**IP/**

Brussels,

# Indoor air pollution: new EU research reveals higher risks than previously thought

***Do you really know what you are breathing when sitting at home? Europeans spend 90% of their time indoor. But closed environments are not always the healthiest. The latest studies on human exposure to indoor pollution, released today by the European Commission at its Joint Research Centre (JRC)[1] facilities in Ispra (Italy), reveal that indoor environments pose their own threats to health and, in some cases, can be at least twice as polluting as outdoor environments. Hundreds of volatile components have been detected and some of them are toxic, mutagenic or carcinogenic while the number of sources is enormous. For instance, up to 20% of Europeans suffer from asthma due to substances inhaled indoor. Tobacco smoke, asbestos, radon and benzene released inside buildings are prime suspects in the increase in cancer cases amongst the European population. The Commission is therefore developing sophisticated analytical methods to provide for a fingerprint of Volatile Organic Compounds (VOCs). Measurements are carried out, inter alia, at the EU INDOORTRON "environmental chamber", and through a network of labs across Europe.***

According to European Research Commissioner Philippe Busquin: "Traffic and smog are of course major causes of pollution, and we are studying and analysing their impact on human health. But unfortunately smoking and chemical substances sometimes follow us even behind closed doors – at home, at the office, in restaurants and bars. Under certain conditions, we can be at risk as well while sitting in our sofa at home, not only while cycling downtown at the rush hour. We are therefore upgrading our indoor pollution monitoring and response capabilities, and we encourage policymakers and public authorities across Europe to address these issues and devise a consistent and effective strategy to solve the problem."

## Not safer at home

It is generally believed that buildings shelter us from most unpleasant and unhealthy outdoor conditions or pollutants. We spend, on average, 85-90% of our time indoors at home, in school, at work or during leisure time. However, reductions in ventilation rates to limit energy consumption and extensive use of new building materials are releasing chemical substances with unknown toxic properties.

Today the Joint Research Centre presented an insight into the potential causes of acute symptoms such as allergies, asthma, mucous irritation, headaches and

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[1] "*The mission of the JRC is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of EU policies.*
*As a service of the European Commission, the JRC functions as a reference centre of science and technology for the Union. Close to the policy-making process, it serves the common interest of the Member States, while being independent of commercial or national interests.*"

tiredness. It is estimated, for instance, that up to 20% of the population suffers from asthma and other allergic diseases caused by substances typically present in indoor environments. In addition, indoor pollutants such as tobacco smoke, radon, asbestos and benzene may substantially contribute to the increase of cancer incidents in the population.

**A breath of fresh air?**

Results from measuring campaigns carried out by the Joint Research Centre in European cities clearly indicate that indoor concentrations of dangerous air pollutants (e.g. benzene) are often much higher than they are outdoors (annex 1). Recent results indicate, for instance, that schoolchildren are exposed to high concentrations of pollutants (e.g. aromatic compounds), which might be particularly harmful for students with allergies, asthma or airway hyper-reactivity (annex 2).

In the case of benzene and other aromatic compounds, overall exposure is at least twice that of urban pollution levels. This means that the indoor risk is doubled or even higher than that expected from existing levels of outdoor concentrations. This risk is increasingly associated with serious health problems for European citizens.

**Tobacco still the main culprit**

Environmental tobacco smoke (ETS), derived primarily from side-stream cigarette smoke emitted between puffs, is a major contributor to indoor air pollution wherever smoking occurs. Tests were undertaken to investigate the impact of various ventilation rates in indoor environments on the air concentration of tobacco components (burning products) during smoking at the Joint Research Centre's environmental chamber, INDOORTRON (see below).

Preliminary evidence indicates that changes in ventilation rates during smoking do not have a significant influence on the air concentration of tobacco components (annex 3). This means, in effect, that efforts to reduce indoor air pollution through higher ventilation rates in buildings and homes would hardly lead to a measurable improvement of indoor air quality.

**INDOORTRON Environment Chamber**

The 30-$m^3$ INDOORTRON laboratory has been built by the Joint Research Centre's site in Ispra, Italy. The INDOORTRON is a walk-in type environmental chamber, allowing for precise control of parameters such as temperature, relative humidity, air quality and exchange rate.

Within its large working space it is possible to:

- measure emissions from equipment;
- determine the release dynamics of materials;
- test models that predict pollutant concentrations;
- evaluate the efficiency of air-cleaning devices;
- carry out exposure measurement and assessment studies.

Experiments conducted in the chamber include:

- source/sink relationships of pollutants;
- measurement of indoor air emissions from photocopy machines;
- testing of construction materials with photo-catalytic properties for the degradation of air pollutants;

- relationships between ventilation rates;
- Environmental Tobacco Smoke (ETS) distribution.

This INDOORTRON facility forms the lynchpin of the Joint Research Centre's strategy towards monitoring Indoor Air Pollution, providing a highly controlled environment where air composition can accurately be measured and adjusted, without any influences from the surrounding atmosphere. This enables researchers to study, under highly controlled environmental conditions, indoor pollution episodes such as interior painting and use of other consumer products that have a potential impact on the health of European citizens.

**The INDEX Project**

The aim of the Joint Research Center's Index project ("Critical appraisal of the setting and implementation of EU Indoor Exposure Limits") is to create a network of European leading scientists in the area of indoor air pollution and its associated health impacts, in order to identify priorities and assess the need for a EU strategy and action plan.

**Key issues**

- setting up a list of priority substances to be regulated in Indoor Environments on the basis of health impact criteria;
- providing suggestions and recommendations on potential exposure limits for these substances;
- providing information on links with existing knowledge, ongoing studies, and legislative steps taking place worldwide.

**Expected results**

- review of exposure and dose response information, plus regulatory actions for selected indoor pollutants worldwide;
- prioritised list of indoor pollutants for regulation;
- risk characterisations for these pollutants;
- proposed exposure limits values or other exposure control regulations for these pollutants;
- assessment of essential research needs for pollutants with high-risk potential, but insufficient information for setting regulatory objectives or selecting regulatory options.

**The way ahead**

Faced with a clear lack of reliable data at a European level, the Joint Research Centre is taking a leading role in developing new analytical approaches, comparison and harmonisation methods, and conducting monitoring surveys around the Member States to quantify contaminants. This is key to providing sound data as the basis for further exposure assessments to safeguard the health of our citizens.

For further information:http://www.jrc.cec.eu.int/

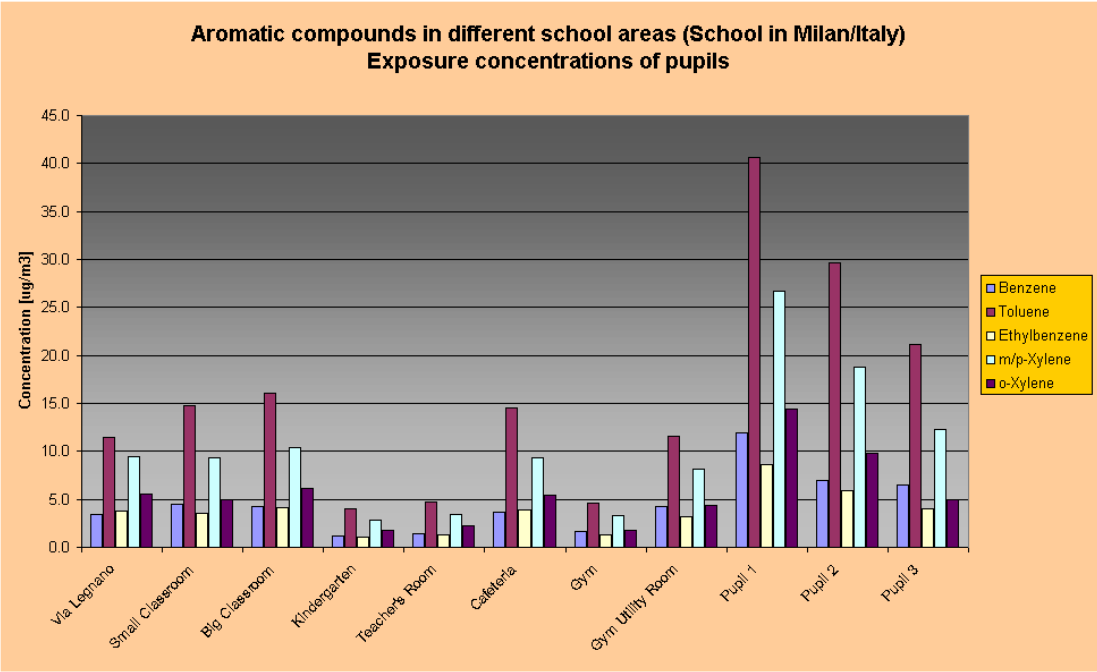
**Annex 1: Expolis & MacBeth Studies**

Personal exposure, outdoor/indoor concentrations and ratios exposure/outdoor (E/O) and indoor/outdoor (I/O) for benzene in different European cities

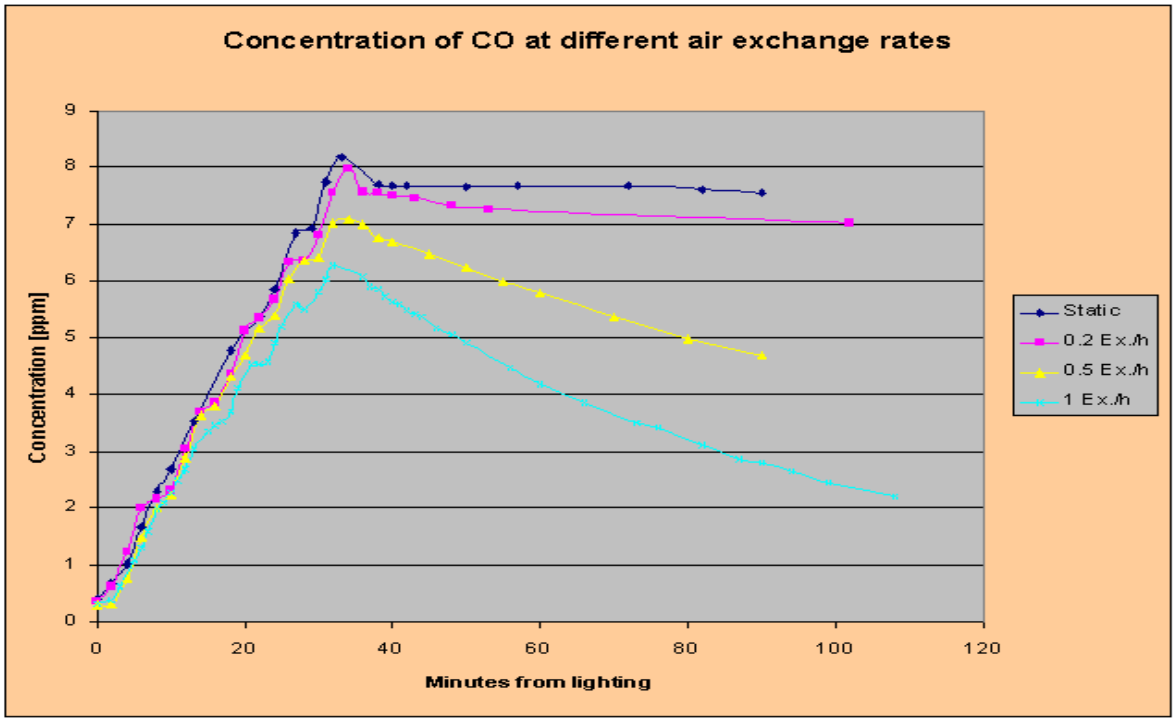
| City | Personal | Indoor Air | Outdoor Air | I/O | E/O |
|---|---|---|---|---|---|
| Athens (1) | 17.6 | 11 | 11 | 1 | 1.6 |
| Basel | 5.6 | 3 | 1.5 | 2 | 3.7 |
| Helsinki | 3.4 | 2.2 | 1.6 | 1.3 | 2.3 |
| Milan | 16 | 13.2 | 10 | 1.3 | 1.6 |
| Prague | 11.6 | 12 | 5.2 | 2.3 | 2.3 |
| | | | | | |
| Athens (2) | 18.8 | 10 | 20.7 | 0.5 | 0.9 |
| Padua | 10.6 | 10 | 8.0 | 1.3 | 1.3 |
| Rouen | 13.4 | 7 | 4.7 | 1.5 | 2.8 |
| Copenhagen | 6.6 | 7 | 3.1 | 2.3 | 2.1 |
| Murcia | 23.1 | 23.5 | 11.7 | 2 | 1.9 |
| Antwerp | 12 | 7.2 | 4.4 | 1.6 | 2.8 |

(1) EXPOLIS study (2) MACBETH study

**Annex 2**


Aromatic compounds in different school areas (School in Milan/Italy)
Exposure concentrations of pupils
Concentration [ug/m3]
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Via Legnano
Small Classroom
Big Classroom
Kindergarten
Teacher's Room
Cafeteria
Gym
Gym Utility Room
Pupil 1
Pupil 2
Pupil 3
Benzene
Toluene
Ethylbenzene
m/p-Xylene
o-Xylene

## Annex 3


Concentration of CO at different air exchange rates
Concentration [ppm]
Minutes from lighting
0
1
2
3
4
5
6
7
8
9
0
20
40
60
80
100
120
Static
0.2 Ex./h
0.5 Ex./h
1 Ex./h