries to it.

Countries are moving into implementation. This became clear at the first meeting held in May 2005 of the CEHAPE Task Force which was set up by the EEHC and attended by the designated environment and health focal points in each Member State. Most countries have already made institutional arrangements to carry out the Budapest Conference commitments in the form of task forces, fora or intersectoral committees, and they are overseeing either revision of national environment and health action plans or the preparation of a national children's environment and health action plan. A web site map is being set up to chart the progress being made, especially in connection with air quality, and it will go live in September 2005 on the EEHC web site:

www.euro.who.int/eehc .

The EEHC air hygiene-related meeting in June 2005 was hosted by the European Environment Agency in Copenhagen and attended by 60 participants, including representatives of 29 Member States, representatives of 5 of the 6 intergovernmental and international organizations, and 9 nongovernmental organizations, Professor William Dab the Chair and Mr Zaal Lomtadze from Georgia the Vice-Chair.

**Regional Priority Goal III**

At the Fourth Ministerial Conference on Environment and Health, held in Budapest in June 2004, countries from the WHO European Region committed themselves to coordinated and sustained action to protect children's health. They endorsed the Children's Environment and Health Action Plan for Europe (known as CEHAPE) and agreed to reduce the burden of diseases by focusing on four priority areas: the four priority goals.

In brief these were on water; injuries and physical activity; chemicals and other agents; and air.

> **III. Air**: "We aim to prevent and reduce respiratory disease due to outdoor and indoor air pollution, thereby contributing to a reduction in the frequency of asthmatic attacks, in order to ensure that children can live in an environment with clean air. We aim to achieve a substantial reduction in the morbidity and mortality from acute and chronic respiratory disorders in children and adolescents…"

Various targets or measures were suggested to different sectors and policy-makers, in a menu or table of actions issued at the Conference. For outdoor air, these ranged from car manufacturers equipping new diesel motor vehicles with particle filters, to educators setting up a pollution-free school zone, to policy-makers setting up monitoring and smog alert systems in cities, to alert schools and the public. For indoor air, it was suggested that minimum indoor air quality requirements be set for schools and public buildings, smoking be banned from public areas, and healthier heating and cooking be promoted in those countries where cooking with biomass was common.

**Case studies**

An associated book of case studies was produced to illustrate measures that could be taken to support CEHAPE. It is currently being updated and expanded. It includes examples such as a campaign in Poland where pilot studies showed that in two cities, Bydogoszcz and Ciechanow, 77% and 60% respectively of small children were exposed to tobacco smoke at home. A campaign was conducted through the local authorities, kindergartens, schools, hospitals, cultural centres, churches and TV channels, to increase the number of smoke-free homes, smoke-free kindergartens and schools, and non-smoking pregnant women. They used meetings, workshops, press conferences, leaflets, counselling and many other methods, and the campaign showed results. In Bydogoszcz half the schools banned smoking and 72% of children asked their parents not to smoke in their presence. The number of children exposed at home decreased from 77% to 58% and from 60% to 44%.

Participants discussed the WHO review, "Health effects of transport-related air pollution" which had just been published along with "Effects of Air Pollution on Children's Health and Development", (for more information, see section "Publications") and the European Commission's Clean Air for Europe (CAFE) programme strategy which was likely to have an impact on policy. They then turned to concerns and developments in their own countries.

**Implementation**

Air quality in the countries in the eastern part of the WHO European Region is not only causing concern now, its future does not look very promising either. While the European Union Member States should see an improvement in air quality by the application of current emissions legislation, eastern Europe with its present legislation and policies, is not likely to. In large parts of the countries in the eastern side of the European Region, current impacts are high, with life expectancy reduced by over 12 months. If the present air quality legislation and policies continue, these impacts will not be reduced significantly in the next 15 years. In contrast to the EU, where current policies have a potential to reduce emissions of PM by about 50%, the expected change in total volume of particulate matter (PM) emissions (currently comparable with the EU) is about 10%. This is only a small fraction of the reductions that can be achieved with currently available technologies, which, if applied, could reduce the emissions to one fifth of the current volume.

The Member States in the Commonwealth of Independent States and parts of Central and Eastern Europe are concerned about the impact particularly on children. In Albania, for example, for children under 14, the leading cause of death is respiratory disease, with 82.5% of that from pneumonia and bronchopneumonia, and 9.3% from chronic diseases and asthma. In cities in Kyrgyzstan, 50% of respiratory disease in children under 14 is ascribed to air pollution by local assessment. In the capital, pollution is very high, and respiratory disease among children is over 2.5 times that of adults. In the Republic of Moldova's urban areas, 70% of morbidity among children is due to respiratory disease, and in rural areas it is 40%.

In response to this, these countries are setting up intersectoral activities. They have few resources for monitoring and collecting data. However, the main cities in Albania have developed local environment and health action plans: the sources of pollution are many. There are an increasing number of cars on the roads in Albania, mostly pre-1990, and 80% of them use diesel, the quality of which is poor. Construction and civil works, along with bad-quality streets, contribute to dust in the urban air. In general, newly constructed buildings do not have central heating systems or thermal insulation so the indoor pollution problem continues. In Tajikistan, 80% of all exposure to air pollution is indoors. Some 75% of children live in rural areas where 60–90% of households burn coal, biomass, manure and straw inside the home, particularly during the frequent winter power cuts. Children and women are most exposed. Kyrgyzstan also has an urgent problem with indoor air pollution largely generated by combustion, poor heating systems and damp, and some progress has been made to assess the housing and health issues in the southern part of the country. Efforts are being made in Kyrgyzstan to monitor outdoor air pollution, assess organic pollutants and control tobacco smoking. A health promotion centre has been established, and it is hoped to develop a children's environment and health action plan with multi-agency involvement. In the south, there are refugees from Uzbekistan, so this makes the situation particularly difficult. In the Republic of Moldova, after finalization of a 2004 study on the incidence of respiratory diseases in children from indoor air pollution at school and at home in their flats, a new research study has been started on children's health in rural areas. A revision of the national programme to reduce emissions from road transport has been initiated by the

nongovernmental, organizations. This programme includes the promotion of cycling, healthy urban planning, reducing up to 50% by 2007 the number of minibuses in use and developing public transport. In Armenia, a three-year action plan is being implemented to tackle air pollution and improve the monitoring of emissions. Public transport is being renovated, and buses brought back after a period of minibuses, which affected emissions negatively.

**Progress in the EU countries**

In the EU countries, the exceedances of the new limit levels have acted as a spur. In Austria, where the biggest air quality problem is fine particles, the exceedances in major cities had to be reduced by action at federal level. Since 2004, a bonus system (€ 150,-) has been attached to new diesel cars to persuade owners to have them fitted with filters; sulphur-free fuels will become mandatory on 1 January 2006. There will also be retrofitting of particle filters to tractors, and a subsidy programme for industry to reduce particulate emissions. Action is being taken on speed limits and to ban certain vehicles. A major public awareness campaign is being launched on children's health, with a brochure going to all doctors in Austria, and a mobility management scheme is being put in place for schools to discourage parents from driving their children to school.

In France, whose national environmental health action plan was adopted in June 2004, recent developments include an asthma and allergy prevention campaign and a guidebook for local authorities on environment and health risks; and local authorities were being encouraged to use a simple system of environmentally friendly construction materials and a ban was to be introduced on some products involving manmade mineral fibres, including ceramic and glass fibres; other initiatives include antipollution devices for buses, avoiding building schools and nurseries on old polluted sites, monitoring carbon monoxide poisoning, and an awareness campaign on the hazards of environmental tobacco smoke. In the Netherlands, progress can also be seen on several fronts. On several occasions local authorities have refused to grant planning permission for new roads, offices, even a new football stadium, because of the pollution implications of very heavy traffic. This summer, extra measures were taken, such as financial incentives for new diesel-powered cars, trucks and buses equipped with a soot filter, but emphasis will also be put on action at regional and local levels.

**"Refuel, rebuild, repair and retrofit"**

Underway in Spain is an assessment of antipollutant technologies summarized as Refuel (fuel quality substitution by hydrogen, biodiesels etc); Rebuild and Repair (for improvements in engine performance) and Retrofit (filters and catalytics, especially in public transport). A roadmap has been established with local authorities, taking into account the data, urban mobility, assessment of anti-pollutant technologies and design action protocols for alert/alarm situations, including how to act and how to give the public information. All Spanish cities with over 100 000 inhabitants now have to implement urban mobility plans, supported by technical materials prepared by the Ministry of Environment to be produced in September 2005.

Sweden has just produced an environmental health report on exposures and results from the national survey on children's environmental health, and a programme is under development for health-related monitoring of the indoor environment, so that progress can be monitored and estimates made of respiratory disease due to environmental tobacco smoke (which is currently on the decline), mould and damp. New subtargets had been made on regional and local $PM_{2.5}$ levels, of a one-year average 15 $\mu g/m^3$ to 30 $\mu g/m^3$ (24 hour).

## Internet cafes

Ukraine has 3800 internet cafés, often open 24 hours a day, in which children and young people spend 3 – 9 hours at a stretch, often at night when they are cheaper to use. The young people are exposed to air pollution of different kinds: a survey found that the formaldehyde levels were 20 times over the limit, there was pollution from heavy metals, strong electromagnetic fields, and concern about mental health. Policy-makers are considering what can be done.

Various countries reported back on some current research findings on the relationship between air quality and health, or policy approaches to it. These include the Copenhagen Prospective Study on Atopy in Children, The French Observatory for Indoor Air Quality, under their national environmental health action plan, and several studies from Spain, where 2 million new diesel cars have been put into service without anti-pollutant devices and $PM_{10}$ concentrations are on the increase in cities of all sizes.

## Conclusion

After a round table and other sessions on other business, the EEHC meeting concluded with general agreement to underline the common responsibility of all Member States to follow in a concrete way the implementation of the Budapest Conference decisions. It is a priority of the EEHC to help ensure that the implementation can be charted and monitored effectively, based on the reports of Member States. Policy has to be underpinned by evidence and bringing the two together in the context of the EEHC had proved to be a fruitful experience.

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The full report of the meeting can be found on the EEHC website at

www.euro.who.int/eehc/metings/20050421_9 .

The air quality website can be found at

www.euro.who.int/air .

# NOTES AND NEWS

## European Commission Proposes Clean Air Strategy to Protect Human Health and the Environment

On 21 September 2005 the European Commission proposed an ambitious strategy for achieving further significant improvements in air quality across Europe. The Thematic Strategy on Air Pollution (CAFE programme) aims by 2020 to cut the annual number of premature deaths from air pollution-related diseases by almost 40% from the 2000 level. It also aims to substantially reduce the area of forests and other ecosystems suffering damage from airborne pollutants. While covering all major air pollutants, the Strategy pays special attention to fine dust, also known as particulate matter (PM), and ground-level ozone pollution because these pose the greatest danger to human health. Under the Strategy the Commission is proposing to start regulating fine airborne particulates, known as $PM_{2.5}$, which penetrate deep into human lungs.

The Commission also proposes to streamline air quality legislation by merging existing legal instruments into a single Ambient Air Quality Directive, a move that will contribute to better regulation.

*Health benefits alone at least five times higher than the costs*

Despite significant improvements in Europe's air quality driven by legislation and other factors, air pollution continues to have serious human health and environmental effects. The EC has therefore developed a Strategy that establishes ambitious targets for protecting human health and the environment against air pollution which are achievable by 2020. The EC has sought the most cost-effective solution that is consistent with the objective of growth and employment (the Lisbon Strategy) and the EU Sustainable Development Strategy.

The Strategy will reduce the number of premature deaths related to fine particulate matter and ozone from 370.000 a year in 2000 to 230.000 in 2020. Without the Strategy there would still be over 290.000 premature deaths a year in 2020. It is estimated that the Strategy will deliver health benefits worth at least € 42 billion per year through fewer premature deaths, less sickness, fewer hospital admissions, improved labour productivity etc. This is more than five times higher than the cost of implementing the Strategy, which is estimated at around € 7.1 billion per annum, or about 0.05% of EU-25 GDP in 2020.

Although there is no agreed way to express damage to ecosystems in monetary terms, the environmental benefits of reduced air pollution are also significant. The Strategy will protect several hundred thousand square kilometres of forests and other ecosystems. European companies could gain competitive advantages by focusing research and development on less polluting technologies that third countries will eventually need to adopt.

*Range of measures foreseen*

Current air quality legislation will be streamlined to help Member States implement it better. A legislative proposal is attached to the Strategy which will combine the existing Framework Directive on air quality, its 'daughter' Directives and a Decision on Exchange of Information. The proposed new Ambient Air Quality Directive would cut 50 % of existing legal texts, clarify and simplify it and modernise reporting requirements. For the first time it would require reductions in average $PM_{2.5}$ concentrations throughout each Member State and set a cap on concentrations in the most polluted areas.

At the same time, more flexibility will be given to the Member States. Where they can demonstrate that they have taken all reasonable measures to implement the legislation but are nevertheless unable to comply with air quality standards in certain places, it is proposed to allow them to request an extension to the compliance deadline in the affected zones provided that strict criteria are met and plans are put in place to move towards compliance.

The EC intends to propose a revision of the National Emission Ceilings Directive to bring its emissions ceilings into line with the objectives of the Strategy.

In addition, a range of the other possible measures will be examined, such as the introduction of a new 'Euro V' set of car emission standards and other initiatives in the energy, transport and agriculture sectors, the structural funds and international cooperation.

*Thematic Strategies*

The air pollution Strategy is one of seven Thematic Strategies the EC is required to prepare under the EU's Sixth Environmental Action Programme (6EAP). The other Strategies will cover the marine environment, waste prevention and recycling, sustainable use of resources, soils, pesticides and the urban environment. They are due to be presented over the next few months. The Thematic Strategies represent a modern way of decision-making. They are based on extensive research and consultation with stakeholders, address the issues in a holistic way that takes into account links with other problems and policy areas, and promote better regulation. Full details of the Strategy are available at:

http://www.europa.eu.int/comm/environment/air/cafe/pdf/strat_com_en.pdf

Extracted from Press Release IP/05/1170
of 21 September 2005 by European Commission.

## AirImpacts.org - Health and Economic Impacts of Air Pollution

AirImpacts.org is the result of recommendations emanated by the International Expert Workshop on the Analysis of the Economic and Public Health Impacts of Air Pollution (Garmisch-Partenkirchen, Germany, September 2001). Its participants recognised a significant need for increasing global awareness and research collaboration regarding the environmental health impacts of air pollution.

The AirImpacts.org website addresses this need serving as host and dissemination point for relevant and useful information to promote increased collaboration among researchers, and to facilitate information exchange between experts and policymakers.

AirImpacts.org is the result of an international initiative funded by the United Nations Environment Programme (UNEP) and led by the UNEP Risoe Centre on Energy, Climate and Sustainable Development (URC), in partnership with

- The World Bank (WB),
- The United States Environmental Protection Agency (US EPA),
- The World Health Organization, Regional Office for Europe (WHO/Europe),
- The Organisation for Economic Cooperation and Development (OECD),
- The National Renewable Energy Laboratory (NREL),
- Health Effects Institute (HEI),
- The East West Centre (EWC),

and in collaboration with

- Carnegie Mellon University (CMU),
- Peking University Health Science Centre,
- P. Catholic University of Chile (PCU),
- Fudan University, former Shanghai Medical University.

## The GAW Urban Research Meteorology and Environment (GURME) project

The GURME project arose in response to the requests for assistance by many National Meteorological Services (NMSs) dealing with urban issues, and in recognition that the management of urban environments requires special attention. The genesis of the project began in the Twelfth World Meteorological Congress 1995 where it was determined that meteorological and climatological aspects of urban environments should receive increased attention within WMO programmes.

In response, the Executive Council added the field of the urban atmospheric environment to the terms of reference of the EC Panel of Experts/CAS Working Group on Environmental Pollution and Atmospheric Chemistry. A meeting of Experts on Atmospheric Urban Pollution and the Role of the National Meteorological Services was convened in Geneva in October 1996 to help define issues and needs and to plan for future WMO activities related to urban environments.

The WMO GAW Urban Research Meteorology and Environment (GURME) project was established in 1999 in response to the requests of the National Meteorological and Hydrological Services (NMHSs). NMHSs have an important role to play in the study and management of urban environment because they collect information and have capabilities that are essential to the forecasting of urban air pollution and the evaluation of the effects of different emission control strategies. The WMO established GURME as a mean to help enhance the capabilities of NMHSs to handle meteorological and related aspects of urban pollution. GURME is designed to do this through co-ordination and focussing of present activities, as well as initiation of new ones. The following projects have been conducted:

- 'The Study of the Mechanism Controlling Atmospheric Environmental Pollution in Beijing',
- 'Meteorological Servicing for Sustainable Development of the Moscow Megapolis',
- 'Air Quality Measurements using Passive Sampling', and
- 'Improvement of Air Quality Forecasting in Latin American Cities'.

More details about the GURME programme can be found at its web site:

http://www.cgrer.uiowa.edu/people/carmichael/GURME/GURME.html

Further information can be obtained from the Scientific Advisory Group:

Gregory Carmichael, University of Iowa (gcarmich@engineering.uiowa.us),

and Liisa Jalkanen, WMO/AREP (Ljalkanen@wmo.int).

## WHO/UNEP – The Health and Environment Linkages Initiative (HELI)

HELI is a global effort by WHO and UNEP to support action by developing country policymakers on environmental threats to health. Environmental hazards are responsible for an estimated 25% of the total burden of disease worldwide, and nearly 35% in regions such as sub-Saharan Africa.

HELI encourages countries to address health and environment linkages as integral to economic development. HELI supports valuation of ecosystem 'services' to human health and well-being – services ranging from climate regulation to provision/replenishment of air, water, food and energy sources, and generally healthy living and working environments. HELI activities include

country-level pilot projects and refinement of assessment tools to support decision-making.

Promoting better access to policy-relevant tools and knowledge about health and environment linkages is a third HELI activity, and the focus of this web portal.

There are two ways to navigate this site. You may search by category of tool. Or you may search by priority risks to environment and health, which are a special focus of HELI. In each priority risk category, you will find a "one-stop shop" containing directories of web-accessible resources and policy briefs. Links and information are focused on the human and monetary 'cost' of environmental hazards to health; practical 'solutions' that address the environment-health linkage; and case study examples of good practice and action.

*Policy relevant tools*

*Scientific data and assessment:* Tools for collection, analysis and reporting of environment and health data, including monitoring and mapping of environment and health trends/indicators; and environmental burden of disease assessment.

*Impact assessment:* Tools for linked consideration of health and environment impacts in policy and development decisions.

*Economic assessment*: Tools for economic valuation of linked health and environment impacts, as integral to the assessment process.

*Priority risks to environment and health*

- *Vector-borne diseases*
- *The urban environment*
- *Indoor air pollution and household energy*
- *Water, health and ecosystems*
- *Climate change*
- *Toxic substances*

The development of the HELI website was made possible with funding from Environment Canada and Health Canada.

For more information, see:
http://www.who.int/heli/en/ .

## WHO/European Commission Promoting and Supporting Integrated Approaches for Health and Sustainable Development at the Local Level across Europe (PHASE) project

The overall objective of PHASE was to promote the integration of health and sustainable development at the local level. The key product of the project was a health impact assessment (HIA) toolkit. PHASE worked in direct cooperation with experts and the Italian and Slovak national Healthy Cities networks to develop and test these products. The cities of Bologna (Italy) and Trnava (Slovakia) piloted the project's draft HIA toolkit in spring 2004. The toolkit was launched and disseminated to all phase III Healthy Cities in June 2005. PHASE cooperated closely with the member networks of the European Sustainable Cities and Towns Campaign to ensure the products are transferable at the European level.

The results of this project have the potential to reach a significant number of cities through the active involvement of Healthy Cities networks (over1000 cities) and the European Sustainable Cities and Town Campaign (1860 cities).

The WHO Healthy Cities network completed the PHASE project in March 2005. This two-year project was funded by the European Commission Environment Directorate-General (DG-ENV) under the Community Framework for Cooperation to Promote Sustainable Development. For more information, see

http://www.who.dk/healthy-cities .

## MEETINGS AND CONFERENCES

### Health basis for air quality management in Eastern Europe, Caucasus and Central Asia (EECCA) WHO consultation meeting, 30-31 May 2005 in Moscow, Russian Federation

WHO/Europe provides assistance to EECCA countries in their efforts to reduce health impacts of air pollution by organizing this consultation, which aims to agree on an action plan that harmonizes the national air quality regulations with the WHO air quality guidelines. The urgent need for such harmonization had been recognized in a previous WHO meeting on air quality and health in EECCA held in St. Petersburg in 2003. For more information, see: http://www.euro.who.int/eprise/main/WHO/Progs/AIQ/activities/20050419_4 .

The consultation gathered representatives of the national authorities responsible for the prevention of health impacts of air pollution, for setting air pollution prevention strategies and for air quality legislation from all EECCA countries, who reported on their national air quality regulations.

With this meeting, WHO/Europe is supporting the implementation of the decisions of the 4th Ministerial Conference on Environment and Health (Budapest, 2004) requesting WHO/Europe to assist the Member States of the EECCA in strengthening their capacities to reduce health risks of exposures to environmental hazards; it is also responding to the request of the 5th Ministerial Conference on "Environment for Europe" (Kiev, 2003), which adopted an environmental strategy that calls for optimizing air quality standards as one of key actions and requests WHO/Europe to facilitate the implementation of this action.

The consultation is part of the air quality and health programme of WHO/Europe and was organised by the WHO European Centre for Environment and Health, Bonn office, with a partial support of the German Ministry for the Environment, Nature Conservation and Nuclear Safety and the WHO Collaborating Centre for Air Quality Management and Air Pollution Control, Berlin. The meeting was hosted by the Ministry of Health of the Russian Federation.

The workshop report will be published as WHO document in English and Russian as hard copy and at the web (http://www.euro.who.int/ecehbonn) until the end of 2005.

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### 17th International Congress of Biometeorology 5-9 September 2005 in Garmisch-Partenkirchen, Germany

The International Society of Biometeorology carry out a Congress every three years. The 17th International Congress on Biometeorology took place from 5 to 9 September 2005 in Garmisch-Partenkirchen, Bavaria, Germany with 274 participants from 46 countries. The oldest participant was more than 90 years old and the participant with the longest travel was from New Zealand. Most of the participants came from Germany (43) followed by Japan (18), Italy (18), Poland (14) and USA (13). Totally 225 oral and poster presentations were achieved.

The main topics of the Congress concern Humanbiometeorology, Climatic change, Pollens, UV-Radiations, Climate and Tourism, Agricultural und Forest Meteorology, Air Pollution, History of Biometeorology, Phenology, Animal-

biometeorology, Artificial/Urban/Indoor-Environments. Furthermore COST-Actions 718 „Meteorological applications for Agriculture“, 726 „Long term changes and climatology of UV radiation over Europe“, 730 „Towards a Universal Thermal Climate Index (UTCI) for Assessing the Thermal Environment of the Human Being“ held specific sessions during the Congress.

Plenary sessions have been held with oral presentation of general interest. The plenary covered topics such as climate adaptation, storm risks and forests, health effects and climate change, UV and Vitamin D-production, thermal environment and humans, anthropogenic and natural air pollution, historical overview of the International Society of Biometeorology, investigation of seasonality of vegetation by phonological and satellite data, adaptation to artificial environments and health adaptation.

Themes presented and discussed during the air pollution session were: Assessment of air pollution in urban and alpine environments, meso-scale modelling and observations to analyze the results from a statistical synoptic climatology of ozone events, impacts of atmospheric environment on dermatitis and genotoxic effects of indoor air pollutants.

Prof. Dr. Peter Höppe, Prof. Dr. Gerd Jendritzky und PD Dr. Andreas Matzarakis acted as the local Congress organizers. The oral and poster presentations were very interesting and followed by a high scientific level. Dr. Tzu Ping Lin from Taiwan got an award for his investigation in the thermal conditions of semi outdoor-environments in his country. Additionally the best three posters have been also awarded.

An excursion to the scientific research station „Schneefernerhaus“ located on the highest Mountain of Germany, “Zugspitze”, was covering also by the scientific program. The whole Congress was accompanied by ideal biometeorological weather conditions with clear sky and air temperature above 20 °C. The extended abstracts of the conference are published in the “Annalen der Meteorologie Vol. 41” of the German Weather Service.

The next International Congress on Biometeorology will be held in September 2008 in Tokyo/Japan.

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## 3rd International Symposium on Air Quality Management at Urban, Regional and Local Scales & 14th IUAPPA Regional Conference, 26-30 September 2005 in Istanbul, Turkey

Since the mid of 90ies the management of air pollution problems became an important issue in the south-eastern part of Europe. As consequence the 1st and 2nd Air Quality Management Symposia (AQM) were conducted 1997 and 2001 in Istanbul. They were seen as exclusively remarkable scientific cornerstones in air pollution science in this part of Europe as well as for Eastern Mediterranean and Arabic countries.

The 3rd AQM symposium (AQM2005) together with the 14th IUAPPA Regional Conference continued the efforts of the previous conferences to establish a sustainable event in this region. The congress was jointly organized by the Clean Air Societies TUNCAP of Turkey and KENSS of Korea. The objective of the congress was to facilitate sharing of scientific findings and provide a forum for the timely exchange of information among scientists and policy makers involved in the field of air quality.

Around 200 participants from universities, research organizations, government and industry of 30 countries from all over the world presented 150 oral and 40 poster papers in a broad variety of research fields, including urban and rural air quality, aerosols,

monitoring and control of air pollutants, air quality modelling and management, regional studies, impact on forests, vegetation and health, climate change, toxic emissions of industries and transport. The papers are published on a conference disc and in the symposium proceedings (Volume I and II; ISBN 975-00331-1-6) edited by S. Topcu, M.F. Yardim, A. Bayram, T. Elbir and C. Kahya.

Concerning air hygiene the majority of studies referred to concentrations of pollutants, such as $PM_{10}$ and ozone, measured at the urban and regional level, their spatial and temporal distributions and variations, as well as exceedances of limit values. Also a limited number of studies on the impact of air pollution on human health had been presented. Few epidemiological studies were concentrated particularly on e.g. children's environment and health, investigating blood-lead monitoring among school children in Jakarta, and respiratory symptoms in children in the main mining centre in Turkey. Additionally, few studies on the public odour annoyance from emitting plants have been presented.

Within a special workshop session of the newly-formed Global Atmospheric Pollution Forum the status and process of International Co-operations on Hemispheric Pollution has been introduced. Besides it was stated, that globalisation will have a crucial impact, in particular the increasing significance of aircraft and shipping emissions, which may require new patterns of global regulation. The importance was recognised that both air pollution and climate change are fundamentally linked to energy use. Co-operation among existing regional networks, notably UNECE/LRTAP, EANET and the Malé Declaration for South Asia, is the essential first step for a better scientific understanding of hemispheric pollution and for any consideration of abatement strategies. It was concluded that these networks differ substantially in their experience and in their current priorities, which seems to be likely to raise the issue of whether new institutional arrangements will ultimately be necessary.

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## Indoor Air 2005 – The 10th International Conference on Indoor Air Quality and Climate 4–9 September 2005 in Beijing, China

INDOOR AIR 2005, the 10th International Conference on Indoor Air Quality and Climate, took place in Beijing from 4 to 9 September 2005. This series of conferences is the most important international conference devoted to the indoor environment. The series is the official conference of the International Academy of Indoor Air Sciences and was started in 1978 in Copenhagen. The fourth conference of the series took place in Berlin in 1987 having been organised by the Institute for Water, Soil and Air Hygiene the year after it had become the WHO Collaborating Centre for Air Quality Management and Air Pollution Control, which is publishing this newsletter.

The Beijing conference gathered some 800 participants from 48 countries. Slightly less than 50 % of the participants came from Asia with the largest number in this group coming from China and Japan. Around 20 % and 25 % of the participants were from the USA and Europe, respectively, most of the latter from Scandinavia.

Contributions were given as both platform and poster presentations. In addition, there were eight plenary lectures in which outstanding experts in the respective field gave overviews on selected topics. Among the subjects addressed in these plenary lectures were ventilation issues, infections in indoor spaces, productivity and indoor air quality, and combustion gases in rural areas of China. Oral presentations and posters were assigned to one of five areas that the organizers had entitled: Indoor Environments, Pollutants and Pollutant Sources, Pollutant Distributions, Contaminant Control, and Health Effects.

The first two of these areas were covered by about 300 contributions each, while the number of papers for the other areas was roughly 75, 150 and 100, respectively. The paper and poster presentations were complemented by 17 forums for the discussion of diverse aspects, which had been proposed and were organised by individual scientists, e.g., "Role of indoor air for the increase in allergies: imaginary or real?", "Recent advances in indoor chemistry", "Education for healthier buildings", "Indoor air quality in vehicles", to name a few. The latter two forums were organised by the respective Task Forces of the International Society of Indoor Air Quality and Climate (ISIAQ; see also http://www.ie.dtu.dk/isiaq/default.asp ).

As sessions were run in parallel, the following report cannot reflect more than an individual impression. All papers of the conference are available on a CD ROM, and in a print version. The former was given to the participants, while the latter was on sale (contact indoorair05@tsinghua.edu.cn for further information).

The question of what "perceived air quality" is and how it can be determined objectively has been intriguing indoor scientists for many years and can still not be answered in a satisfactory way. On the other hand, providing an answer to this question is essential for being able to provide good quality indoor environments. In this context, it is essential to remind that the indoor environment comprises more than just air. In fact, when asked for their impression of perceived air quality, occupants of a space will generally not be able to separate any innocuous influence of parameters such as lighting and noise in giving their impression. A very interesting experiment carried out by Danish researchers gave hints to which parameters occupants may consider important besides the well-known general desire of self-determination. After the study persons had been provided with lower temperature and noise level as requested, their performance in carrying out mental tests increased noticeably.

With regard to sources, emissions from building products continued to be an important topic for study. Studies on products with large surface areas prevailed and both primary emissions and secondary emissions due to sorption processes were considered. A number of papers addressed chemical reactions in the indoor air, such as those in which ozone is involved leading to the formation of pollutant mixtures containing radicals. These mixtures may be responsible, at least in part, to effects such as the sick building syndrome. The underlying mechanisms are still not sufficiently well understood, although new information on irritation properties of such mixtures has become available. In a similar way, the possibilities to objectively test the odour properties of a material are still limited, and different groups of scientists defend their findings and opinions against those of their colleagues. Very likely, this can only be solved in a convention-typed agreement.

With regard to possibilities to reduce indoor air pollutant levels, the most straightforward measure is emission reduction. Only if this cannot be achieved easily should dilution by ventilation be envisaged. Furthermore, the use of air cleaning devices can in same cases help lower concentrations in polluted rooms. This may become important in the case of emergency situations where people are urged to stay indoors for protection against outdoor pollution. The events of 11 September 2001 have promoted research on air cleaning devices. The discussion showed that it is not easy to establish criteria to compare the performance of air cleaners. In general, as these devices represent a kind of "end-of-pipe" technique, preference should given to using low-emitting products whenever possible.

Representatives of the US-EPA reported on a new indoor air research programme entitled Program Needs for Indoor Environments Research (PNIER), which was published in March 2005 after several years of intensive cooperation between a wide range of EPA offices. This programme touches on almost all

aspects related to the indoor environment (cf. www.epa.gov/iaq/pubs/pnier.pdf).

From the sessions on policy, standards and guidelines it can be concluded that it does not make sense to adopt outdoor-air-type legislation to indoor air. Rather than developing strictly binding legal regulation, countries have generally adopted a somewhat "weaker" approach using indoor air guideline values instead of indoor air standards, or voluntary systems to limit product emissions. In a study carried out in Norway, the ventilation standards set in Scandinavian countries were compared. Marked differences were observed although one would imagine that these countries are very similar from the climatic and cultural viewpoint. This demonstrates that scientific findings are not the only determining parameter if it comes to national policy.

A critical appraisal of the literature on allergy and asthma was given in one of the sessions on health effects. The review of 360 publications from 1966 to 2003 confirmed the known influence of tobacco smoke and dampness. The influence of dampness was also confirmed in a large survey carried out on 40,000 Swedish children in 2003 (www.socialstyrelsen.se; see under "Miljöhälsorapport 2005"). In fact, 20 % of the parents reported the presence of dampness and mould growth, which leads to additional cases of asthma.

Thanks to the hard preparative work of the Chinese colleagues, INDOOR AIR 2005 was another well-organised conference. Contributions covered the whole broad field of the indoor environment with a good number of high quality papers. These and the possibility to renew old and create new personal contacts by far outweigh the fact that the content of some presentations added little to our present knowledge and looked like the $n^{th}$ confirmation of what has been known for several years.

The next conference of this series, INDOOR AIR 2008 will take place in Copenhagen in the summer of 2008. The conference will thus return to where it had been born in 1978.

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## WHO air quality guidelines global update
## Working group meeting, 18-20 October 2005 in Bonn, Germany

Since the most recent update of the WHO AQG, completed in 1997, very many new studies have investigated the effects of air pollution on human health. Focusing on the most common pollutants (particulate matter (PM), ozone and nitrogen dioxide) WHO/Euro reviewed this new evidence in the framework of the project systematic review of health aspects of air quality in Europe. The project concluded that the new evidence warrants an update of the WHO AQG on PM and ozone. It found no sufficient evidence to reconsider the current AQG for nitrogen dioxide, though the justification for the current guidelines may be revised. WHO guidelines should be applicable to all people, living in all regions, and support air quality policies and management strategies in various parts of the world. A global consultation of the conclusions emerging from the scientific evidence is therefore needed.

Based on the results of the systematic review performed with the focus on the WHO European Region, the assessment will be generalized to the other regions. This WHO working group meeting was convened to formulate and adopt updated WHO AQG. It assesses issues specific to developing countries and situations prevalent outside the European Region. The WHO AQG will be completed by the end of 2005.

Further information can be obtained from: http://www.euro.who.int/eprise/main/who/progs/aiq/home .

# PUBLICATIONS

## WHO

### The World Health Report 2005: Make every Mother and Child Count

WHO Publications, Geneva 2005, 252 pages, ISBN 92 4 156290 0, Sw. Fr. 40,-, in developing countries Sw. Fr. 15. For more information, see: bookorders@who.int

The World Health Report 2005 - Make Every Mother and Child Count examines the reasons why so many children under five years of age and women in pregnancy, during childbirth or soon after continue to die from causes that are largely preventable - and how the annual toll can be reduced. This year, almost 11 million children under five years of age will die. Among them are 4 million babies who will not survive the first month of life. On top of that, 3.3 million babies will be stillborn. At the same time, about half a million women will die in pregnancy, childbirth or soon after.

### The European Health Report 2005: Public Health Action for Healthier Children and Populations

WHO Regional Office for Europe, European Centre for Environment and Health, Rome Office 2005.
Available through the net:
www.euro.who.int/Document/CHE/CHECSSBook.pdf

Governments and policy-makers in the WHO European Region know that good health is a fundamental resource for social and economic development. While rightly proud of the overall improvement in health in the Region, they still face a wide gap between western and eastern countries and between socioeconomic groups in countries. Reducing these inequalities is increasingly vital. *The European health report 2005* – along with a separate summary – shows that it is also feasible. The report summarizes the major public health issues facing the Region, particularly its children, and describes effective policy responses. This helps to supply the reliable, evidence-based information needed for sound decision-making on public health.

### Effects of Air Pollution on Children's Health and Development

WHO Regional Office for Europe, Copenhagen 2005. For more information, see:
publicationrequests@euro.who.int .

Concerns about the adverse effects of air pollution on children's health and development are important determinants of environmental and public health policies. To be effective, they must be based on the best available evidence and research. This book presents an assessment of research data gathered over the last decade, and provides conclusions concerning the risks posed by ambient air pollutants to various aspects of children's health. The authors of this evaluation, constituting a WHO Working Group, comprise leading scientists active in epidemiology, toxicology and public health. They summarize research into the effects of air pollution common in contemporary European cities on infant health, the development of lung function, childhood infections, the development and severity of allergic diseases (including asthma), childhood cancer and neurobehavioural development. On all of these health issues, the Working Group formulates conclusions regarding the likelihood of a causal link with air pollution.

### Health effects of transport-related air pollution

WHO Regional Office for Europe, Copenhagen 2005, 190 pages, ISBN 92 890 1373 7, Sw. Fr. 60,-.

This book provides a systematic review of the literature and a comprehensive evaluation of the health hazards of transport-related air pollution. The review addresses: factors determining emissions, the contribution of traffic to pollution levels, human exposure and the results of epidemiological and toxicological studies to identify and measure the health effects. This publication is designed for two main audiences: policy-makers and experts in transport-related air pollution and public health. Accordingly, it offers both information for the former and full discussion, primarily for the latter. A separate summary for policy-makers is also available. For both groups, this book identifies the key facts emerging from the accumulated evidence, and uses them to suggest both topics for further research and well-justified short-term action to protect health. It can help both groups play their part in making and implementing transport policies in the European Region that maximize the benefits to health.

### Extreme weather events and public health responses

Kirch, Wilhelm; Menne, Bettina; Bertollini, Roberto (Eds.), WHO 2005, 303 pages, 94 illustrations, Hardcover, ISBN: 3-540-24417-4, € 59.95. For more information, see:
http://www.euro.who.int/eprise/main/WHO/Progs/GCH/Topics/20050809_1 .

Case studies, research and experiences on the health impacts of recent events collated in this book show the efforts being made by the public health and environment communities to evaluate the effectiveness of the responses to crises, to assess the early warning

systems in place, and to use the lessons learnt to better tailor future activities. The experiences summarized in the book highlight the need to address more systematically the response of the health system to weather-related crises as well as the knowledge gaps regarding both the effectiveness of the early warning systems in place and the interactions between different phenomena, for instance heat and air pollution.

# OTHERS

## APHEIS: Health Impact Assessment of Air Pollution and Communication Strategy (Third-year Report)

Published by Institut de Veille Sanitaire, Saint-Maurice, France 2005, 200 pages, ISBN 2 11 0948388, www.apheis.net .

The new evidence provided by the third phase of the APHEIS (Air Pollution and Health: A European Information System) programme conducted in 26 cities in 12 European countries confirmed the finding of APHEIS-2 that air pollution continues to pose a significant threat to public health in urban environments in Europe. Another key part of APHEIS-3 investigated how to reach individuals who make and influence policy on air pollution and health in Europe; and how to deliver APHEIS' findings to them effectively and efficiently. This work produced a model that shows who the key players are in the policy-making process; how information flows between them; what types of information scientific and policy users active in the process each require; and what are the best forms in which to deliver this content to them to ensure maximum understanding and usage of the information APHEIS produces. This twin focus on both providing the latest scientific findings and developing a strategy for communicating them aims to fulfill APHEIS' mission of meeting the information needs of individuals and organizations concerned with the impact of air pollution and health in Europe, and in particular the needs of individuals who influence and set policy in this area on the European, national, regional and local levels.

## Towards Healthy Air in Dwellings in Europe: The THADE Report

Published by the European Federation of Allergy and Airway Diseases Patients' Association, Brussels, Belgium 2004, pdf-download: http://www.efanet.org/activities/documents/THADEReport.pdf .

Following in the wake of the very successful 'Indoor Air Pollution in Schools' (2000) study, in 2002 EFA was awarded a grant by the European Commission (DG SANCO) for a project entitled 'Towards Healthy Air in Dwellings in Europe – THADE'. The aim was to compile an overview of evidence-based data about exposure to indoor air pollution and its health effects, particularly as regards allergies, asthma and other respiratory diseases such as COPD; review indoor air quality; review legislation and guidelines on indoor air pollution; and recommend an integrated strategy that defines appropriate indoor air quality policies for implementation in Europe.

## Air Quality, Human Exposure and Health Impact Assessment of Air Pollution in Ljubljana, Slovenia

European Commission, Joint Research Centre, Ispra, Italy 2005, 44 pages, EUR 21649 EN, for more information, see : http://europa.eu.int .

## Probabilistic Modelling of $PM_{2.5}$ Exposures in the Working Age Population of Helsinki Metropolitan Area

O. Hänninen, Publication of the National Public Health Institute, Helsinki 2005, 90 pages + reprints of 7 articles related to $PM_{2.5}$, ISBN 951 740 521 0 (print), ISBN 951 740 522 7 (pdf), for more information, see: http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja_a/ .

## Air Quality in Austria 2004

W. Spangl et al., Umweltbundesamt Österreich, Wien 2005, 179 pages, ISBN 3 85457 793 1, pdf-download: www.umweltbundesamt.at/publikationen/publikationssuche/publikationsdetail/?&wai=1&pub_id=1567 .

## Annual Report of Air Quality and Meteorological Measurements in Austria 2004

W. Spangl et al., Umweltbundesamt Österreich, Wien 2005, 106 pages, ISBN 3 85457 794 X, pdf-download: www.umweltbundesamt.at/publikationen/publikationssuche/publikationsdetail/?&wai=1&pub_id=1568 .

## Air Pollution in the Czech Republic 2004

Czech Hydrometeorological Institute, Prague 2005, 168 pages, ISBN 80 86690 29 6, for more information, see: http://www.chmi.cz/noco/indexe.html .

## Air Pollution and Atmospheric Deposition in Data, the Czech Republic 2004

Czech Hydrometeorological Institute, Prague 2005, 132 pages, ISBN 80 86690 28 8.

# COMING EVENTS

## 2006

May 2006

**Air Pollution 2006**
22-24 May, The New Forest, UK.
For more information, see:
www.wessex.ac.uk/conferences/2006/air2006/cfp.html .

**INIS: International Inhalation Symposium**
31 May- 3 June, Hannover, Germany.
For more information, see:
www.item.fraunhofer.de/english/index.html .

June 2006

**Healthy Buildings 2006**
4-8 June, Lisbon, Portugal.
For more information, see: www.hb2006.org .

**Particles in Europe**
13-14 June, Antwerp, Belgium.
A Conference with Posters and Exhibition arranged by the Automation and Analytical Management Group – Royal Society of Chemistry.
For more information, see: www.aamg-rsc.org .

**Ninth Environmental Health Congress of the International Federation of Environmental Health (IFEH)**
18-23 June, Dublin, Ireland.
For more information, see:
www.ifeh.org/ifehcongresses.html .

**Risk Analysis 2006: Fifth International Conference on Computer Simulation in Risk Analysis and Hazard Mitigation**
19-21 June, Malta. For more information, see:
www.wessex.ac.uk/conferences/2006/risk06/ .

**Waste Management 2006 – Third International Conference on Waste Management and the Environment**
21-23 June, Malta. For more information, see:
www.wessex.ac.uk/conferences/2006/waste2006/1.html .

**IEA-EEF European Congress: Epidemiology and Health Care Practice**
28 June-1 July, Utrecht, The Netherlands.
For more information, see: www.euroepi2006.org .

July 2006

**Urban Transport 2006 – 12th International Conference on Urban Transport and the Environment in the 21st Century**
12-14 July, Prague, Czech Republic.
For more information, see:
www.wessex.ac.uk/conferences/2006/urban06/1.html .

September 2006

**Joint ISEE/ISEA Int. Conference on Environmental Epidemiology & Exposure**
2-6 September, Paris, France. Theme: Science, Population Diversity, Caution and Precaution.
For more information, see: www.paris2006.afsse.fr .

**15th IUAPPA Regional Conference**
5-8 September, Paris and Lille, France.
For more information, see: www.iuappa-lille2006.org .

**International Aerosol Conference 2006**
10-15 September, St. Paul, Minnesota, USA.
For more information, see:
www.aaar.org/IAC06/index.htm .

## 2007

**19th Conference of the International Society for Environmental Epidemiology (ISEE)**
6-9 September, Mexico City, Mexico.
For more information, see.
www.iseepi.org/conferences/future.html .

**14th World Clean Air and Environmental Protection Congress**
9-13 September, Brisbane, Australia.
For more information, see:
www.icms.com.au/iuappa2007 .

**EDITORS' NOTE**

We appreciate submissions to NOTES AND NEWS regarding programmes and projects within the field. Notes (100-500 words) should be sent directly to the WHO Collaborating Centre for Air Quality Management and Air Pollution Control.

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