

Airway Protection in Covid-19
pandemic: *Severity* Prevention
WITH
Exposure Reduction

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Assuming exposure to Covid-19, can we try to reduce severity with non-invasive means?

- What are the existing options?
- What may work for other viruses?
- Why the winter?
- Do we TRULY understand cause and effect?

What is at stake?

- Eventually, you WILL get exposed to Covid-19 – it will become ubiquitous in our environment
- Wouldn't it be better to try to stay as an asymptomatic individual than one with symptoms, or one who needs hospitalization or worse, a ventilator
- Reduce shedding possibly to protect others

Do we fully understand cause/effect in Covid-19 viral illness severity?

- Conventional “germ theory” view does not discriminate well between “infection” and colonization, where the virus is present, but causing few or no symptoms
- They why is it believed winter/cold weather is a factor?
- Viral Stabilization in cold, dry air? Viruses like this, and other pathogens piggyback on viral infection
 - Our immune systems are reduced in the cold – Keep warm and you won’t “catch”
- Or, are we missing something major?

Could we be missing something?

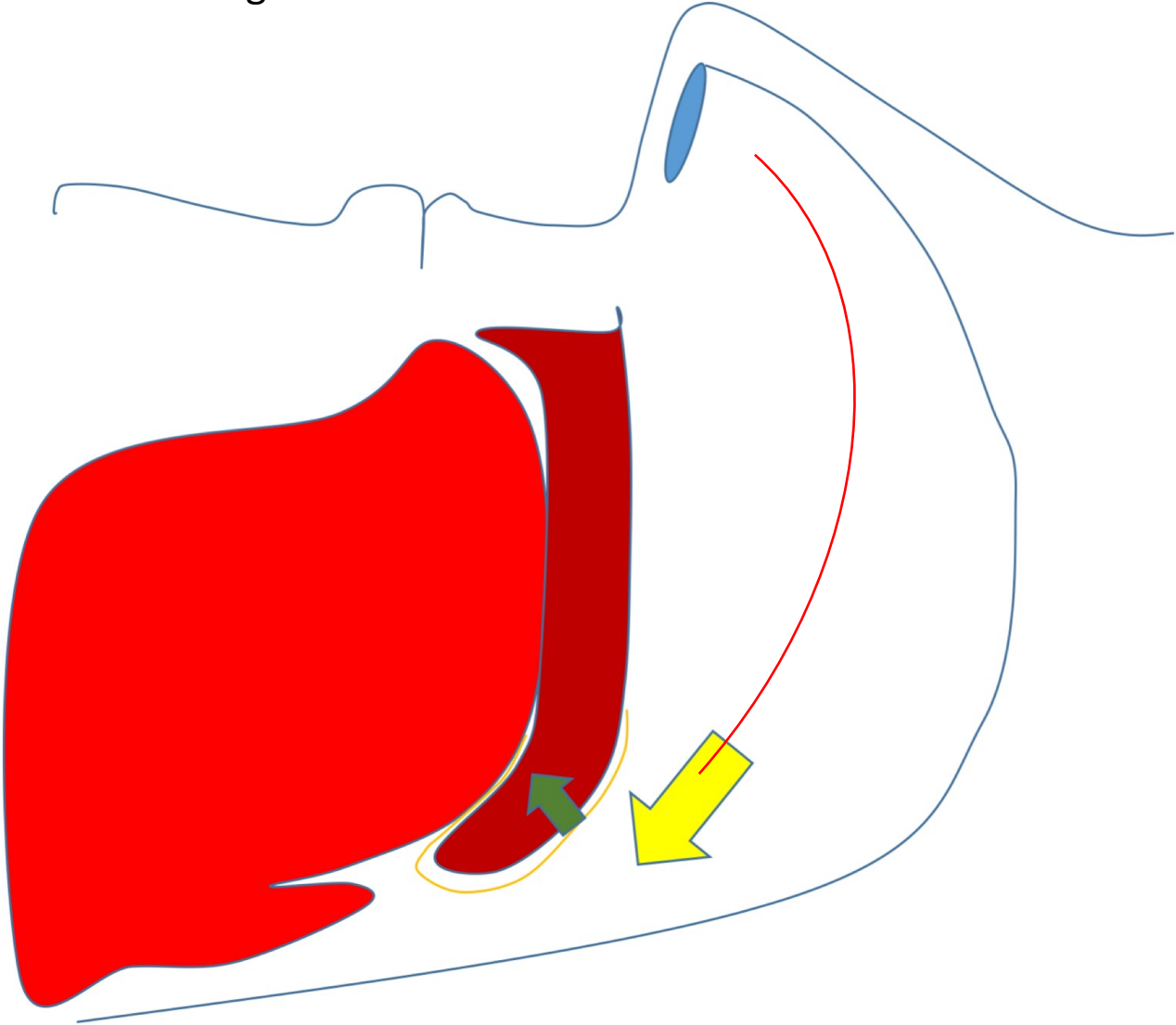
- If microbes including Group A Strep and influenza are ubiquitous in our environment, what triggers them to “invade” host respiratory mucosa? If Covid-19 is a newcomer to humans, what makes it invasive to some, and quiet passengers in others?
- The universal principal is that **the mucosal barrier is broken down by ENVIRONMENTAL factors!** Only after mucosal barrier disruption can these pathogens become truly pathogenic to the host – the viruses themselves are not the only cause of severity...
- If we can determine WHICH environmental factors permit these pathogens to break through our tissue (reach our sub-mucosa tissue), we can effectively prevent and even reverse the mucosal barrier wounding

What causes the barrier of our airway/throat to be disrupted (permitting penetration and true "infection" by Covid-19?

Factor 1: Negative pressure during sleep

- Breathing with mouth open during sleep
- MOST patients don't realize they do!
- Manifests as “dry mouth” in AM
- Worst with anything that reduces tone:
 - Deep sleep stages (REM)
 - High BMI/Obesity
 - Sedentary
 - Sedatives/Alcohol
 - “Weak chin”/structural weakness or petite-ness of facial features

Nasal breathing “lifts” the tongue and palate



Mouth-Open position causes tongue-based collapse



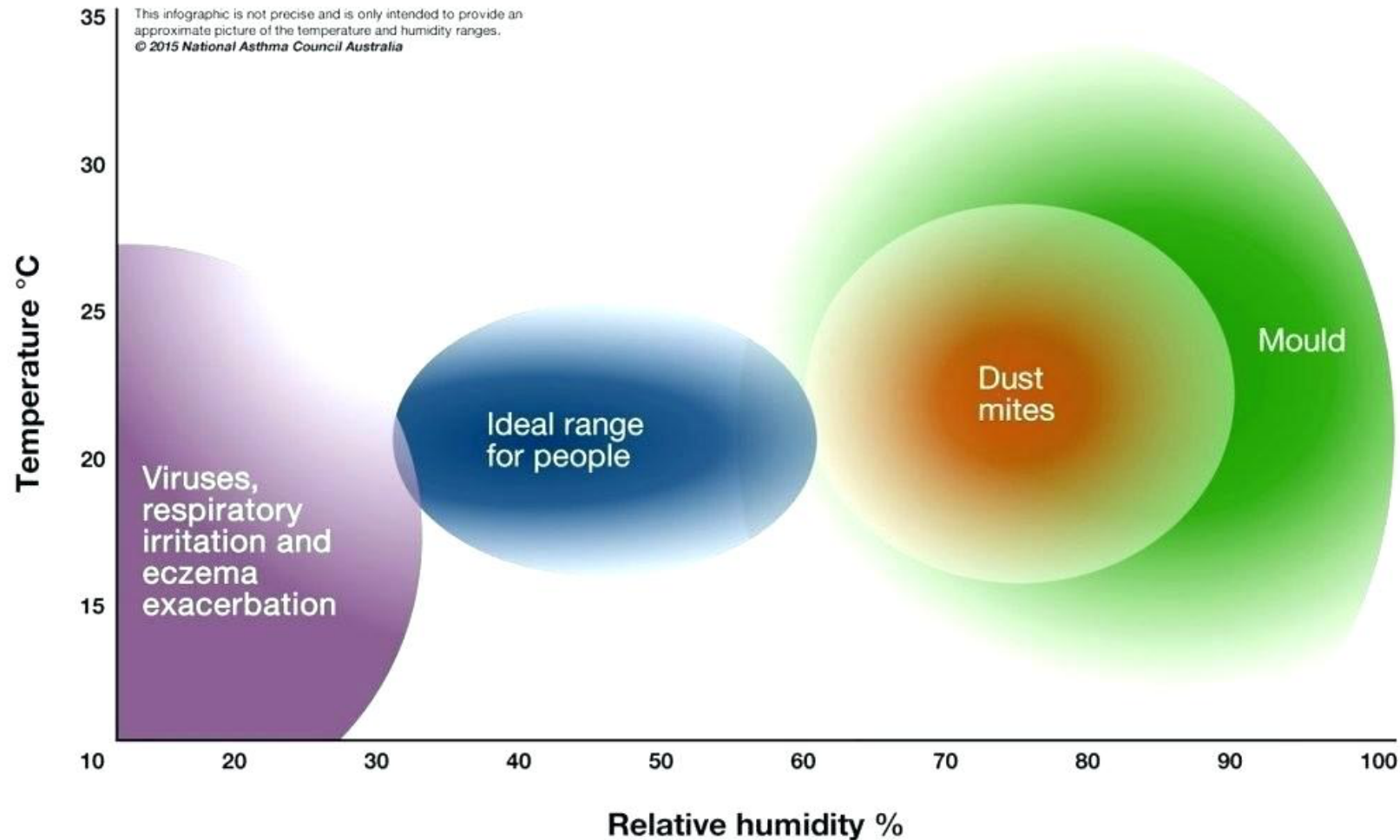
Shown Clinically as Well

- Kukwa W, Guilleminault C, Tomaszewska M, Kukwa A, Krzeski A, Migacz E. Prevalence of upper respiratory tract infections in habitually snoring and mouth breathing children. Int J Pediatr Otorhinolaryngol. 2018 Apr;107:37-41.

Factor 2. Dessication/Mucosal Dryness

- Relative Humidity (indoor) for human airway safe 40-60% - amount of moisture in the air
- In winter, this can drop to single digits on very cold days
- Keeping the heat on – especially forced hot air can drop humidity in the apartment even worse!
- So, winter in a NYC apartment/house can have VERY low humidity
- Outdoor humidity is usually better

So, low humidity (cold winter weather) is associated with respiratory infection (URI), but HOW?



Low humidity dries our mucosal barrier and breaks it down!

- Kudo E, Song E, Yockey LJ, Rakib T, Wong PW, Homer RJ, Iwasaki A. **Low ambient humidity impairs barrier function and innate resistance against influenza infection.** Proc Natl Acad Sci U S A. 2019 May 28;116(22):10905-10910
- R. Williams, N. Rankin, T. Smith, D. Galler, P. Seakins Relationship between the humidity and temperature of inspired gas and the function of the airway mucosa. Crit. Care Med., 24 (1996), pp. 1920-1927

Wait, I thought that low humidity cause viruses to be stronger!

- Nope! –

Kormuth KA(1), Lin K(2), Prussin AJ 2nd(2), Vejerano EP(3), Tiwari AJ(2), CoxSS(2), Myerburg MM(4), Lakdawala SS(1), Marr LC(2).

Influenza Virus Infectivity Is Retained in Aerosols and Droplets Independent of Relative Humidity.. J Infect Dis. 2018 Jul 24;218(5):739-747.

Mouth-breathing ITSELF also causes dryness

- Naclerio RM, Pinto J, Assanasen P, Baroody FM. Observations on the ability of the nose to warm and humidify inspired air. *Rhinology*. 2007 Jun;45(2):102-11.

So, airway negative pressure and
deseccation from low humidity are
SYNERGISTIC! Both are caused by
mouth-breathing!

Dryness + Negative Pressure = Barrier disruption of throat = Potential for invasion
by invasive microbes including Covid-19 if exposed

Mechanical factors that promote URI

- Low-humidity = Dry mucosa
- Mouth-breathing = Dry mucosa
- Negative Pressure from sleep-related mouth-breathing = mucosal stretch and damage
- Dry heat in winter = dry mucosa
- **END RESULT is mucous membrane damaged and susceptible to pathogen invasion! In other words, it is not the pathogen that attacks, but a breach in the lining of the airway!**

LOCATION in airway

- Peak negative pressure and dryness – just distal to obstacle
 - Sinus
 - Nasal cavity
 - Middle Ear
 - Pharynx/throat
 - Larynx/Trachea

Temporality (Acute vs. Chronic)

- Long-term dryness and negative pressure = Chronic, with local inflammation
 - Ex: chronic tonsillitis, sinusitis
 - Is tonsil part of regional immunity to respiratory viruses?
- Acute = Lack of local immunity – risk of acute symptoms and systemic response
 - Ex: influenza, acute Strep infection, Severe Covid-19 infection

Koch's 5th Postulate

- Mucosal Barrier Breakdown?

What can we do?

- STRATEGIES FOR PREVENTION AND TREATMENT

- **GOAL:**

- 1 ENCOURAGE NASAL BREATHING
- 2 DISCOURAGE MOUTH BREATHING
- 3. KEEP AMBIENT RELATIVE HUMIDITY BETWEEN 40-60%
- Get lots of extra sleep – go to bed early, wake late, to maximize restorative sleep
- Outdoor air and CONSTANT ACTIVITY improves tone and improves air humidity and quality
- Reduce BMI (Body mass index) to appropriate via diet and maximal activity

Activity vs. Exercise

- Why do I distinguish between constant activity and exercise?
- Most physicians and health organizations recommend 30 minutes a day exercise
- To get in best tone, one should sit very little, but be maximally active all day, NOT just 30 minutes of intensive exercise

ENCOURAGE NASAL BREATHING/DISCOURAGE MOUTH BREATHING

- nasal decongestants for short-term, with nasal dilator strips?
- Repair any severe deviations
- JAW SUPPORT
 - Oral appliance?
 - Chin STRAP? Headband oriented vertically?
 - POSITIONING – ELEVATION to sitting during sleep prevents tongue collapse and negative pressure buildup
 - Lip closure tape???
 - Confirm adequate nasal airway with test or thermal imaging

MAINTAIN HUMIDITY between 40-60% - maintain airway hydration

- Spend time outdoors even if cold!
- Lower heat in apartment/house – wear warmer clothes if needed
- Avoid forced hot air
- Use a humidifier every night in winter not just when sick
- Clean humidifier filter regularly
- Use a hygrometer to check!
- Talk to your landlord or housing authority!
- Stay hydrated – drink lots of water

Maintain Airway Health

- USE these environmental measures **AGGRESSIVELY** but follow closely!
- Only use antibiotics with severe **ACUTE** systemic symptoms (high fevers, abscess on CT, or complications of URI – orbital/cranial manifestations)
- For chronic sinusitis/Tonsillitis, surgery is not helpful as conventional wisdom says, but fixing the root environmental causes is!

What if you do develop symptoms?

- Avoid NSAIDs
- Sleep elevated to prevent shortness of breath, sitting better
- Humidifier
- Hydration with water, etc.
- Rest, obviously stay at home
- Avoid cough suppressants
- Consult your healthcare provider with worsening symptoms