



How the pandemic has changed the medical perception of safe indoor air

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- Work:
 - Aerosol medicine research group leader in Helsinki University Hospital
- Funding:
 - Business Finland Co Innovation Fund 7/2021 – 4/2024
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 - Jalmari ja Rauha Ahokas Foundation 1/2021 – 5/2021
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- Collaborations:
 - Podiatri-podcast (Boehringer Ingelheim)
 - Teva-talk expert (Teva Ratiopharm)
 - Lectures (Lääkäriliitto, Terveystalo, AbbVie, Orion, Roche)



AGENDA: How the pandemic has changed the medical perception of safe indoor air



Overview

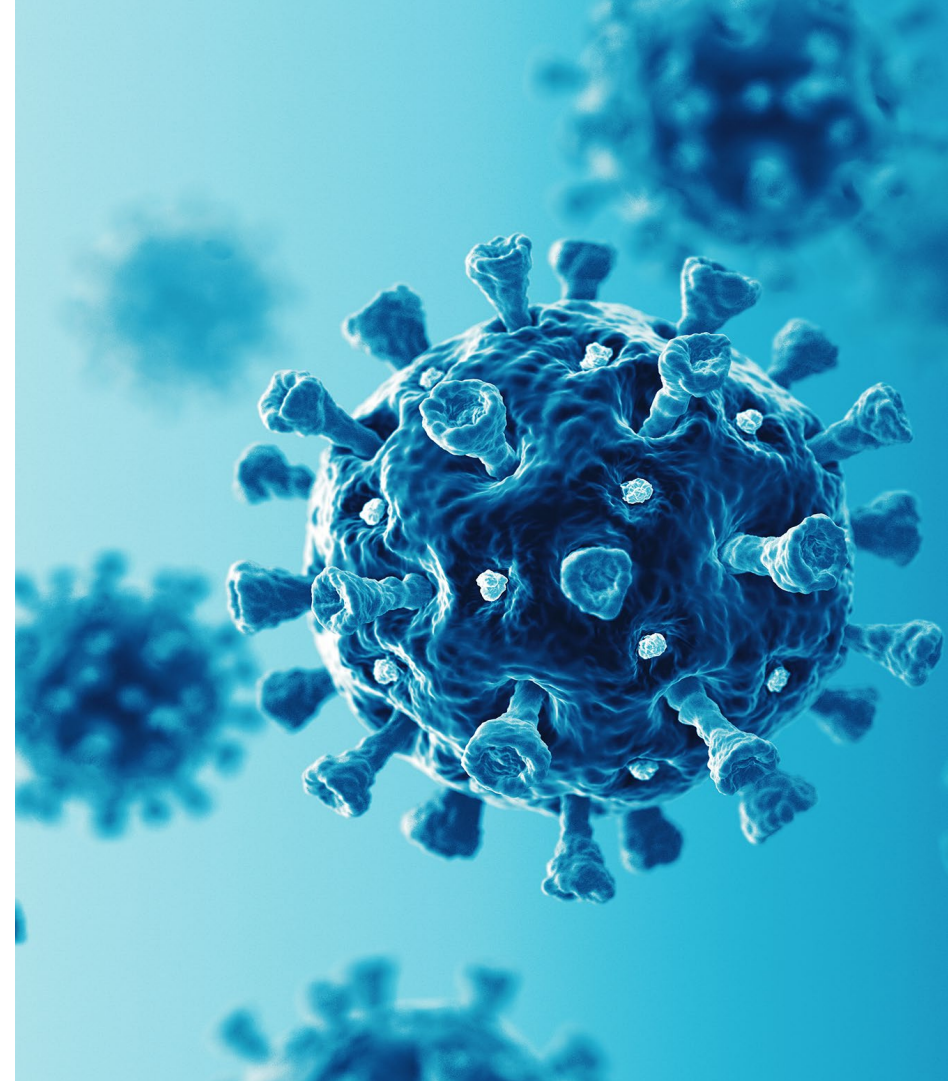


Examples : Prevention of infectious diseases

- Literature
- Own research



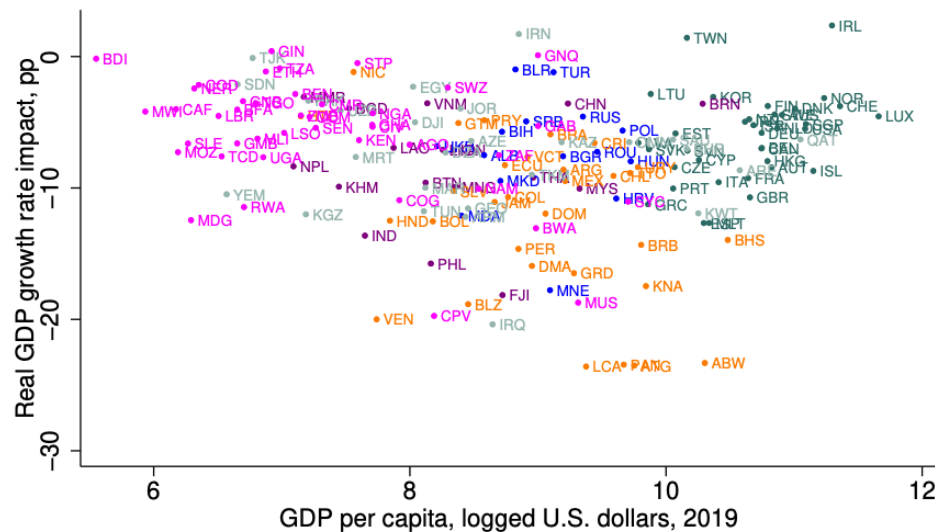
Summary





How pandemic changed our society?

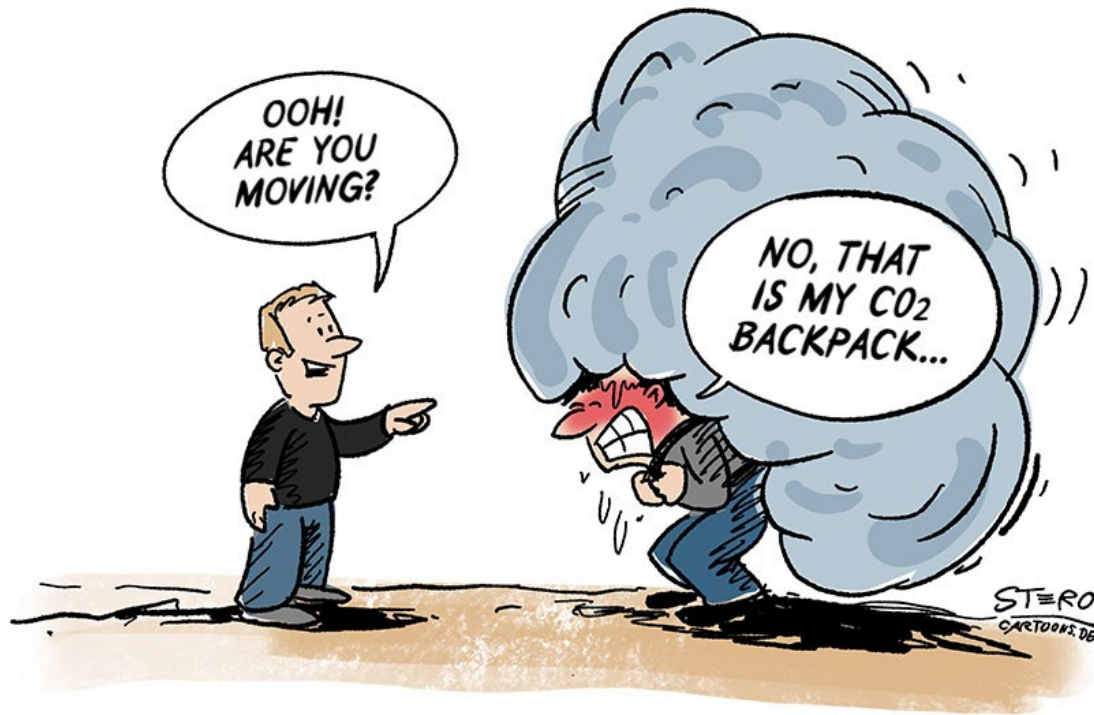
COVID-19 impact on GDP by country



- Advanced
- E&D Europe
- E&D Middle East and Central Asia
- E&D Asia
- E&D Latin America and Caribbean
- E&D Sub-Saharan Africa

- Employment/sickness absences
- GDP
- Inequality
- Hospital, diagnostic costs, etc
- Different sectors (event and tourism)
- Long-term disadvantages

BEFORE 2020

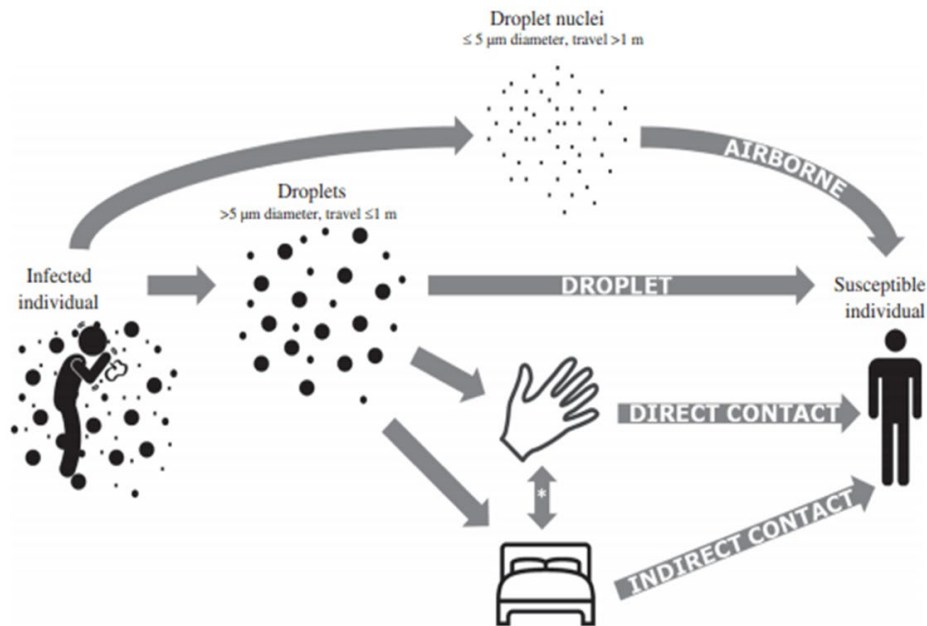


AFTER 2020



Disease transmission

- The majority of pathogens (more than 80%) are carried along with particles smaller than $5\ \mu\text{m}$



* Transmission routes involving a combination of hand & surface = indirect contact.

Examples: Prevention of
infectious diseases





RESEARCH

REVIEW SUMMARY

CORONAVIRUS

Airborne transmission of respiratory viruses

Chia C. Wang*, Kimberly A. Prather*, Josué Sznitman, Jose L. Jimenez, Seema S. Lakdawala, Zeynep Tufekci, Linsey C. Marr

THE LANCET

Ten scientific reasons in support of airborne transmission of SARS-CoV-2

Trisha Greenhalgh^a ✉, Jose L Jimenez^b, Kimberly A Prather^c, Zeynep Tufekci^d, David Fisman^e, Robert Schooley^f



International Journal of
*Environmental Research
and Public Health*



Article

Airborne or Fomite Transmission for Norovirus?
A Case Study Revisited

Shenglan Xiao^{1,*} , Julian W. Tang^{2,3} and Yuguo Li¹



ELSEVIER

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevier.com/locate/jhin



Detection of influenza virus in air samples of patient rooms

A. Chamseddine^a, N. Soudani^{b,c}, Z. Kanafani^d, I. Alameddine^a, G. Dbaibo^e, H. Zaraket^b, M. El-Fadel^{a,*}



Human Influenza Resulting from Aerosol Inhalation

[Robert H. Alford](#), [Julius A. Kasel](#), [Peter J. Gerone](#), more...

First Published July 1, 1966 | Research Article

Volunteers were given A2 influenza virus in a small-particle aerosol. Infection and typical influenza resulted from low doses of virus administered in this manner. Low levels of serum neutralizing antibody were not completely effective in preventing infection and illness. The human infectious dose of this influenza strain when administered by aerosol to subjects free of serum neutralizing antibody was approximately 3 TCID₅₀.

nature communications

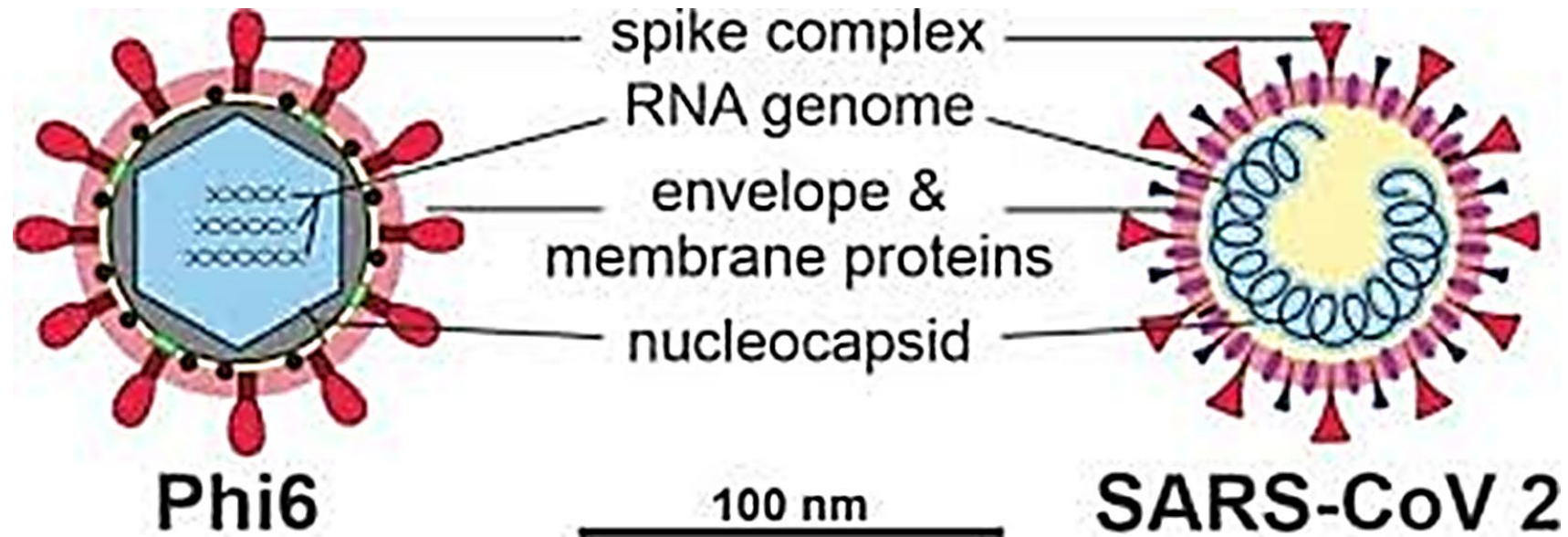
SARS-CoV-2 disease severity and transmission efficiency is increased for airborne compared to fomite exposure in Syrian hamsters

Transmission of SARS-CoV-2 is driven by contact, fomite, and airborne transmission. The relative contribution of different transmission routes remains subject to debate. Here, we show Syrian hamsters are susceptible to SARS-CoV-2 infection through intranasal, aerosol and fomite exposure. Different routes of exposure present with distinct disease manifestations. Intranasal and aerosol inoculation causes severe respiratory pathology, higher virus loads and increased weight loss. In contrast, fomite exposure leads to milder disease manifestation characterized by an anti-inflammatory immune state and delayed shedding pattern. Whereas the overall magnitude of respiratory virus shedding is not linked to disease severity, the onset of shedding is. Early shedding is linked to an increase in disease severity. Airborne transmission is more efficient than fomite transmission and dependent on the direction of the airflow. Carefully characterized SARS-CoV-2 transmission models will

Limiting the virus transmission in the restaurant



Methods: phi6 as a stuntman



ORIGINAL ARTICLE

WILEY

Combining Phi6 as a surrogate virus and computational large-eddy simulations to study airborne transmission of SARS-CoV-2 in a restaurant

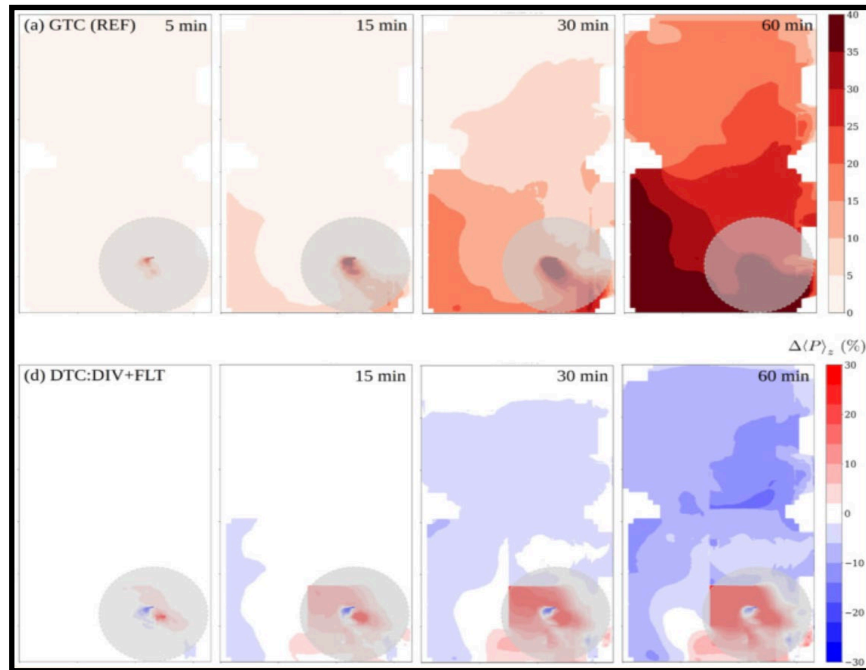
Lotta Oksanen^{1,2} | Mikko Auvinen³ | Joel Kuula³ | Rasmus Malmgren⁴ |
 Martin Romantschuk^{4,5} | Antti Hyvärinen³ | Sirpa Laitinen⁶ | Leena Maunula⁷ |
 Enni Sanmark^{1,2} | Ahmed Geneid^{1,2} | Svetlana Sofieva^{3,4} | Julija Salokas⁴ |
 Helin Veskiväli⁴ | Tarja Sironen^{8,9} | Tiia Grönholm³ | Antti Hellsten³ |
 Nina Atanasova^{3,4}

RESEARCH ARTICLE | JANUARY 19 2022

High-resolution large-eddy simulation of indoor turbulence and its effect on airborne transmission of respiratory pathogens—Model validation and infection probability analysis

Special Collection: Flow and the Virus

Mikko Auvinen | Joel Kuula | Tia Grönholm | Matthias Sühring | Antti Hellsten



- Using air purifiers can reduce the infection risk by >30%
- With improved air hygiene we can reduce infections and allow social contact



Limiting virus transmission in the daycare



Limiting virus transmission in the daycare: why is this important?



- Small children get up to 10–13 viral infections per year, and these can last 1–3 weeks



- The cost of work absence for companies = €476/per day in a company with 200 employees and an average salary of €3000/month

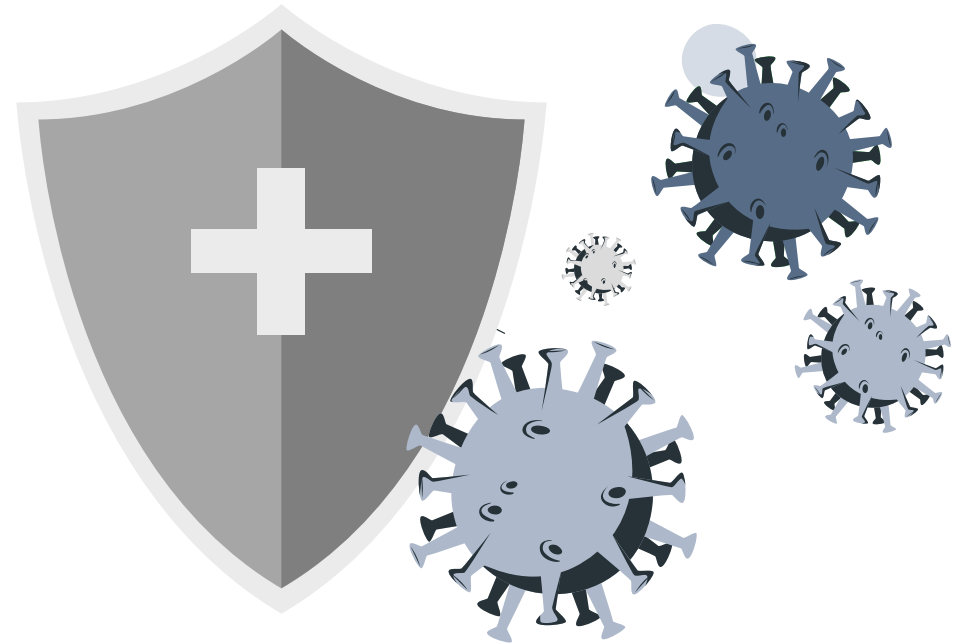


- Illness in a child is associated with extensive productivity losses due to parental work absenteeism

Summary

As in medicine:

Prevention is better than cure.
We need new innovations to
protect against common
infections



Thank you!



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