Editorial

Modern construction and indoor air quality - a challenging partnership

Historically, housing has offered mankind shelter from bad weather conditions and the dangers of the outdoors. Throughout time, man has evolved from living primarily outdoors to spending more and more time inside buildings. For the populations of industrial nations this is more than 90% of their day time. Of course, the amount of time spent within different kinds of buildings depends on a person’s daily routine and personal habits. This means that people are exposed during the day to varying indoor conditions [1, 2]. This applies in particular for temperature, humidity and air exchange rate depending on whether it is a private residential building, a place of work, or a publically accessible building.

Faced with the increasing amount of time people spend indoors, the influence of indoor conditions on human health has become increasingly important for scientific research. In the mid 19th century (1858), the German chemist and hygienist Max von Pettenkofer defined the concentration of carbon dioxide (CO₂) in indoor air as an indicator of poor indoor air quality [3]. In stating this, he emphasized that these factors themselves do not have a negative effect on human health, but that they would weaken the body’s resistance to infections [4]. The very first hygiene requirement for indoor air is associated with his name – i.e. the indoor air CO₂ concentration should not be allowed to exceed 1000 ppm (0.1 Vol.-%, the so-called “Pettenkofer figure”). As a result, carbon dioxide remained the only guideline parameter for evaluating indoor climate hygiene conditions for a long time. The Pettenkofer figure has, in principle, maintained its validity until today [5].

Table of Contents

Editorial

Modern construction and indoor air quality - a challenging partnership ..................1

Indoor air quality in tight dwellings

The influence of energy-saving measures and modern building construction on indoor air quality..............................3

Additional technical means for achieving good indoor air quality in energy-optimized buildings ..................................5

Publications and Resources ............9

Literature ................................10

Event Announcements ..................23

Message Board ............................24

The mode of construction of formerly built buildings differs significantly from modern dwellings. Cracks and openings in walls and unsealed windows and doors in older buildings allow a natural exchange of air, providing good air quality. Issues concerning correct ventilation did not arise until houses became more airtight, which was primarily pursued in order to save energy. In Germany, key points for this development were the energy crisis of 1973 and the laws implemented through the German Ordinance on Energy Saving in 2002 (Energieeinsparverordnung - EnEV) [6, 7].

The lower energy requirements of energy-optimized buildings are primarily achieved through effective insulation of the building’s outer shell and by installing sealed doors and windows. Thus, correct ventilation behavior and the need to achieve a sufficient air exchange rate became of key importance [7, 8]. The EnEV does indeed contain recommendations on a minimum air exchange rate, but practical experience shows that these are not formulated.
clearly enough and that there is an obvious lack of detailed specified requirements and regulations [9].

Changed physical requirements for the building construction open up new challenges in terms of indoor air quality. The increasing airtightness of building envelopes leads to increased CO₂ concentrations and humidity indoors. This facilitates microbial growth on surfaces and an increase of air contaminants and noticeable odors. A main basic requirement in construction and carrying out conversion work is therefore to clearly define a ventilation concept in line with the foreseen use of the building. If this is not feasible, new developments such as air purification devices, filter systems and/or functional surfaces designed to counteract air contaminants may be possible solutions. However, it should still be the aim to meet indoor air hygiene requirements.

The two following articles in this newsletter provide an overview of the effects of energy-saving measures and modern architecture on indoor air quality and present additional technical means for its improvement.

Dr. Alexandra Schieweck, Dr. Jan Gunschera, Fraunhofer Institute for Wood Research, Wilhelm-Klauditz-Institute WKI, Braunschweig, Germany.
alexandra.schieweck@wki.fraunhofer.de; jan.gunschera@wki.fraunhofer.de

References


The influence of energy-saving measures and modern building construction on indoor air quality

Dr. Alexandra Schieweck, Fraunhofer WKI Dept. Material Analysis and Indoor Chemistry, Braunschweig, Germany. alexandra.schieweck@wki.fraunhofer.de

Modern inhabitants of an industrial nation spend most of their time indoors. Complex daily routines mean changing indoor locations throughout the day and different time/activity patterns depending on age and gender [1]. Therefore, indoor air quality in occupied rooms of private and public buildings is becoming increasingly important, as it influences people’s well-being and health.

Types and requirements of buildings as well as their usage forms have always changed considerably as decades have passed. In recent times, the introduction of the German Ordinance on Energy Saving (Energieeinsparverordnung - EnEV) [2] has been a significant intervention in building physics and building’s technical features. The EnEV sets boundary conditions specifying a building’s primary energy requirement. These include both the building shell’s heat insulation properties and the efficiency of the operating energy requirement. The key demand is to build dwellings in such a way that energy loss under conditions of heating and cooling is avoided where possible. Current technologies foresee the reduction of the energy loss mainly by sealing the building’s outer shell. The implementation of the EnEV thus led to an increased development of efficient heating systems that reduce the fossil fuel requirement, a stronger consideration of renewable energies, an improvement of heat insulation materials and the development of new construction concepts.

Many existing buildings have recently undergone energy-saving measures to reduce their energy consumption. State subsidy programmes have been put in place to promote such activities. These measures have primarily focused upon greater insulation of the buildings’ shell (outer walls, roof and cellar) and modernization of windows and doors. Energy-saving renovation work on existing buildings and such concepts in new buildings implement optimizations in the buildings’ structure to allow them to meet the EnEV standards or better (low-energy houses). Continued improvement of heat insulation can even reduce thermal energy requirements so far that the demand can be covered by passive sources alone (e.g. sunlight, heat emitted by users of the building or by electrical devices), in some cases allowing to forego traditional heating systems (passive houses). New developments are even pushing the boundaries, for example by using solar panels to collect and generate even more energy than the building itself requires (plus-energy house). Continued improvement of heat insulation can even reduce thermal energy requirements so far that the demand can be covered by passive sources alone (e.g. sunlight, heat emitted by users of the building or by electrical devices), in some cases allowing to forego traditional heating systems (passive houses). New developments are even pushing the boundaries, for example by using solar panels to collect and generate even more energy than the building itself requires (plus-energy house). It must be considered, however, that this only applies to the overall balance. It is still the case that such buildings require an energy supply from time to time. However, all variations of energy-saving renovation work have in common that the measures implemented to reduce energy consumption result in a severe reduction of the natural air exchange. If the ventilation concept is not adapted to the new situation, this will have a negative effect on indoor air quality. Conflicting interests are the result [3].

According to a statement given by the Indoor Air Hygiene Commission at the German Federal Environmental Agency in 2006 [4], energy-saving construction methods and good indoor air quality should not be conflicting aims. This particularly applies when the minimum air exchange rate is met (fully opening all the windows several times a day, controlled ventilation systems) and low-emission construction products and furnishings are used. Practical experience from recent years show, however, that these conflicting interests between energy-saving on one side and good indoor air quality on the other continue to exist [3].

The additional insulation often seals the building’s outer shell so completely that the natural exchange of air between the interior and exterior is practically non-existent. The building’s heat and humidity balance can thus no longer be regulated or influenced in a typical manner. Without additional ventilation measures, incorrect or unadapted ventilation behavior (particularly in private households) leads to very low natural air exchange rates (< 0.1 h⁻¹) [5] and, as a result, to rising indoor concentrations of, for example, carbon dioxide (CO₂). There can also be excessively high humidity levels. Especially during the times when the heating system is in operation, humidity levels above the dew-point temperature can occur (if the rooms are insufficiently ventilated). Without considering and ensuring a suf-
ficient hygienic minimum air exchange, energy-optimized buildings present a risk of microbial growth on surfaces cooler than the indoor air, for example condensation on walls. The formation of microbial deposits depends on the material’s capacity to absorb water and behavior in absorbing and releasing water and on the air flow patterns in the room. Mould can release secondary metabolic products into indoor air. These so-called mycotoxins primarily enter the gas phase particle-bound and can cause health issues, beginning with allergic reactions and moving on to direct fungal infections or acute toxic effects [6]. The microbial load in indoor areas is therefore moving more strongly into the focus of public attention and research, even though it must be said that bacterial and microbial growth does not lead to health issues in every case.

A growth of mould can also cause unpleasant odours in the building. These can also be caused by organic primary and secondary products emitted from the variety of different building and furnishing products in the rooms [7, 8]. These compounds often have low odour thresholds meaning that a noticeable odour is not always an indication of a health risk in the room through air contamination. However, a strong reduction of the natural air exchange through energy-saving measures can lead to a long-lasting, more intensive perception of odours. The perceived odour of indoor air quality has therefore been of increasing interest in recent years [9, 10].

Emissions from building materials and furnishings are the most significant source of organic compounds (VOCs) in indoor air. Faced with a considerable reduction of natural air exchange, clearly measurable indoor air concentrations can arise from even low-emission sources if there is insufficient additional ventilation. Guideline values for indoor air may well be exceeded. Construction materials used for the energy-saving measures can themselves be a source of emissions, such as inner and outer insulation materials. Certain studies have shown that emissions from these products can cause massive indoor air quality problems [11, 12]. The widespread use of flammable insulation materials on outer facades bring up, beyond indoor air quality issues, the additional questions of fire safety and the end-of-life disposal of these materials.

While the emission behavior of building products is regulated and liable to registration in certain areas (AgBB scheme) [13, 14], not nearly all products used in the interior are subject to such tests. There also exist only guideline values, but no binding legal requirements for evaluating indoor air quality as such. The regulation difficulties are due to the situation that indoor air quality is influenced by a wide range of peripheral parameters which interact with each other (e.g. emission sources, climatic conditions, ventilation, user behavior) [15].

Paragraph 6 of the EnEV mentions the necessity to ensure the minimum air exchange required for health and heating [2]. However it is not specifically mentioned how this can be achieved, maintained and monitored. Therefore, this aspect receives little consideration, as numerous “damage cases” show. Faced with the lack of specific figures, this parameter is not clearly defined and can be interpreted too broadly. By installing mechanical ventilation systems, these problems could generally be eliminated, although new hygiene problems (fungal contamination) can then arise from the equipment if it is of poor quality or poorly maintained. In addition, there is so far no set of regulations for operating such mechanical ventilation systems in private residential buildings.

Another attractive way to solve problems is the use of construction materials with catalytically active surfaces and/or the use of air cleaners, but currently there is a lack of mandatory regulations for testing and using these, too.

References


Additional technical means for achieving good indoor air quality in energy-optimized buildings

Dr. Jan Gunschera, Fraunhofer WKI Dept. Material Analysis and Indoor Chemistry, Braunschweig, Germany. jan.gunschera@wki.fraunhofer.de

1. Introduction

Recent years have seen a strengthening trend towards increasing insulation of buildings in order to reduce energy costs [1, 2]. A consequence of this is that the natural air exchange in energy-optimized buildings is becoming ever-lower. Without suitable countermeasures, this can have negative effects on the well-being or even on the health of the occupants [3, 4]. **Fig. 1** shows examples of technical measures which can be implemented to still achieve good indoor air quality:

- Installation of a ventilation system
- Forced ventilation, e.g. around windows
- Using air cleaners in the rooms
- Integration of functional anti-contaminant surfaces
All of these measures can be useful on their own or in combination and are even necessary in some cases. They can, however, also be counterproductive if they are applied wrongly or not properly used. The most important aspects are examined more closely in the following.

2. Ventilation systems

The installation of ventilation systems is the most comprehensive and flexible solution towards ensuring sufficient air exchange and therefore the supply of fresh air necessary for proper hygiene. This does not only apply to reducing the chemicals emitted from building materials and consumer products present in the building and to reducing the CO₂ levels in the room – it also regulates the humidity level and the temperature. Ventilation systems fundamentally work by exchanging indoor and outdoor air with the aim of an air exchange of about 30 m³/h per person or an average air exchange of 0.3 h⁻¹ [5]. The loss of warmth is minimized by using highly efficient heat exchangers. The installed filters remove undesired substances and particles from the outdoor air.

When operating a ventilation system, attention should be paid on ensuring the hygienically necessary minimum air exchange, optimal adjustment and regular maintenance of the system. If the filter capacity is exhausted, the filter will gradually lose its effect and substances from outside can pass into indoor air unhindered [4]. Also, filters based on activated carbon are especially prone to forming irritants and other hazardous substances when reacting with ozone from the outdoor air. These substances can then enter the building’s interior [6]. Poor humidity management can lead to mould or germs building up inside the system or to the formation of odorous substances [7]. When conducting renovation work of older buildings, it is often difficult or even impossible to install a ventilation system within a realistic budget.

A correctly installed ventilation system with regular professional maintenance is, however, in many cases a good solution for combining energy-saving measures with healthy living and well-being in terms of indoor air quality [8].

3. Natural ventilation via windows

A simpler way of achieving a hygienic level of air exchange is manual or integrated ventilation via the windows. This can be achieved by regularly opening the windows or by integrating outdoor air inlets in the windows themselves. Both options have the disadvantage that heat is lost (or cold air comes in) due to the air exchange and thereby the effect of the insulation will partly get lost. With manual ventilation, some residents may become over-keen and cause more warmth to be lost than necessary or a
longer absence may lead to too little ventilation, with the corresponding consequences for the indoor air quality and humidity levels [5]. Another disadvantage is the lack of filtering. This leads to substances in the outdoor air being able to enter the building in higher quantities. This problem is a considerable factor in urban areas [9]. However, even rural areas can experience these problems, e.g. odours. In the future, sensor-controlled windows could be an intelligent solution. Security issues and the cost factor would of course be questions which would need to be answered before implementation.

4. Air cleaners

One means for counteracting at least elevated concentrations of air contaminants is to set up air cleaners. These have different ways of working such as photocatalysis, electrostatic filters, plasma, UV, ionization or by using various adsorption filter techniques [10]. While the first-mentioned systems remove air contaminants and thus have longer maintenance intervals, adsorber materials have to be replaced regularly. Most devices affect neither the CO₂-level nor the humidity level, which might necessitate supplementary measures. Air cleaners also consume a certain amount of energy, as do ventilation systems. In addition, the operation of such devices can, in itself, cause an emission of air contaminants or airborne pollutants if they are not fully mineralized to carbon dioxide (CO₂), water or other mineral oxidation products. Such reaction products, also known as secondary emissions, could be more relevant in respect to odour and toxicity than the initial compounds themselves [11, 12]. For example, aldehydes can be formed by such reaction mechanisms and thus also formaldehyde [13]. Such emissions are counteracted in some devices by means of an additional filter.

Functional verifications based on specific investigations offer a degree of certainty. Fig. 1 shows an example in which the functionality of two such devices in reducing toluene (a substance often carried in from the outside air) is compared. It can be seen that the less effective device (cleaner 2) reduces toluene to a significant extent to formaldehyde. Formaldehyde is additionally emitted from the device itself when in operation.

![Fig. 1: Reduction of toluene levels with two different air cleaners (Source: Fraunhofer Institute for Wood Research, Wilhelm Klauditz Institute WKI, Braunschweig)](image)

Properly developed air cleaners can be used to reduce the concentrations of air contaminants or odours, but they really only serve as a supplementary measure. However, generally recognized test procedures which allow a statement to be made on the efficiency and indoor compatibility of such devices in practice are only now being developed [14].
5. Functional surfaces

The reduction of undesired air contaminants or odorous substances can be also achieved via so-called functionalized surfaces. Such surfaces are equipped with a catalyst which directly or indirectly oxidizes adsorbed molecules. In an ideal case, the substances are mineralized this way. However, various conditions must be fulfilled before this can happen and these conditions are not always present in real indoor environments. Photocatalysts, for example, require sufficient light with enough intensity of the required wavelength. This is not always available. Also, the reaction requires a sufficiently long adsorption time of the target substances to be reduced on the surface. To achieve this, the surface carrying the catalyst must be appropriately designed, which in many situations is not or is insufficiently the case. All this can lead to incomplete reduction reactions resulting in substances which “poison” the catalyst, smell unpleasant or can even be hazardous to human health. With some products, even a self-decomposition has been observed which can, for example, lead to formaldehyde formation [15-17]. The conclusion is therefore that when using functionalized construction products, a professional selection of products and their suitability in proper application is to be ensured.

6. Summary

Modern construction compliant to the EnEV often results in buildings which, while energy-optimized, have not been sufficiently examined during its planning and construction in terms of the minimum air exchange necessary for hygiene. The building’s air exchange rate can be sustainably improved using additional mechanical ventilation systems. Undesirable concentrations or air contaminants in indoor air can be reduced by using air cleaners and functional construction products, but such measures harbour the above-mentioned risks which then can have negative effects on indoor air quality due to the production of undesired by-products and substantial deactivation of the catalysts used. These aspects should be thoroughly and professionally considered during the planning and execution of such measures.

References


Publications and Resources

Health ratings for urban environments provided by new software

New software has been developed to rate the health risks of different activities in the urban environment, for example, cycling or driving in different areas of a city. 'CENSE' is based on a variety of different pollutants and environmental health hazards encountered in urban environments and may provide a useful tool for urban planning and improving residents' quality of life, its developers say.


European test standard on VOC emission

Volatile organic compounds (VOC) that pass off, for example, oriented strand boards (OSB) into indoor air, may cause health problems such as mucous membrane irritations. A new test standard for building products shall ensure that VOC emissions can be uniformly measured and declared throughout Europe. This new standard shall be implemented within the European Economic Area over the year. Consumers will so obtain reliable information on building products. The German Umweltbundesamt (UBA) was involved in the development of the new test standard and applies the new test method to the award criteria for the eco-label "Blue Angel".

http://www.umweltbundesamt.de/themen/neue-bauprodukte-pruefnorm-fuer-einheitliche

Odours in the home

Odours are information of chemical nature: fragrances and scents are recognized by receptor cells in the nose. This information is directly transmitted through nerve fibres from the nose to the brain. Here, the information is analyzed and interpreted. If odours are associated with strong emotions such as the typical smell at the dentist or the favourite perfume of the partner, they are especially well remembered. However, since fragrances may also cause headache or can even trigger allergic reactions, they should be omitted or used only sparingly in the home.

Literature

In this section we will provide a collection of recent housing and health publications from a variety of backgrounds. Literature published in German or French, respectively, is indicated with the German flag 🇩🇪 or the French flag 🇫🇷.

If you have suggestions for interesting journals that we should screen for the literature collection, please let us know!

Table of Topics

<table>
<thead>
<tr>
<th>Allergies and Respiratory Diseases</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indoor Air</td>
<td>10</td>
</tr>
<tr>
<td>Mould and Dampness</td>
<td>11</td>
</tr>
<tr>
<td>Light and Radiation</td>
<td>13</td>
</tr>
<tr>
<td>Smoking / Environmental Tabacco Smoke</td>
<td>14</td>
</tr>
<tr>
<td>Home Safety</td>
<td>15</td>
</tr>
<tr>
<td>Housing and Ageing Society</td>
<td>16</td>
</tr>
<tr>
<td>Housing Conditions</td>
<td>17</td>
</tr>
<tr>
<td>Housing and Mental Health</td>
<td>18</td>
</tr>
<tr>
<td>Thermal Comfort / Energy</td>
<td>19</td>
</tr>
<tr>
<td>Urban Planning / Built Environment</td>
<td>19</td>
</tr>
<tr>
<td>Social Inequality</td>
<td>20</td>
</tr>
<tr>
<td>Noise</td>
<td>20</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>21</td>
</tr>
</tbody>
</table>

Allergies and Respiratory Diseases

Residential proximity to major highways - United States, 2010.

The impact of environmental factors on quality of life and symptoms of children with allergic rhinitis.

Association of tobacco smoke exposure and atopic sensitization.

Controversial role of pets in the development of atopy in children.

Impact of parental smoking on childhood asthma.

The synergistic effect of heredity and exposure to second-hand smoke on adult-onset asthma.
Lajunen TK, Jaakkola JJ, Jaakkola MS. Am J Respir Crit Care Med. 2013 Oct 1;188(7):776-82.

Environmental control for asthma: recent evidence.
Indoor pollutant exposures modify the effect of airborne endotoxin on asthma in urban children.

Association between pet-keeping and asthma in school children.
Medjo B, Atanaskovic-Markovic M, Nikolic D, Spasojevic-Dimitrijeva B, Ivanovski P, Djukic S.

Environmental assessment and exposure control of dust mites: a practice parameter.

Urinary S-PMA related to indoor benzene and asthma in children.
Inhal Toxicol. 2013 Jun;25(7):373-82.

Trends in the prevalence of asthma.
Sears MR.

Nocturnal Asthma and Domestic Exposure to Fungi.
Terčelj M, Salobir B, Narancsik Z, Kriznar K, Grzetic-Romcevic T, Matos T, Rylander R.

Indoor Air

Biomass smoke exposure as a serious health hazard for women.
Babalik A, Bakirci N, Taylan M, Bostan L, Kiziltas S, Basbug Y, Calisir HC.

Children's phthalate intakes and resultant cumulative exposures estimated from urine compared with estimates from dust ingestion, inhalation and dermal absorption in their homes and daycare centers.

Systematic review of the effects of domestic paints on asthma related symptoms in people with or without asthma.
Canova C, Jarvis D, Walker S, Cullinan P.

Associations of particulate air pollution and daily mortality in 16 Chinese cities: an improved effect estimate after accounting for the indoor exposure to particles of outdoor origin.
Chen R, Zhou B, Kan H, Zhao B.
Environ Pollut. 2013 Nov;182:278-82.

Phthalates in German daycare centers: occurrence in air and dust and the excretion of their metabolites by children (LUPE 3).
Environ Int. 2013 Nov;61:64-72.

Using PM2.5 concentrations to estimate the health burden from solid fuel combustion, with application to Irish and Scottish homes.
Galea KS, Hurley JF, Cowie H, Shafrir AL, Sanchez Jimenez A, Semple S, Ayres JG, Coggins M.
Environmental epigenetics and its implication on disease risk and health outcomes.
Ho SM, Johnson A, Tarapore P, Janakiram V, Zhang X, Leung YK.

Lead and other heavy metals in dust fall from single-family housing demolition.

Qualitative and Quantitative Analyses of the Halogenated Volatile Organic Compounds Emitted from the Office Equipment Items.
Kowalska J, Gierczak T.
Indoor and Built Environment 2013 Dec;22:920-931.

Cooking oil fumes and lung cancer: a review of the literature in the context of the U.S. population.
Lee T, Gany F.

Indoor pollutant exposures modify the effect of airborne endotoxin on asthma in urban children.

Exposure to herbicides in house dust and risk of childhood acute lymphoblastic leukemia.
Metayer C, Colt JS, Buffalo PA, Reed HD, Selvin S, Crouse V, Ward MH.

HBCD and TBBPA in particulate phase of indoor air in Shenzhen, China.
Ni HG, Zeng H.

Decreased mitochondrial DNA content in association with exposure to polycyclic aromatic hydrocarbons in house dust during wintertime: from a population enquiry to cell culture.

Exposure to environmental and lifestyle factors and attention-deficit / hyperactivity disorder in children - a review of epidemiological studies.
Polańska K, Jurewicz J, Hanke W.

Diurnal variation, vertical distribution and source apportionment of carcinogenic polycyclic aromatic hydrocarbons (PAHs) in Chiang-Mai, Thailand.
Pongpiachan S.

A new exposure metric for traffic-related air pollution? An analysis of determinants of hopanes in settled indoor house dust.

Health impact of air pollution to children.

Pyrethroids in house dust from the homes of farm worker families in the MICASA study.
Trunnelle KJ, Bennett DH, Tancredi DJ, Gee SJ, Stoecklin-Marois MT, Hennessy-Burt TE, Hammock BD, Schenker MB.
Personal exposures to fine particulate matter and black carbon in households cooking with biomass fuels in rural Ghana. 
Van Vliet ED, Asante K, Jack DW, Kinney PL, Whyatt RM, Chillrud SN, Abokyi L, Zandoh C, Owusu-Agyei S. 

Lead, allergen, and pesticide levels in licensed child care centers in the United States. 
Viet SM, Rogers J, Marker D, Fraser A, Friedman W, Jacobs D, Zhou J, Tulve N. 

Temporal variation of residential pesticide use and comparison of two survey platforms: a longitudinal study among households with young children in Northern California. 
Wu XM, Bennett DH, Ritz B, Tancredi DJ, Hertz-Picciotto I. 

Human health risk assessment of lead from mining activities at semi-arid locations in the context of total lead exposure. 
Zheng J, Huynh T, Gasparon M, Ng J, Noller B. 

Mould and Dampness

Dampness and mould in schools and respiratory symptoms in children: the HITEA study. 

Residential culturable fungi, (1-3, 1-6)-β-d-glucan, and ergosterol concentrations in dust are not associated with asthma, rhinitis, or eczema diagnoses in children. 
Choi H, Byrne S, Larsen LS, Sigsgaard T, Thorne PS, Larsson L, Sebastian A, Bornehag CG. 
Indoor Air. 2013 Sep 10. [Epub ahead of print]

Extrolites of Wallemia sebi, a very common fungus in the built environment. 
Desroches TC, McMullin DR, Miller JD. 
Indoor Air. 2014 Jan 29. [Epub ahead of print]

Association of indoor dampness and molds with rhinitis risk: a systematic review and meta-analysis. 
Jaakkola MS, Quansah R, Hugg TT, Heikkinen SA, Jaakkola JJ. 

Review of health hazards and prevention measures for response and recovery workers and volunteers after natural disasters, flooding, and water damage: mold and dampness. 
Johanning E, Auger P, Morey PR, Yang CS, Olmsted E. 

Indoor water and dampness and the health effects on children: a review. 
Kennedy K, Grimes C. 

Dampness and mould in schools and respiratory symptoms. 
Kreiss K. 

Modifiable Factors Governing Indoor Fungal Diversity and Risk of Asthma. 
Sharpe R, Thornton CR, Osborne NJ. 
Clin Exp Allergy. 2014 Jan 28. [Epub ahead of print]

Odors and sensations of humidity and dryness in relation to sick building syndrome and home environment in Chongqing, China. 
Dampness and moulds in relation to respiratory and allergic symptoms in children: results from Phase Two of the International Study of Asthma and Allergies in Childhood (ISAAC Phase Two).

Light and Radiation

Review of low-energy construction, air tightness, ventilation strategies and indoor radon: results from Finnish houses and apartments.
Arvela H, Holmgren O, Reisbacka H, Vinha J.

Effizienz und Nutzerakzeptanz. Evaluierung der LED-Beleuchtung eines Bürogebäudes.
Aydınli S, Böhm M, Gramm S.
Licht. 2013;65(9):76-79.

Determination of radon prone areas by optimized binary classification.
Bossew P.
J Environ Radioact. 2014 Jan 9;129C:121-132. [Epub ahead of print]

Radon in indoor concentrations and indoor concentrations of metal dust particles in museums and other public buildings.
Carneiro GL, Braz D, de Jesus EF, Santos SM, Cardoso K, Hecht AA, Dias da Cunha MK.

Radon survey and soil gamma doses in primary schools of Batman, Turkey.
Damla N, Aldemir K.
Isotopes Environ Health Stud. 2014 Jan 20. [Epub ahead of print]

Methodology developed to make the Quebec indoor radon potential map.
Drolet JP, Martel R, Poulin P, Dessau JC.

Radon concentrations in different types of dwellings in Israel.
Epstein L, Koch J, Riemer T, Orion I, Haquin G.
Radiat Prot Dosimetry. 2013 Dec 30. [Epub ahead of print]

Pilot survey of indoor radon in the dwellings of Bulgaria.
Ivanova K, Stojanovska Z, Badulin V, Kunovska B.

Air conditioning impact on the dynamics of radon and its daughter concentration.
Kozak K, Grzadziel D, Polednik B, Mazur J, Dudzinska MR, Mroczek M.

Major influencing factors of indoor radon concentrations in Switzerland.
Kropat G, Bochud F, Jaboyedoff M, Laedermann JP, Murith C, Palacios M, Baechler S.

Modeling of indoor radon concentration from radon exhalation rates of building materials and validation through measurements.
Kumar A, Chauhan RP, Joshi M, Sahoo BK.

Estimation of annual effective dose from indoor radon/thoron concentrations and measurement of radon concentrations in soil.
Mehra R, Bala P.
A complexity measure based method for studying the dependance of 222Rn concentration time series on indoor air temperature and humidity.
Mihailovic DT, Udovičić V, Krmar M, Arsenić I.


Residential radon exposure and esophageal cancer. An ecological study from an area with high indoor radon concentration (Galicia, Spain).
Int J Radiat Biol. 2014 Jan 27. [Epub ahead of print]

Physical conditions of a house and their effects on measured radon levels: data from Hillsborough Township, New Jersey, 2010-2011.
Shendell DG, Carr M.

Seasonal indoor radon concentrations in Eskisehir, Turkey.
Sogukpinar H, Algin E, Asici C, Altinsoz M, Cetinkaya H.
Radiat Prot Dosimetry. 2013 Dec 29. [Epub ahead of print]

Radon and thoron levels, their spatial and seasonal variations in adobe dwellings - a case study at the great Hungarian plain.
Isotopes Environ Health Stud. 2014 Jan 20. [Epub ahead of print]

Determination of mechanisms and parameters which affect radon entry into a room.
Vasilyev AV, Zhukovsky MV.

Psychologische Befunde zu Licht und seiner Wirkung auf den Menschen - ein Überblick.
Werth L, Steidle A, Hubschneider C, de Boer J, Sedlbauer K.

Smoking / Environmental Tabacco Smoke

Is exposure to secondhand smoke associated with cognitive parameters of children and adolescents?--a systematic literature review.
Chen R, Clifford A, Lang L, Anstey KJ.

Effects of tobacco smoke exposure in childhood on atopic diseases.
Ciaccio CE, Gentile D.

Perception of smoke-free policies among workers in an Italian Local Health Agency: survey of opinions, knowledge and behaviours.
Giraldi G, Fovi De Ruggiero G, Cattaruzza MS, Camilli F, Dionette P, Osborn JF, De Luca d'Alessandro E.

Thirdhand smoke causes DNA damage in human cells.

Reducing children's exposure to secondhand smoke at home: a randomized trial.
Harutyunyan A, Movsisyan N, Petrosyan V, Petrosyan D, Stillman F.
Active and passive smoking and the risk of myocardial infarction in 24,968 men and women during 11 year of follow-up: the Tromsø Study.
Iversen B, Jacobsen BK, Løchen ML.

Biomarker evidence of tobacco smoke exposure in children participating in lead screening.

Secondhand smoke exposure and smoking behavior among young adult bar patrons.
Kalkhoran S, Neilands TB, Ling PM.

Association of secondhand smoke exposure with mental health in men and women: cross-sectional and prospective analyses using the U.K. Health and Lifestyle Survey.
Lam E, Kvaavik E, Hamer M, Batty GD.

Local tobacco control: application of the essential public health services model in a county health department’s efforts to Put It Out Rockland.
Lieberman L, Diffley U, King S, Chanler S, Ferrara S, Alleyne O, Facelle J.

Attention deficit hyperactivity disorder among children exposed to secondhand smoke: a logistic regression analysis of secondary data.
Max W, Sung HY, Shi Y.

Ng M, Freeman MK, Fleming TD, et al.

The efficacy of different models of smoke-free laws in reducing exposure to second-hand smoke: a multi-country comparison.

Exposure to parental smoking and child growth and development: a cohort study.
Yang S, Decker A, Kramer MS.

Home Safety

Evidence-Based Evaluation of Staircase Architectural Design to Reduce the Risk of Falling for Older Adults.
Afifi M, Parke B, Al-Hussein M.
Journal of Housing For the Elderly. 2014:28(1).

Pediatric sink-bathing: a risk for scald burns.
Baggott K, Rabbitts A, Leahy NE, Bourke P, Yurt RW.

Laundry detergent capsules and pediatric poisoning.
Bonney AG, Mazor S, Goldman RD.

Baby Gate-Related Injuries Among Children in the United States, 1990-2010.
Cheng YW, Fletcher EN, Roberts KJ, McKenzie LB.
Epidemiology of paediatric minor head injury: Comparison of injury characteristics with Indices of Multiple Deprivation.
Hawley C, Wilson J, Hickson C, Mills S, Ekeocha S, Sakr M.

Global childhood unintentional injury study: multisite surveillance data.
He S, Lunnen JC, Puvanachandra P, Amar-Singh, Zia N, Hyder AA.

Exposure to harmful housing conditions is common in children admitted to Wellington Hospital.

Patterns of burns and scalds in children.
Kemp AM, Jones S, Lawson Z, Maguire SA.
Arch Dis Child. 2014 Feb 3. [Epub ahead of print]

Declines in elevated blood lead levels among children, 1997-2011.

Epidemiology of paediatric burns in Lithuania: Focus on a vulnerable population exposed to the risk of scalds at home without hot tap water supply.
Kubilius D, Smailytė G, Rimdeikienė I, Malcius D, Kaikaris V, Rimdeika R.

Use of sanitizing products: safety practices and risk situations.
Silva AA, Passos RS, Simeoni LA, Neves FD, Carvalho ED.

Effectiveness of web-based tailored advice on parents' child safety behaviors: randomized controlled trial.
vан Beelen ME, Beirens TM, den Hertog P, van Beeck EF, Raat H.

Housing and Ageing Society

Animal-assisted interventions for elderly patients affected by dementia or psychiatric disorders: a review.
Bernabei V, De Ronchi D, La Ferla T, Moretti F, Tonelli L, Ferrari B, Forlani M, Atti AR.

Housing Choice in Retirement: Community versus Separation.

Well-Being and Perceived Quality of Life in Elderly People Displaced After the Earthquake in L'Aquila, Italy.
Giuliani AR, Mattei A, Santilli F, Clori G, Scatigna M, Fabiani L.
J Community Health. 2013 Dec 4. [Epub ahead of print]

What is the relation between fear of falling and physical activity in older adults?
Hornyak V, Brach JS, Wert DM, Hile E, Studenski S, Vanswearingen JM.
Arch Phys Med Rehabil. 2013 Dec;94(12):2529-34.

[Age-Wohnmatrix : Using basic needs rather than defined terms.]
Jann A.
The impact of housing tenure in supporting ageing in place: exploring the links between housing systems and housing options for the elderly.
Lux M, Sunega P.

Health care and personal care needs among residents in nursing homes, group homes, and congregate housing in Japan: why does transition occur, and where can the frail elderly establish a permanent residence?
Nakanishi M, Hattori K, Nakashima T, Sawamura K.

You Can't Get There From Here: Reaching the Outdoors in Senior Housing.
Rodiek S, Lee C, Nejati A.
Journal of Housing For the Elderly. 2014:28(1).

IAServ: an intelligent home care web services platform in a cloud for aging-in-place.
Su CJ, Chiang CY.

Autonomy and Control in Everyday Life in Care of Older People in Nursing Homes.
Wikström E, Emilsson UM.
Journal of Housing For the Elderly. 2014:28(1).

[Shared-housing arrangements for care-dependent persons : Legal frameworks and numbers in Germany.]

Healthy Residential Environments for the Elderly.
Yeo M, Heshmati A.
Journal of Housing For the Elderly. 2014:28(1).

Housing Conditions

Severe ear chondritis due to cowpox virus transmitted by a pet rat.

Long-term residential exposure to air pollution and lung cancer risk.
Hystad P, Demers PA, Johnson KC, Carpiano RM, Brauer M.

'Neighbour smoke'--exposure to secondhand smoke in multiunit dwellings in Denmark in 2010: a cross-sectional study.
Kester B, Brink AL, Clemmensen IH.
Tob Control. 2013 May;22(3):190-3.

Children, parents and pets exercising together (CPET): exploratory randomised controlled trial.

Evidence for the transmission of Salmonella from reptiles to children in Germany, July 2010 to October 2011.
Biomonitoring of the general population living near a modern solid waste incinerator: a pilot study in Modena, Italy.

Assessment of human health risks from heavy metals in outdoor dust samples in a coal mining area.
Rout TK, Masto RE, Ram LC, George J, Padhy PK.

Zoonoses from cats: with special reference to Egypt.
Sabry AH, Fouad MA, Morsy AT.

Blood lead levels among rural Thai children exposed to lead-acid batteries from solar energy conversion systems.
Swaddiwudhipong W, Tontiwattanasap W, Khunyotying W, Sanreun C.

Housing and Mental Health

Longitudinal Effects on Mental Health of Moving to Greener and Less Green Urban Areas.
Alcock I, White MP, Wheeler BW, Fleming LE, Depledge MH.

Anxiety and depression in care homes in Malta and Australia: part 2.
Baldacchino DR, Bonello L.

Warmer is healthier: effects on mortality rates of changes in average fine particulate matter (PM2.5) concentrations and temperatures in 100 U.S. cities.
Cox LA Jr, Popken DA, Ricci PF.

Seelische Gesundheit in der Stadt.
Meyer-Lindenberg A.

Thermal Comfort / Energy

Improving thermal and energy performance of buildings in summer with internal phase change materials.
Becker R.

Interactive short-term effects of equivalent temperature and air pollution on human mortality in Berlin and Lisbon.
Environ Pollut. 2013 Dec;183:54-63.

Inferring frail life expectancies in Chicago from daily fluctuations in elderly mortality.
Murray CJ, Lipfert FW.

Effect of ambient temperature and air pollutants on the risk of preterm birth, Rome 2001-2010.
Schifano P, Lallo A, Asta F, De Sario M, Davoli M, Michelozzi P.
Environ Int. 2013 Nov;61:77-87.
Indoor air quality and thermal comfort in temporary houses occupied after the Great East Japan Earthquake.
Indoor Air. 2013 Dec 6. [Epub ahead of print]

Urban Planning / Built Environment

Influence of urban morphology on total noise pollution: Multifractal description.
Ariza-Villaverde AB, Jiménez-Hornero FJ, Gutiérrez De Ravé E.

The impact of environmental metals in young urbanites' brains.

Sleep fragmentation and sleep-disordered breathing in individuals living close to main roads: results from a population-based study.

Hirschfield A, Birkin M, Brunsdon C, Malleson N, Newton A.
Urban Studies 2014 Apr;51:1057-1072.

Long-term residential exposure to air pollution and lung cancer risk.
Hystad P, Demers PA, Johnson KC, Carpiano RM, Brauer M.

Industrial wind turbines and adverse health effects.
Jeffery RD, Krogh CM, Horner B.

Healthy Mixing? Investigating the Associations between Neighbourhood Housing Tenure Mix and Health Outcomes for Urban Residents.
Lawdern R, Walsh D, Kearns A, Livingston M.

Does a geographical context of deprivation affect differences in injury mortality? A multilevel analysis in South Korean adults residing in metropolitan cities.
Lee WY, Lee J, Noh M, Khang YH.
J Epidemiol Community Health. 2014 Feb 18. [Epub ahead of print]

An assessment of residential exposure to environmental noise at a shipping port.
Murphy E, King EA.

Social Inequality

Community-level characteristics associated with variation in rates of homelessness among families and single adults.
Fargo JD, Munley EA, Byrne TH, Montgomery AE, Culhane DP.

Fitzpatrick S, Stephens M.
Permanent supportive housing: addressing homelessness and health disparities?
Henwood BF, Cabassa LJ, Craig CM, Padgett DK.

Do psychosocial stress and social disadvantage modify the association between air pollution and blood pressure?: the multi-ethnic study of atherosclerosis.
Hicken MT, Adar SD, Diez Roux AV, O'Neill MS, Magzamen S, Auchincloss AH, Kaufman JD.

Disparities in exposure to automobile and truck traffic and vehicle emissions near the Los Angeles-Long Beach port complex.
Houston D, Li W, Wu J.

Neighbourhood Structures and Crime: The Influence of Tenure Mix and Other Structural Factors upon Local Crime Rates.
Livingston M, Kearns A, Bannister J.

Particulate air pollution and health inequalities: a Europe-wide ecological analysis.
Richardson EA, Pearce J, Tunstall H, Mitchell R, Shortt NK.

Efficient targeting of homelessness prevention services for families.
Shinn M, Greer AL, Bainbridge J, Kwon J, Zuiderveen S.

The effectiveness of cigarette price and smoke-free homes on low-income smokers in the United States.
Vijayaraghavan M, Messer K, White MM, Pierce JP.

Pet ownership, dog types and attachment to pets in 9-10 year old children in Liverpool, UK.

Noise

Das menschgerechte Schallwellenmeer. Von der Lärmvermeidung zur Akustischen Raumplanung.
Androsch P, Sedmak F, Wiesner J.
Bundesinstitut für Bau-, Stadt- und Raumforschung -BBSR-, Bonn (Hrsg).
Informationen zur Raumentwicklung (ISSN: 0303-2493), Nr.3, 2013, Seite 259-267.

Updated exposure-response relationship between road traffic noise and coronary heart diseases: A meta-analysis.
Babisch W.

Noise levels in fitness classes are still too high: evidence from 1997-1998 and 2009-2011.
Beach EF, Nie V.

Residential exposure to aircraft noise and hospital admissions for cardiovascular diseases: multi-airport retrospective study.
Correia AW, Peters JL, Levy JI, Melly S, Dominici F.

Prevalence and characteristics of tinnitus after leisure noise exposure in young adults.
Degeest S, Corthals P, Vinck B, Kepler H.
Noise Health. 2014 Jan-Feb;16(68):26-33.
Road traffic noise, air pollution components and cardiovascular events.

Aircraft noise and cardiovascular disease near Heathrow airport in London: small area study.

A study of classroom acoustics and school teachers' noise exposure, voice load and speaking time during teaching, and the effects on vocal and mental fatigue development.

Indoor noise exposure at home: a field study in the family of urban schoolchildren.

Development of a traffic noise prediction model for an urban environment.

The Relation between Scores on Noise Annoyance and Noise Disturbed Sleep in a Public Health Survey.

The assessment and evaluation of low-frequency noise near the region of infrasound.
Ziaran S. Noise Health. 2014 Jan-Feb;16(68):10-17.

Miscellaneous

Air pollution and childhood leukaemia: a nationwide case-control study in Italy.

Nanoparticles: toxicity, radicals, electron transfer, and antioxidants.

Quantifying uncertainty in health impact assessment: a case-study example on indoor housing ventilation.

Recent advances in particulate matter and nanoparticle toxicology: a review of the in vivo and in vitro studies.

Ambient carbon monoxide associated with reduced risk of hospital admissions for respiratory tract infections.
Events Announcement

VDI Forum Indoor Pollutants
VDI - Wissensforum - Schadstoffe in Innenräumen - Ursachen - Messstrategie - Bewertung
March 25-26, 2014
Munich, Germany
Further Information: VDI Wissensforum: Schadstoffe in Innenräumen

WHO | World Health Day 2014 : vector-borne diseases
April 7, 2014
Worldwide
Further Information: WHO | World Health Day - 7 April 2014

25th APPA Annual Meeting
25. Jahrestagung der Arbeitsgemeinschaft Pädiatrische Pneumologie und Allergologie
May 23-25, 2014
Leipzig, Germany
Further Information: APPA-2014

Indoor Air 2014 - ISIAQ International Society of Indoor Air Quality and Climate
July 7-14, 2014
Hong Kong, People’s Republik of China
Further Information: Indoor Air 2014 — ISIAQ

7th GHUP Annual Meeting
7. GHUP Jahrestagung 2014
July 26-27, 2014
Cologne, Germany
Further Information: GHUP - Jahrestagung

26th Conference of the International Society for Environmental Epidemiology ISEE
August 24-28, 2014
Seattle / Washington, USA
Further Information: ISEE - International Society for Environmental Epidemiology

9th Conference of the German Society for Epidemiology (DGEpi) e.V.
September 17-20, 2014
Ulm, Germany
Further Information: German Society for Epidemiology - DGEpi

9th German Conference on Allergies
9. Deutscher Allergiekongress
October 2-4, 2014
Wiesbaden, Germany
Further Information: Allergiekongress

Microbiology and Infection 2014
4th Joint Conference of the German Society for Hygiene and Microbiology (DGHM) and the Association for General and Applied Microbiology (VAAM)
October 5-8, 2014
Dresden, Germany
Further Information: dghm-vaam-kongress.de

24th Conference of the International Society of Exposure Science ISES
October 12-16, 2014
Cincinnati / Ohio, USA
Further Information: International Society of Exposure Science (ISES)
Message Board

In this section we will inform you about activities and projects related to housing and health that are being carried out by WHO or the WHO CC. This may relate to ongoing activities and projects, as well as invitations to participate in data collections or case study projects.

WHO work on indoor and built environments

Urban and housing-related inequalities in Malta

The report presents the first national assessment of the magnitude and distribution of environmental health inequalities in the Maltese Islands. The assessment report is based on a set of 14 core inequality indicators related to housing, injuries and the environment developed by the WHO Regional Office for Europe. National data has provided a good snapshot of the current distribution of environmental risk factors, indicating that environmental health inequalities are a reality in Malta. This report is the first national follow-up report to the European assessment of environmental health inequalities published in 2012.

For the European report: see http://www.euro.who.int/__data/assets/pdf_file/0010/157969/e96194.pdf

Disparities in access to water and sanitation

In the WHO European Region, access to water and sanitation in urban as well as rural areas varies widely between countries, provinces and even people in the same communities, regardless of countries’ level of development. A major difficulty in addressing these inequities is the lack of both a detailed picture of the level of access for all population groups and a clear understanding of the main factors in the origin of the inequities. This is especially relevant at times of financial crisis.

For the first time, inequities in access to water and sanitation can now be measured with a new analytical tool prepared by UNECE and the WHO Regional Office for Europe: the Equitable Access Score-card. The Score-card provides a checklist to enable a country, region or city to gather, organize and evaluate information, enabling users to undertake a comprehensive overview of existing policy measures on fair access to water and sanitation.

For the full report, please see: http://www.unece.org/index.php?id=34032

Under preparation: WHO Guidelines on environmental noise

The WHO Regional Office for Europe is currently developing the WHO Environmental Noise Guidelines for the European Region. These will provide suitable scientific evidence and recommendations for protecting human health from environmental noise exposure originating from various sources and community settings. The need for health-based guidelines originates in part from the European Union, which requires EU Member States to establish action plans to control and reduce the harmful effects of noise exposure. In addition, the noise guidelines will include additional noise sources not addressed in the previous Guidelines for Community Noise (1999), such as personal electronic devices, toys, and wind turbines. The process for guideline development has been initiated in 2013 and the publication is expected to be finalized in 2015.

For further information and access to the current Community Noise Guidelines, please see http://www.euro.who.int/en/health-topics/environment-and-health/noise/activities/update-of-who-guidelines-for-community-noise-for-the-european-region
Countries urged to reduce health risks from asbestos, second-hand smoke and toxic chemicals by 2015

With the approach of the 2015 deadline for achieving 3 of the 5 commitments made at the 2010 Fifth Ministerial Conference on Environment and Health, 30 countries at the third meeting of the Environment and Health Task Force agreed to boost action to free Europe from asbestos-related diseases and exposure to second-hand tobacco smoke and toxic chemicals.