HUMIDIFICATION FOR INFECTION CONTROL

Humidification and Evaporative Cooling

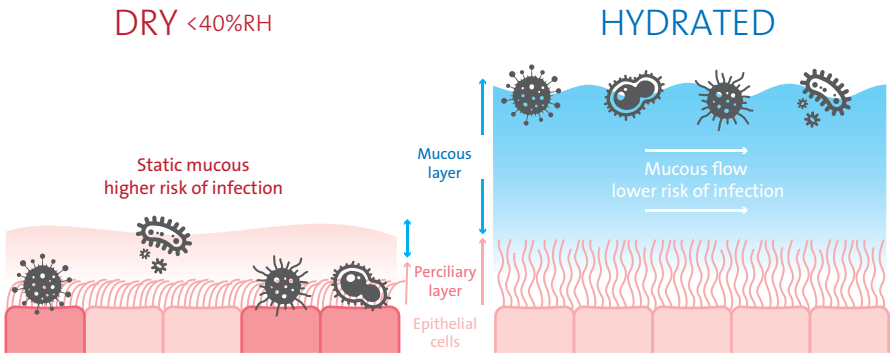
condair

THREE REASONS FOR MAINTAINING A HEALTHY HUMIDITY

Scientific studies have shown three mechanisms by which indoor humidity affects the transmission and cross infection of airborne viruses.

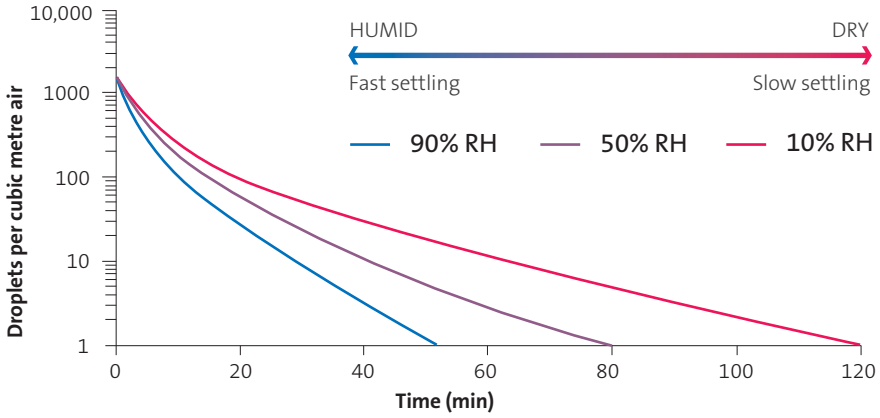
1. Optimal functioning of the respiratory immune system

Breathing dry air below 40%RH dries the mucous layer in our nose and throat. It becomes less effective at capturing and clearing airborne pollutants and microbes, which in turn leaves us more susceptible to infections.[1]



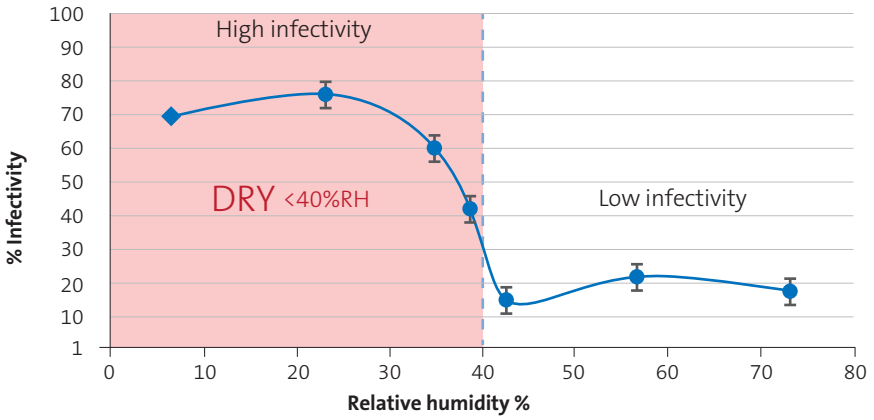
2. Reduced quantity of airborne viruses

When infected people breathe, talk, cough or sneeze, they release droplets that contain potentially infectious viruses. The smaller these droplets are, the longer they remain airborne. In dry air, airborne virus concentrations have been shown to remain higher. This is due to more droplets evaporating to a size that enables them to stay airborne for longer in dry air, and greater merging together of droplets in humid air, leading to faster settling.[2]



3. Airborne viruses are less infectious

In air above 40%RH airborne viruses suspended in droplets will more rapidly deactivate and are less infectious. In dry air below 40%RH, airborne viruses survive and remain infectious for longer periods of time.[3]

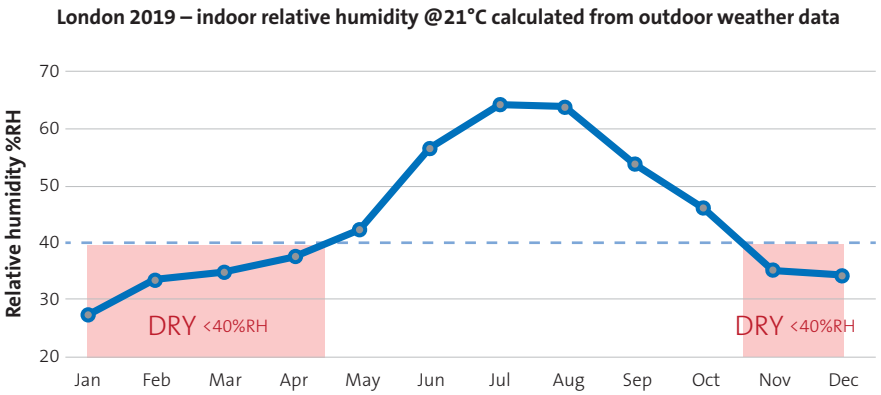


Scientific research indicates that the optimum indoor humidity to prevent airborne respiratory infection is **40-60%RH**. At this level, our immune system is more robust, there are fewer airborne viruses and they are less infectious.

References:
1. Moriyama et al 2020. Annual Review of Virology: Seasonality of Respiratory Viral Infections
2. Yang & Marr 2011. Dynamics of Airborne Influenza A Viruses Indoors and Dependence on Humidity
3. Noti et al 2013. High Humidity Leads to Loss of Infectious Influenza Virus from Simulated Coughs

THE INDOOR DRY SEASON

In the UK, indoor humidity will typically drop below 40%RH in heated buildings from October/November to March/April. This period corresponds very closely to the UK's flu season. Research studies have concluded that low indoor humidity is a causal factor in the rise and fall of seasonal respiratory illness.



Without proactively adding moisture to an indoor environment with humidifiers, a building's indoor humidity is dependent upon the condition of the outdoor air entering the building and any indoor heating that is taking place.

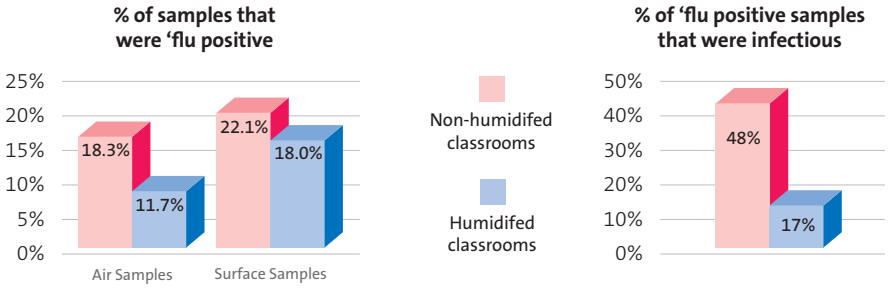
The graph above shows the calculated[4] average indoor humidity for a non-humidified building in London, which is heated to 21°C, based on the recorded outdoor weather data[5] for 2019. It shows an average indoor humidity below 40%RH for six months of the year.

In order to combat the triple threat to respiratory health that dry air presents, buildings need to use humidifiers to maintain humidity above 40%RH throughout the winter months.

Humidification is a natural, non-pharmaceutical infection control strategy

Empirical studies have shown that maintaining the humidity above 40%RH with humidifiers during the winter is an effective infection control mechanism against respiratory illnesses, such as influenza.

Dr Jennifer Reiman[6], PhD, Mayo Clinic, monitored the amount of 'flu virus found in the air and on surfaces in four nursery school classrooms across a winter period. Two classrooms were humidified and two were not.



The study found that more than a third less virus was detected in the air of humidified classrooms than the non-humidified. Across both surfaces and air, there was around 25% less virus present in the humidified classrooms. Of the flu-positive virus samples detected, in the humidified classrooms, only 17% were deemed capable of causing an infection, compared to 48% in the non-humidified classrooms.

4. Calculation carried out using CIBSE Guide C: Reference Data: section 1. Properties of Humid Air
5. Weather data from http://nw3weather.co.uk
6. Reiman et al 2018. Humidity as a non-pharmaceutical intervention for influenza A

HUMIDIFICATION SYSTEMS

Employing commercial humidifiers to maintain a building's indoor humidity throughout the winter is a practical solution to reducing seasonal airborne respiratory infections.

Commercial humidifiers can supply moisture either to a central air handling unit in a building's plant room or directly to a room's atmosphere. Humidifiers deliver moisture to an atmosphere by either boiling water to create steam, creating a fine mist that rapidly evaporates, or by directly evaporating moisture from a wetted surface.

A humidistat controls a humidification system's output. Sensors monitor and feedback humidity levels to ensure the humidifier precisely maintains the building's humidity to the desired level, without over or under-humidifying.

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