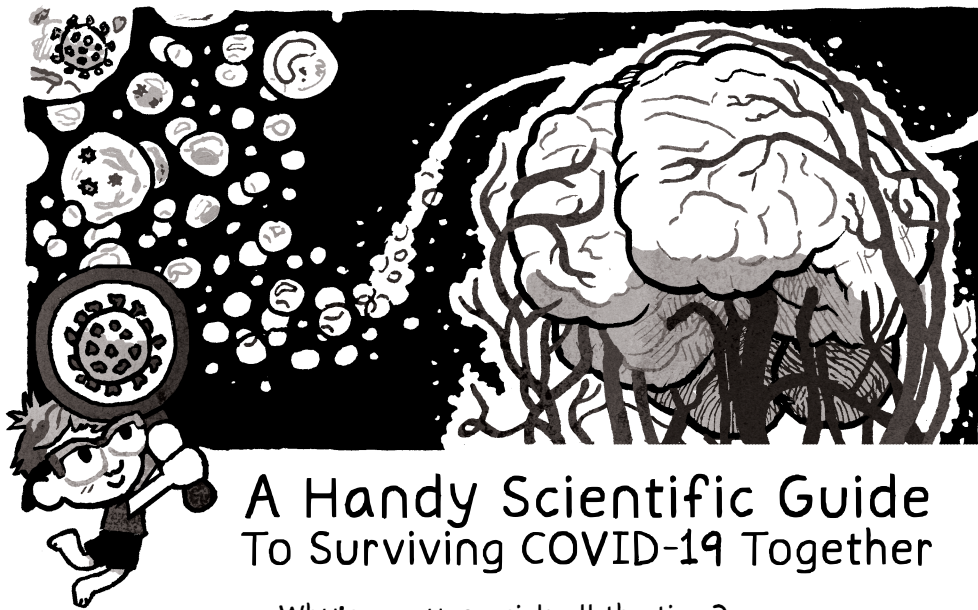




## A Handy Scientific Guide To Surviving COVID-19 Together

Why's everyone sick all the time?  
Well, it's not "just a cold" & it's definitely not "mild"...  
It's SARS-COV-2, & it can change your life forever.

This 26-pg zine cuts through years of COVID-19 chaos  
with simple, accessible language & cartoon visuals.  
Learn how the virus spreads through the air, what it  
does inside your body when you get infected, and  
why we mask to protect ourselves and each other.

PLUS: Science illustrations featuring  
fat, queer, trans & disabled people of color!  
Resources for surviving all these pandemics!  
Hopeful words to keep you going!



# WHY WE MASK: IT'S NOT 'JUST A COLD'





This comic would not exist without my partner Kimball Anderson's hard work and COVID know-how.

Their editing kept the zine going during my RSI flare-ups, and their emotional support got me through it all. Thank you!

I'm also grateful to everyone who gave me zine feedback, with an extra big thank you to Dupe and Caitlin for their copy edits.

Finally, thank you to everyone who's made SARS-CoV-2 research & resources more accessible online, and to everyone fighting to keep each other alive out there.

## Laurel Lynn Leake



...is a white, queer, and disabled artist & full-time lump. She's taking care of herself even though it's hard!

You can find them at:

laurelynnleake.com  
laurelynnleake.storenvy.com  
laurel-lynn-leake.itch.io  
counterintuitivecomics.tumblr.com  
patreon.com/Counterintuitive

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THANK YOU FOR READING

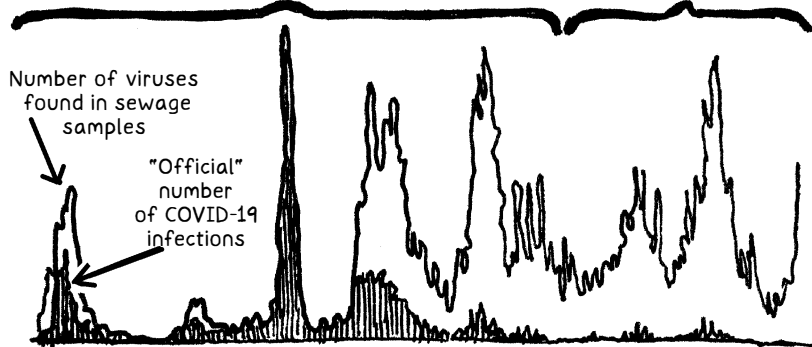
If you stopped masking, let this be the excuse to start again!  
And if you never stopped - thank you, thank you, thank you.



## Trackers

"DURING THE PANDEMIC"

"POST-PANDEMIC"



Source: Santa Clara County Public Health Dept, inspired by Lee Altenberg, PhD.

Wastewater trackers monitor sewage plant samples for viral debris (like SARS-CoV-2, HSN1, RSV, influenza, etc) and then visualize that data by location. They're far more accurate than the deliberately under-counted government and corporate numbers on COVID-19 cases, hospitalizations, and deaths.

However, wastewater numbers do SKEW LOW & have a 2 week delay. Also, since they depend on gov access, most have been forced into removing public data & ignoring all developing pandemics.

Air Quality Index (AQI) trackers don't report viruses, but they're a useful tool for flagging dangerous air conditions that require respirator masks, like wildfires & chemical leaks.

### TURTLE ISLAND

aka "North America"

WastewaterScan Dashboard  
[data.wastewaterscan.org/](https://data.wastewaterscan.org/)

"Weather Reports"  
 on the PeoplesCDC.org/

Canadian Tracker  
[COVID19Tracker.ca](https://COVID19Tracker.ca)

### GLOBAL

KFF Global Tracker  
<https://t.co/7fmeb93fYI>

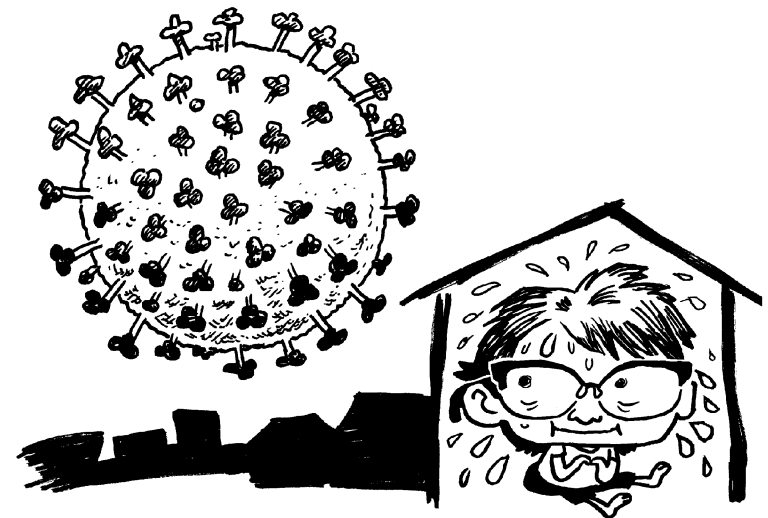
IQAir - [iqair.com](https://www.iqair.com)  
 Air Quality Index, includes  
 fire, wind, & PM 2.5 data.

Worldometer  
[worldometers.info/coronavirus/](https://worldometers.info/coronavirus/)

PurpleAir  
[map.purpleair.com](https://map.purpleair.com)  
 Crowd-sourced air quality data.

## WHY WE MASK: IT'S NOT "JUST A COLD"

A Handy Scientific Guide  
 To Surviving COVID-19 Together



featuring ME! ↗



## Guides & Tools

### Works Cited

Flip to page 22-24 for the endnotes.  
For a web version with working URLs, use the link  
or QR below. You can also download the zine to  
print your own copies to share!

[LaurelLynnLeake.com/WhyWeMask](http://LaurelLynnLeake.com/WhyWeMask)



By the way! I am not a doctor or scientist, and this zine  
is not meant as a replacement for medical care. It's all  
based on free-to-read, peer-reviewed scientific papers,  
but since I cartoonified everything for clarity,  
the illustrations aren't perfectly to scale.

Resources for currently sick people:

COVID-Conscious Solidarity Database - [tinyurl.com/currentlysick](http://tinyurl.com/currentlysick)  
Find COVID-19 Medications (USA) - [treatments.hhs.gov/](http://treatments.hhs.gov/)  
Drug Interaction Checker - [Covid19-DrugInteractions.org/checker](http://Covid19-DrugInteractions.org/checker)  
COVID Safe Providers - [covid-safeproviders.com/](http://covid-safeproviders.com/)  
Treatment Research - [C19early.org/](http://C19early.org/)

Resources for long-term disability & chronic illness:

Long COVID Physio - [LongCovid.physio/pacing/](http://LongCovid.physio/pacing/)  
Long COVID Justice - [longcovidjustice.org/](http://longcovidjustice.org/) (English/Español)  
How to Get On by Lily Silver - [HowToGetOn.wordpress.com/](http://HowToGetOn.wordpress.com/)  
A self-advocacy guide for homebound/bedbound people in the USA.

Protections that aren't masks:

Clean Air Crew  
[CleanAirCrew.org/](http://CleanAirCrew.org/)

We Have The Tools  
[wehavethetools.neocities.org/](http://wehavethetools.neocities.org/)

HOCl Water Info  
[t.co/w14EN05F4X](http://t.co/w14EN05F4X)

[ko-fi.com/sarssafesocials/](http://ko-fi.com/sarssafesocials/)  
Viv's DIY guide, virtual workshops, &  
kits for making HOCl water, a cheap  
antiviral & antibacterial cleaner.



Resources for buying & adjusting masks for your face shape:

Mask Database - [tinyurl.com/maskdb](http://tinyurl.com/maskdb)  
Respirator Repository - [tinyurl.com/PDXMaskLibrary](http://tinyurl.com/PDXMaskLibrary)  
Buy Lower Cost Masks (USA) - [linktr.ee/buymasks](http://linktr.ee/buymasks)  
Masking Through Blackness by Sabrina Sims- [starlybri.itch.io](http://starlybri.itch.io)

Combating misinformation with research:

How To Talk To Your Loved Ones About COVID - [covid.tips/](http://covid.tips/)  
LitCOVID - [ncbi.nlm.nih.gov/research/coronavirus/](http://ncbi.nlm.nih.gov/research/coronavirus/)

MASK UP, WE NEED YOU: Palestinian Solidarity, COVID-19,  
& the Struggle For Liberation by Rimona Eskayo & Sheyam Ghieth  
[rimoskyo.com/shop/](http://rimoskyo.com/shop/), [sheyamghieth.com/shop](http://sheyamghieth.com/shop)

What's Up With COVID & How To Protect Yourself  
by Hazel Newlevant - [newlevant.com/COVIDzine](http://newlevant.com/COVIDzine) (English/Español)

We Keep Each Other Safe -

[ForwardTogether.org/tools/we-keep-each-other-safe/](http://ForwardTogether.org/tools/we-keep-each-other-safe/) (English/Español)  
Visual guide "By & For Black, Indigenous, Latinx, POC & LGBTQ Communities"



- 38 Cai M, Xie Y, Topol EJ, Al-Aly Z. Three-year outcomes of post-acute sequelae of COVID-19. Nature Med Pub online May 30, 2024;1-10.
- 39 Maier HE, Kowalski-Dobson T, Eckard A, et al. Reduction in Long-COVID symptoms & symptom severity in vaccinated comp to unvaccinated adults. Open Forum Infectious Diseases. Pub online Jan 23, 2024.
- 40 Khullar D, Zhang Y, Zang C, et al. Racial/Ethnic Disparities in Post-acute Sequelae of SARS-CoV-2 Infection in New York: an EHR-Based Cohort Study...Pub online Feb 16, 2023.
- 41 Shelly, Elaine. We've only just begun to examine the racial disparities of long covid. MIT Technology Review. Pub online Sep 20, 2022.
- 42 Wirtz AL, Reisner SL, Cole SW, et al. Long COVID in transgender and gender nonbinary people in the United States. Scientific Reports. 2025;15(1).

## PAGE 15: LONG COVID SYMPTOMS THROUGH THE BODY

- 43 Jiao T, Huang Y, Sun H, Yang L. Research progress of post-acute sequelae after SARS-CoV-2 infection. Cell Death & Disease. 2024;15(4):1-16.
- 44 Nicolai L, Kaiser R, Stark K. Thromboinflammation in long COVID - the elusive key to post-infection sequelae? Journal of Thrombosis & Haemostasis. Pub online May 1, 2023.
- 45 Kogevinas M, Karachaliou M, Espinosa A, et al. Risk, determinants, and persistence of long-COVID in a population-based cohort study in Catalonia. BMC Medicine. 2025;23(1).
- 46 Sherif ZA, Gomez CR, Connors TJ, Henrich TJ, Reeves WB. Pathogenic mechanisms of post-acute sequelae of SARS-CoV-2 infection (PASC). eLife. 2023;12.
- 47 Wright J, Astill SL, Sivan M. The Relationship between Physical Activity & Long COVID: A Cross-Sectional Study. Intl Jnl of Environmental Research & Public Health. 2022;19(9):5093.
- 48 Appelman B, Charlton BT, Goulding RP, et al. Muscle abnormalities worsen after post-exertional malaise in long COVID. Nature Communications. 2024;15(1):17.

## PAGE 16: THE DAMAGE GETS WORSE W/ EVERY INFECTION

- 49 Bowe B, Xie Y, Al-Aly Z. Acute & postacute sequelae associated with SARS-CoV-2 reinfection. Nature Med. 2022;28:1-8.
- 50 Boufidou F, Medić S, Lampropoulou V, Sifakas N, Tsakris A, Anastassopoulou C. SARS-CoV-2 Reinfections & Long COVID in the Post-Omicron Phase of the Pand. Intl Jnl of Molecular Sciences. 2023;24(16):12942.
- 51 Glynn P, Tahmasebi N, Gant V, Gupta R. Long COVID following mild SARS-CoV-2 infection: characteristic T cell alterations & response to antihistamines. Jnl of Investigative Med. 2022;70(1):61-67.
- 52 Cibis A. Infographic Sliders: Live. AngieCibis.com. Accessed July 1, 2024.
- 53 Zuo W, Zuo W, He D, et al. The persistence of SARS-CoV-2 in tissues & its ass. w/ long COVID symptoms: a cross-sectional cohort study in China. The Lancet Infectious diseases. Pub online April 1, 2024
- 54 Sollini M, Morbelli S, Ciccirelli M, et al. Long COVID hallmarks on (18F) FDG-PET/CT: A case-control study. European Jnl of Nuclear Medicine & Molecular Imaging. Pub online March 7, 2021:1-11.

## PAGE 17: IMMUNE DYSREGULATION

- 55 Chang T, Yang J, Deng H, Chen D, Yang X, Tang ZH. Depletion and Dysfunction of Dendritic Cells: Understanding SARS-CoV-2 Infection. Frontiers in Immunology. 2022;13.
- 56 Winheim E, Rinke L, Lutz K, et al. Impaired function and delayed regeneration of dendritic cells in COVID-19. Suthar M, ed. PLOS Pathogens. 2021;17(10):e1009742.
- 57 Yin K, Peluso MJ, Luo X, et al. Long COVID manifests w/ T cell dysregulation, inflammation & an un-coordinated adaptive immune response... Nature Immunology. Pub online Jan 11, 2024:1-8.
- 58 Lechuga GC, Morel CM, De-Simone SG. Hematological alterations associated with long COVID-19. Frontiers in Physiology. 2023;14:1203472.

## PAGE 18: STOPPING THE SPREAD (SWISS CHEESE MODEL)

- 59 Mackay AM, PhD. The Swiss cheese infographic that went viral. Virology Down Under. Pub Dec 26, 2020.

## THE BASICS:

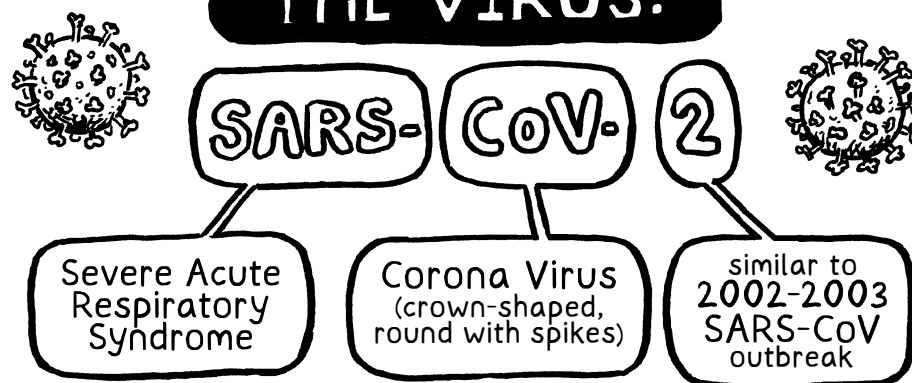
COVID-19 is an illness caused by the virus SARS-CoV-2, and mainly spreads through the air.<sup>1</sup>

A single infection, even one that seems "mild", can cause severe damage throughout your body. What's worse, each new infection risks new damage to your brain, immune system, lungs, heart, and more, and can add up to permanent disabilities or death.<sup>2</sup>

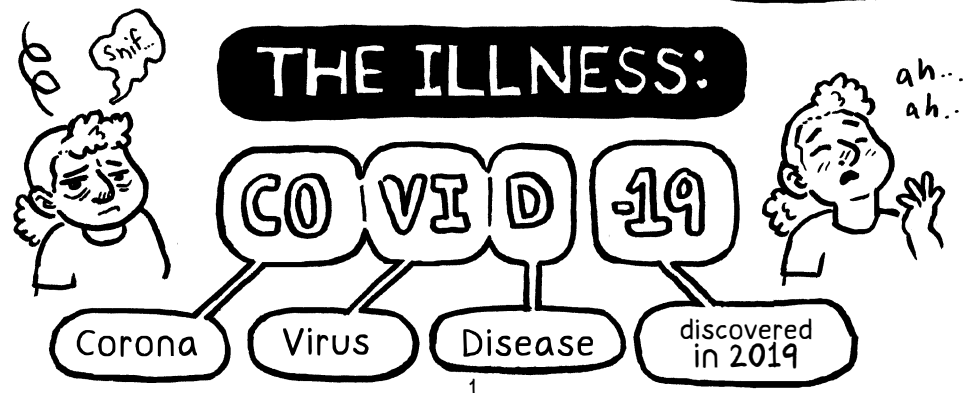
Right now, at least 75% of all adults<sup>3</sup> (and 30% of children<sup>4</sup>) are at a high risk for catching severe infections that could hospitalize or even kill us.

And if you have EVER had COVID-19, even once, YOU are now officially high risk too.

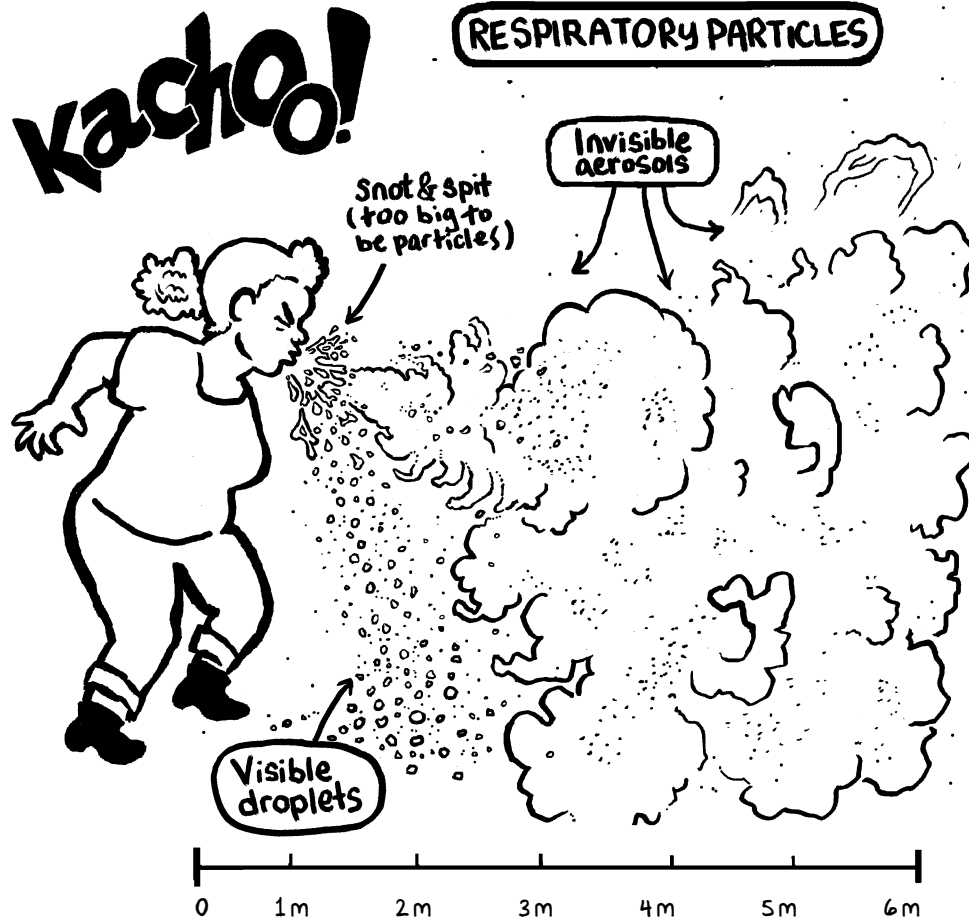
## THE VIRUS:



## THE ILLNESS:



# COVID-19 is an AIRBORNE ILLNESS.<sup>5</sup>



It spreads when infected people exhale clouds of mostly invisible RESPIRATORY PARTICLES carrying hidden viruses. RPs are the tiny drops of fluid that shoot out of our mouths whenever we cough, sneeze, talk, or even breathe.

If you're infected and contagious, you can breathe out enough virus to infect others in just 20 seconds!<sup>6</sup> And in places with no fresh air or ventilation, the tiniest RPs can float around like smoke for HOURS.<sup>7,8</sup>

## PAGE 6: HOW COVID SPREADS (1: INHALATION)

- 18 Malin Alsved, Nygren D, Thuresson S, Fraenkel CJ, Patrik Medstrand, Jakob Löndahl. Size dist of exhaled aerosol particles cont SARS-CoV-2 RNA. *Infectious Diseases*. 2022;55(2):158-163.
- 19 Ehsanifar M. Airborne aerosol particles & COVID-19 transition. *Envtl Research*. 2021;200:111752.
- 20 Alsved M, Nyström K, Thuresson S, et al. Infectivity of exhaled SARS-CoV-2 aerosols is sufficient to transmit covid-19 within minutes. *Scientific Reports*. 2023;13(1):21245.

## PAGE 7: HOW COVID SPREADS (2: DIRECT 3: INDIRECT)

- 21 Hu K, Patel J, Patel BC. Ophthalmic Manifestations Of Coronavirus (COVID-19). *PubMed*. Pub 2020.
- 22 Center N. Science Brief: SARS-CoV-2 and Surface (Fomite) Transmission for Indoor Community Environments. *Nih.gov*. Pub April 5, 2021.

## PAGE 8: WHEN YOU BREATHE IN...(CILIA & BRCHIOLES)

- 23 Kuek LE, Lee RJ. 1st contact: the role of respiratory cilia in host-pathogen interactions in the airways. *American Jnl of Physiology-Lung Cellular & Molecular Phys*. 2020;319(4):L603-L619.

## PAGE 9: VACCINES

- 24 Rajah MM, Bernier A, Buchrieser J, Schwartz O. The Mechanism & Consequences of SARS-CoV-2 Spike-Mediated Fusion & Syncytia Formation. *Jnl of Molecular Biology*. 2021;434(6):167280.
- 25 Rahmani K, Shavaleh R, Forouhi M, et al. The effectiveness of COVID-19 vaccines in reducing the incidence, hospitalization, & mortality from COVID-19: A systematic review... *Frontiers in Pub Health*. 2022;10.
- 26 Tian D, Sun Y, Zhou J, Ye Q. The global epidemic of SARS-CoV-2 variants & their mutational immune escape. *Journal of Medical Virology*. Pub online Oct 13, 2021.

## PAGE 11: HEALTHY ALVEOLI

- 27 Thangavel P, Park D, Lee YC. Recent Insights into Particulate Matter (PM2.5)- Mediated Toxicity in Humans: An Overview. *International Journal of Enviro. Research & Public Health*. 2022;19(12):7511.

## PAGE 12: CYTOKINE STORM IN AN ALVEOLI

- 28 Fajgenbaum DC, June CH. Cytokine Storm. Longo DL, ed. *New England Jnl of Med*. 2020;383(23).
- 29 Otsuka R, Seino K. Macrophage activation syndrome & COVID-19 Inflammation & Regeneration. 2020;40.
- 30 Ackermann M, Anders HJ, Bilyy R, et al. Patients with COVID-19: in the dark-NETs of neutrophils. *Cell Death & Differentiation*. 2021;28(11):3125-3139.
- 31 O'Sullivan JM, Gonagle DM, Ward SE, Preston RJS, O'Donnell JS. Endothelial cells orchestrate COVID-19 coagulopathy. *The Lancet Haematology*. 2020;7(8):e553-e555.

## PAGE 13: VASCULAR DAMAGE

- 32 Jing H, Wu X, Xiang M, Liu L, Novakovic VA, Shi J. Pathophysiological mechanisms of thrombosis in acute and long COVID-19. *Front Immunol*. 2022;13(13).
- 33 Bad Blood? The Uncertainty Around Microclots & Long Covid. *Undark Magazine*. Pub May 20, 2024.
- 34 Ramón Martínez-Mármol, Giordano-Santini R, Kaulich E, et al. SARS-CoV-2 infection & viral fusogens cause neuronal & glial fusion that compromises neuronal activity. *Science Advances*. 2023;9(23).
- 35 Taschetti-Millane M, Fornell D. PHOTO GALLERY: How COVID-19 Appears on Medical Imaging. *Imaging Technology News*. Pub March 22, 2022.

## PAGE 14: LASTING EFFECTS (AKA LONG COVID)

- 36 Li J, Zhou Y, Ma J, et al. The long-term health outcomes, pathophysiological mechanisms & multidisciplinary mgnt of long COVID. *Signal Transduction & Targeted Therapy*. 2023;8(1).
- 37 Wang C, Ramasamy A, Verdusco-Gutierrez M, W. Michael Brode, Melamed E. Acute & post-acute sequelae of SARS-CoV-2 infection: a review of risk factors & social determinants. *Virology Jnl*. 2023;20(1).



# WORKS CITED

## PAGE 1: THE BASICS

- 1 Greenhalgh T, Jimenez JL, Prather KA, Tufekci Z, Fisman D, Schooley R. Ten scientific reasons in support of airborne transmission of SARS-CoV-2. *The Lancet*. 2021;0(0).
- 2 Davis HE, McCorkell L, Vogel JM, Topol EJ. Long COVID: major findings, mechanisms and recommendations. *Nature Reviews Microbiology*. 2023;21(3):1-14.
- 3 Ajufu E, Rao S, Navar AM, Pandey A, Ayers CR, Khara A. U.S. population at increased risk of severe illness from COVID-19. *American Journal of Preventive Cardiology*. 2021;6(14):100156.
- 4 Kompaniyets L, Agathis NT, Nelson JM, et al. Underlying Medical Conditions Associated With Severe COVID-19 Illness Among Children. *JAMA Network Open*. 2021;4(6):e2111182.

## PAGE 2: COVID-19 IS AN AIRBORNE ILLNESS

- 5 van Doremalen N, Bushmaker T, Morris DH, et al. Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1. *New England Journal of Medicine*. 2020;382(16):1564-1567.
- 6 Lane G, Zhou G, Hultquist JF, et al. Quantity of SARS-CoV-2 RNA copies exhaled per min during natural breathing over the course of COVID-19 infection. *eLife*. 2024;13.
- 7 van Doremalen N, Bushmaker T, Morris DH, et al. Aerosol & Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1. *New England Journal of Medicine*. 2020;382(16):1564-1567.
- 8 Rosti ME, Olivieri S, Cavaola M, Seminara A, Mazzino A. Fluid dynamics of COVID-19 airborne infection suggests urgent data for a scientific design of social distancing. *Scientific Reports*. 2020;10(1).

## PAGE 3: WHAT'S INSIDE A RESPIRATORY PARTICLE?

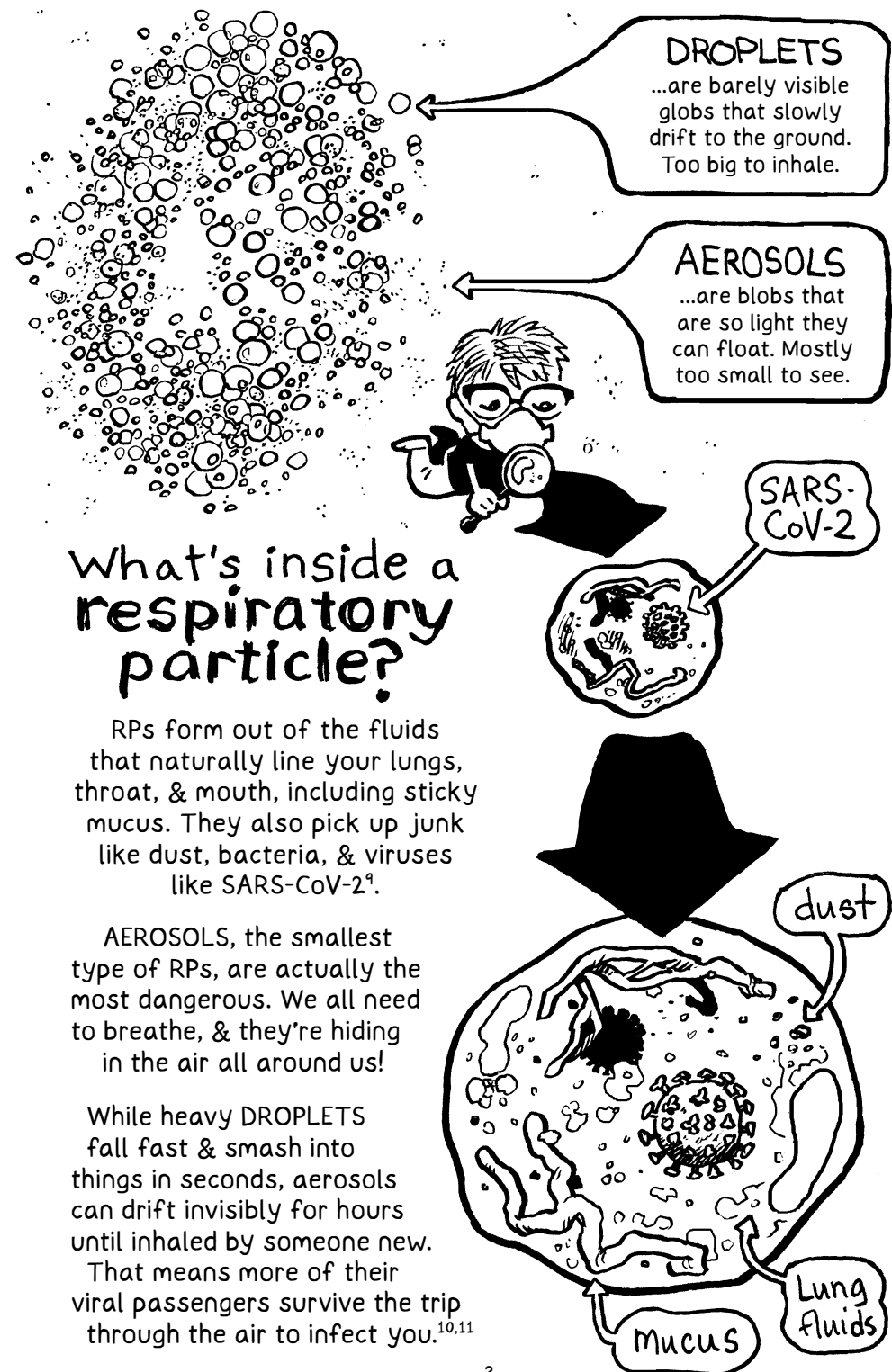
- 9 Dommer A, Casalino L, Kearns F, et al. COVIDisAirborne: AI-enabled multiscale comp microscopy of delta SARS-CoV-2 in a resp aerosol. *The Intl Jnl of High Per Computing Applications*. 2022;37(1).
- 10 Liu K, Allahyari M, Salinas JS, Zgheib N, Balachandar S. Peering inside a cough or sneeze to explain enhanced airborne transmission under dry weather. *Scientific Reports*. 2021;11(1).
- 11 Wang CC, Prather KA, Sznitman J, et al. Airborne transmission of respiratory viruses. *Science*. 2021;373(6558).

## PAGE 4: SYMPTOMS

- 12 Boucau J, Marino C, Regan J, et al. Duration of Shedding of Culturable Virus in SARS-CoV-2 Omicron (BA.1) Infection. *New England Journal of Medicine*. 2022;387(3):275-277.
- 13 Marquez C, Kerkhoff AD, Schrom J, et al. COVID-19 Symptoms & Duration of Rapid Antigen Test Positivity at a Community Testing and Surveillance Site During Pre-Delta, Delta, and Omicron BA.1 Periods. *JAMA Network Open*. 2022;5(10):e2235844.
- 14 Boyton RJ, Altmann DM. The immunology of asymptomatic SARS-CoV-2 infection: what are the key questions? *Nature Reviews Immunology*. 2021;21.
- 15 Almadhi MA, Abdulrahman A, Sharaf SA, et al. The high prevalence of asymptomatic SARS-CoV-2 infection reveals the silent spread of COVID-19. *Intl Jnl of Infectious Diseases*. 2021;105:656-661.

## PAGE 5: SEVERE SYMPTOMS

- 16 Howard J. People with darker skin are 32% more likely to have pulse oximeter readings overestimate oxygen levels, report says. *CNN*. Pub March 20, 2024.
- 17 Pusey-Reid E, Quinn L, Samost ME, Reidy PA. Skin Assessment in Patients with Dark Skin Tone. *AJN, American Journal of Nursing*. 2023;123(3):36-43.



# SYMPTOMS

SARS-CoV-2 symptoms start about 3-6 days after infection, and last about 12-14 days.<sup>12</sup> This initial or acute infection stage is more commonly called COVID-19. Symptoms and contagiousness differ by viral variant, but often include...<sup>13</sup>



Then again, you could be one of the 32-50% of people with COVID-19 who are...<sup>14, 15</sup>

CONTAGIOUS  
WITH NO  
SYMPTOMS



# RESOURCES

Includes my ENDNOTES with all works cited, plus useful GUIDES & TOOLS. For a web version with working URLs, use the link or scan the QR code below:

[LaurelLynnLeake.com/WhyWeMask](https://LaurelLynnLeake.com/WhyWeMask)





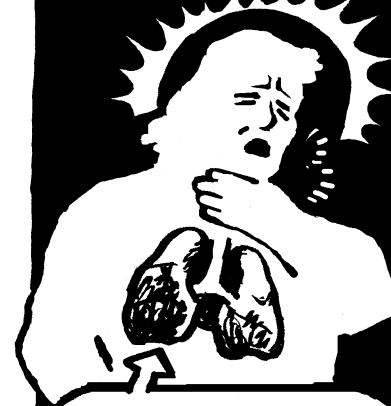
Just like how masks work better when more of us wear them, when we come together - locally & globally - we keep each other safe.

We mask because we refuse to accept a world where any of us are disposable.

We fight for a future with room for all of us.



## ! SEVERE SYMPTOMS !



STRAINED AND/OR  
RAPID BREATHING,  
WHEEZING

CHEST PAIN  
AND/OR PRESSURE

PNEUMONIA  
(fluid in the lungs)

### HYPOXEMIA

COVID-19 can impair O<sub>2</sub> flow to your blood, even w/o obvious breathing issues.

LOW BLOOD OXYGEN symptoms can cause organ failure and even death without treatment.

Measure BLOOD OXYGEN LEVELS at home with a PULSE OXIMETER:



91-94% = concerning  
90% and under = emergency!!

**WARNING:** Oximeters may give FALSELY HIGH READINGS to people with dark skin &/or painted nails.<sup>16</sup>

Hypoxemia symptoms include:

CONFUSION OR  
DISORIENTATION



RACING HEART



INABILITY TO  
WAKE UP OR STAY AWAKE

CYANOSIS

PALE, GREY, or BLUE-TINTED  
TONGUE, LIPS, &/or NAILBEDS,  
depending on skintone.<sup>17</sup>

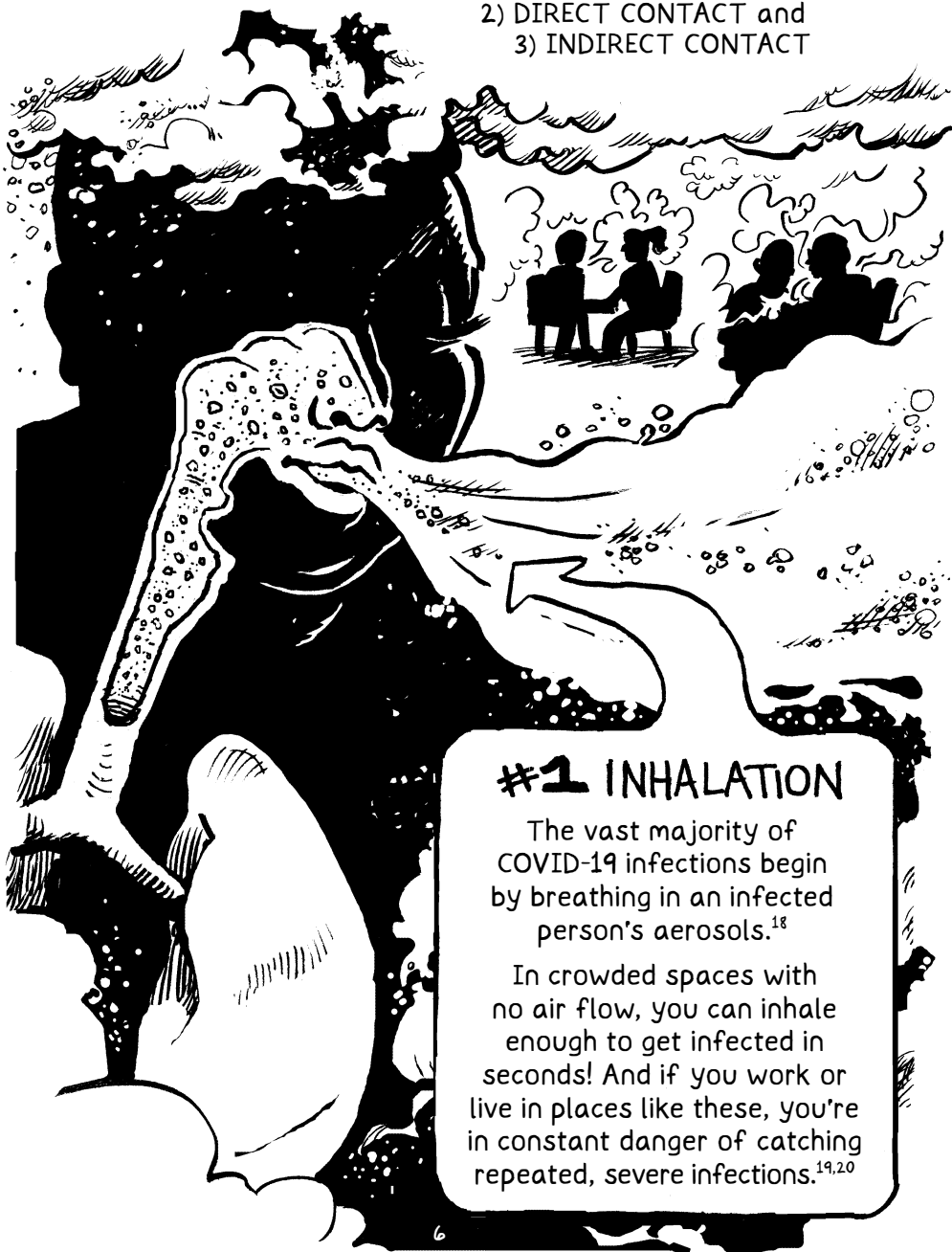


**ALL THESE REQUIRE EMERGENCY HOSPITALIZATION!**

# HOW COVID SPREADS

Respiratory particles carrying SARS-CoV-2 usually enter our bodies in one of three ways:

- 1) INHALATION,
- 2) DIRECT CONTACT and
- 3) INDIRECT CONTACT



## #1 INHALATION

The vast majority of COVID-19 infections begin by breathing in an infected person's aerosols.<sup>18</sup>

In crowded spaces with no air flow, you can inhale enough to get infected in seconds! And if you work or live in places like these, you're in constant danger of catching repeated, severe infections.<sup>19,20</sup>



## COMMUNITY CARE

To survive pandemics, we must follow the lead of Disability Justice and survive TOGETHER.

That means all of us:

The infants and toddlers too young to mask, the disabled, the chronically ill, and the neurodiverse, Black and Indigenous people and all people of color, queer and trans and intersex people, sex workers, pregnant people, immunocompromised people, the undocumented, the unhoused, the invisible, the incarcerated and institutionalized...

People forced into constant exposure at home, work, and school until they've lost count of infections, people forced into indefinite isolation because one infection could kill them or permanently change their life for the worse, people who get fired when they run out of sick days and then evicted when they run out of money...

Everyone abused by our medical industry and abandoned by our governments,

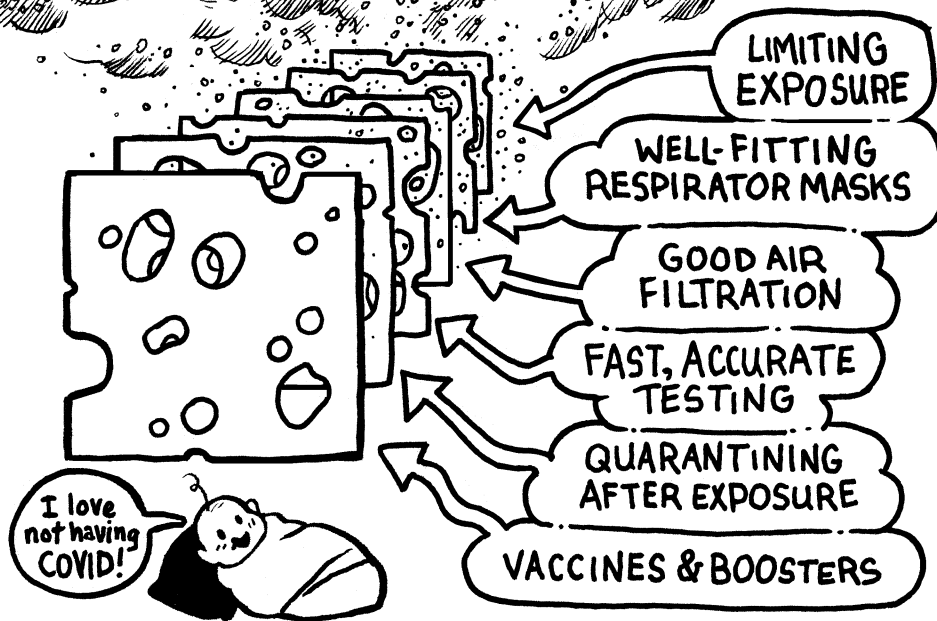
**ALL OF US.**

# STOPPING THE SPREAD

So obviously we want to stop constantly getting sick, but how? We can't end pandemics through individual action alone.

So we work together!  
And we combine many strategies,  
both individual and systemic.

The SWISS CHEESE MODEL  
OF INFECTION PREVENTION  
is an easy, cheesy way  
to visualize this tactic.<sup>59</sup>



Just like how every Swiss cheese slice has holes,  
no single protection method against SARS-CoV-2 works  
100% perfectly. So we stack together methods until we've  
covered up all the holes, and maximized protection!

## #2 DIRECT CONTACT

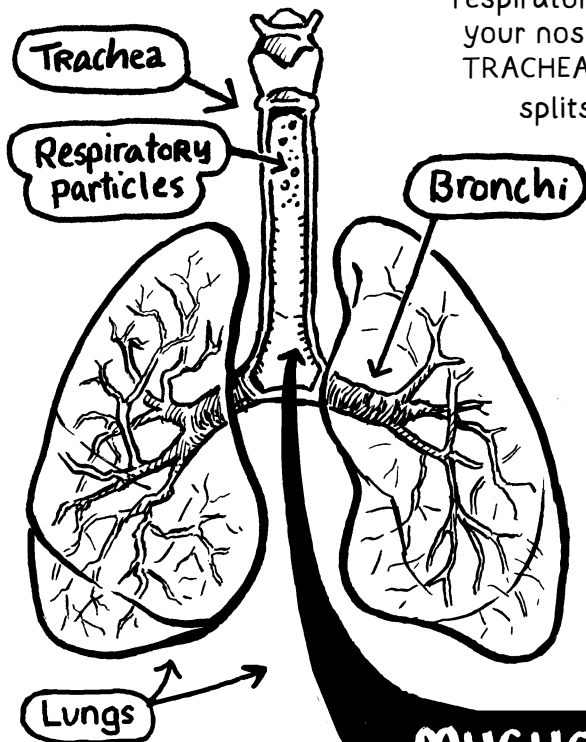
Viral aerosols/droplets can also collide directly into your MUCOUS MEMBRANES.<sup>21</sup> These are the layers of soft, wet cells lining your nose, mouth, eyes, respiratory tract, etc.





# When you breathe in...

...air (including any nearby respiratory particles) rushes into your nose or mouth, down your **TRACHEA** or windpipe, and then splits into the twin **BRONCHI** tubes of the **LUNGS**.



## This whole system is called the **RESPIRATORY TRACT**

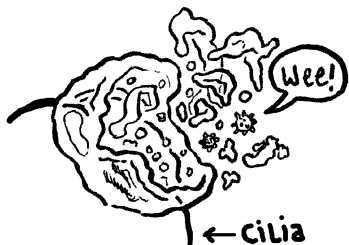
...and it's protected by a special kind of **MUCOUS MEMBRANE** cell lining covered in tiny waving tentacles called **CILIA**. They're coated with slippery **MUCUS** fluids.

## MUCOUS MEMBRANES

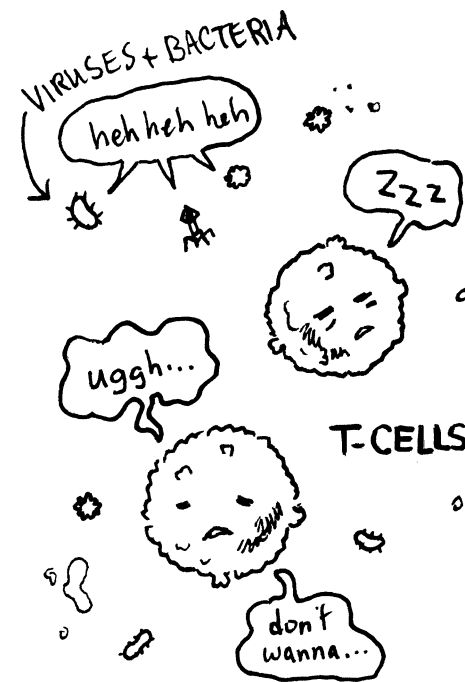


Cilia use their mucus to collect any dangerous **PATHOGENS** you inhale (like dust, viruses, or bacteria).

While they can catch a few virus-carrying RPs, cilia get overwhelmed by hundreds at once.



RPs dissolve inside the warm, wet respiratory tract, & their viral passengers break free! **SARS-CoV-2** attack nearby cells, in the "initial phase" of a new **COVID-19** infection.<sup>23</sup>



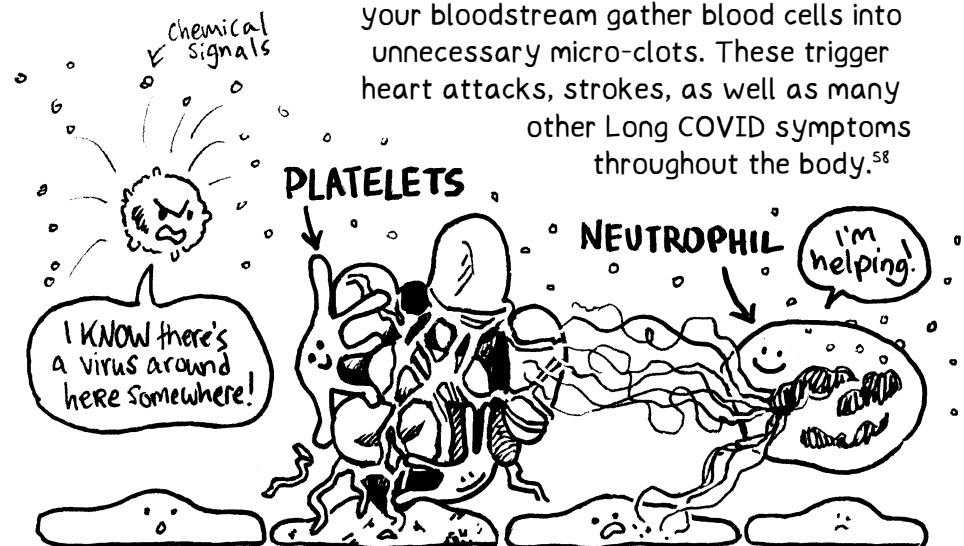
# Immune System DYSFUNCTION

**COVID-19** infections can leave your immune system depleted and unable to fight off much of anything.<sup>55</sup>

Exhausted immune cells called **T-CELLS** can miss invading pathogens like bacteria or other viruses. They might even "reset" and forget how to handle infections they've fought off before.<sup>56</sup>

**COVID-19** infections can also leave you with a fired up immune system in constant high alert against your own body (aka **AUTOIMMUNITY**). Your **T-cells** and **NEUTROPHILS** may attack healthy cells & cause systemic inflammation, especially when triggered by old viral debris.<sup>57</sup>

Meanwhile, overactive **PLATELETS** in your bloodstream gather blood cells into unnecessary micro-clots. These trigger heart attacks, strokes, as well as many other Long **COVID** symptoms throughout the body.<sup>58</sup>



## THE DAMAGE GETS WORSE WITH EVERY NEW INFECTION

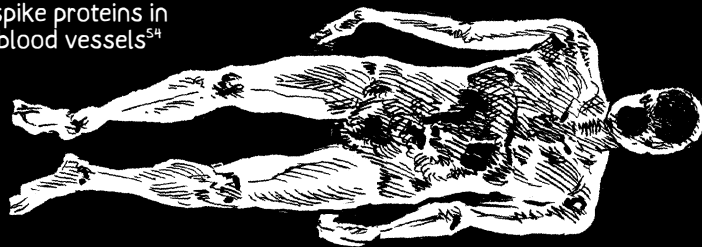
Most people don't know that SARS-CoV-2 damage is CUMULATIVE.

That means every new infection you get raises the odds you'll be hit by horrible new health complications that may become permanent.<sup>49,50</sup>

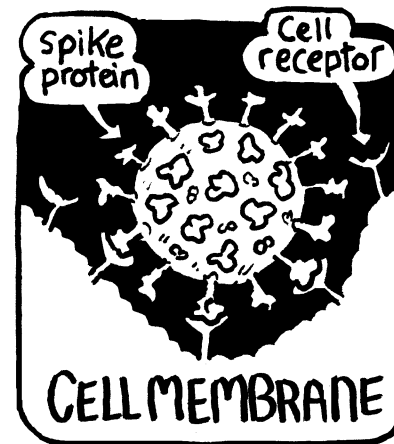
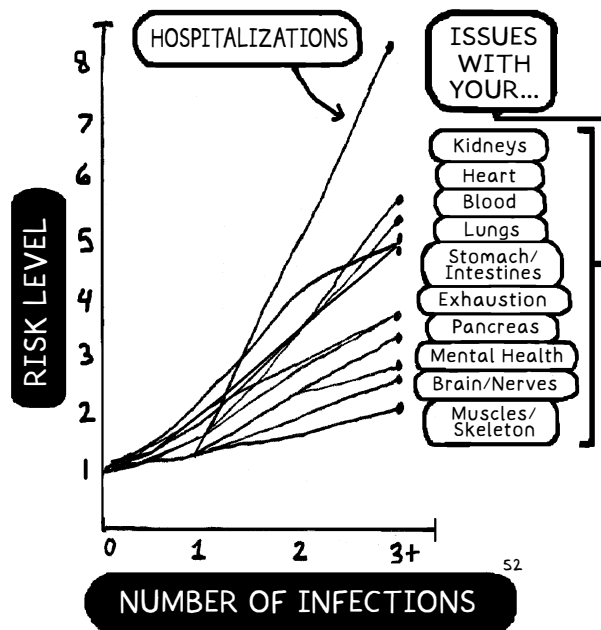
Even infections that feel like "just a cold" or "just allergies" can cause you health trouble immediately or down the line.<sup>51</sup>

An easy or entirely asymptomatic initial infection may even mean your immune system barely activated to fight off the virus. Long after you recover from the "mild" symptoms, the inactive viral debris from the infection can remain hidden throughout your body.<sup>53</sup>

FDG-PET scan showing spike proteins in joints & blood vessels<sup>54</sup>



These are VIRAL RESERVOIRS: Leftover virus chunks & spike proteins that collect in your muscles, bones, & organs, ready to reinfect you whenever your immune system gets stressed.



SARS-CoV-2 uses its SPIKE PROTEINS like lockpicks on cells' outer membranes, tricking them into opening and letting the virus inside.

It then re-program the host cells to pump out new copies of SARS-CoV-2. The infected cells swell with copies until they burst, scattering the virus all over their healthy cell neighbors.<sup>24</sup>



## VACCINES

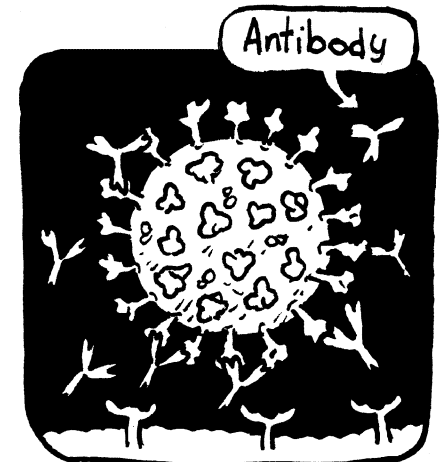


Most COVID-19 vaccines teach our immune systems to create defensive ANTIBODIES. These specialized proteins lock onto SARS-CoV-2's lockpick spikes to make them useless.

While antibodies don't block every single virus in your body, they help a lot - vaccinated people have far better chances of surviving initial infections.<sup>25</sup>

But after 6 yrs of unchecked spread, we're now dealing with dangerous VIRAL VARIANTS.

These SARS-CoV-2 mutations (like Delta/Omicron/FLiRT/JN.1) have fancy spike proteins that old antibodies simply don't fit!<sup>26</sup>

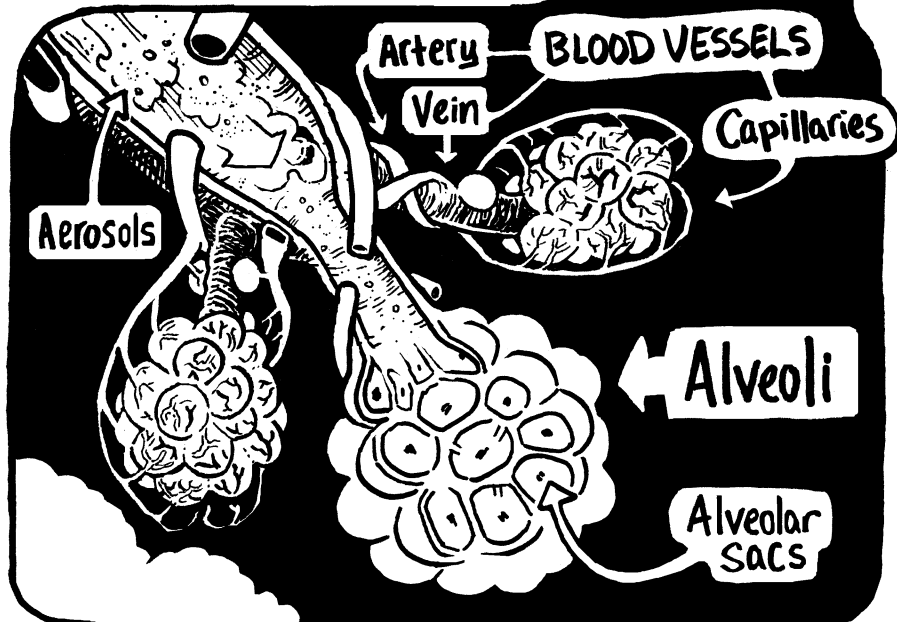


So scientists race to keep up with yearly booster vaccines that can block the latest viral variants with new antibodies.

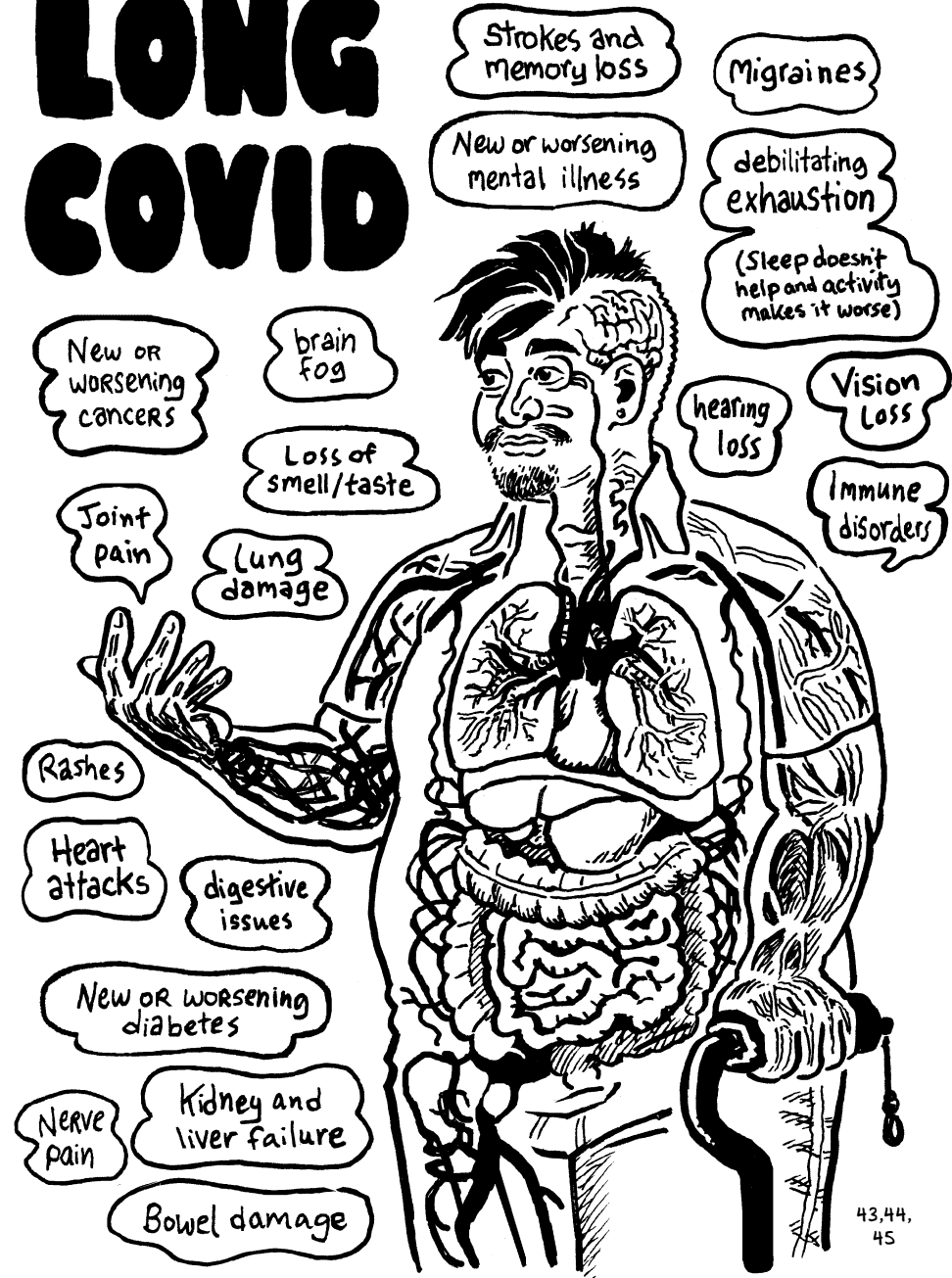
# BRONCHIOLES

Once air reaches the lungs, it flows into the BRONCHIAL TREE, where the twin BRONCHI airways split into smaller & smaller twig-like BRONCHIOLES intertwined with BLOOD VESSELS, the ARTERIES & VEINS that carry blood cells to & from the heart.

Each bronchiole is tipped with ALVEOLI, clusters of flexible ALVEOLAR SACS that look sort of like grapes. These clusters are wrapped in nets of CAPILLARIES, the tiniest, most delicate type of blood vessel.



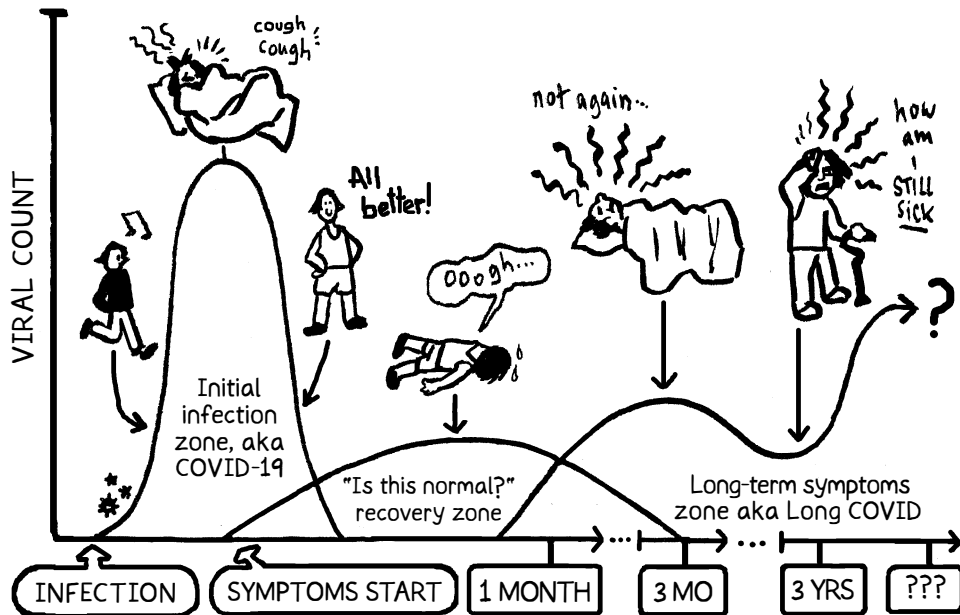
# LONG COVID



As of 2025, we keep discovering new ways SARS-CoV-2 damages the body long-term, but we still don't have a "cure". There are many ways to treat the symptoms (primarily serious, extended REST<sup>46,47,48</sup>), but no silver bullet to reverse damage.



# LASTING EFFECTS



At least 10-30% of people who survive COVID-19 report symptoms reappearing months or even YEARS later. That's 10-30% of ALL adults, of all ages and backgrounds.<sup>36,37,38</sup> Millions have had their lives changed for the worse, with no end in sight.

Long COVID (aka POST-COVID SYNDROME or POST-ACUTE SEQUELAE OF SARS-COV-2) varies wildly from person to person, but common symptoms include difficult coughs, strokes, heart attacks, immune dysfunction, & debilitating exhaustion. We're only just beginning to understand it as a POST-VIRAL ILLNESS, like Shingles (caused by the Chickenpox virus) & AIDS (caused by HIV).

COVID vaccines lower the likelihood of long-term damage, but don't prevent it entirely.<sup>39</sup> Long COVID also hits marginalized people the hardest, and we often go undiagnosed and untreated due to systemic bigotry in healthcare.<sup>40,41,42</sup>



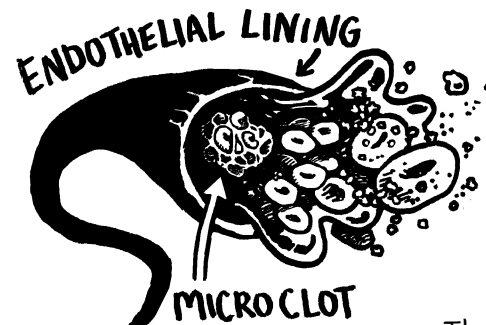
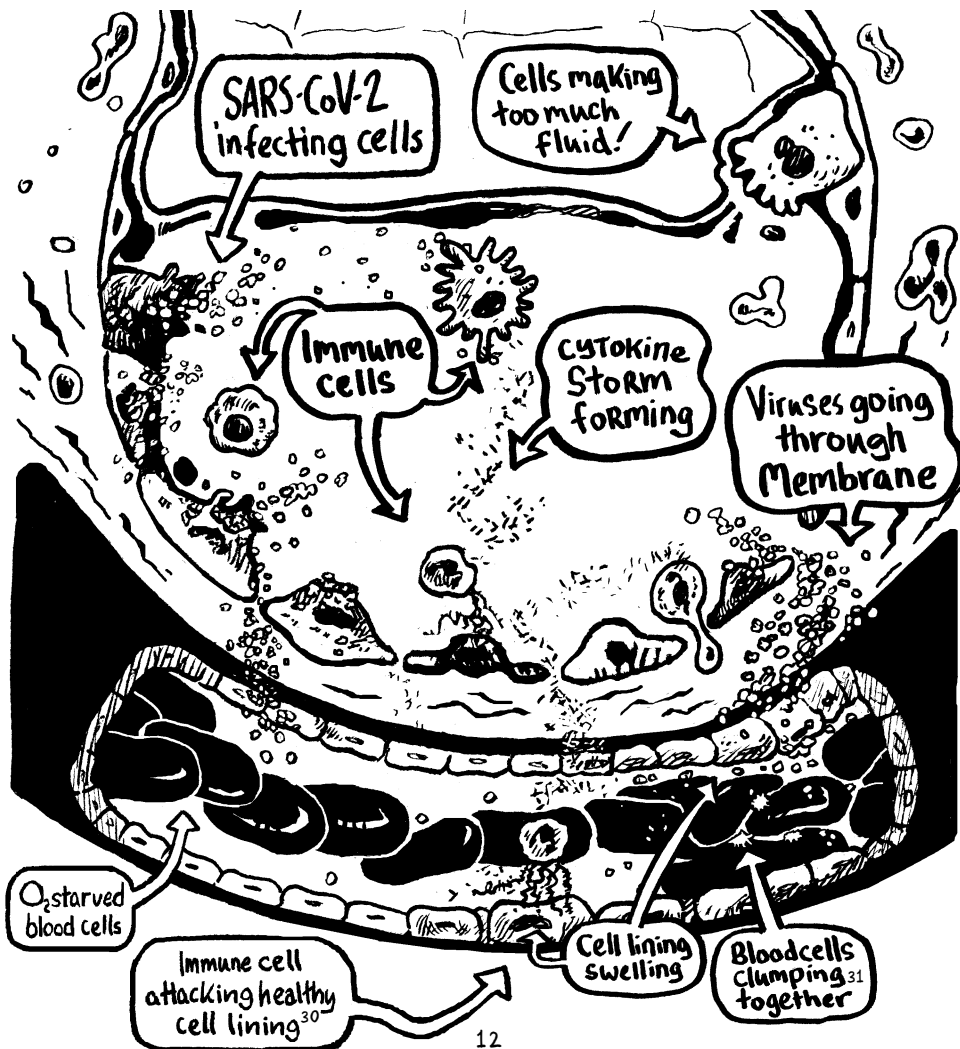
# Healthy Alveoli



Our body takes defensive action against SARS-CoV-2 with IMMUNE CELLS, but variants excel at turning our immune response against itself in escalating CYTOKINE STORMS.<sup>28</sup>

Infected, dying cells release CYTOKINES, or chemical signals that summon immune cells...But then those cells get attacked too, so they summon even MORE immune cells, & on & on...!<sup>29</sup>

Your inflamed alveoli try to flush the invaders out with protective fluids, until they're swollen with pus. This causes a suffocating state called PNEUMONIA, where your infected alveolar sacs struggle to keep exchanging  $O_2/CO_2$  through their damaged walls. Without treatment, this can end in death.



# Meanwhile...

...SARS-CoV-2 spreads into your CIRCULATORY SYSTEM, triggering your blood to form MICRO CLOTS while attacking the ENDOTHELIAL LINING.<sup>32</sup>

That's the thin layer of cells lining every artery, vein, and capillary that normally keeps all your blood and tissues functioning.

Vascular damage like this damages EVERY part of you.

Even "mild" initial COVID-19 infections travel through the bloodstream to injure your BRAIN, HEART, & other critical organs - whether you notice that damage or not.<sup>33</sup>

