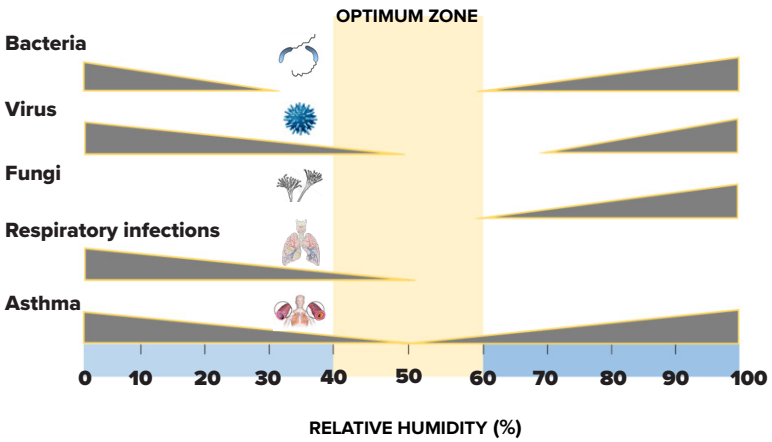
1.0 ACUTE RESPIRATORY INFECTIONS (A.R.I.)

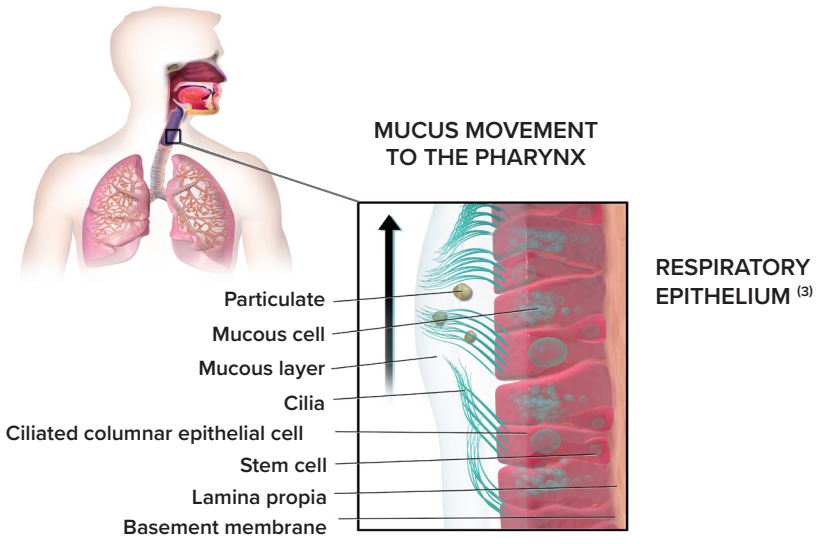
Nasal obstruction, sore throat, tonsillitis, pharyngitis, laryngitis, sinusitis, otitis media, common cold and pneumonia are commonly acute respiratory infections. These infections usually have a viral origin. Winter is the strongest infection period because it is the driest season with a low outdoor humidity ratio (around 1 - 2 g/kg) and low indoor relative humidity (< 35%) [7].

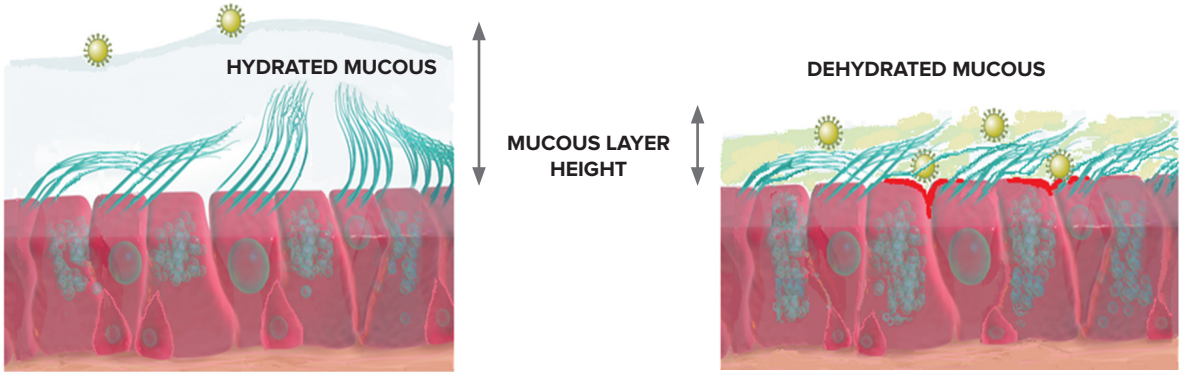


From Scofiel - Sterling diagram [1][2]

2.0 Correct Relative Humidity Protects the Respiratory Tract

Respiratory epithelium (present in nose, pharynx and tracheal system) humidifies and warms inhaled air. Additionally it cleans the upper respiratory cavities producing mucous, which binds particulates that are transported to the pharynx by cilia on the epithelial cells. Each epithelial cell contains about 200 cilia [4]. This mucociliary clearance is the lungs' first line of defense and loss is a significant cause of respiratory infections[8].





RIGHT INDOOR AIR HUMIDITY (OPTIMAL AT 50% R.H.[4])

- Maintains the right mucous hydration
- Reduces mucous density
- Increases mucous fluidity
- Reduces mucous production
- Increases mucous layer
- Increases height ciliary layer
- Increases cilia motion
- Increases mucociliary clearance
- Increases particulate elimination
- Reduces any inflammation risk
- Reduces any tissue damage
- Increases tissue defense
- Increases tissue repair

[5][6]

DRY INDOOR AIR

- Causes mucous dehydration
- Increases mucous density and fluidity
- Increases mucous production
- Reduces mucous layer
- Reduces height of ciliary layer
- Immobilizes cilia
- Reduces mucociliary clearance
- Reduces particulate elimination
- Increases inflammation risk
- Increases tissue damage
- Reduces tissue defense and repair

[5][6]

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3.0 Correct Relative Humidity Protects the Lungs

Particulates and microbes that evade the first line of defense, that is, epithelial mucus, reach the distal lung. From there, they must be cleared rapidly and efficiently by the second line of defense: phagocytes. Alveolar macrophages are the dominant phagocytic cells in the lungs [8].

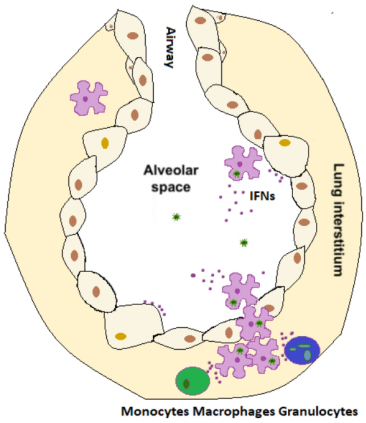
Acute inflammation represents the immediate response to an aggressive agent, of short duration (a few days or weeks), often abrupt in onset and characterized by intense vasculo-exudative phenomena. Multiple biochemical mediators start inflammation. Among them, interferons (IFNs) activate macrophages and inhibit the replication of viruses.

4.0 Correct Relative Humidity Protects the Lungs

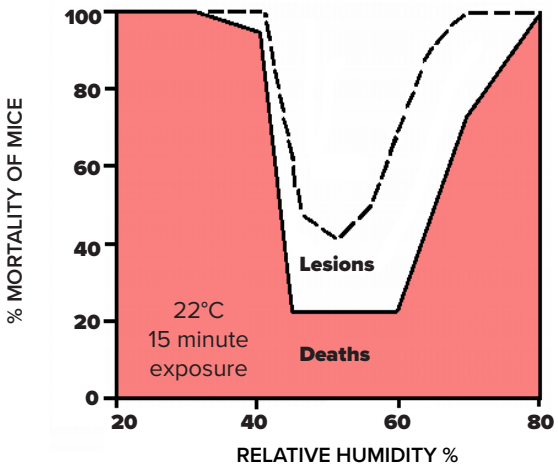
Indoor humidity ratio around 7 - 10 g/kg (relative humidity 40%-60%), ideal to increase innate protective macrophage defense and to decrease A.R.I. virulence.

RIGHT INDOOR AIR HUMIDITY (OPTIMAL AT 50% R.H. [3])

- Reduces respiratory cell damage
- Decreases infection of airway epithelium
- Increases virus clearance by protective alveolar macrophages
- Increases inducible antiviral innate immunity.
- Increase type I IFN-mediated and IFN-independent antiviral defense mechanisms.
- Increases other innate defense mechanisms.
- Reduces sensitivity to inflammasome activation,
- Reduces Caspase activation,
- Decreases cytokine (interleukins 1 and 18) production. [5][6]



INNATE IFNS-MACROPHAGE PROTECTION



Deaths and lung lesions are minimized when humidity is held between 40 and 60% rh. [2,9]

Sources

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Author: P.E. David, Pharmacist and HVAC specialist at Armstrong International

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