Masked Effects

Droplet vs Airborne transmission of SARS-CoV-2 (CoViD19 virus) and appropriate mask use
DROPLET SPREAD
SARS-CoV-2 / Coronavirus

Viruses are contained in water droplets which are through the air and land on surfaces

Cough
Sneeze
Speech
Yawn
Burp

Large droplets travel 1-3 ft then fall to the ground
Small droplets travel 3-5 ft

Surfaces in the “spray zone” AT THE TIME OF THE SPRAY get dusted in droplets containing virus. As they dry, the virus starts to decay, at a different rate on different surfaces. YOU are a surface.

AIRBORNE SPREAD
Chickenpox / Varicella

Virus particles are free of water vapour and are light enough to float. Different viruses tolerate dry conditions longer than others.

Surfaces in the room within an HOUR of the spray get dusted with viral particles. They decay somewhat faster on surfaces without the protective water droplet but can float farther.
**DROPLET SPREAD**  
*SARS-CoV-2 / Coronavirus*

- Cough
- Sneezing
- Speech
- Yawning
- Burping

It is possible to inhale droplets only if “in the line of fire” and close proximity.

<table>
<thead>
<tr>
<th>Surface</th>
<th>Half Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plastic</td>
<td>7h</td>
</tr>
<tr>
<td>Cardboard</td>
<td>1h</td>
</tr>
<tr>
<td>Stainless steel</td>
<td>5h</td>
</tr>
</tbody>
</table>

Droplets leave a residue on surfaces that starts to dry. Some surfaces are more hospitable than others. One “half life” is the time it takes for 50% of the viruses to dry up and die.

**AIRBORNE SPREAD**  
*Chickenpox / Varicella*

- Exhaling

Airborne particles are inhaled passively regardless of distance in an enclosed space.

Varicella decays at a rate of 50% per hour.

Particles also settle on surfaces but the air is their main vehicle.
**DROPLET SPREAD** is mostly vs **AIRBORNE SPREAD**

**SARS-CoV-2** / Coronavirus vs **Chickenpox** / Varicella

- Cough
- Sneeze
- Speech
- Yawn
- Burp

It is possible to inhale droplets only if “in the line of fire” and close proximity.

Contaminated hands touch the face & introduce the virus to airways.

The average person touches their face 15x/hr.

Touching any contaminated surface that hosts VIABLE virus contaminates your hands. RNA fragments, which can last for days or weeks are like the “bones” left by viral “carcases.” They are harmless.

Airborne particles are inhaled passively regardless of distance in an enclosed space.

Exhale
Particles float in **ALL** directions

**DROPLET AIRWAY PROTECTION**

- Cough
- Sneeze
- Speech
- Yawn
- Burp

Droplets are propelled a short distance and then fall. If in quite close proximity, these droplets land on a surgical mask and start to dry.

**AIRBORNE PROTECTION**

- Exhale

The primary defense of the N95 mask is the close fit, which prevents particulate drift into airways.

**Chickenpox / Varicella**

**SARS-CoV-2 / Coronavirus**

Viruses cannot penetrate the mask unless it’s wet through.

Surgical masks offer very good droplet protection - we rely on them to keep surgery safe for staff & patients every day.

Because of the loose fit of routine surgical masks, airborne pathogens can float through gaps. N95 respirators are needed.
DROPLET SPREAD → AEROSOLIZED → AIRBORNE SPREAD

SARS-CoV-2 / Coronavirus

Under artificial influences, droplet transmitted viruses can be propelled into airborne forms.

When propellant is added to the system, water droplets are expelled as both vapour and particles. Smaller droplets have arc even farther than 5 ft and free particulate can float.

Droplets cannot aerosolize by lungs alone.

Aerosol Generating Medical Procedure (AGMP)

ADD GAS

ADD VELOCITY
How can I trust that my patient won’t spontaneously aerosolize?

SARS-CoV-2 / Coronavirus

While there is much to learn about SARS-CoV-2 we have studied its cousin SARS-CoV-1 extensively and already examined Coronavirus’ ability to be aerosolized. Not even the most forceful cough changes the nature of transmission. Surgical masks are effective droplet barriers for non-AGMP encounters.
REFERENCES

Van Doremalen et al “Aerosol and surface stability of SARS-CoV-2 as compared with SAR-CoV-1”, NEJM Mar 17 2020


Nicas M, Best D “A study quantifying the hand-to-face contact rate and its potential application to predicting respiratory tract infection”. J Occup Environ Hyg 2008:5(6) 347-352

Walter BA, Ewald PW “Pathogen survival in the external environment and the evolution of virulence” Biol Rev 2004 79;849-869