Healthy HEATING

Educational Resource Site

Related Articles:

Current State of the Science: Health Effects and Indoor Environmental Quality

Elements That Contribute to Healthy Building Design

In Search of a Common European Approach to a Healthy Indoor Environment

Childhood Asthma and Environmental Interventions

Improving Indoor Environmental Quality for Public Health

Bringing Green Homes within Reach: Healthier Housing for More People

Associations between ambient, personal, and

HVAC Systems and Indoor Environmental Quality

The following papers present research based information on the influence of HVAC systems on the indoor environments (determined by the building scientists) and subsequently the potential influence on the occupants health (determined by the health scientists). As always, it's important to not draw unsupported conclusions such as HVAC system and equipment directly improve peoples health; or develop creative interpretations such as HVAC systems prevent asthma. The use of association to show causality can be very misleading.

Is the indoor environment influenced by HVAC systems?
Yes.

Does system type change how the indoor environment is influenced?
Yes.

Can different systems improve aspects of indoor environmental quality?
Yes.

Do some occupants benefit from improvements in indoor environmental quality?
Yes.

Building Science and Health Science: An illustration separating and integrating the roles of the those in the building science field and those from the health science field.

[indoor exposure to fine particulate matter.](#)

[The Relationship of Housing and Population Health:A 30-Year Retrospective Analysis](#)

[Dr. Jessica Green, Microbes: Buildings are complex ecosystems](#)

[Dr. Charles J. Weschler, Healthy Buildings Research: New Developments, Future Directions and Potential Solutions](#)

Quotes

Of new-onset asthma cases in adults, 15–23% are work-related asthma.

American Thoracic Society 2004

The highest percentage of work-related asthma occurred among operators, fabricators, and laborers


Effects of the indoor environment on the fraction of exhaled nitric oxide in school-aged children

New: [Effects of the Indoor Environment on the Fraction of Exhaled Nitric Oxide in School-Aged Children](#)

Study includes a look at hydronic radiant, forced air and electric baseboard heating systems.

citation: Kovesi, T.A., Dales, R.E., Effects of the indoor environment on the fraction of exhaled nitric oxide in school-aged children, Canadian Respiratory Journal, Vol.16 No 3 May/June 2009, © Pulsus Group Inc


ScienceDirect

ATMOSPHERIC ENVIRONMENT

Air change rate and concentration of formaldehyde in residential indoor air

[Air change rate and concentration of formaldehyde in residential indoor air](#)

The purpose of this study was to investigate the relationship between air change rates and indoor concentrations of formaldehyde; includes a look at heating systems.

citation: Gilbert, N. L., M. Guay, et al. (2008). "Air change rate and concentration of formaldehyde in residential indoor air." Atmospheric Environment, 42(10): 2424-2428.

(32.9%).

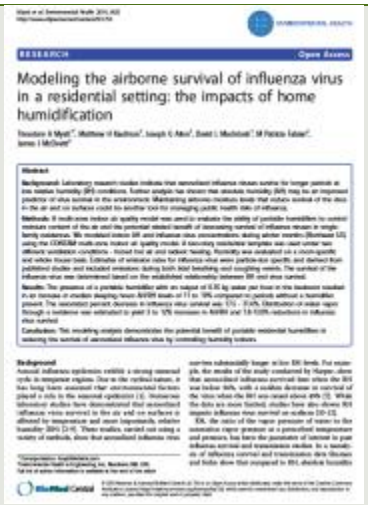
Worker Health Chartbook 2004

Between 35 and 60 million of the 89 million indoor environment workers have building-related symptoms of eye, nose, and throat irritations or headache and fatigue (Mendell 2002). Source: National Institute for Occupational Safety and Health(NIOSH)

Kids Health, "to maintain good air quality inside your home, … "consider buying one with baseboard or radiant heating."

Source: Kids Health Comes From Nemours

Health based web sites and resources with HVAC recommendations


Modeling the airborne survival of influenza virus in a residential setting: the impacts of home humidification

[Modeling the airborne survival of influenza virus in a residential setting: the impacts of home humidification]

Study explores the effects of humidification on influenza virus survival in rooms conditioned with radiant heating and forced air.

citation: Myatt, T.A, Kaufman, M.H., Allen, J.G., MacIntosh, D.L., Fabian, M.P., McDevitt, J.J., Modeling the airborne survival of influenza virus in a residential setting: the impacts of home humidification, Environmental Health 2010, 9:55


BMJ RESEARCH

Effects of improved home heating on asthma in community dwelling children: randomised controlled trial

[Effects of improved home heating on asthma in community dwelling children: randomised controlled trial]

Study demonstrates benefits from certain heating systems.

citation: Howden-Chapman, P. et al, Effects of improved home heating on asthma in community dwelling children: randomised controlled trial, British Medical Journal (BMJ). 2008; 337: a1411. Published online 2008 September 23. doi: 10.1136/bmj.a1411. PMCID: PMC2658826

Asthma Foundation

Dr. Dean Mitchell's Allergy and Asthma Solution

> "..if you have control of deciding what heating to use for your home, ...consider radiant heating"

A note on radiant heating and asthma.

As per my previous discussions cautioning the use of association to show causality; radiant systems in of themselves do not reduce asthma.

They also do not totally eliminate air movement as there will be both natural convection from the radiant surface and there will be forced convection from the necessarily required ventilation system (CSA F326 and ASHRAE 62.1 and 62.2).

The facts

What radiant systems do in

Heat recovery ventilators prevent respiratory disorders in Inuit children*

Study explores the use of HRV's to make improvements to the indoor air quality and demonstrates a benefit to the occupants.

citation: Kovesi, T., Zaloum, C., Stocco, C., Fugler, D., Dales, R. E., Ni, A., Barrowman, N., Gilbert, N. L., Miller, J.D., Heat recovery ventilators prevent respiratory disorders in Inuit children, Indoor Air 2009; 19: 489–499

*The above article is useful but we disagree with the title since any ventilation system would have the same results ergo its not exclusive to HRV's but the quality of the air.

Air filters and air cleaners: Rostrum by the American Academy of Allergy, Asthma & Immunology Indoor Allergen Committee

This paper provides an excellent overview on filtration from the perspective of healthcare professionals.

citation: Sublett JL, Seltzer J, Burkhead R, et al. Air Filters and Air Cleaners: Rostrum by the American Academy of Allergy, Asthma and Immunology Indoor Allergen Committee. J Allergy Clin Immunol.Volume 125, Issue 1 , Pages 32-38, January 2010

comparison to all air systems is drastically reduce the volumetric airflow rate through the building thereby potentially reducing the recirculation and redistribution of airborne pollutants.

The secondary benefit with radiant coupled to dedicated outdoor air systems, is the air system (collectively known as a hybrid) is designed and operated exclusively for treating the air for moisture, odours, gases and particulate - regardless of the need for space heating and cooling. Such dedicated ventilation systems often use energy recovery ventilators (HRV's or ERV's) and when ducted to each habitable space is considered by our team as the benchmark in ventilation design.

When incorporated into buildings constructed with materials having low toxicity, the above described system can greatly improve the health of the indoor environment which can be beneficial to all inhabitants but

Report of the Surgeon General's Workshop on Healthy Indoor Environment

This report is a comprehensive overview for the general public, the medical community, the public health community and those from the construction industry.

citation: Report of the Surgeon General's Workshop on Healthy Indoor Environment, National Institutes of Health, Bethesda, MD, Department of Health and Human Services, January 12–13, 2005

Control of asthma triggers in indoor air with air cleaners: a modeling analysis

Study examines peak and time-integrated concentrations of common asthma triggers present in indoor air over a year as a function of natural ventilation, portable air cleaners, and forced air ventilation equipped with conventional and high efficiency filtration systems.

citation: Myatt , T.A., Minegishi , T., Allen, J.G., MacIntosh, D.L., Control of asthma triggers in indoor air with air cleaners: a modeling analysis, Environmental Health 2008, 7:43doi:10.1186/1476-069X-7-43

particularly to those with respiratory illness and/or sensitivities to their surroundings.

If you are not clear about inappropriate use of association to show causality consider the following:

The earth is round - basketballs are round, therefore the earth is a basketball. Clearly the conclusion is wrong even though the argument has validity.

Now consider this title, "Heat recovery ventilators prevent respiratory disorders in Inuit children".

It would be advantageous for manufacturers of heat recovery ventilators (HRV's) to use this to sell product since this actual paper is authored by recognized experts including a medical doctor. However, it was not the equipment itself which prevented respiratory disorders but the process of ventilation and filtration - which can be accomplished


Reactions of ozone with human skin lipids:
Sources of carbonyls, dicarbonyls,
and hydroxycarbonyls in indoor air

Reactions of ozone with human skin lipids: Sources of carbonyls, dicarbonyls, and hydroxycarbonyls in indoor air

Study looks at skin reactions to ozone, implications for ventilation systems and naturally ventilated spaces.

citation: Wisthalera, A., Weschler, C.J., Reactions of ozone with human skin lipids: Sources of carbonyls, dicarbonyls, and hydroxycarbonyls in indoor air, Proceedings of the National Academy of Sciences, April 13, 2010 vol. 107 no. 15 6568-6575


Environmental Health

Association of residential dampness and mold with respiratory tract infections and bronchitis

Association of residential dampness and mold with respiratory tract infections and bronchitis

Study looks at dampness and mold associations with a variety of adverse respiratory health effects, including respiratory tract infections.

citation: Fisk, W.J., Eliseeva , E.A., Mendell, M.J., Association of residential dampness and mold with respiratory tract infections and bronchitis: a meta-analysis, Environmental Health 2010, 9:72 doi:10.1186/1476-069X-9-72

without the use of heat recovery ventilators.

This is a good example of the inappropriate use of association to show causality.

Remember this, "Scientific studies that show an association between a factor and a health effect do not necessarily imply that the factor causes the health effect".

For more on this topic see this presentation.

Physiological and Subjective Responses in the Elderly When Using Floor Heating and Air Conditioning Systems

Study looks at two groups of people exposed to radiant and air conditioning.

citation: Hashiguchi, N., Tochihara, Y., Ohnaka, T., Tsuchida, Chiaki, C., Otsuki, T., Physiological and Subjective Responses in the Elderly When Using Floor Heating and Air Conditioning Systems , Journal of physiological anthropology and applied human science , Vol. 23: 1345-3475 , Nov. 2004

Housing characteristics, reported mold exposure, and asthma in the European Community Respiratory Health Survey

Study investigated associations between housing characteristics including heating systems, related to dampness, mold exposure, and house dust mite levels and adult asthma.

citation:Zock JP, Jarvis D, Luczynska C, Sunyer J, Burney P., European Community Respiratory Health Survey. Housing characteristics, reported mold exposure, and asthma in the European Community Respiratory Health Survey, J Allergy Clin Immunol. 2002;110:285-92. [PubMed: 12170270]

Miscellaneous

Does usage of domestic heating influence internal environmental conditions and health?*

[Does usage of domestic heating influence internal environmental conditions and health?]

Study investigates heating use and the presence of environmental problems in the home, such as mould and condensation

citation: Walker J., Mitchell R., Platt S.D., Petticrew M.P., Hopton J., Does usage of domestic heating influence internal environmental conditions and health?, Eur J Public Health, 2006;16:463-9.

What Is an Effective Portable Air Cleaning Device? A Review

[What Is an Effective Portable Air Cleaning Device? A Review]

Study looks at the use and testing of portable room air cleaners against common room pollutants.

citation: Shaughnessy, R.J., Sextro, R.G., What Is an Effective Portable Air Cleaning Device? A Review, Journal of Occupational and Environmental Hygiene, 3: 169–181, 2006

Additional reading

1. Eccles, R., An explanation for the seasonality of acute upper respiratory tract viral infections. Acta Otolaryngol 2002; 122:183–191. <http://tinyurl.com/mndbpph>
2. Johnson, C., Eccles, R. Acute cooling of the feet and the onset of common cold symptoms. Family Practice 2005; 22: 608–613. <http://fampra.oxfordjournals.org/content/22/6/608.full.pdf html>
3. Eccles. R., Acute cooling of the body surface and the common cold. Rhinology, 40, 000-000, 2002 <http://tinyurl.com/kks92dc>
4. Yale University. "Cold virus replicates better at cooler temperatures." ScienceDaily. ScienceDaily, 5 January 2015. <www.sciencedaily.com/releases/2015/01/150105170014.htm>.

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