



Disinfectant Health & Safety Information

Chemicals that kill germs are not likely to be without health concerns.

Who I am?

Pesticides Toxicologist with Maine
Board of Pesticides Control

Pamela J. Bryer, PhD

- I am here as a resource for you, your co-workers, friends, and family for questions about pesticides.

YES, I WORK FROM HOME.



HOW DID YOU KNOW?

It's a different world

My body has absorbed so much soap and water, hand sanitizer & disinfectant that now when I pee it cleans the toilet.

[@womenafter50.com](https://www.instagram.com/womenafter50.com)

Real frustration with using disinfectants.



Leads us to wonder, why this hub-bub?

Why are we talking about the safety of cleaning chemicals?

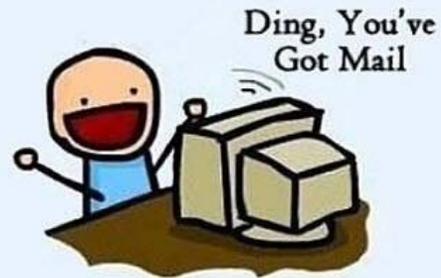


Familiarity breeds contempt

15 Years Ago



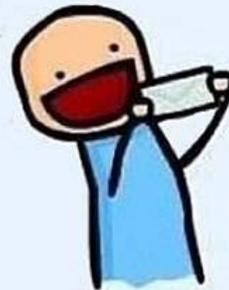
Sigh! Letters



Today



220 Unread
Emails



OMG! A Letter

When I say “pesticide” what do you think of?



What is a pesticide?

What is a Pesticide?

Pesticide law defines a “pesticide” (with certain minor exceptions) as:

- Any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest.
- Any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant.
- Any nitrogen stabilizer.

U.S. Code Title 7, Chapter 6, Subchapter II, Section 136 - Definitions

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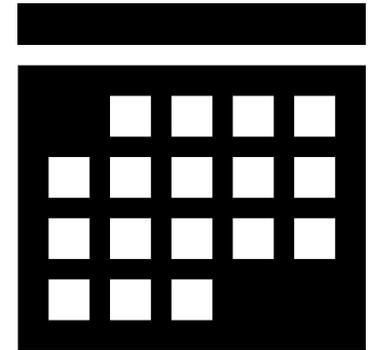
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Important difference between agricultural and disinfecting uses



Mainers injured from disinfectants every year

Household cleaning products accounted for 22% of the 926 substances involved in these 847 cases, with bleaches (n = 60), disinfectants (n = 31), and wall, floor and tile cleaners (n = 15) being the most common.

Taken from 2020 Annual Report Northern
New England Poison Center Maine Report

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Maine case statistics were heavily influenced by three factors during this period.

- The NNEPC handled 1,293 cases called in after hours on the Maine CDC's disease reporting line—727 human exposure cases, 14 animal exposures and 552 information requests. This was more than three times the number of such cases the center typically handles, an increase that was directly tied to the COVID-19 pandemic: 63% of the cases (n = 813) were related to COVID-19.
- The pandemic also had a significant effect on the overall makeup of the NNEPC's case load. The center saw a surge in cases generated by calls from residences, largely related to unintentional misuse of household products, while generally receiving fewer calls from health care facilities. These both ran counter to recent trends.
- There were 387 cases stemming from a multipatient incident at a school. This incident was first reported to the NNEPC by a health care facility, although only one patient was treated at the facility. This affected statistics related to calls from health care facilities (see Health Care Facility Exposure Cases and Multicase Exposures below).

exposures in the past two years.

- Adults 60 years and older accounted for 12% of all exposures (n = 1,411). There was a 20% increase in cases involving older adults, largely due to the COVID-19 pandemic.

Occupational injury trends in Maine

Roughly 20 Mainers die each year on the job



INJURIES AND ILLNESSES DUE TO WORKPLACE CHEMICALS AND RELATED HAZARDS
ME DOL Publication
2012-2013 Worker's Comp claims

TABLE 1
NATURE OF WORKERS' COMPENSATION CLAIMS FROM EXPOSURE TO HAZARDOUS CHEMICALS OR ADVERSE ENVIRONMENTAL/MICROBIOLOGICAL CONDITIONS (2012-2013)

NATURE OF INJURY OR ILLNESS	INCIDENTS	PERCENT	PRIVATE SECTOR	PUBLIC SECTOR
Respiratory symptoms: coughing, irritation, inflammation, difficulty breathing, asthma	136	33.5%	90	46
Thermal, chemical and inhalation vapor burns	54	13.3%	47	7
Swelling, inflammation, infections	43	10.6%	39	4
Dermatitis, allergic skin reactions	37	9.1%	33	4
Unspecified injuries and disorders	35	8.6%	26	9
Unspecified allergic reactions	35	8.6%	28	7
General, physical symptoms	23	5.7%	17	6
Dizziness, weakness or nausea	20	4.9%	14	6
Headache, migraine, visual loss	9	2.2%	6	3
Shock, loss of consciousness, convulsions	7	1.7%	4	3
Other traumatic injuries	7	1.7%	7	0
TOTALS FOR ALL CLAIMS	406		311	95

TABLE 4
OCCUPATIONS INVOLVED WITH WORKERS' COMPENSATION CLAIMS FROM EXPOSURE TO HAZARDOUS CHEMICALS OR ADVERSE ENVIRONMENTAL/MICROBIOLOGICAL CONDITIONS (2012-2013)

OCCUPATION (SOC CODE)	INCIDENTS	PERCENT	PRIVATE SECTOR	PUBLIC SECTOR
Office and administrative support workers (43-0000)	50	12.3%	31	19
Production workers (51-9000)	39	9.6%	38	1
Healthcare practitioners and technicians (29-0000)	36	8.9%	32	3
Building/ grounds maintenance and cleaning workers (37-0000)	30	7.4%	18	12
Equipment installation, maintenance /repair workers (49-0000)	29	7.1%	24	5
Healthcare support workers (31-0000)	28	6.9%	27	1
Transportation and material moving workers (53-0000)	28	6.9%	26	2

TABLE 2
SOURCES OF WORKERS' COMPENSATION CLAIMS FROM EXPOSURE TO HAZARDOUS CHEMICALS OR ADVERSE ENVIRONMENTAL/MICROBIOLOGICAL CONDITIONS (2012-2013)

SOURCES	INCIDENTS	PERCENT	PRIVATE SECTOR	PUBLIC SECTOR
Cleaning and polishing agents	61	15.0%	47	14
Ambient conditions, unknown chemicals/microbes in the air	66	16.3%	38	28
Unspecified or unclassified chemicals	58	14.3%	44	14
Mold, fungi	35	8.6%	24	11
Propane, natural gas, gasoline, diesel fuel, petroleum fuels	21	5.2%	19	2
Drugs, alcohol, medications, vaccines	19	4.7%	17	2
Paint, lacquer, varnish, thinners	18	4.4%	14	4
Cosmetics, beauty preparation	18	4.4%	17	6
Other specific chemicals with less than three incidents	13	3.2%	10	3
Disinfectants	9	2.2%	8	1
Scrap detergents, shampoos	9	2.2%	8	1
Blends	9	2.2%	8	1
Acids	9	2.2%	8	1
Smokes (non-firefighting)	9	2.2%	7	2
Evans	8	2.0%	8	0
Alkalia, wet cement, lime	7	1.7%	7	0
Pesticides, herbicides	7	1.7%	6	1
Gases, adhesives	6	1.5%	5	1
Sulfur compounds	5	1.2%	4	1
Aldehydes	4	1.0%	4	0
Asthma	4	1.0%	4	0
Carbon monoxide	4	1.0%	3	1
Metallic particles and lead	4	1.0%	4	0
Solvents, degreasers	3	0.7%	2	1
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Hospitals (622000)	55	13.5%	53	2
Public Administration (920000)	51	12.6%	1	50
Education (610000)	42	10.3%	11	31
Manufacturing (310000 - 330000)	39	9.6%	39	0
Ambulatory Services (621000)	29	7.1%	29	0
Administrative support waste management and remediation (560000)	26	6.4%	26	0

Occupational injury
 2,080 hours in a work year.

88 worker's compensation claims related to
 disinfectants in Maine for the 2012-2013 year.

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Bleach	9	2.2%	8	1
Airids	9	2.2%	8	1
Brushes (non-flammable)	9	2.2%	7	2
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Once every 3 days

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Occupational injury trends in Maine

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Bleach	9	2.2%	8	1
Acids	9	2.2%	8	1
Smoke (non-firefighting)	9	2.2%	7	2
Freon	8	2.0%	8	0
Alkalis, wet cement, lime	7	1.7%	7	0
Pesticides, herbicides	7	1.7%	6	1
Glues, adhesives	6	1.5%	5	1
Sulfur compounds	5	1.2%	4	1
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More grizzly death/injury statistics

Annual US fatalities

- Public building ~575
- Farm ~400

For comparison the same database counted only 15 deaths from stings and bites.

US cases involving missed days of work injured by chemical products

~1,000 janitors/cleaners

~75 pest control workers

Interesting data on COVID-19

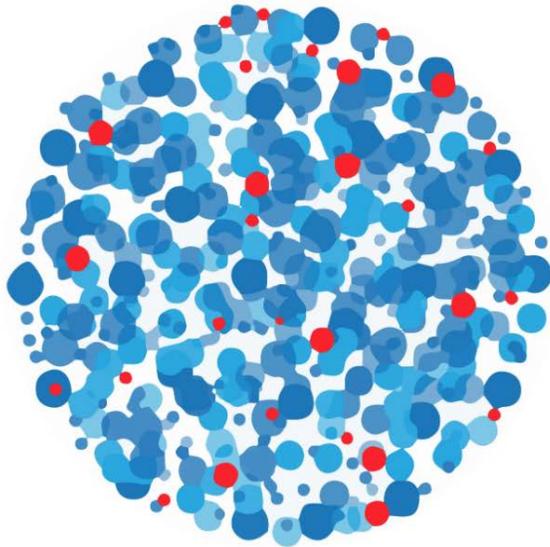
Work in progress

66,491 publications on
COVID-19



<https://safeairspaces.com/>

Safe Air Spaces



The SAFEAIRSPACES
COVID-19 Aerosol
Relative Risk Estimator

Estimate Your Risk

<https://safeairspaces.com/>

Exposure Risk Estimation

Summary of Inputs

- Air changes per hour (ACH) = 0.6
- Outdoor air supply (cfm/person) = 2.6
- Outdoor air supply (cfm/sq.ft) = 0.10
- Space per person (sq.ft/person) = 27
- Filtration CADR (cfm) = 0.0
- Floor area (sq.ft) = 377
- Volume (cubic.ft) = 3881
- Occupants (#) = 14
- Masks = Off
- High emitter = Off
- Low emitter = Off

Summary of Estimation

- Average inhaled & deposited dose by all occupants (picoliters) = 0
- Average inhaled & deposited dose per occupant (picoliters) = 0.0
- Average infectious virus inhaled & deposited per occupant = 0

Current Status

Low but not-zero risk

Infection probability	# Susceptible occupants	Estimated # of infections
0.00	14	0

$0.00 \times 14 \rightarrow 0$

Where do the particles go?

- Exhausted & in-room air
- Surface deposition
- Deposited in occupants
- Filtration

Particle Concentration in Room

Dose Inhaled & Deposited (total occupants)

Risk Scale

Extreme risk	0.56
	0.49
	0.37
	0.3
	0.23
	0.18
Moderate risk	0.12
	0.06
Low but not-zero risk	0.0

MODEL PARAMETERS

- OCCUPANTS (#)
- FLOOR AREA (M2)
- CEILING HEIGHT (M)
- OUTDOOR AIR SUPPLY (M3/H)
- FILTRATION CADR (M3/H)
- TIME IN ROOM (HOUR)

APPLY CANCEL

<https://safeairspaces.com/>

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MODEL PARAMETERS

FILTRATION CADR (M3/H)

TIME IN ROOM (HOUR)

MASKS

HIGH EMITTER

LOW EMITTER

APPLY CANCEL

Current Status Detail

Current Infection Probability A	0.0
Current Infection Probability B	0.0

<https://safeairspaces.com/>

The screenshot displays the 'Exposure Risk Estimation' interface of the Safe Air Spaces app. It is divided into several sections:

- Summary of Inputs:** Lists parameters such as Air changes per hour (ACH) = 0.6, Outdoor air supply (cfm/person) = 2.6, Space per person (sq.ft/person) = 27, Filtration CADR (cfm) = 0.0, Floor area (sq.ft) = 377, Volume (cubic.ft) = 3881, Occupants (#) = 14, Masks = Off, High emitter = On, and Low emitter = Off.
- Summary of Estimation:** Shows 'Average inhaled & deposited dose by all occupants (picoliters) = 156', 'Average inhaled & deposited dose per occupant (picoliters) = 11.2', and 'Average infectious virus inhaled & deposited per occupant = 34'. The 'Current Status' is 'Extreme risk'.
- Calculation:** A red circle highlights the calculation: Infection probability (0.84) × # Susceptible occupants (14) = Estimated # of infections (12).
- Where do the particles go?:** A donut chart shows the distribution: Exhausted & in-room air (10%), Surface deposition (30%), Deposited in occupants (45%), and Filtration (15%).
- Anatomical Diagram:** Shows particle deposition in the Head, Trach&Bronch, and Alveolar regions.
- Particle Concentration in Room:** A line graph showing concentration (particles/m³) over time (0 to 15 minutes) for 'Current' and 'Low emitter' scenarios.
- Dose Inhaled & Deposited (total occupants):** A line graph showing total dose (picoliters) over time (0 to 15 minutes) for 'Current' and 'Low emitter' scenarios.
- Exposure Risk Estimation Bar:** A vertical bar with a color gradient from red (Extreme risk) to white (Low but not-zero risk). A green dot is positioned at the 0.37 risk level.
- MODEL PARAMETERS:** Includes sliders for FILTRATION CADR (M3/H) set to 0, TIME IN ROOM (HOUR) set to 3, MASKS (unchecked), HIGH EMITTER (checked), and LOW EMITTER (unchecked).
- Buttons:** 'APPLY' and 'CANCEL' buttons are at the bottom.

Now with
-high emitter

<https://safeairspaces.com/>

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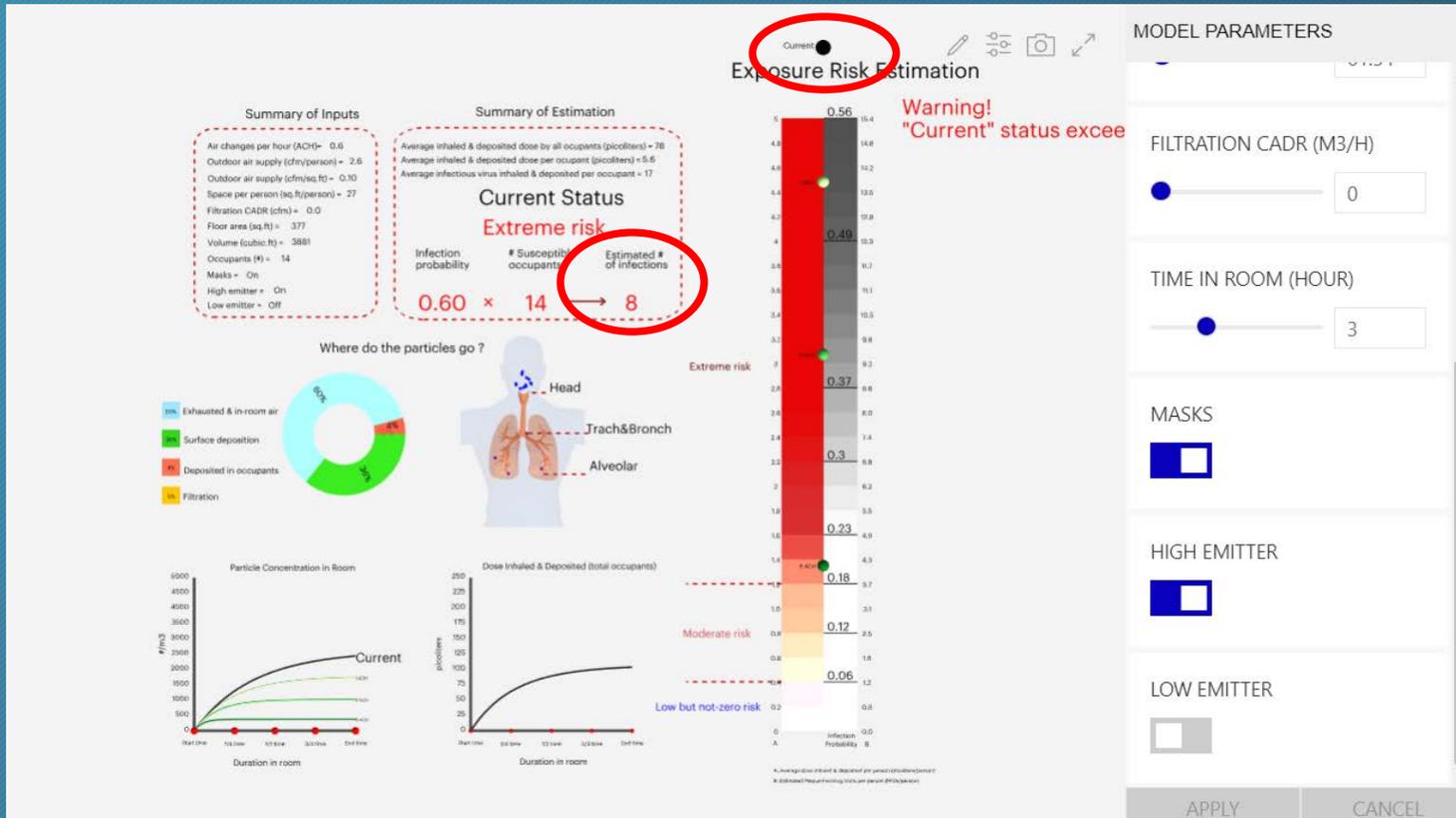
- Summary of Inputs:** Lists parameters such as Air changes per hour (ACH) = 0.6, Outdoor air supply (cfm/person) = 2.6, Space per person (sq ft/person) = 27, and Filtration CADR (cfm) = 248.7.
- Summary of Estimation:** Shows 'Average inhaled & deposited dose by all occupants (picoliters) = 49' and 'Average infectious virus inhaled & deposited per occupant = 11'. The 'Current Status' is 'Extreme risk', calculated as $0.44 \times 14 \rightarrow 6$. The 'Estimated # of infections' is 6, circled in red.
- Where do the particles go?:** A donut chart shows the distribution: Exhausted & in-room air (1%), Surface deposition (1%), Deposited in occupants (1%), and Filtration (97%).
- Human Diagram:** Shows particle deposition in the Head, Trach&Bronch, and Alveolar regions.
- Vertical Risk Scale:** A color-coded scale from 0.06 (Low but not-zero risk) to 0.56 (Extreme risk). The current risk level is marked at 0.44.
- Graphs:** Two line graphs show 'Particle Concentration in Room' and 'Dose Inhaled & Deposited (total occupants)' over time, both showing a 'Current' level.
- MODEL PARAMETERS:** A sidebar on the right allows adjusting 'FILTRATION CADR (M3/H)' to 422.4, 'TIME IN ROOM (HOUR)' to 3, and selecting 'MASKS' (off), 'HIGH EMITTER' (on), and 'LOW EMITTER' (off).

Now with
-high emitter

&

-filtration at 420 m³/h

<https://safeairspaces.com/>



Now with
-high emitter

&

-masks (but no filtration)

Ventilation reduces all exposures \rightleftarrows Biological Chemical

Rhinitis and laryngitis

Large particles are deposited in the nose, pharynx, and larynx. More soluble gases (e.g., sulfur dioxide) are absorbed by upper respiratory tract mucous membranes, causing edema and mucus hypersecretion.

Tracheitis, bronchitis, and bronchiolitis

Large particles (more than $10\ \mu\text{m}$ in diameter) are deposited and then cleared by cilia. Small particles and fine fibers are deposited in bronchioles and bifurcations of alveolar ducts. Less soluble gases penetrate to deeper, small airways.

Asthma and chronic obstructive pulmonary disease

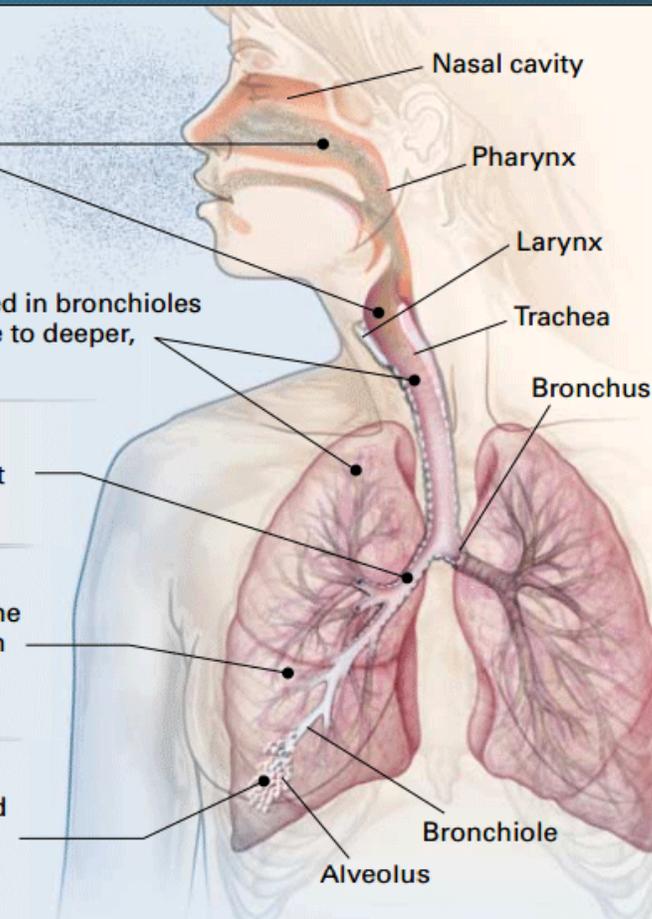
Allergens and irritants are deposited in large airways by turbulent flow, causing chronic inflammatory changes.

Cancer

Carcinogens (asbestos and polycyclic aromatic hydrocarbons) come into contact with bronchial epithelial cells, causing mutations in proto-oncogenes and tumor-suppressor genes. More than one such contact results in malignant transformation.

Interstitial disease

Small particles (less than $10\ \mu\text{m}$ in diameter) and fibers are deposited in terminal bronchioles, alveolar ducts, and alveoli. Penetration to the interstitium results in fibrosis and the formation of granulomas.



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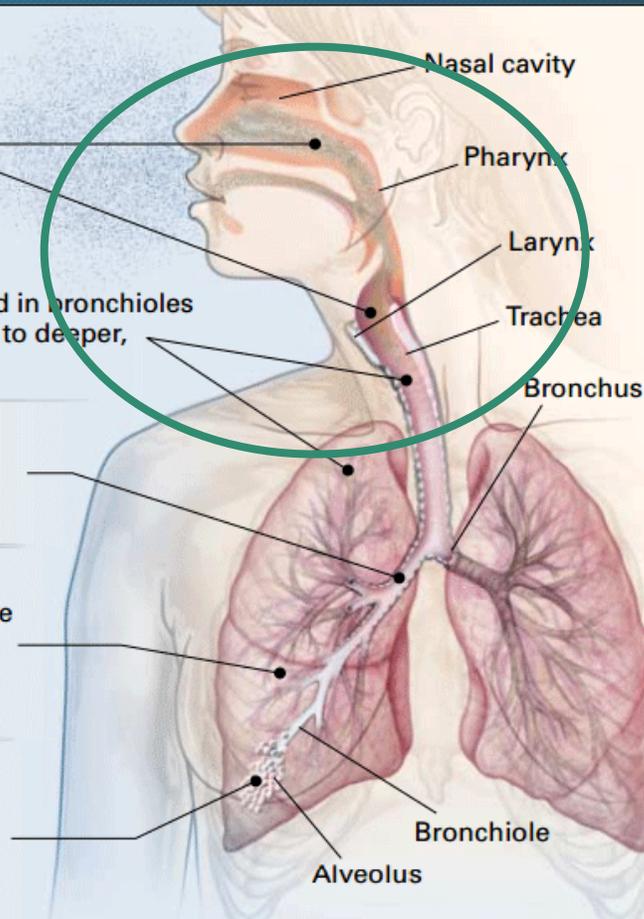
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Cancer

Carcinogens (asbestos and polycyclic aromatic hydrocarbons) come into contact with bronchial epithelial cells, causing mutations in proto-oncogenes and tumor-suppressor genes. More than one such contact results in malignant transformation.

Interstitial disease

Small particles (less than $10\ \mu\text{m}$ in diameter) and fibers are deposited in terminal bronchioles, alveolar ducts, and alveoli. Penetration to the interstitium results in fibrosis and the formation of granulomas.



Ventilation reduces all exposures \rightleftarrows Biological Chemical

Rhinitis and laryngitis
Large particles are deposited in the nose, pharynx, and larynx. More soluble gases (e.g., sulfur dioxide) are absorbed by upper respiratory tract mucous membranes, causing edema and mucus hypersecretion.

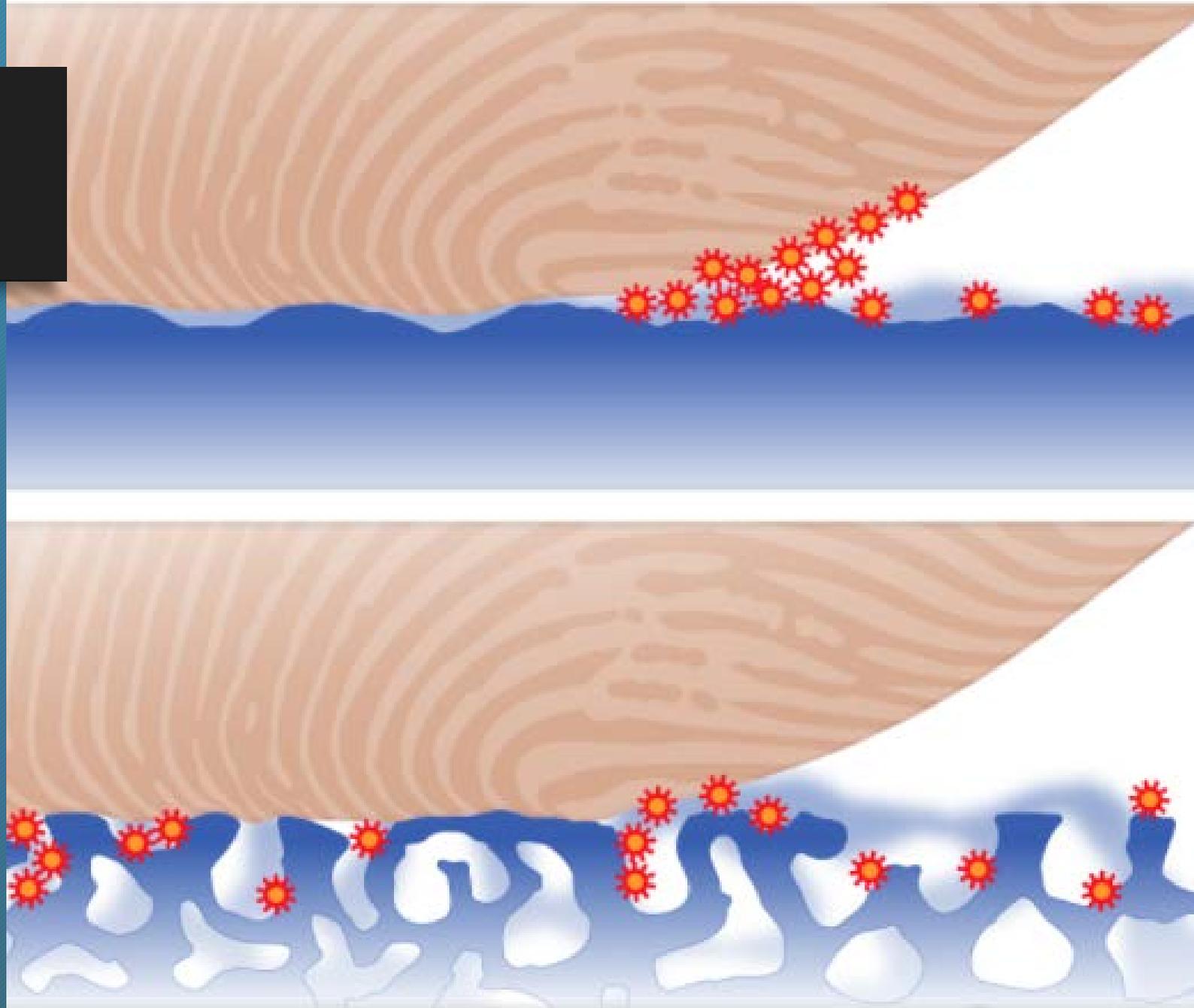
Tracheitis, bronchitis, and bronchiolitis
Large particles (more than $10\ \mu\text{m}$ in diameter) are deposited and then cleared by cilia. Small particles and fine fibers are deposited in bronchioles and bifurcations of alveolar ducts. Less soluble gases penetrate to deeper, small airways.

Asthma and chronic obstructive pulmonary disease
Allergens and irritants are deposited in large airways by turbulent flow, causing chronic inflammatory changes.

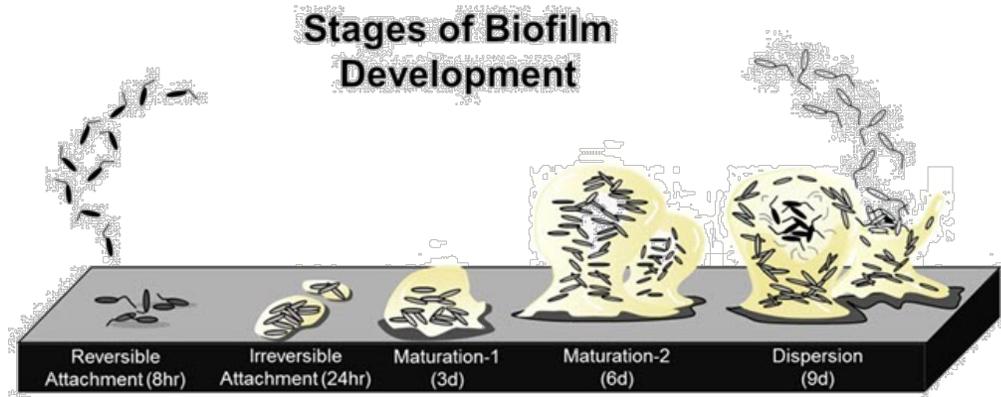
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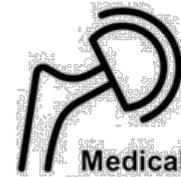
Surface transfer



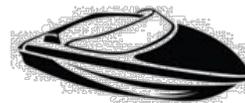
Residue from
cleaning/disinfecting
leading to biofilm
growth



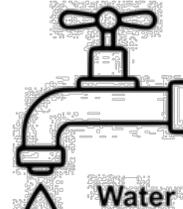
Teeth



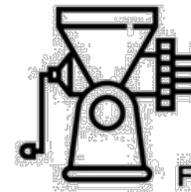
Medical Implants



Ship Hulls

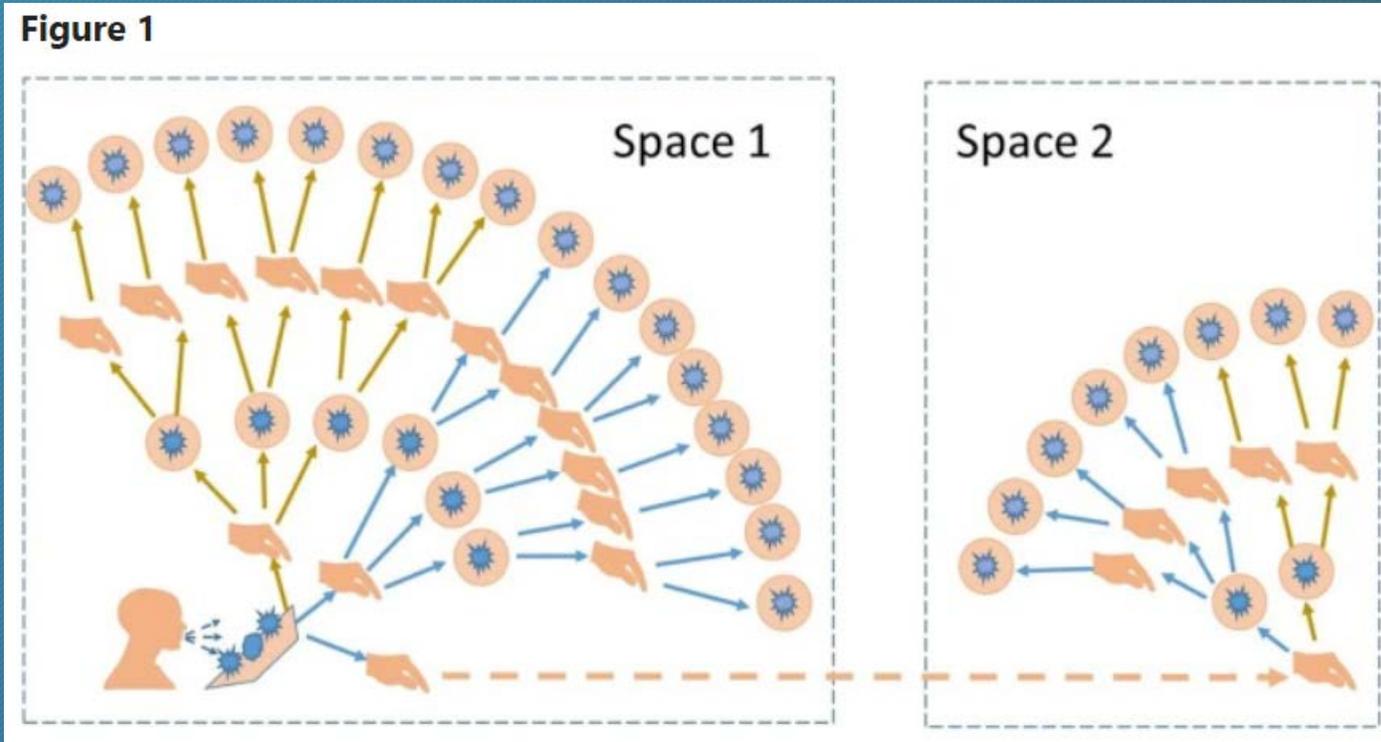


Water Systems



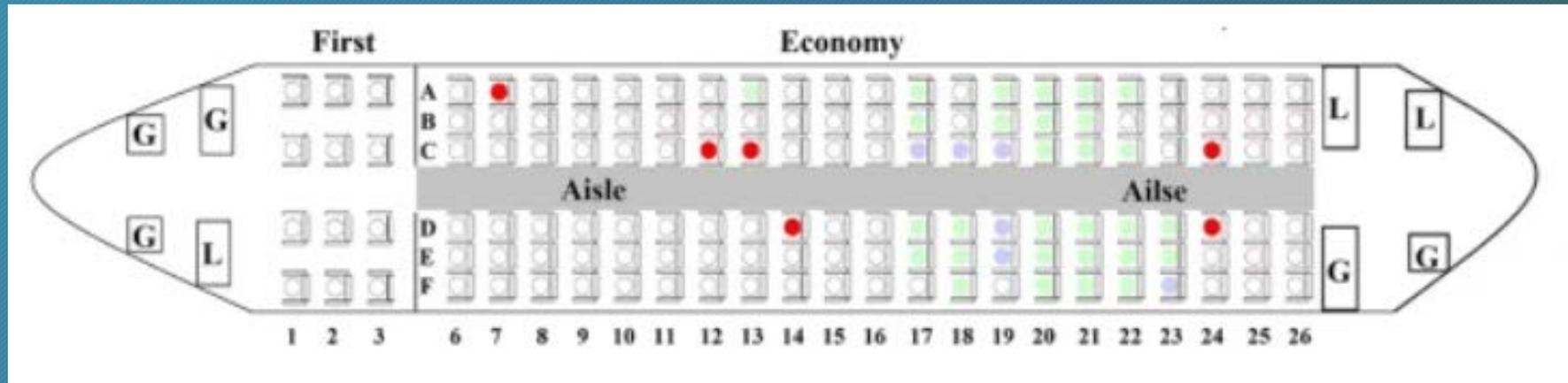
Food Processing

Norovirus outbreak from plane



A hand contaminated ... can contaminate up to seven other surfaces

Norovirus outbreak from plane



A hand contaminated ... can contaminate up to seven other surfaces

One hour after routine cleaning

Table 1. SARS-CoV-2 RNA test results from environmental surfaces in a COVID-19 designated hospital

	Sampling locations	Number of samples ^a	Number of positive samples ^b
High-risk area	Bed rails and nightstands in the ICU ward for COVID-19 patients	9	-
	Patients' personal belongings (mobile phone, clothes, pillowcase, towel)	12	-
	Surfaces of medical supplies (infusion pump, operating table in nurse station, temperature gun etc.)	12	-
	Hands of doctor/nurse in the ICU	6	-
	Toilet and sink in isolation ward	6	-
	Door handle in isolation ward	6	-
	Inside of the patient's mask	3	2 (first and second)
	Goggles after use	6	-
Medium-risk area	Door handle in buffer zone	6	-
	Inner wall of waste container	6	-
Low-risk area	Hands of doctor/nurse in clean zone	6	-
	Computer keyboard in nurse station	6	-
	Computer mouse in nurse station	6	-
Total		90	2

^aAll samples were collected 1 h after routine cleaning.

^bAll samples were tested by qualitative RT-PCR. Sampling and testing were repeated three times at each location.

INSIDE
PATIENT'S MASK

Table 2. Environmental and PPE Sites Sampled and Corresponding RT-PCR Results

Sites ^a	Positive samples (patient C; before routine cleaning) ^b	Cycle threshold value ^c
Environmental sites^d		
Patient's room		
1. Cardiac table, including handle	1/1	35.44
2. Entire length of bed rail	1/1	37.95
3. Control panel on bed	0/1	
4. Call bell attached to bed	0/1	
5. Locker with hand slot	1/1	36.21
6. Chair	1/1	37.07
7. Light switches behind bed	1/1	37.54
8. Stethoscope	1/1	38.24
9. Sink, external rim	1/1	37.94
10. Sink, internal bowl	1/1	37.94
11. Floor	1/1	30.64
12. Glass window in room	1/1	35.79
13. Glass door interior	1/1	35.71
14. PPE storage area over sink	1/1	34.89
15. Air outlet fan	2/3	32.96, 37.94
Toilet area		
16. Door handle	1/1	35.83
17. Toilet bowl, surface	1/1	37.75
18. Hand rail	0/1	
19. Sink, external rim	0/1	
20. Sink, internal bowl	1/1	37.11

3 patients in hospital

- 2 no COVID anywhere in room
- 1 COVID everywhere

TABLE

Postcleaning samples were negative, suggesting that current decontamination measures are sufficient.

Table 2. Environmental and PPE Sites Sampled and Corresponding RT-PCR Results

Sites ^a	Positive samples (patient C; before routine cleaning) ^b	Cycle threshold value ^c
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10. Sink, internal bowl	1/1	37.95
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17. Toilet bowl, surface	1/1	37.75
18. Hand rail	0/1	
19. Sink, external rim	0/1	
20. Sink, internal bowl	1/1	37.11

3 patients in hospital

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BED RAIL

Postcleaning samples were negative, suggesting that current decontamination measures are sufficient.

Table 2. Environmental and PPE Sites Sampled and Corresponding RT-PCR Results

Sites ^a	Positive samples (patient C; before routine cleaning) ^b	Cycle threshold value ^c
Environmental sites^d		
Patient's room		
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18. Hand rail	0/1	
19. Sink, external rim	0/1	
20. Sink, internal bowl	1/1	37.11

3 patients in hospital

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CHAIR

Postcleaning samples were negative, suggesting that current decontamination measures are sufficient.

Table 2. Environmental and PPE Sites Sampled and Corresponding RT-PCR Results

Sites ^a	Positive samples (patient C; before routine cleaning) ^b	Cycle threshold value ^c
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18. Hand rail	0/1	
19. Sink, external rim	0/1	
20. Sink, internal bowl	1/1	37.11

3 patients in hospital

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LIGHT SWITCH

Postcleaning samples were negative, suggesting that current decontamination measures are sufficient.

Table 2. Environmental and PPE Sites Sampled and Corresponding RT-PCR Results

Sites ^a	Positive samples (patient C; before routine cleaning) ^b	Cycle threshold value ^c
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18. Hand rail	0/1	
19. Sink, external rim	0/1	
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3 patients in hospital

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SINK

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Table 2. Environmental and PPE Sites Sampled and Corresponding RT-PCR Results

Sites ^a	Positive samples (patient C; before routine cleaning) ^b	Cycle threshold value ^c
Environmental sites^d		
Patient's room		
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Toilet area		
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17. Toilet bowl, surface	1/1	37.75
18. Hand rail	0/1	
19. Sink, external rim	0/1	
20. Sink, internal bowl	1/1	37.11

3 patients in hospital

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FLOOR

Postcleaning samples were negative, suggesting that current decontamination measures are sufficient.

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Sites ^a	Positive samples (patient C; before routine cleaning) ^b	Cycle threshold value ^c
Environmental sites^d		
Patient's room		
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18. Hand rail	0/1	
19. Sink, external rim	0/1	
20. Sink, internal bowl	1/1	37.11

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- 1 COVID everywhere

WINDOW

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18. Hand rail	0/1	
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DOOR

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AIR VENT

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TOILET

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Balance of risks

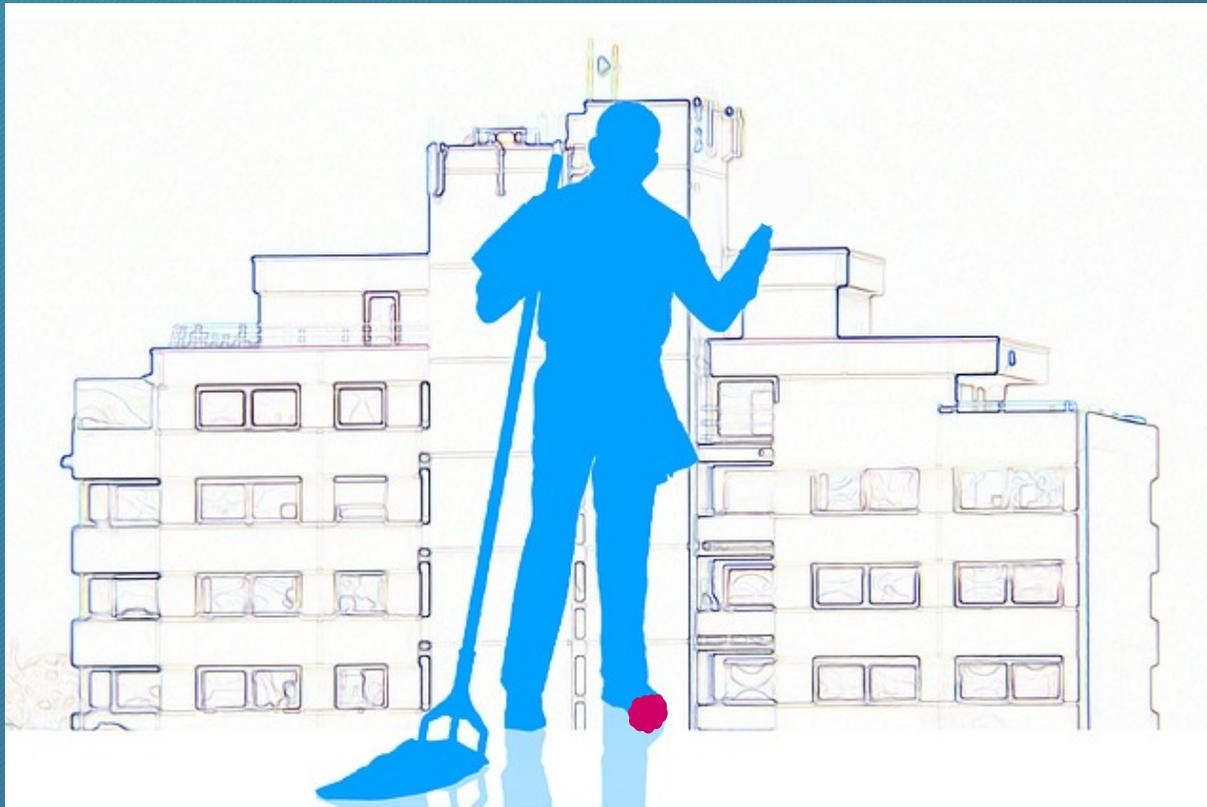
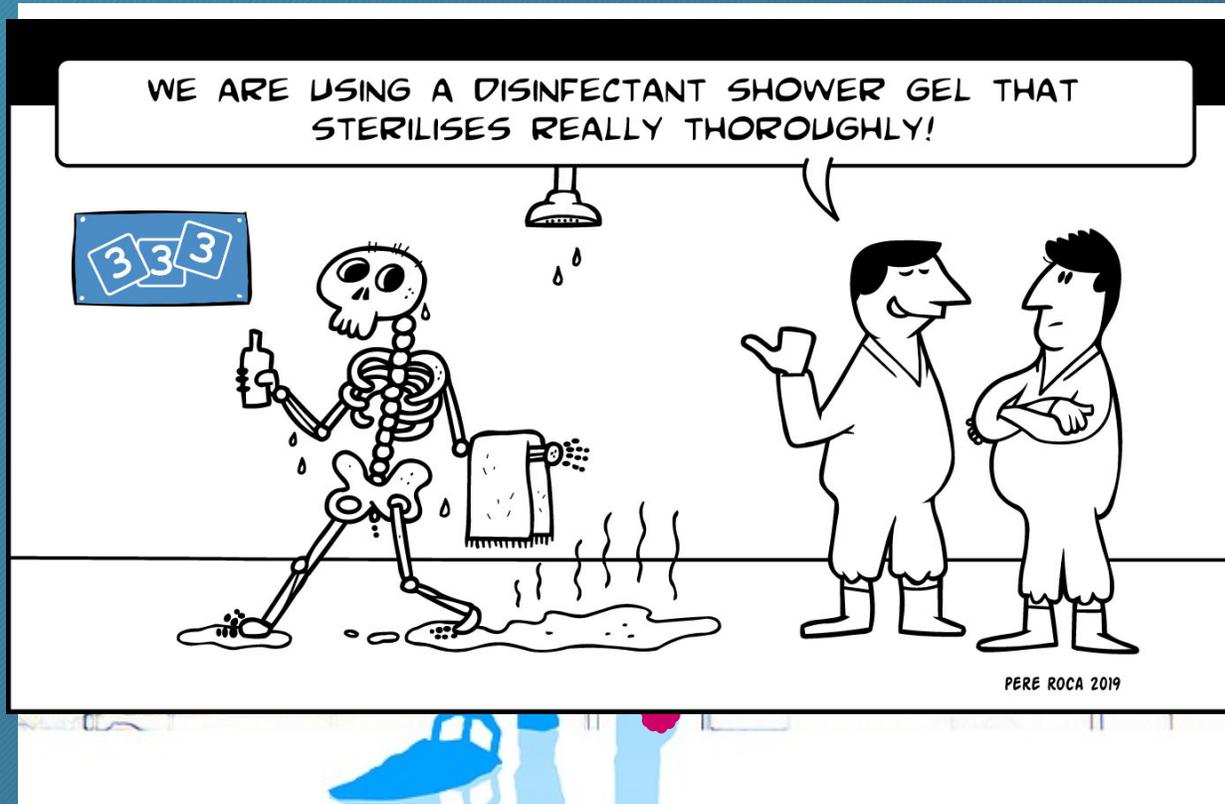


Image by [Gerd Altmann](#) from [Pixabay](#)

Balance of risks



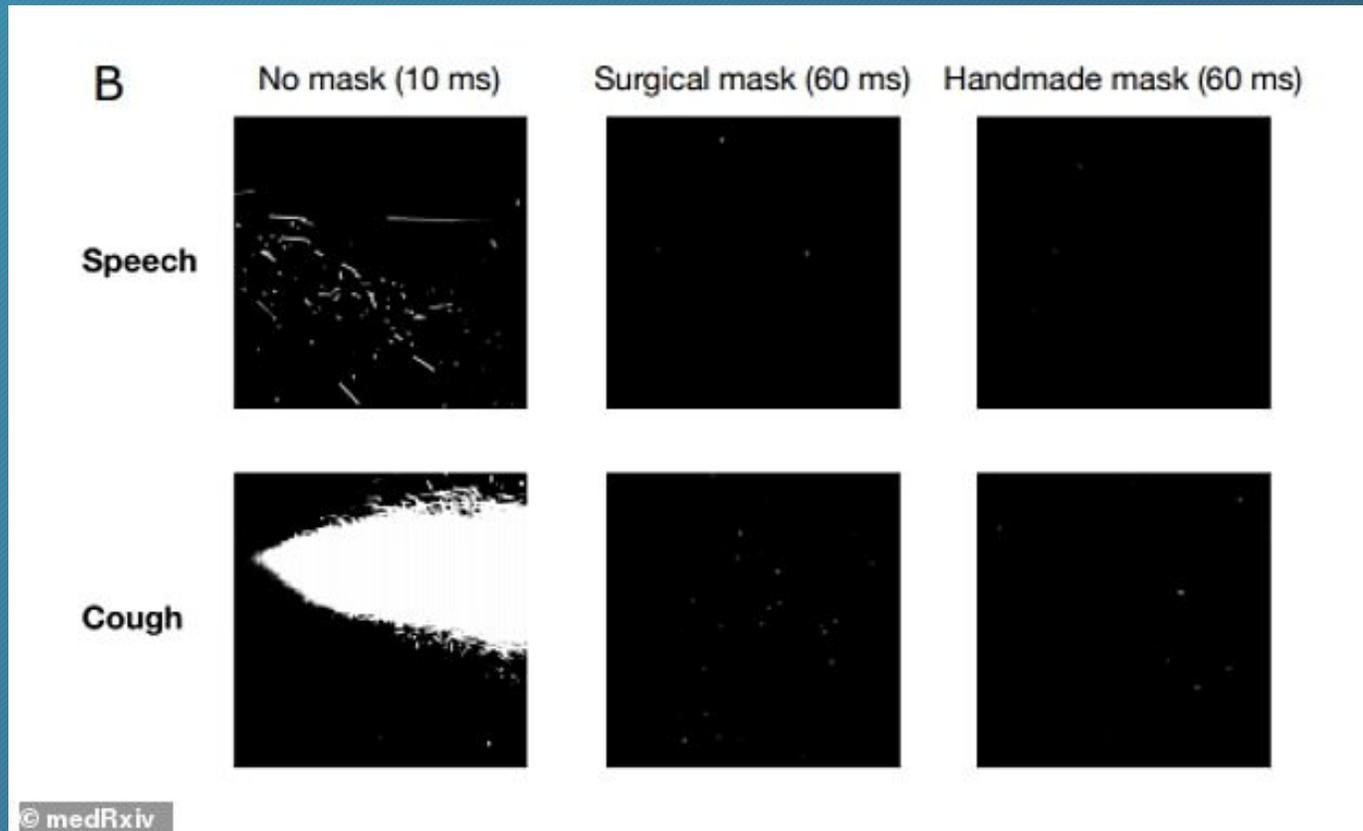
COVID-19 persistence will vary

Humidity
Temperature
Sunlight

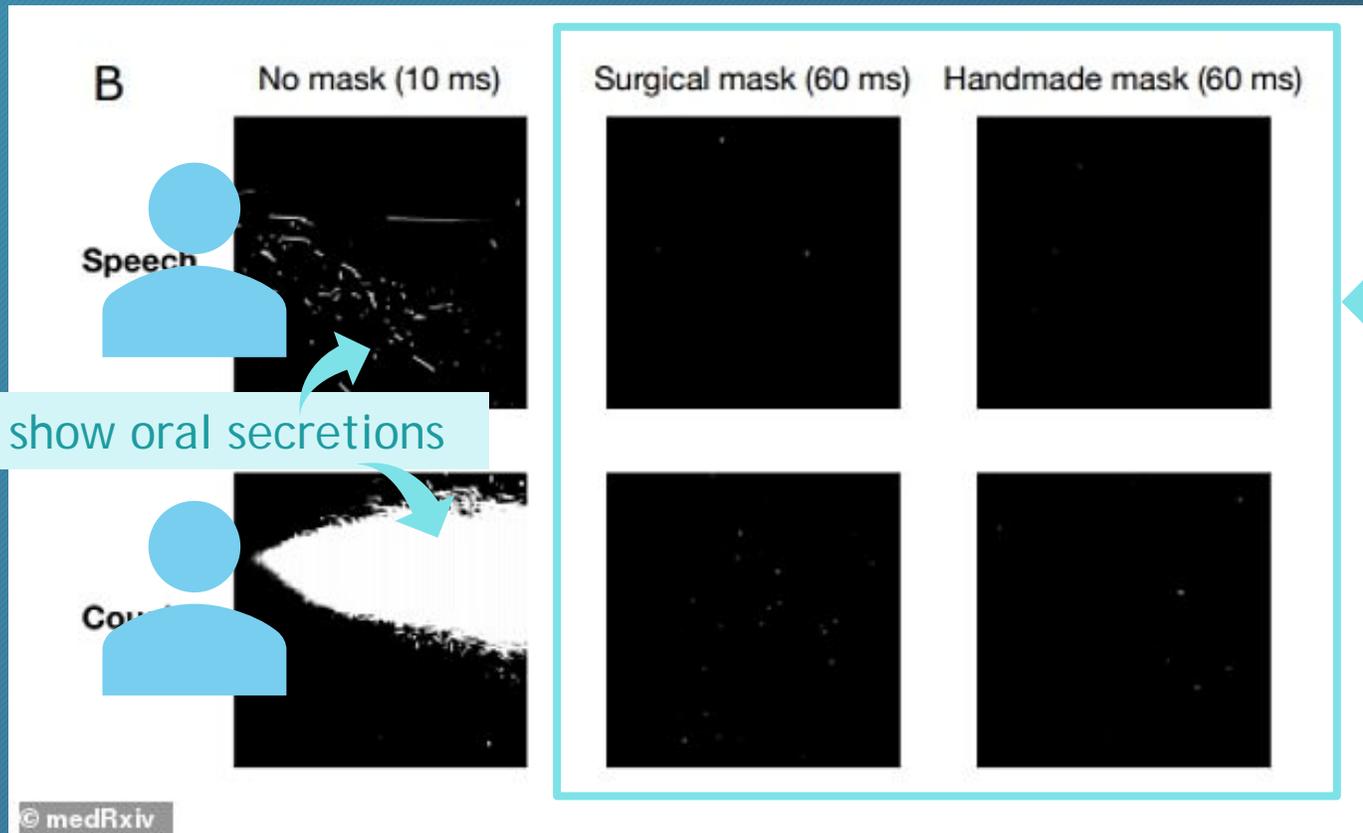
...

- Glass: five days
- Wood: four days
- Plastic and stainless steel: three days
- Cardboard: 24 hours
- Copper: four hours.

People are constantly spreading germs



People are constantly spreading germs

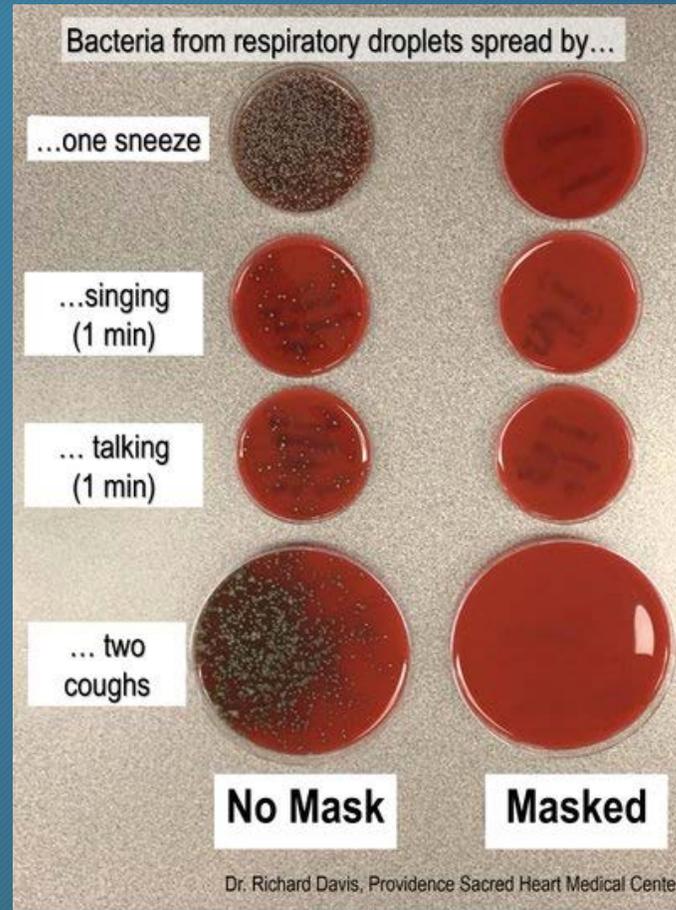


White marks show oral secretions

Masks shown to reduce bulk

Choosing priority surfaces

- particles from the air (greatest on upward-facing surfaces),
- direct emission through coughing,
- aerosolization due to vomiting and diarrhea incidents,
- toilet flushing,
- and hand touching (greatest on high-touch surfaces).



Note: In this demonstration presence of bacteria (not viruses) on plates is only meant to be a proxy for microbes present in respiratory droplets.

Likely, smaller aerosolized droplets (that could carry viruses like SARS-CoV-2) are also produced by coughing, sneezing etc. and that these would travel further and stay in the air longer than larger respiratory droplets.

IPM -a common sense approach to pest management

Germs only travel so far. 

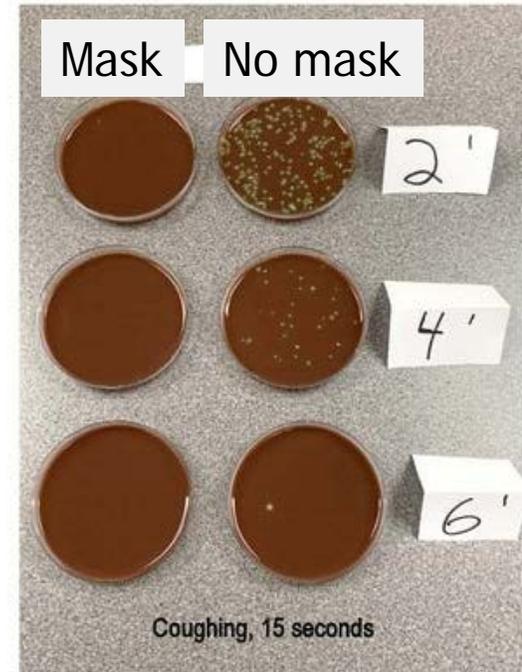
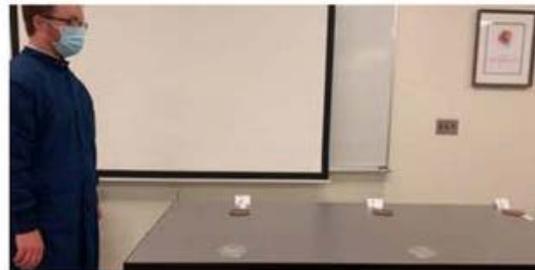
-The entire facility doesn't need constant intense disinfection.

-Areas with unmasked people will need greater disinfection.



Masks limit the spread of most microbe-containing droplets produced by coughing. Even without a mask, these droplets mostly traveled less than 6 feet.

Demonstration: To show the value of appropriate masking and distancing, bacteria culture plates were placed 2 feet, 4 feet and 6 feet away from a person who coughed aggressively for ~15 seconds. Droplets from the upper respiratory tract and mouth landed on the plates and after culturing for 24 hours, colonies of bacteria (not viruses*) can be seen.



***Note:** It is likely that smaller aerosolized droplets (that could carry viruses like SARS-CoV-2) are also produced by coughing, sneezing etc. and that these would travel further and stay in the air longer than larger respiratory droplets.

Experiment performed by: Richard E. Davis, PhD,
PHC Regional Director of Microbiology Providence
Sacred Heart Medical Center and Children's Hospital

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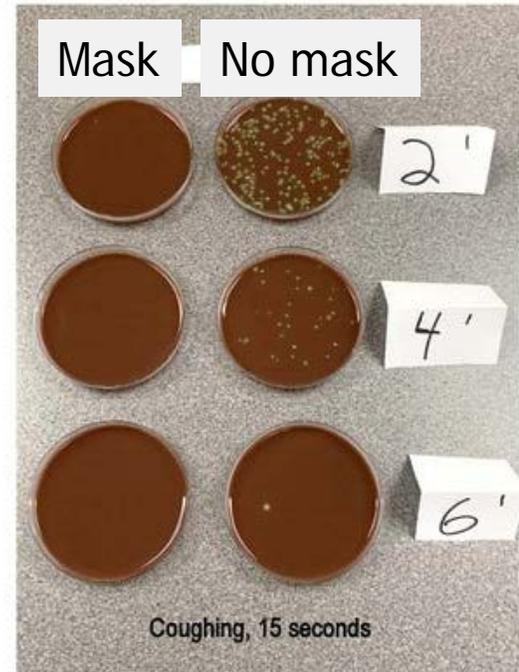
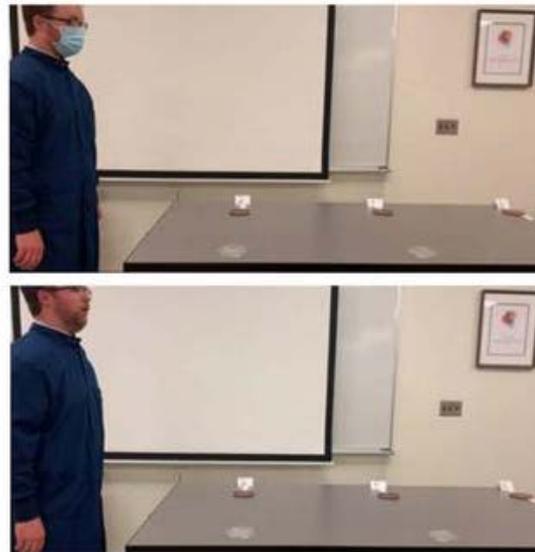
-Areas with unmasked people will need greater disinfection.

*yes, viruses are smaller and will travel farther but gravity still applies



Masks limit the spread of most microbe-containing droplets produced by coughing. Even without a mask, these droplets mostly traveled less than 6 feet.

Demonstration: To show the value of appropriate masking and distancing, bacteria culture plates were placed 2 feet, 4 feet and 6 feet away from a person who coughed aggressively for ~15 seconds. Droplets from the upper respiratory tract and mouth landed on the plates and after culturing for 24 hours, colonies of bacteria (not viruses*) can be seen.



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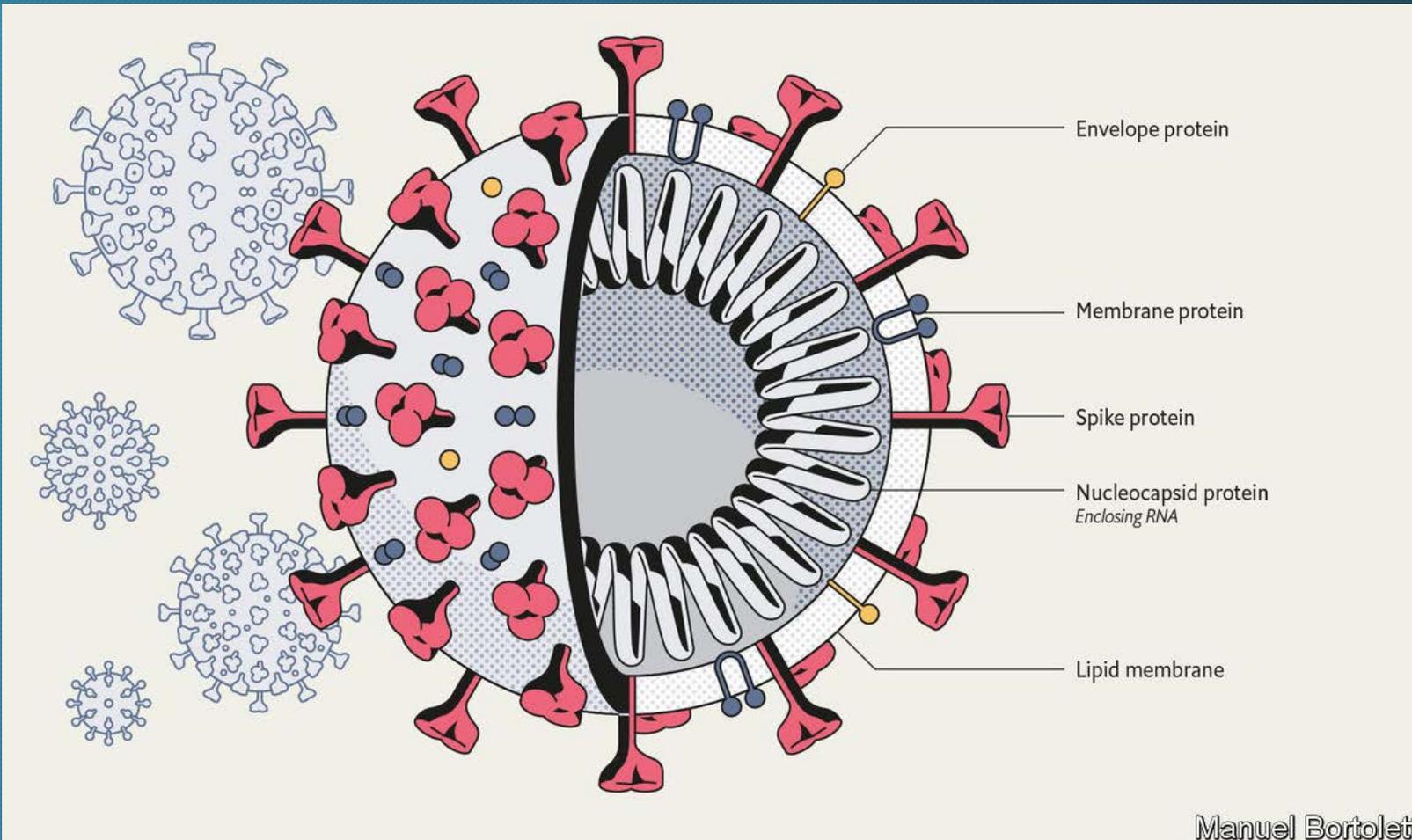
Experiment performed by: Richard E. Davis, PhD,
PHC Regional Director of Microbiology Providence
Sacred Heart Medical Center and Children's Hospital



“Yuck! Am I crazy or do they all taste like disinfectant?!”

Mechanics of soap & disinfectants

COVID-19 virus



Mechanics of soap & disinfectants

Soap:

water-y head & oil

Oil & Water don't

Oily part of soap s

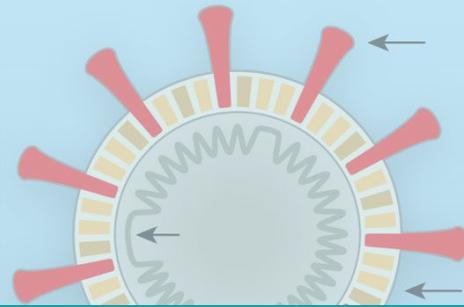
Watery part seeks out watery areas

Bacteria, viruses, cells in general
effected by soaps

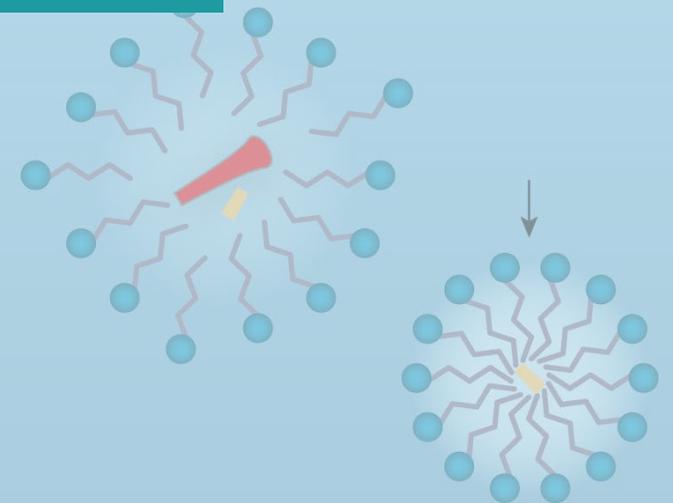
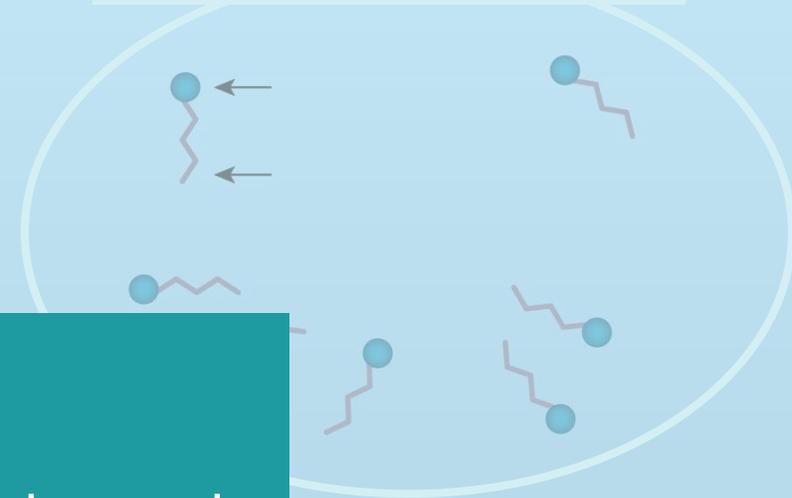
Quick word on "soap" vs "detergent":

I'm using "soap" to mean both soap and detergent.

Yes, there are small differences.



Individual soap molecules



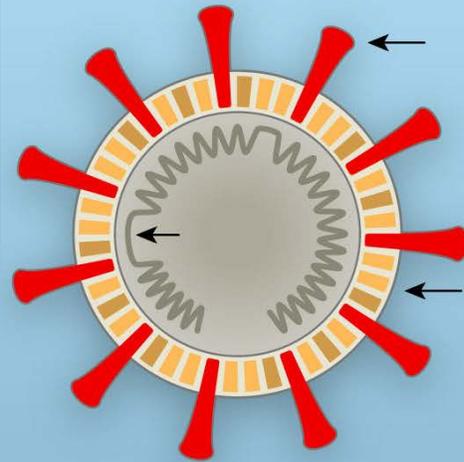
Mechanics of soap & disinfectants

Soap:
water-y head & oil-y tail

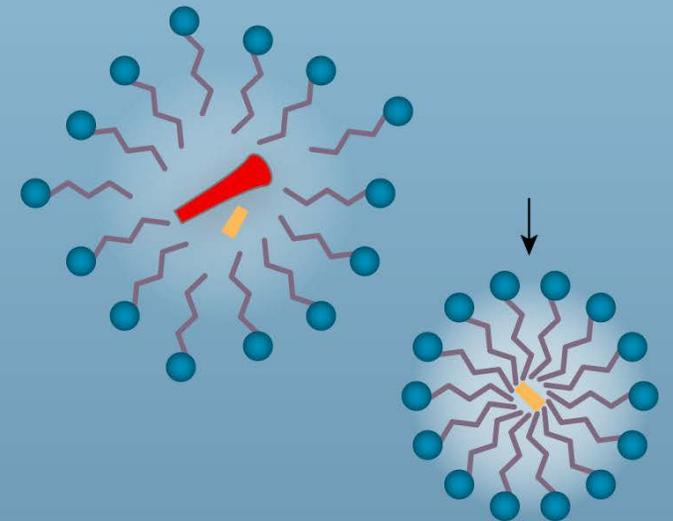
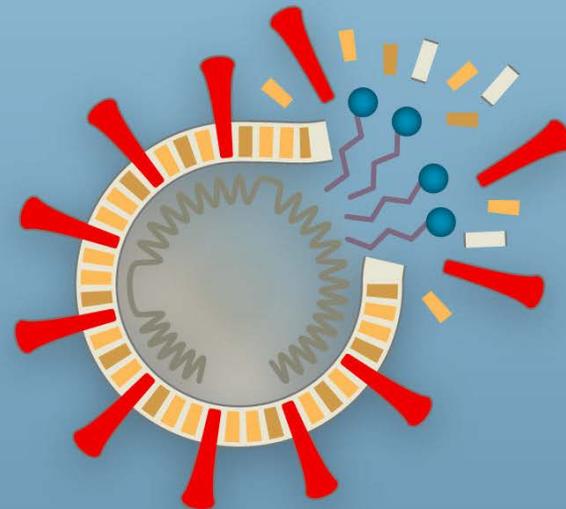
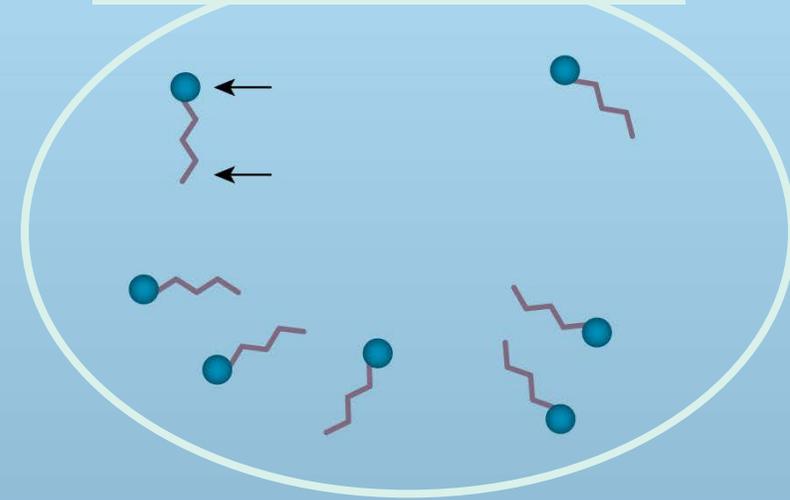
Oil & Water don't mix

Oily part of soap seeks out oily areas
Watery part seeks out watery areas

Bacteria, viruses, cells in general
effected by soaps



Individual soap molecules



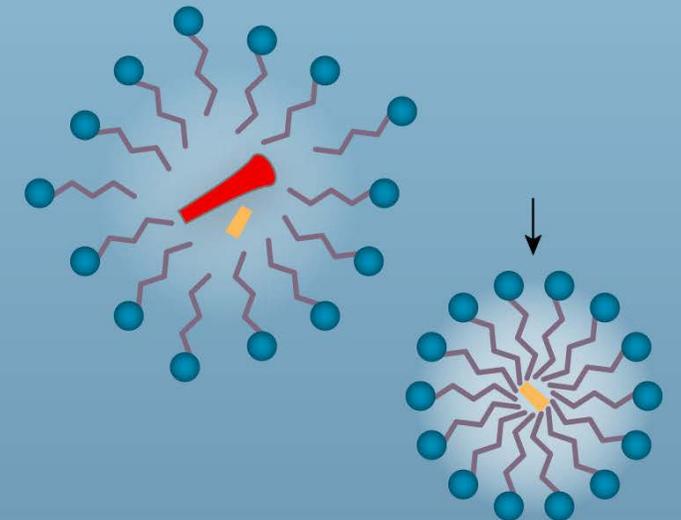
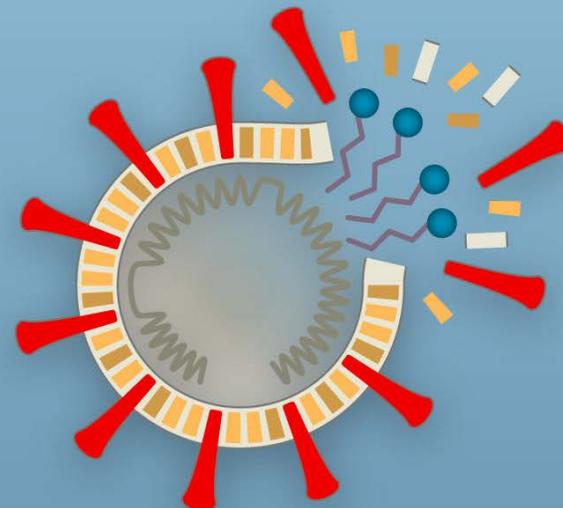
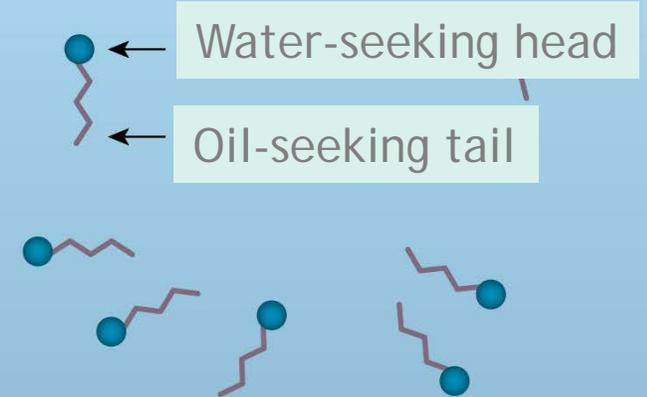
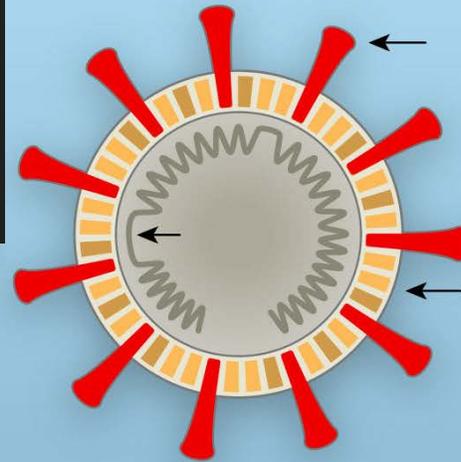
Mechanics of soap & disinfectants

Soap:
water-y head & oil-y tail

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Mechanics of soap & disinfectants

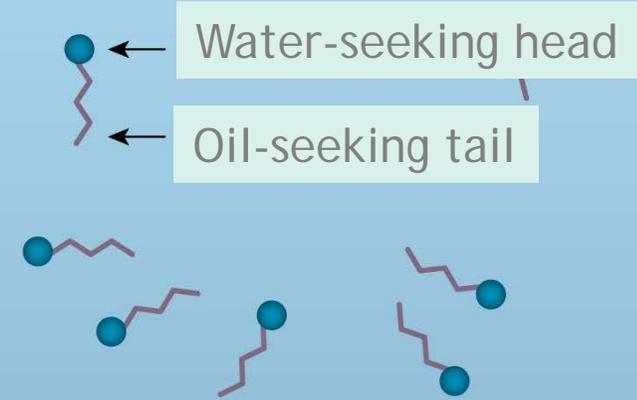
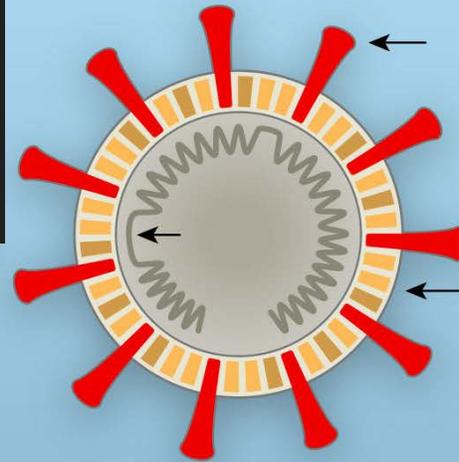
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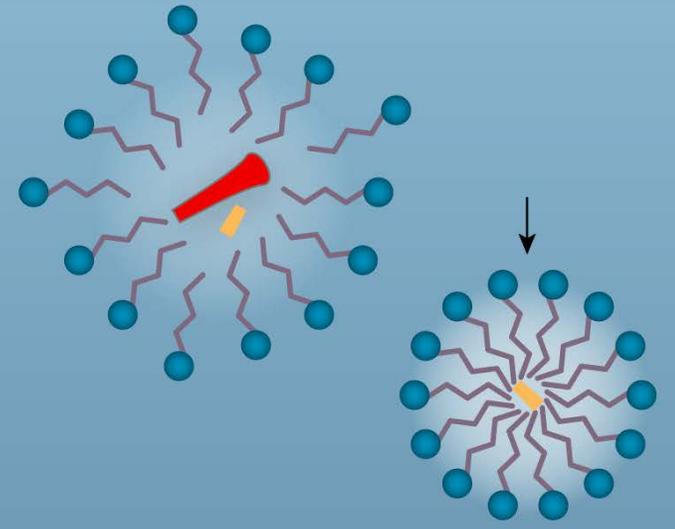
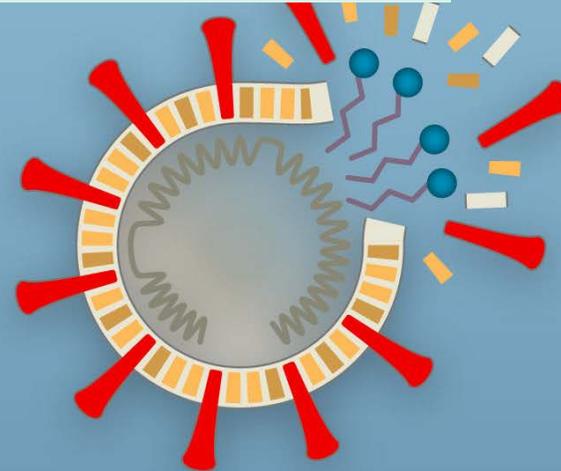
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Oil-seeking tails slip right into the protective layer



Mechanics of soap & disinfectants

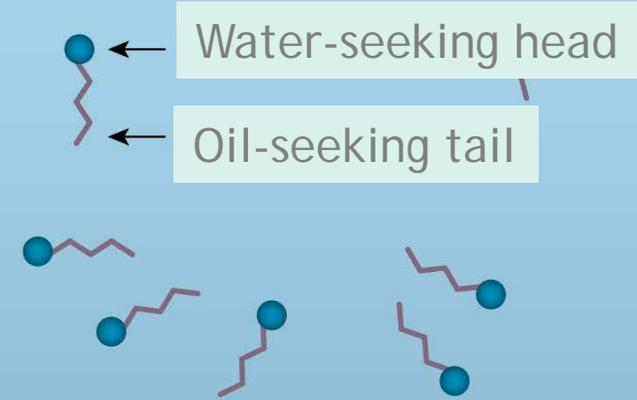
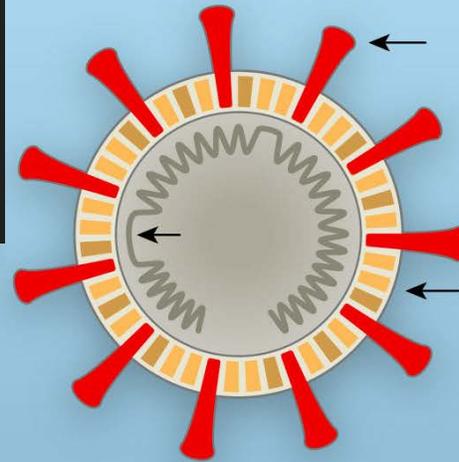
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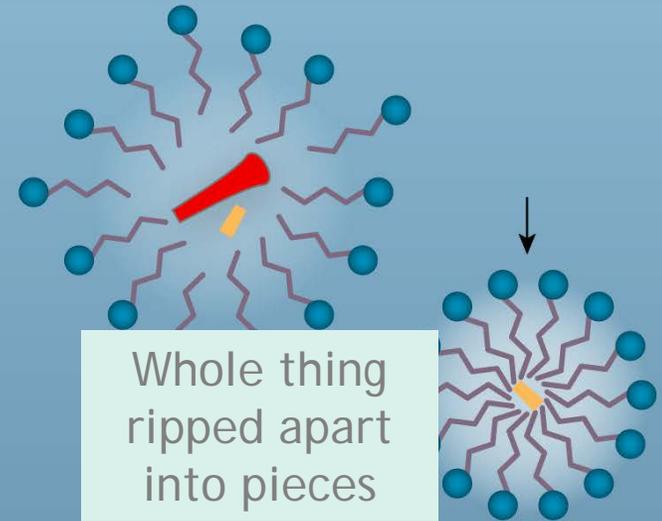
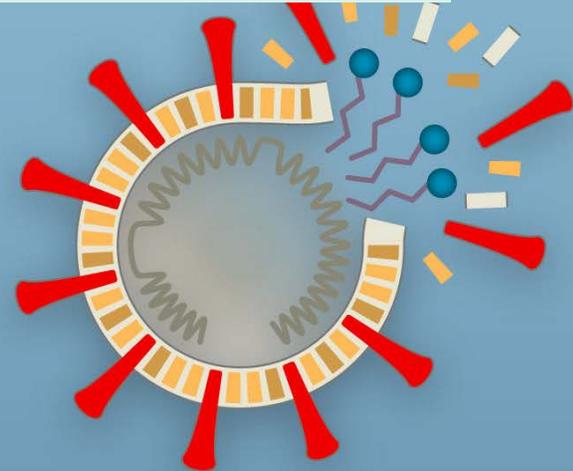
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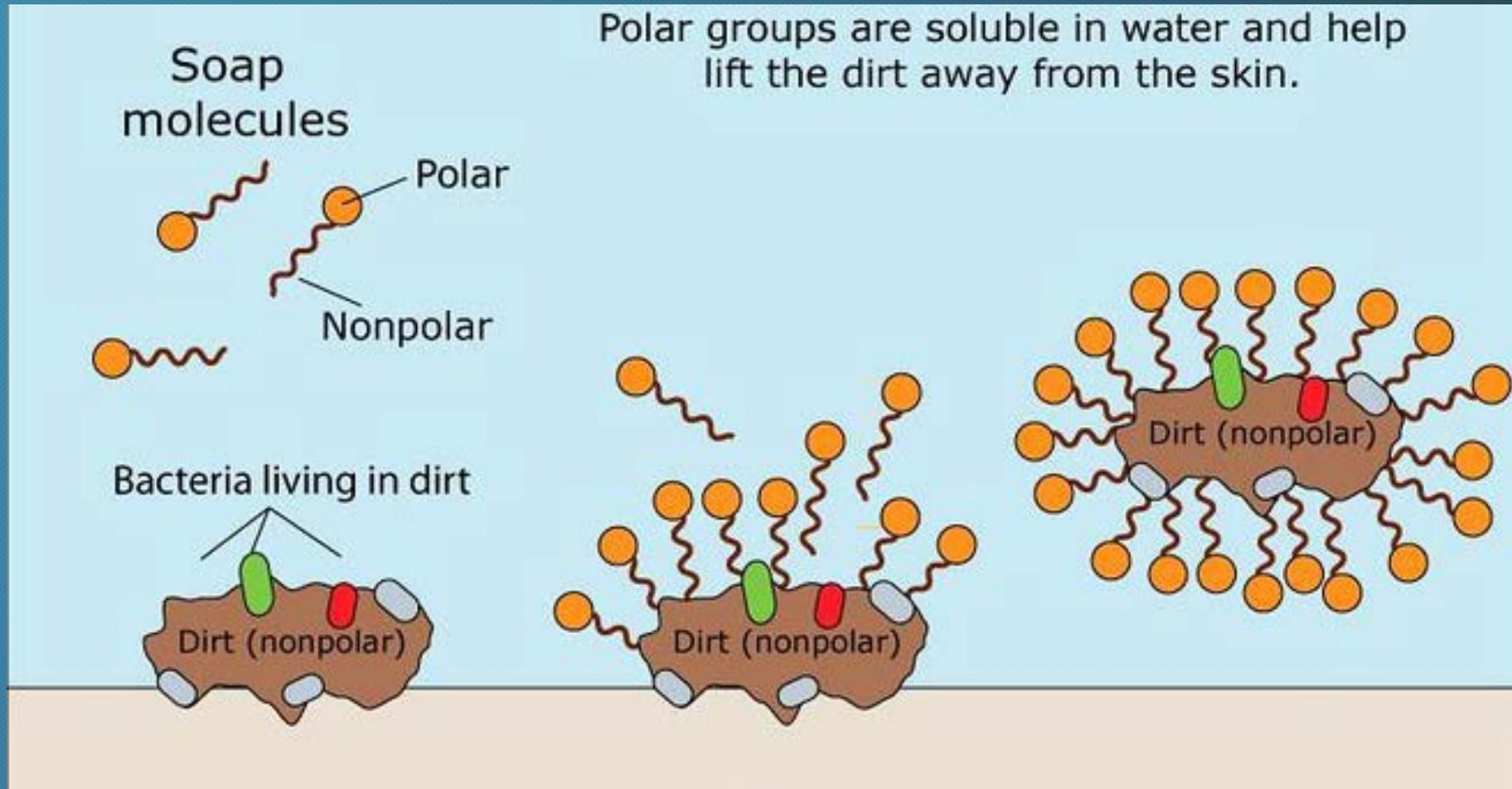


Oil-seeking tails slip
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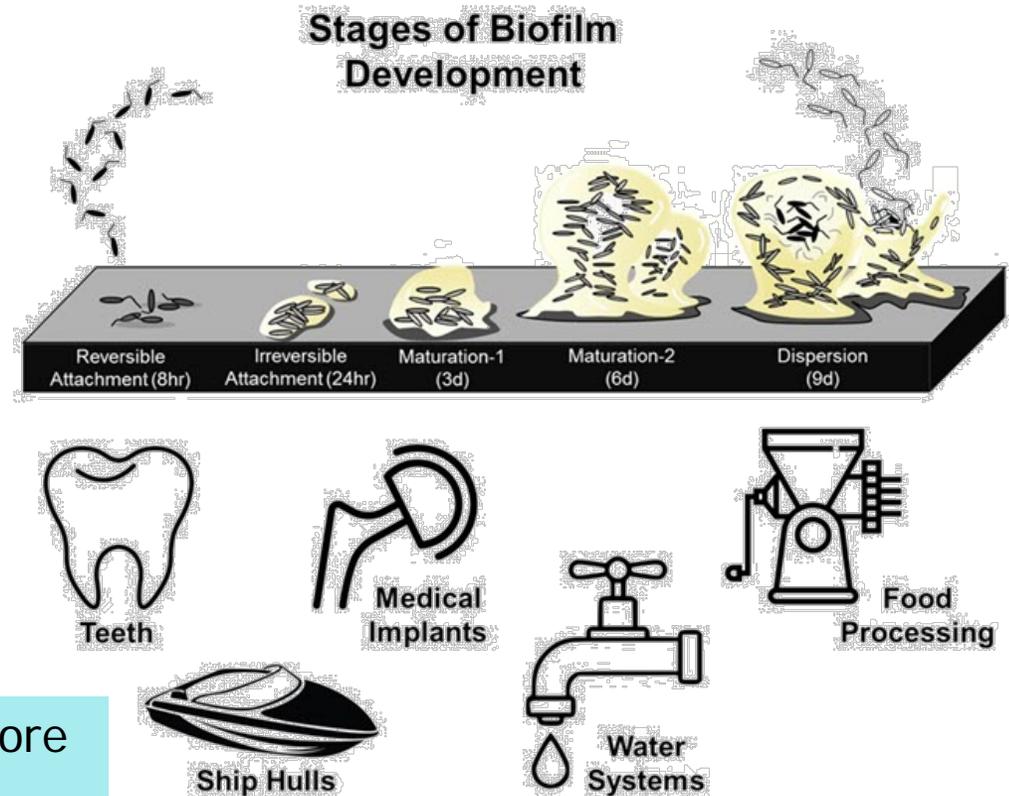
Whole thing
ripped apart
into pieces

Works for dirt too

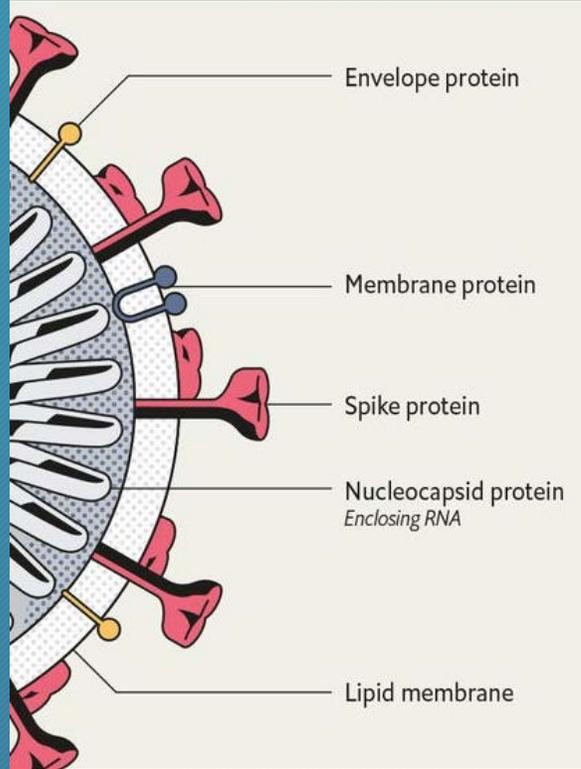


Residue from
cleaning/disinfecting
leading to biofilm
growth

“Natural” soap products are more
likely to leave residue than
detergent products.



Disinfectants also can ruin proteins



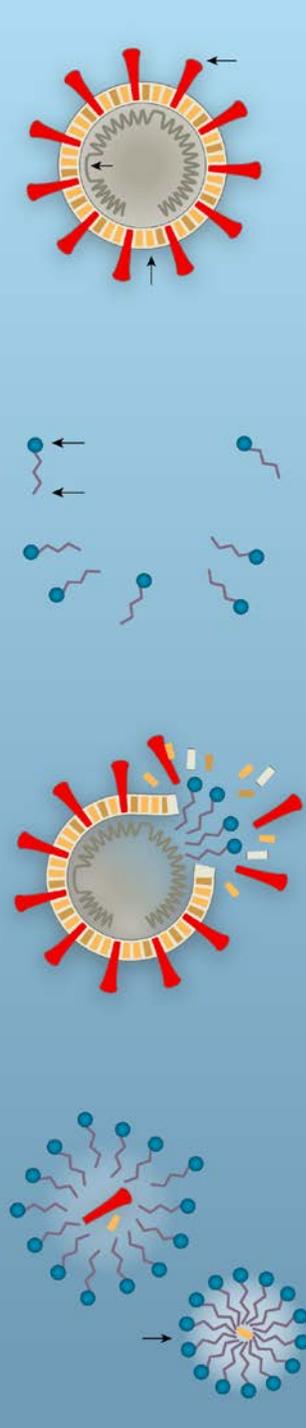
Mechanics of soap & disinfectants

This is why more doesn't always help

This is why timing is important

This is why agitation is frequently needed

This is why disinfectants can affect us too



Risk = Hazard + Exposure

- Risk: how safe/dangerous something is for you
- Hazard: inherent danger of something
- Exposure: amount or time around the thing

Risk = Hazard + Exposure

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 - Swimming vs swimming when you can't swimAccidents happen in all scenarios but some are higher risk than others
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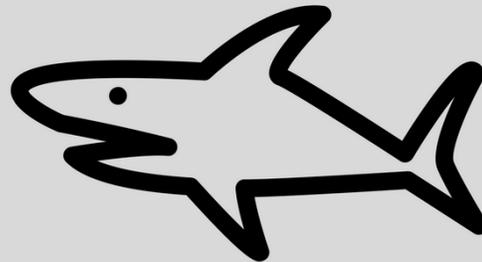
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- Exposure: amount or time around the thing
 - Oxygen in air vs. 100% oxygen from tank
 - 10 minutes in bright sun vs. 10 hours in bright sun

Risk equation

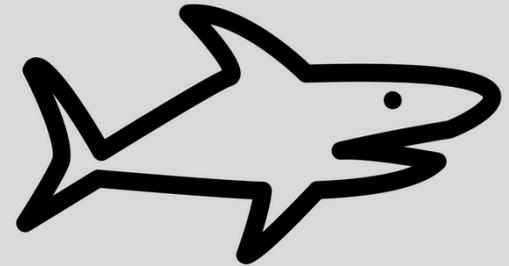
$$\text{Risk} = \text{Hazard} + \text{Exposure}$$

Hazard

Something that can potentially cause harm



Risk



= hazard + exposure

Acute vs Chronic Exposures

Alcohol as example

- (Toxicologist's perspective alcohol is a poison)

Acute alcohol poisoning,
cognitive deficits,
vomiting, & worse.

Acute exposures happen over short period of time



Think

24 hrs

Acute vs Chronic Exposures

Alcohol as example

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Acute vs Chronic Exposures

Alcohol as example

- (Toxicologist's perspective alcohol is a poison)

Chronic alcohol poisoning,
heart disease, liver
disease, cancer.

Chronic exposures happen over a long period of time



Acute vs Chronic Exposures



Alcohol as example

- (Toxicologist's perspective)

Chronic exposures have



Work-Related Asthma

Two types:

Occupational asthma

Asthma caused by something in the workplace



Enzymes
(in detergents or laboratories) and moulds



Proteins from animals, plants, foods, insects, fish and shellfish



Wheat or other flour and enzyme exposures



Western red cedar dust



Isocyanates in spray paints, some glues, foundry moulds, polyurethane foam

Work-exacerbated asthma

Something in the workplace aggravates existing asthma



Perfumes



Dusts
(construction, grains)



Ozone
(some swimming pools, bottling plants, photocopiers)



Ammonia
(farming environments such as barns)



Fumes, vapours, smoke and gases
(metalworking fluids, paint fumes, cleaning chemicals)



Environment
(cold, heat and humidity)

15%

Internationally, up to 15% of adult onset asthma may be related to the workplace.

What employers can do...



Read and be aware of safety data sheet information about respiratory health effects.



Replace substances with less harmful ones.



Minimize exposure (ventilation, enclosures).



Develop administrative controls (such as changing the job or tasks).

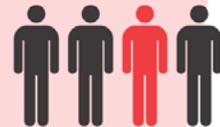


Educate workers on proper handling, avoiding spills and good housekeeping practices.



Provide personal protective equipment. This should be the last option.

If there is one worker with asthma symptoms, it may warrant a closer look at the air quality of the workplace and its ventilation controls.



Asthma is a respiratory disease

It creates a narrowing of the air passages that makes it difficult to breathe.



Symptoms



Tightness of the chest



Difficulty breathing



Wheezing



Coughing

Symptoms are usually worse on work days and improve when away from the workplace.

Industries affected

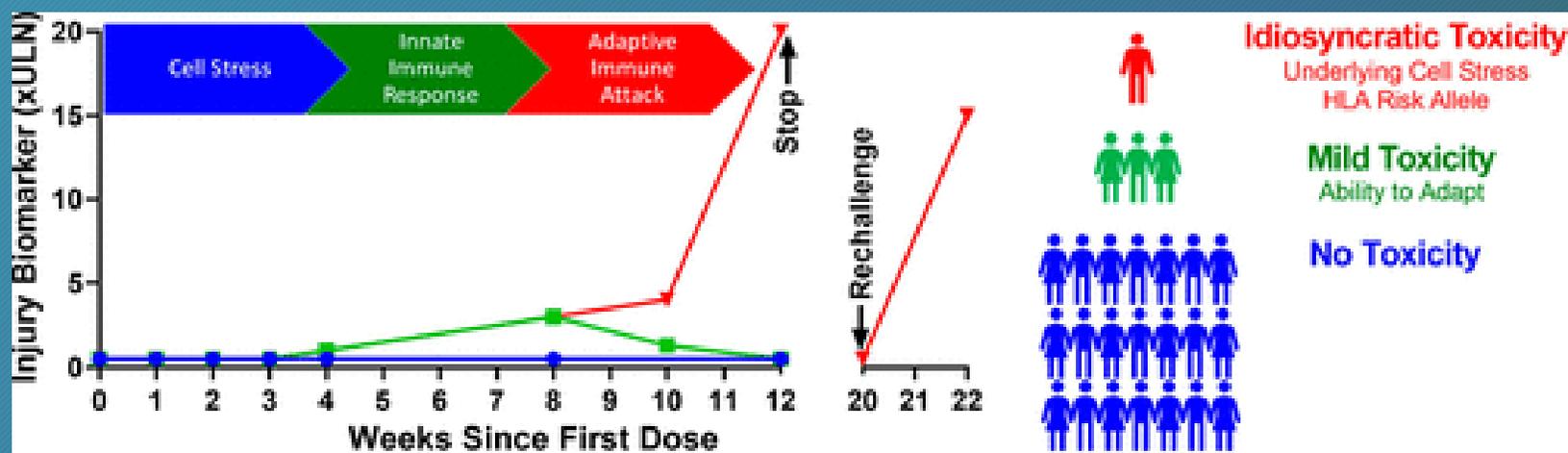
- Cleaning and janitorial services
- Bakeries
- Healthcare
- Manufacturing
- Construction
- Agriculture
- Automobile spray painting
- Insulation and polyurethane work
- Fisheries and fish processing
- Forestry

Created in partnership with

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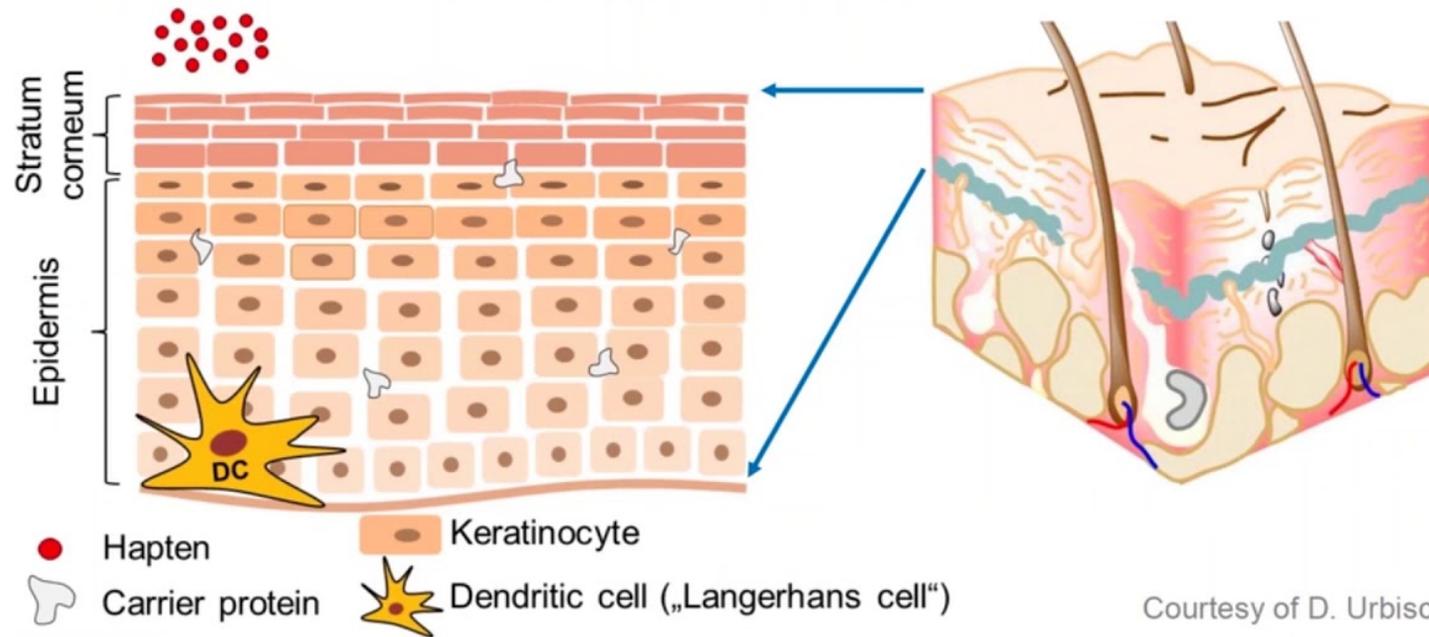
 **CCOHS.ca**
Canadian Centre for Occupational Health and Safety

Response to chemicals is different between and within people



Response to chemicals is different between and within people

The Skin Sensitisation Mechanism



Courtesy of D. Urbisch

Tools for evaluating chemicals

Hazard Comparison Dashboard Hazard Predict Search Standardizer

Hazard Comparison None Export

3 / 3

Legend: **VH** - Very High, **H** - High, **M** - Medium, **L** - Low, **I** - Inconclusive **Authoritative**, Screening, QSAR Model

CAS Name	Human Health Effects												Ecotoxicity		Fate				
	Acute Mammalian Toxicity			Carcinogenicity	Genotoxicity Mutagenicity	Endocrine Disruption	Reproductive	Developmental	Neurotoxicity		Systemic Toxicity		Skin Sensitization	Skin Irritation	Eye Irritation	Acute Aquatic Toxicity	Chronic Aquatic Toxicity	Persistence	Bioaccumulation
	Oral	Inhalation	Dermal						Repeat Exposure	Single Exposure	Repeat Exposure	Single Exposure							
89-83-8 Thymol	M	I	L	I	L	H	I	I	I	I	I	I	I	VH	VH	H	H	L	L
64-19-7 Acetic acid	M	H	M	I	L	L	I	L	I		M	H	I	VH	VH	M	L	L	L
7681-52-9 Sodium hypochlor...	L	L	L	I	I		I	I			M	M	L	VH	VH	VH	VH	L	L

Skipped (0)
 Filters (0)
 Sorting (0)
 Products (0)
 Structure

<https://hazard.sciencedataexperts.com/#/hazard>

Growing safety literature

- Better Ways to Clean
 - Walk-off mats placed inside and outside of entry-ways (to prevent dirt from being tracked into the building);
 - Microfiber mops, cloths and dusters;
 - High-filtration HEPA vacuums;
 - Walk-behind hard floor auto-scrubbers;
 - Hands-free mops; and
 - Chemical-free cleaning systems.

Source: <https://www.osha.gov/Publications/OSHA3512.pdf>

Reducing exposure beyond PPE



- Saferchoice
- <https://www.cdc.gov/niosh/topics/disinfectant/default.html>

<p>Sodium hypochlorite (solution, active chlorine >10%)^{1, 55} Bleach</p>	<p>7681-52-9</p>		<ul style="list-style-type: none"> • Causes severe skin burns and eye damage. • May cause respiratory irritation. 	<p>>8 hours: Butyl rubber Natural rubber Neoprene rubber Nitrile rubber Polyvinyl chloride</p>	<p>Follow manufacturer's recommendations in the product safety data sheet.</p>
<p>Thymol[®] 2-Isopropyl-5-methylphenol</p>	<p>89-83-8</p>		<ul style="list-style-type: none"> • Harmful if swallowed. • Causes severe skin burns and eye damage. 	<p>No barrier guidance is provided in Forsberg (2020). Follow manufacturer's recommendations on the product safety data sheet.</p>	<p>Follow manufacturer's recommendations in the product safety data sheet.</p>

Northern New England
Poison Center

1 800 222 1222 | LIVE CHAT | TEXT

POISON INFORMATION | EDUCATION | STATISTICS | FOR PROVIDERS

Call Us 24 hours / day
1 800 222 1222

Call | Chat | Text

> POISON SAFETY DURING A PANDEMIC: GUIDANCE FOR SCHOOL NURSES, TEACHERS AND DAYCARE PROVIDERS

Contact info:

Pam Bryer

Best: pamela.j.bryer@maine.gov

or: 287-7596

Board of Pesticides Control

pesticides@maine.gov

287-2731

