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## How Airborne Is This Virus?

Carolyn Boscia

*University of Vermont*

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### QOD 3/19/20: How airborne is this virus?

**Q from Dr. Wyll Everett:** “Sorry to bug you”—of note: I ASKED you to bug me ;-)—“have we found any new data about **whether covid is airborne and whether the n95’s are necessary?** I know the PPE guidelines are kind of changing...”

**A:** Great question! There have been several studies on this, with the most accessible and up-to-date summary of information I could find being in [this statnews article](#) from 3/16.

I’m attaching links to a couple of primary articles for those interested, with short summaries at the bottom of this email. In the meantime, a summarized way to think about this:

#### Key points:

- As is true for all things COVID, there is ongoing uncertainty. Best evidence at this time is that:
- It certainly **CAN aerosolize**
- **\*\*Remember from boards: patients with aerosolizable illness** who are in strict negative pressure rooms (e.g. pulmonary TB) **still only need a simple facemask when they’re out and about**. This is because cough is what aerosolizes the particles, and if they cough into a mask, it only spreads droplets to the inside of their mask. The only reason we need N95’s while in their rooms is because they DON’T have a mask on and therefore there’s potential for airborne spread in that environment.
- COVID seems to **mostly spread via droplet and contact** route (including possible fecal-oral transmission, with kids as important viral shedders, the cute little vectors)
- Given limited airborne spread, negative-pressure rooms are not necessary for all patients; patients should wear masks as much as feasible even in their rooms, if it does not exacerbate their symptoms
- In an **ideal world**, we would all be wearing **fit-tested N95’s** to care for any suspected COVID patients. In a world where **shortages** are becoming more common, **we may be instructed to use simple facemasks instead**. This seems reasonable given very low rates of aerosolization outside of when certain procedures are going on. **If you are immunocompromised or have a chronic cardiopulmonary condition**, avoid serving on a designated COVID care team (currently all being handled by non-teach), and if unavoidable in a particular scenario, **insist on an n95**. [Current CDC guidelines](#) align with this overall approach to N95 vs simple facemask.
- **Aerosolizing medical procedures** promote airborne spread; these include nebulizers, high-flow nasal cannula, CPAP/BiPAP, and intubation. These should only be undertaken in a **negative-pressure room and under airborne precautions**. **Ways to reduce airborne spread in medical settings** thus include:
  - **Use of inhalers rather than nebs:** remember: **a 2.5mg albuterol neb is equivalent to 2-4 puffs of an albuterol inhaler!** So make sure to order ENOUGH inhaler if avoiding nebs; patients who would need a 5mg neb need at least 4 puffs of their MDI. Fortunately, we know that **MDI’s with spacers work just as well, if not better than, nebulizers** for people with bronchospasm (of course you have to have some mental status for the MDI!)
  - **Avoidance of HFNC and NIPPV** (non-invasive PPV aka CPAP/BiPAP) particularly if pt is not in a negative-pressure room, move to early intubation if ventilator scarcity is not an issue
  - **Enhanced airborne precautions around intubation**, including minimizing personnel, maximizing paralytic dose used to minimize residual cough reflex, preoxygenating with

simple facemask rather than bag-mask, and minimizing number of attempts (aka will all due respect to our awesome sets of other mad skills, **none of us should be asked to intubate unless it's truly the apocalypse**)

- **Fecal shedding of virus seems to happen quite a bit**, and studies have found aerosolized virus in higher concentrations in the bathroom air of COVID patients. From a practical standpoint, this makes me think that:
  - we should be avoiding bathrooms of COVID patients particularly if wearing simple facemask only
  - environmental services staff should be provided with fit-tested N95's as a top priority
  - **We should be counseling everyone everywhere to close their toilet lid before flushing!** Tell your friends and fam! (\*\*this is my personal opinion only and reflects no existing COVID evidence, BUT, read the following to learn about [toilet plumes aka open-flush practices](#) and how they have been shown to aerosolize lots of germs; unclear implications for COVID transmission but please ask everyone to put a lid on it 😊)

### Primary literature: airborne or not??

**JAMA 3/4/2020:** Extensive testing of the rooms of 3 COVID patients in Singapore. After routine room cleaning, surfaces tested neg. Prior to cleaning, virtually all surfaces tested positive for virus, including heavy pos in the bathroom area (nice). ALL AIR SAMPLES WERE NEGATIVE.

**Caveats:** very small sample size; testing did not confirm VIABLE virus, just presence of virus in general; and these were all negative-pressure rooms where the air is filtered frequently, so doesn't necessarily mean that in regular rooms there won't be any airborne transmission.

**Take-home's:** all the regular precautions i.e. handwashing, gown/gloves, simple mask, will be most important in preventing the bulk of COVID transmission

**BioRxiv 3/10/2020:** testing of the air throughout the patient care and medical staff areas of a Wuhan hospital. Some aerosol samples tested positive at low levels, it was way worse in patient bathrooms, and they found that aerosolized virus does deposit on surfaces, which would increase further potential for contact transmission.

**Caveats:** we don't know what concentrations of airborne particles are clinically significant; and I've never before seen this journal but the study looks reasonable

**Take-homes: avoid the bathrooms of COVID patients.** I would argue that **environmental services staff cleaning these rooms should have fit-tested N95's** given level of aerosolization that happens in the bathroom and the amount of particle deposition throughout rooms.

**NEJM 3/17/20:** in-vitro aerosolization of COVID particles did result in viable airborne virus, with a half-life of 1.1-1.2 hrs.

**Caveats:** they intentionally aerosolized high concentrations of virus in a lab setting, which probably overestimates the amount of viable aerosolized virus created from, say, a patient cough. And we still don't know the concentration that results in clinically significant spread

**Take-homes:** aerosolizable, and viable when aerosolized. But remember: patients under airborne precautions need only a simple facemask themselves to avoid aerosolizing particles via cough.