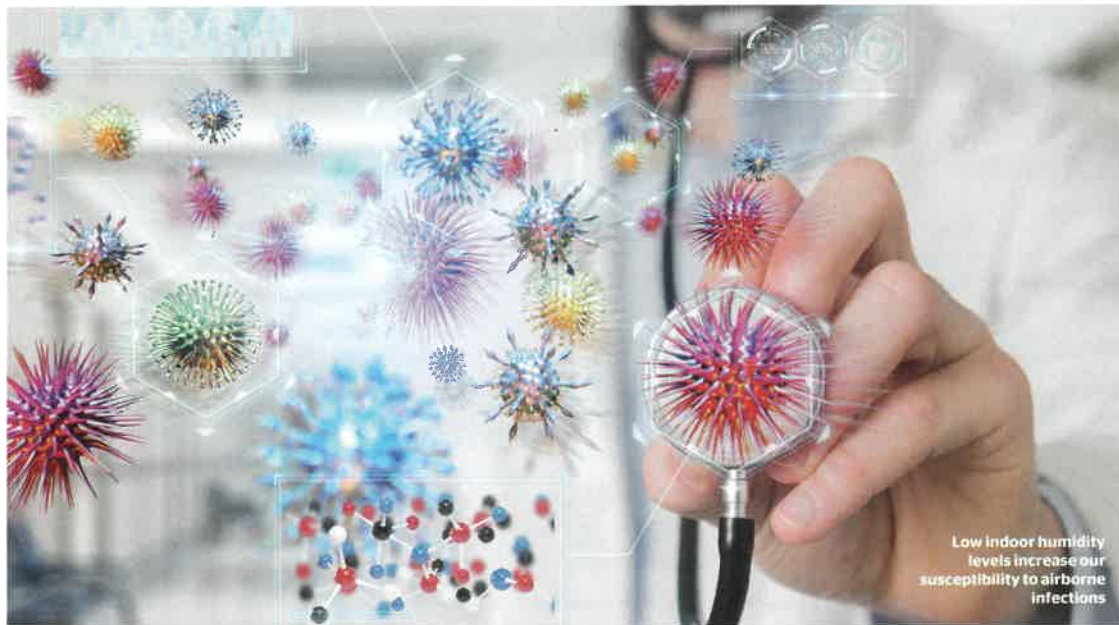


Humidification

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Dave Marshall-George is UK sales manager at **Condair plc**



Humidity and healthcare

Dave Marshall-George examines the implications for hospitals of a recently published study on humidity and influenza infection

The Department of Health's guidance on the design of HVAC systems for healthcare premises advises that, due to high running costs, humidity control is not required unless there is a "very specific application requirement". However, a recently published Yale University study has shown that a low indoor humidity level increases our susceptibility to airborne infections and makes us much less able to combat them.

Given that a hospital's main purpose is to promote the health of its occupants, is maintaining humidity at an optimum level for health, a specific enough "application requirement" to make humidity control in hospitals a necessary part their HVAC design?

The Yale study, carried out in the laboratory of Dr Akiko Iwasaki, showed that breathing air with a low humidity level reduces our immune system's capability to fight off flu infections. The research results indicated that using humidifiers in the winter to increase the moisture content of air in occupied buildings, such as offices, schools and hospitals, is a potential strategy to reduce the

seasonal impact of flu on society. The Yale study used mice that respond to flu in a similar way to humans. The mice were infected with flu and kept in either low humidity or mid-level humidity conditions. Their physical reactions to the flu virus were then examined, including weight loss, temperature changes, their ability to clear the virus from their respiratory system and heal resultant inflammation, and ultimately their mortality rate. The scientists found that the mice kept in low humidity (10-20 per cent RH) suffered a much worse disease course than the mice kept in mid-level humidity (50 per cent RH). They suffered more rapid and greater weight loss, were unable to maintain a normal body temperature and experienced a higher mortality rate.

Dr Iwasaki commented: "What we found was that low humidity impairs the ability of the respiratory tract, lung and nose to get rid of the flu virus. In the airway cells, hair-like projections, called cilia, are constantly moving inhaled particles along to get rid of them. However, in low humidity we found that this cilia movement, as well as particle removal, was impaired. This is

particularly important for people who are very susceptible such as the very young, infant or the older person over 65, as mortality from flu mostly occurs in this age group."

The researchers also observed that low humidity reduces the ability of cells in the lungs, damaged by flu, to repair themselves. A third effect of low humidity identified in this study, was that infected cells stopped signalling for help from neighbouring cells. The ability to recruit additional immune cells to fight invading viruses or bacteria is an essential part of the body's natural defence system, and is key to limiting disease from infections.

Mid-range humidity levels
Commenting on the results of the study, Dr Stephanie Taylor, Infection Control Consultant at Harvard Medical School and an ASHRAE Distinguished Lecturer, said: "This study clearly shows the need to maintain indoor relative humidity at 40-60 per cent in homes, schools, offices, hospitals, aeroplanes and all other occupied spaces."

This study is not alone in its findings that maintaining a mid-range indoor humidity level is

optimum for human health. Condair has published on its website summaries from 25 scientific studies which took place between 1948 and 2019 relating to humidity and health. They all indicate that maintaining an indoor level of around 40-60 per cent RH is vital for the body's natural defence against airborne infection and in creating an atmosphere that limits the spread of airborne cross-infection.

The Yale study is yet further evidence for a regulatory minimum humidity level to be set for public places to reduce the impact of seasonal flu, particularly in places such as hospitals. Healthcare establishments bring infected individuals into close proximity with high risk groups, such as the elderly, very young or infirm.

It is relatively simple to maintain a healthy indoor humidity of 40-60 per cent RH in hospitals and other public buildings using commercial humidification systems. However, unlike temperature, humidity is not easily perceivable by occupants. This frequently results in building operators saving money by not installing, or even turning off, their humidifiers and allowing indoor humidity to drop very low in the winter.

The problem is compounded by legislation that requires building operators to reduce energy consumption. Building owners and designers are forced to minimise building services to become more efficient. However, the result is necessary services, such as humidity control, are being sacrificed at the expense of occupant health.

According to the National Institute for Health and Care Excellence, it is estimated that 300,000 patients a year in England acquire a healthcare-associated infection (HAI), as a result of care within the NHS. The most common type of healthcare-associated infections are respiratory infections, accounting for 22.8 per cent of all HAIs.

Given the cost of airborne cross infection on the NHS, and the science showing how maintaining 40-60 per cent RH could potentially reduce HAIs, surely it's time that the DoH's guidelines on the need for humidification in hospitals were reviewed? ■