

# STANDARD DEVIATIONS: What Were We Thinking?

Greetings,



{Ahh, the good ol' days.}

We've all made choices that seemed right at the time.

Only to find out later that we were completely wrong.

Are mistakes discovered after the fact, or after new information comes to light, really mistakes? It depends.

Slavery? YES

Mullets? NO (Well, maybe. Now, if they make a comeback, that's a mistake.)

Mouth pipetting? NO. What?!?

Let me try to explain.

Why do we even need to mention mouth pipetting as a No-No? When was the last time you saw someone give that a try? In truth, it isn't exactly black and white. There was a time, kids, when these things made sense.

Back in the olden (golden?) days of clinical lab science we did things differently. We made all those reagents that now come in foil packages with official lot numbers and exact outdates. Our reagents were labeled with tape and initials and a ballpark pH.

And, yes, we mouth pipetted. Far and away the task involved reagents and not specimens. It was just a common practice to get that small amount of water, acetone, or isopropyl alcohol by mouth with a single pipette rather than adding flasks and cylinders to the chore.



And, we did mouth pipette samples. It was common and accepted practice to use your mouth to move bone marrow across a slide to identify spicules. It was less common to do so on the bench with plasma or serum; but it happened. Look, back then we did not wear gloves (much). We had food and drink on the bench. I remember smoking allowed in areas inside the lab!

Syringes came with needles in cork or just bent, and we just recapped them. Samples came to the lab in cups of ice, not in sealed bags. Broken glass was the only hazard we had special containment to contain; everything else got tossed in the garbage or flushed down the sink.

The world was a different place and we did things the way we were taught. It's a story of evolution in our understanding of safety and risk. We're in a better place today and we'll be in an even better place tomorrow.

The same kind of hindsight, backseat driving, sideline quarterbacking is going on with SARS-CoV2. A controversy over masks, social distancing, and droplet versus aerosol has brought a mistake in our understanding of virus transmission to light.

For years (nearly a century) the standard concept of transmissibility has been flawed. By adhering to mistaken theory about how pathogens move around, the number of people affected by COVID-19 is far greater than it needed to be.

The guidance from WHO about the novel coronavirus emerging in China was adamant in their tweet in April of 2020: **“FACT: #COVID19 is NOT airborne.”**

And this tweet from the U. S. Surgeon General was issued February 29, 2020:

**“Seriously people- STOP BUYING MASKS!**

**They are NOT effective in preventing general public from catching #Coronavirus...”**

In a March 8 interview with 60 Minutes, Director of the National Institute of Allergy and Infectious Diseases *Anthony Fauci* also argued that **“when you're in the middle of an outbreak, wearing a mask might make people feel a little bit better and it might even block a droplet, but it's not providing the perfect protection that people think that it is.”**

Turns out they were wrong.

But, in the medical canon, nearly all respiratory infections transmit through coughs or sneezes: Whenever a sick person hacks, bacteria and viruses spray out like bullets from a gun, quickly falling and sticking to any surface within a blast radius of 3 to 6 feet. Only a few pathogens were known to break the droplet rule, like measles and tuberculosis.

That's why our original practices were based on hand hygiene and social distancing; masking didn't come around for months. Airborne transmission was occurring right under (literally) our noses. Remember, mask **mandates** didn't occur widely until the fall of 2020. Air travel mask mandates didn't happen until July 14, 2020.

The dichotomy of droplet and aerosol understanding is tied to studies of droplet dispersion, gravity, and evaporation from the 1930's. This early work created a 5 micron threshold of



particle size that was specific to TB and the way it infected the deep tissues of the lung. That data became conflated as some kind of universal standard for respiratory pathogens.

And that work replaced another mistaken theory about transmission.

The obsolete **miasma theory** held that disease was caused by “bad air.” That thinking, that we couldn’t see what was causing disease, led to germ theory and tangible, quantifiable cause. Droplets made sense and aerosols defied the logic. Now we know better.



{Understanding of aerosol dynamics is still evolving.}

In truth (right now, anyway), that particle size should be around 100 microns and most bugs are more promiscuous than TB and can embed in particles of any size and infect cells all along the respiratory tract. The importance of respiratory protection, masking, and air handling has driven much of the success in our response to SARS-CoV2.

Nowadays, I’d say we were dumb not stupid. Just like mouth pipetting, we made a mistake with SARS-CoV2 transmission, and now we do things differently.

Just like mouth pipetting, our understanding of risk with aerosols has evolved. On the bench, our use of lids on rotor cups, biosafety cabinets, and N95 and PAPR PPE has improved our mitigation strategy. Understanding the dynamics of aerosol transmission in public health may improve our response to a world-wide pandemic and protect more people in the future.

And someday, when we look back and wonder: “What were we thinking?” we can say that we were doing what we, mistakenly, thought best at the time.

Have a great week and be safe,

Bryan

