



# AEROSOLS IN DENTISTRY

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## Content



Basic information



Methodology of bacterial aerosol



How much aerosol is generated in the dental office?



Recommendation for safe work in the dental office

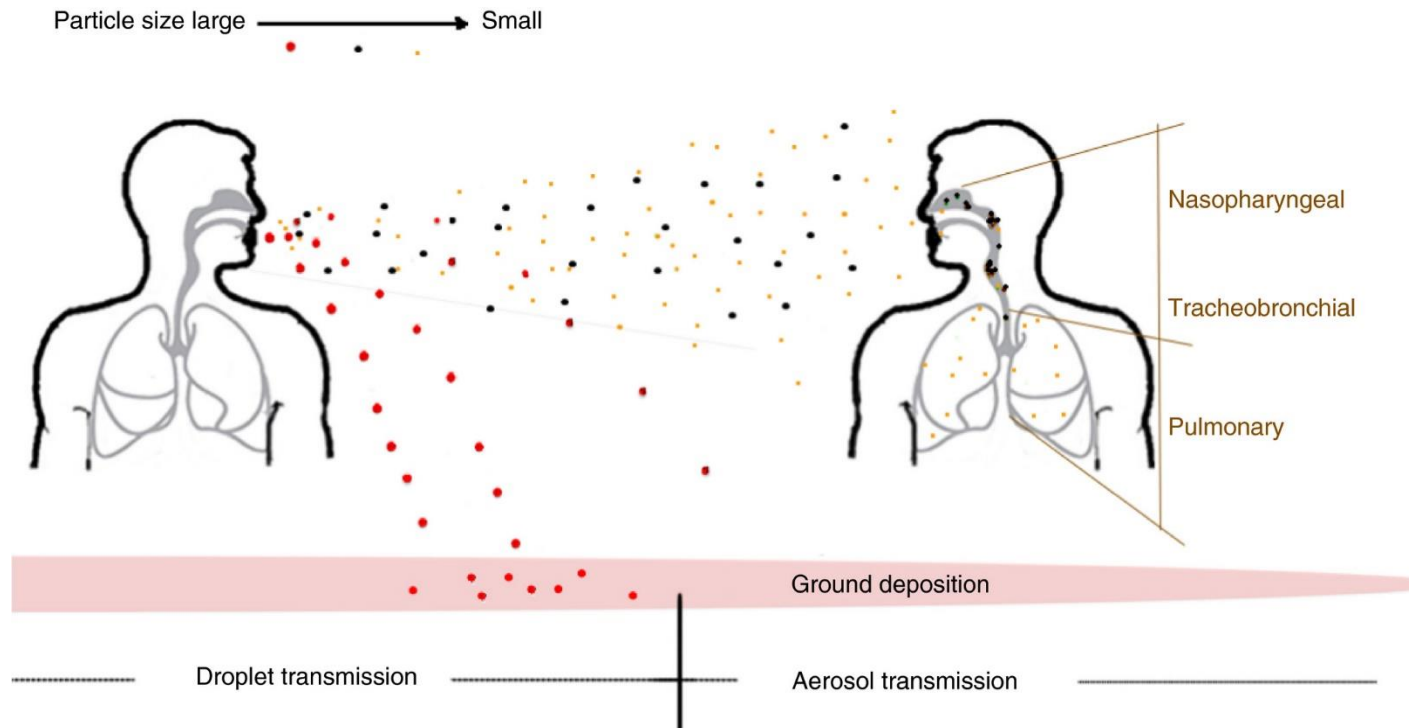
# DEFINITION



**Aerosols** = liquid or solid particles suspended in the air by humans, animals, instruments, or machines.

**Bio-aerosols** = aerosols containing particles of any kind of organism.

# DEFINITION



- Aerosol - particles less than 5  $\mu\text{m}$  in diameter
- Splatter - particles larger than 5  $\mu\text{m}$  in diameter

# SIZE COMPARISON

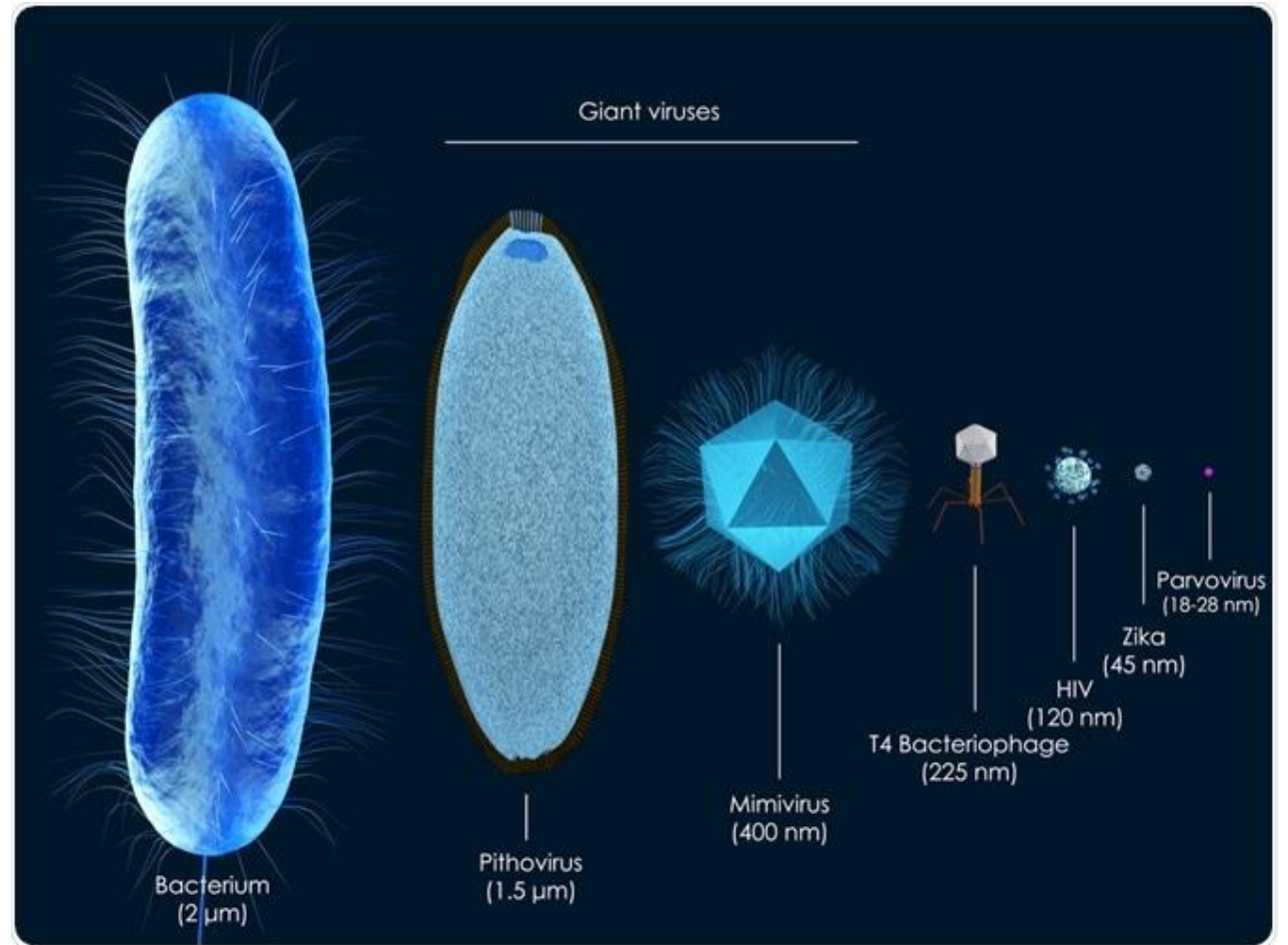
Aerosol particles:  $< 5 \mu\text{m}$

Mycobacterium tuberculosis:  $2 \mu\text{m}$

Staphylococcus epidermidis:  $1,5 \mu\text{m}$

Coronaviridae:  $90\text{-}150 \text{ nm}$

Influenza viruses:  $80\text{-}120 \text{ nm}$





# DISEASES KNOWN TO BE SPREAD BY DROPLETS OR AEROSOLS

Tuberculosis, Influenza, Legionnaires' Disease, Severe Acute Respiratory Syndrome, Measles, Pneumonic Plague, diseases caused by herpetic viruses (Varicella Zoster Virus), rhinoviruses



# INFECTIOUS AEROSOLS IN DENTAL ENVIRONMENT

## What is the composition of contaminated droplets or aerosols?

Complete overview micro-organisms identified in the dental setting.

### Bacteria N = 19

#### Gram negative

*Acinetobacter wolffii*

*Legionella* spp.

*Pseudomonas aureus*

*Staphylococcus aureus*

#### Gram positive

*Staphylococcus capitis*

*Staphylococcus lentus*

*Staphylococcus xylosus*

*Staphylococcus chromogenes*

*Staphylococcus haemolyticus*

*Staphylococcus epidermidis*

*Staphylococcus fominis*

*Micrococcus luteus*

*Micrococcus* spp.

*Micrococcus lylae*

*Bacillus pumilus*

*Diphtheroids*

*Corynebacteria*

*Bacillus* spp.

*Actinomycetes*

### Viruses N = 0

None reported

### Parasites N = 0

None reported

### Fungi N = 23

*Alternaria alternata*

*Alternaria brassicicola*

*Alternaria citri*

*Arthrinium phaesospermum*

*Aspergillus*

*Aspergillus flavus*

*Aspergillus fumigatus*

*Aspergillus niger*

*Botrytis* spp

*Cladosporium cladosporiodias*

*Cladosporium cucumerinum*

*Cladosporium ramotenellum*

*Cladosporium sphaerospermum*

*Cladosporium* spp

*Cladosporium spongiosum*

*Geotrichum* spp

*Monocillim indicum*

*Monodictys glauca*

*Pencillium* spp

*Penicillium chrysogenum*

*Stemphylium* spp

*Stemphylium* spp

*Ulocladium alternariae*

# AEROSOL SAMPLING METHODOLOGY

Passive air sampling

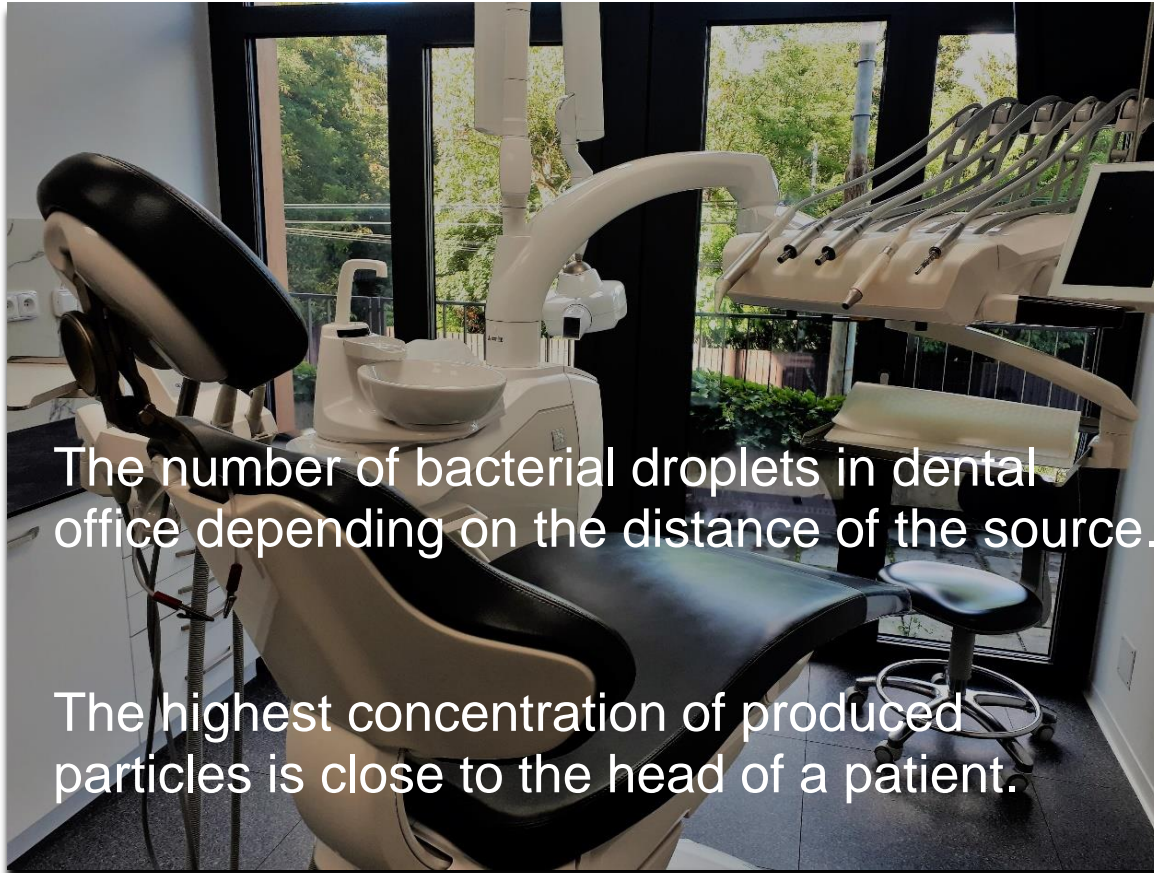
Active air sampling (air sampler)



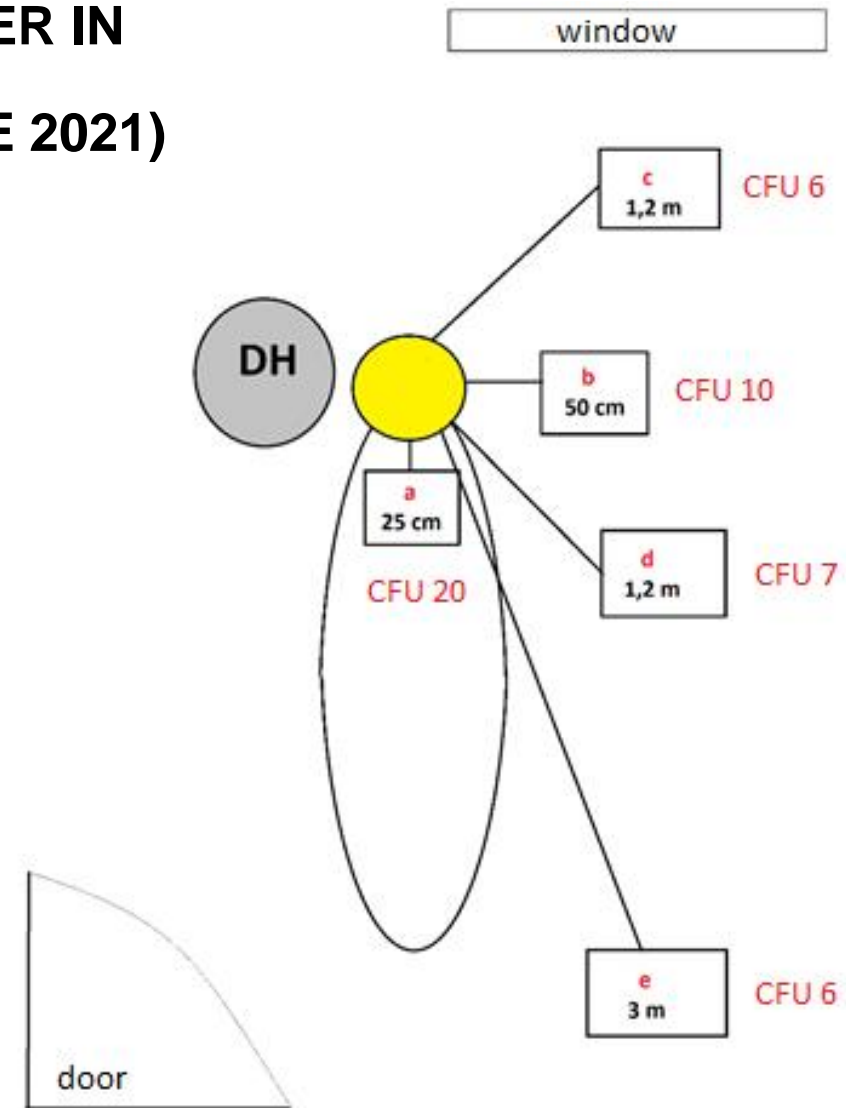
**Note:** viral particles such as influenza, rhinoviruses, SARS coronavirus and bacteria such as Mycobacteria tuberculi and strict anaerobic bacteria could not be measured if common culture medium and cultivation conditions were used.



# PILOT MEASUREMENT OF BACTERIAL SPLATTER IN THE ENVIRONMENT OF A DENTAL CLINIC (JUNE 2021)



- The number of bacterial droplets in dental office depending on the distance of the source.
- The highest concentration of produced particles is close to the head of a patient.















WRONG

12 Dental office



RIGHT

MUNI  
MED

# CONTROL OF DROPLETS AND AEROSOLS IN THE DENTAL ENVIRONMENT

- 1) Reduction or avoidance of droplet/aerosol generation
- 2) Use of rubber dam isolation
- 3) Use of pre-procedure mouthwash
- 4) Dilution and efficient removal of contaminated ambient air
- 5) Disinfect air/aerosol generated
- 6) Adoption of contact precautions



# CONTROL OF DROPLETS AND AEROSOLS IN THE DENTAL ENVIRONMENT

## 1) Reduction or avoidance of droplet/aerosol generation

- Aerosol and splatter generation is inevitable when ultrasonic scalers, rotary brushes and air prophylactics are used. Avoid the use of rotary handpieces for operative procedures if possible.

# CONTROL OF DROPLETS AND AEROSOLS IN THE DENTAL ENVIRONMENT

- 1) Reduction or avoidance of droplet/aerosol generation
- 2) Use of rubber dam isolation
  - Rubber dam effectively isolates the operating field and its use is well known to prevent or minimise the generation of potentially infectious splatter and aerosol

# CONTROL OF DROPLETS AND AEROSOLS IN THE DENTAL ENVIRONMENT

- 1) Reduction or avoidance of droplet/aerosol generation
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- 3) Use of pre-procedure mouthwash

- A pre-procedural 0.12% chlorhexidine mouth rinse can reduce the microbial load of saliva, and by implication a resultant aerosol due to instrumentation. Although the effect of chlorhexidine gluconate on human coronavirus is unknown it is effective against many respiratory viruses, like herpes and HIV

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- 1) Reduction or avoidance of droplet/aerosol generation
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- 3) Use of pre-procedure mouthwash
- 4) Dilution and efficient removal of contaminated ambient air
  - *High volume evacuation (HVE)*
  - *General ventilation*
  - *Air filtration (HEPA filters)*

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- 5) Disinfect air/aerosol generated
  - *Ultraviolet germicidal irradiation (UVGI)*



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- 5) Disinfect air/aerosol generated
- 6) Adoption of contact precautions
  - Personal protection equipment (PPE)

# It is good to know...



...humans produce infectious aerosols in a wide range of particle sizes, but pathogens predominate in small particles (  $< 5 \mu\text{m}$  ) that are immediately respirable by exposed individuals.



...proper hand hygiene is still one of the most important factors in preventing the spread of infectious diseases. Remember, all surfaces in your dental office are covered with aerosol and droplets.