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New Jersey Agricultural Experiment Station

A Food Microbiologist Thinks About COVID-19

Don Schaffner

Distinguished Professor and Extension Specialist

Huh?

- What does a food microbiologist know about SARS-CoV-2 or COVID-19?
  - Microbial risk
  - Handwashing
  - Cross-contamination
- Why would I care?
  - Extension Specialist in Food Science
  - Lots of concern from the public/news media
  - Exceeds “5 sec rule” levels of engagement

My pandemic life on twitter (@bugcounter)

- Saturday, Mar 14th, 2020 (hand sanitizer)
- Monday, Mar 16th, 2020 (Lysoling takeout)
- Wednesday, Mar 25th, 2020 (soap on produce)
- Thursday, Mar 26th, 2020 (sanitizing groceries)
- Saturday, Apr 4th, 2020 (inactivation on surfaces)
- Thursday, Apr 16th, 2020 (transmission)
- Friday, Apr 24th, 2020 (disinfectant wipes)
- Saturday, Apr 25th, 2020 (facemasks)

Saturday, Mar 14th, 2020 (sanitizer)

Monday, Mar 16th, 2020 (takeout)

Don Schaffner @bugcounter · Mar 16

Hey folks, @LexFri asks a great question. I've been doing a ton of conventional media talking about this. Here are a few quick hot takes on Lex's message which is linked here: twitter.com/lexfri/status/... (1/10)

Lex Friedman @lexfri · Mar 16

Replying to @bugcounter

Say more on this! You're not worried about the food being contaminated by kitchen staff? Is hot food better to order than cold?

4 64 101

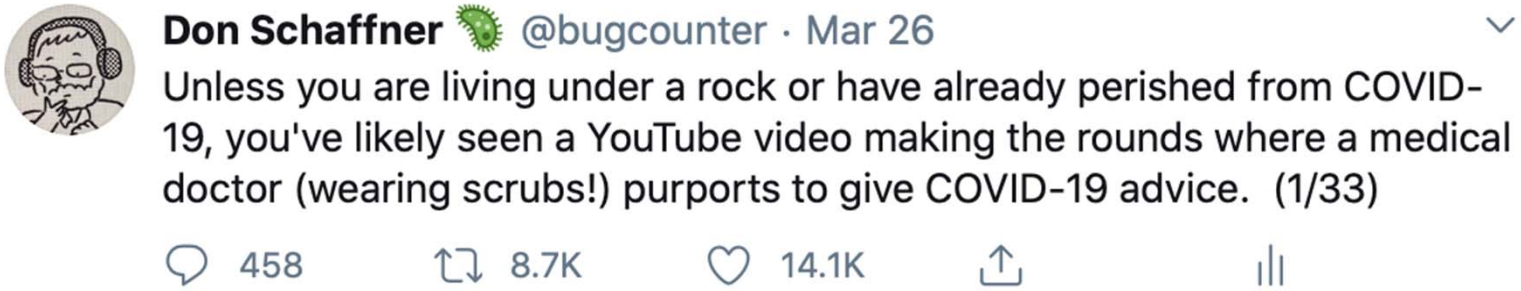
Wednesday, Mar 25th, 2020 (soap)

Don Schaffner @bugcounter · Mar 25

There's a bunch of people out there recommending you wash your fresh produce with soap. This is not a good idea. Soap is known to cause vomiting and or diarrhea. It's for washing hands not for use on food. (1/6)

64 568 1.1K

Thursday, Mar 26th, 2020 (groceries)



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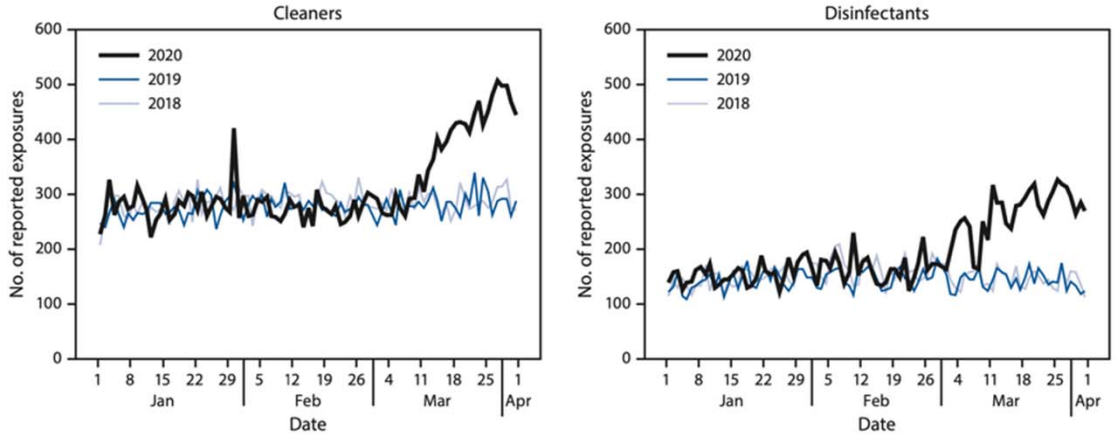
Morbidity and Mortality Weekly Report

Cleaning and Disinfectant Chemical Exposures and Temporal Associations with COVID-19 — National Poison Data System, United States, January 1, 2020–March 31, 2020

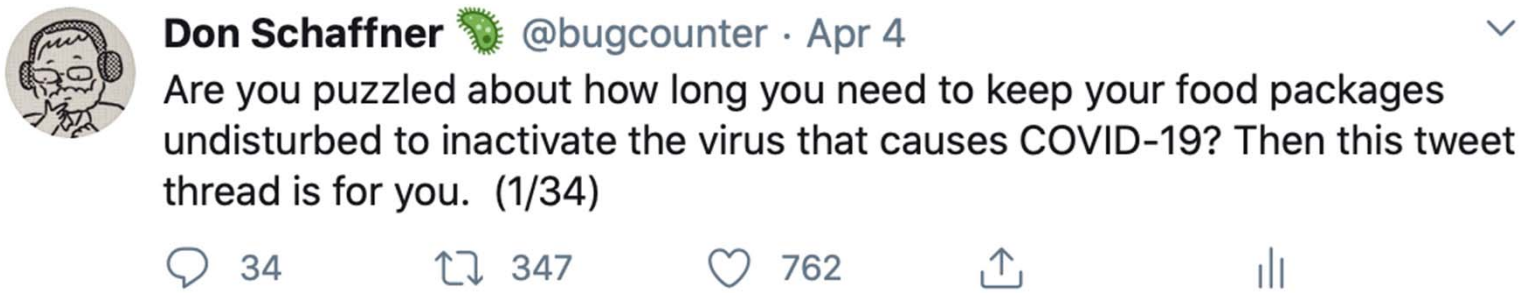
Arthur Chang, MD[1]; Amy H. Schnall, MPH[1]; Royal Law, PhD[2]; Alvin C. Bronstein, MD[3]; Jeanna M. Marraffa, PharmD[4]; Henry A. Spiller, MS[5]; Hannah L. Hays, MD[5]; Alexandra R. Funk, PharmD[5]; Maria Mercurio-Zappala, MS[6]; Diane P. Calello, MD[7]; Alfred Aleguas, PharmD[8]; Douglas J. Borys, PharmD[9]; Tegan Boehmer, PhD[1]; Erik Svendsen, PhD[1]

FIGURE. Number of daily exposures to cleaners and disinfectants reported to U.S. poison centers — United States, January–March 2018, 2019, and 2020*,†



* Excluding February 29, 2020.
† Increase in exposures to cleaners on January 29, 2020, came from an unintentional exposure to a cleaning agent within a school.

Saturday, Apr 4th, 2020 (surfaces)



How long does the virus survive?

- Public Health Responses to COVID-19 Outbreaks on Cruise Ships — Worldwide, February–March 2020, MMWR March 23, 2020
- PCR based?
- False positive?
- Ct value?

and crew. SARS-CoV-2 RNA was identified on a variety of surfaces in cabins of both symptomatic and asymptomatic infected passengers up to 17 days after cabins were vacated on the Diamond Princess but before disinfection procedures had been conducted (Takuya Yamagishi, National Institute of Infectious Diseases, personal communication, 2020). Although

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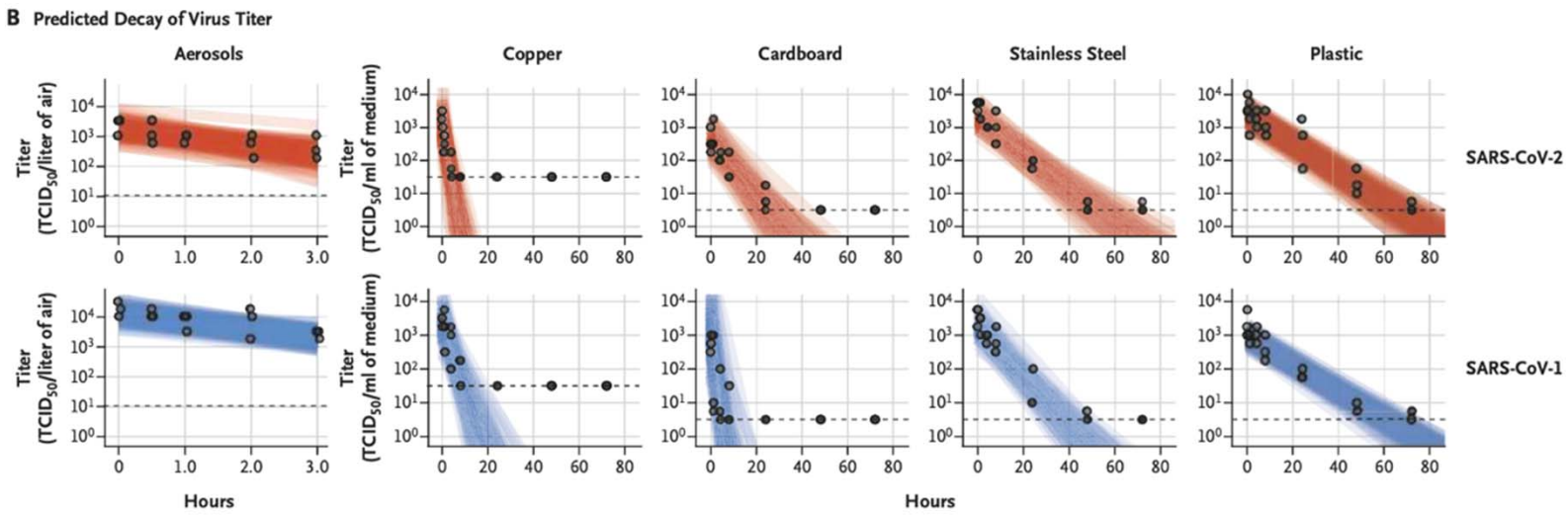
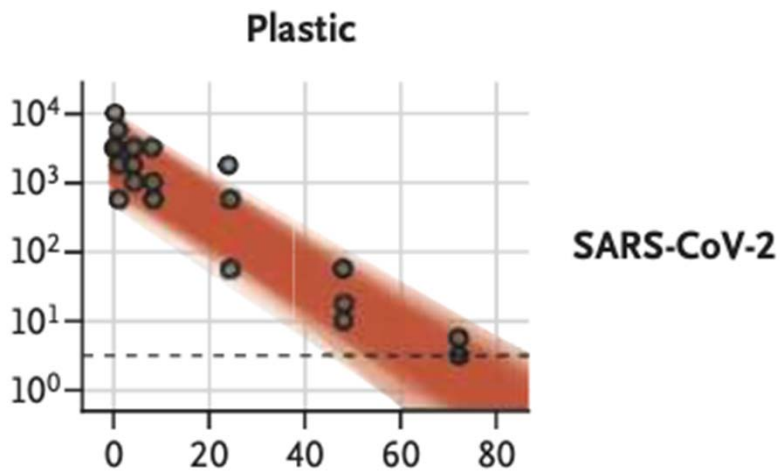
How long does the virus survive?

- NEJM article says half life of 7 hours (worst case)
- Uses $TCID_{50}$ Method



How long does the virus survive?

- It's not about the <u>time</u>
  - Starting level
  - Limit of detection
- It's about the <u>rate</u>
  - Half life
    - 1000, 500, 250, 125, etc.
  - D value (decimal log reduction)
    - 1000, 100, 10, 1, 0.1 etc.
    - What is 0.1 virus?



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It's the friends you've made along the way…

Exaggerated risk of transmission of COVID-19 by fomites

Published Online
July 3, 2020
https://doi.org/10.1016/S1473-3099(20)30561-2

This online publication has been corrected. The corrected version first appeared at thelancet.com/infection on July 30, 2020

A clinically significant risk of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) transmission by fomites (inanimate surfaces or objects) has been assumed on the basis of studies that have little resemblance to real-life scenarios.

The longest survival (6 days) of severe acute respiratory syndrome coronavirus (SARS-CoV) on surfaces was done by placing a very large initial virus titre sample (10^7 infectious virus particles) on the surface being tested.[1] Another study that claimed survival of 4 days used a similarly large sample (10^6 infectious virus particles) on the surface.[2] A report by van Doremalen and colleagues found survival of both SARS-CoV and SARS-CoV-2 of up to 2 days (on surfaces) and 3 days (in aerosols generated in the laboratory), but again with a large inoculum (10^5–10^7 infectious virus particles per mL in aerosols, 10^4 infectious virus particles on surfaces).[3] Yet another study found long survival (5 days) of human coronavirus 229E on surfaces with what I would still consider a substantially large viral load (10^3 plaque-forming units) in a cell lysate.[4] However, using a cell lysate rather than purified or semipurified virus might enable initial viral proliferation or protection from the effects of the sample drying out.

None of these studies present scenarios akin to real-life situations. Although I did not find measurements of coronavirus quantities in aerosol droplets from patients, the amount of influenza virus RNA in aerosols has been measured, with a concentration equivalent to 10–100 viral particles in a droplet, with even fewer infectious influenza virus particles capable of growth in a plaque assay.[5] By contrast, one study found human coronavirus 229E to survive for only 3–6 h (depending on the surface tested), and human coronavirus OC43 to survive for 1 h, after drying on various surfaces including aluminum, sterile latex surgical gloves, and

Can I buy a ticket to the Hygiene Theatre?

- Schaffner told me, “In the entire peer-reviewed COVID-19 literature, I’ve found maybe one truly plausible report, in Singapore, of fomite transmission. And even there, it is not a slam-dunk case. ”

IDEAS

Hygiene Theater Is a Huge Waste of Time

People are power scrubbing their way to a false sense of security.

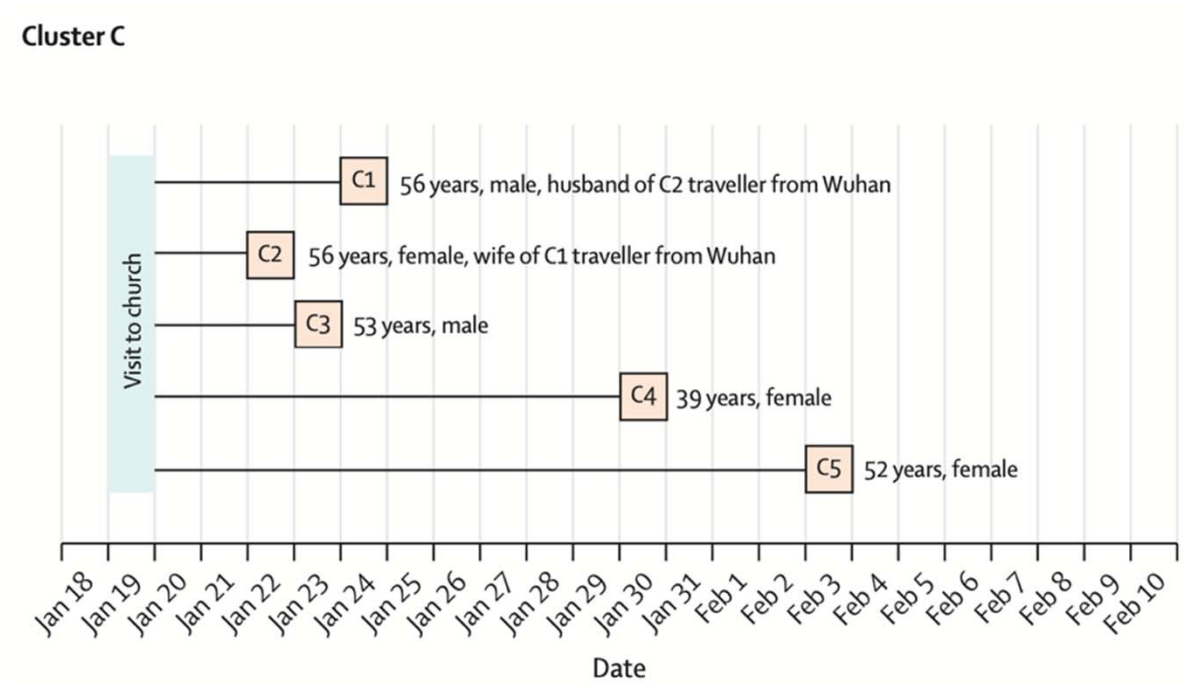
JULY 27, 2020

Derek Thompson

Staff writer at *The Atlantic*

Fomite (object) transmission

- Lancet, March 28, 2020, page 1039
- Box marks date of symptom onset
- C5 occupied the same seat as C1 and C2 at the prayer meeting after the morning service.
- Possible transmission from the seat or surrounding area, separated by a short but unreported amount of time.



Even I can be a virologist

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ENVIRONMENTAL MICROBIOLOGY

Check for updates

Modeling the Inactivation of Viruses from the *Coronaviridae* Family in Response to Temperature and Relative Humidity in Suspensions or on Surfaces

Laurent Guillier,[a] Sandra Martin-Latil,[b] Estelle Chaix,[a] Anne Thébault,[a] Nicole Pavio,[c] Sophie Le Poder,[c] on behalf of Covid-19 Emergency Collective Expert Appraisal Group, Christophe Batéjat,[d] Fabrice Biot,[e] Lionel Koch,[e] Don Schaffner,[f] Moez Sanaa[a]

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[e]Bacteriology Unit, French Armed Forces Biomedical Research Institute (IRBA), Brétigny-sur-Orge, France
[f]Department of Food Science, Rutgers University, New Brunswick, New Jersey, USA

Temperature matters

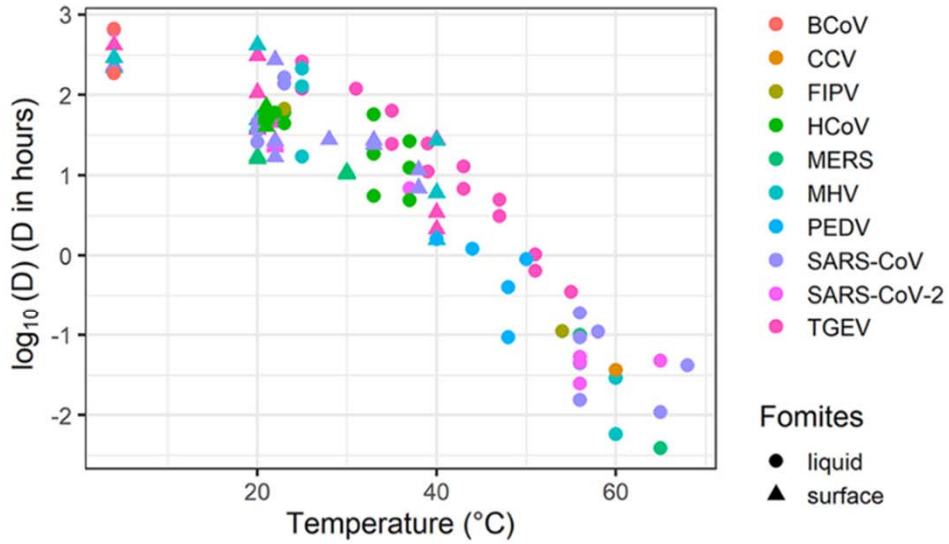

FIG 1 Decimal reduction times of 10 coronaviruses according to temperature in suspension or on inert surfaces.

Now I'm a funded virologist

- FoodCoVNET: A collaborative approach to managing SARS-CoV-2 within the food industry; filling data gaps and impacting behaviors

FoodCoVNET objectives

- Catalog, collate, review, and rapidly disseminate existing SARS-CoV-2 information
- Identify COVID-19 management knowledge gaps related to the food industry
- Utilize surrogate organisms and SARS-CoV-2 to characterize virus survival and spread
- Translate new knowledge incorporated with existing data into evidence-based best practices and promote risk reduction
- Evaluate to document project impact and repeat

Objective 3

- Study transfer and survival relevant to the food industry

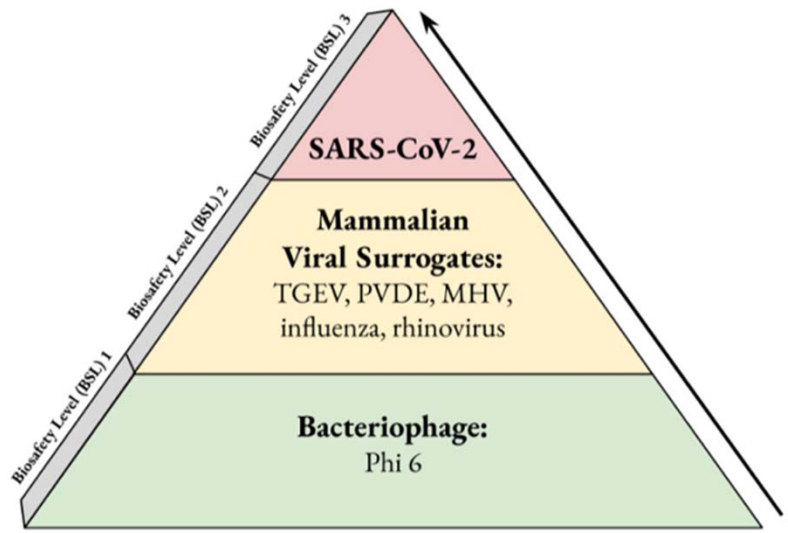

Figure 3. Microbiological approaches moving from surrogates to target pathogen (Objective 3).

Future directions

- SARS-CoV-2 quantitative microbial risk assessment for conditions relevant to the food industry