

Increased Indoor Exposure to Commonly Used Disinfectants during the COVID-19 Pandemic

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Disinfecting during the pandemic

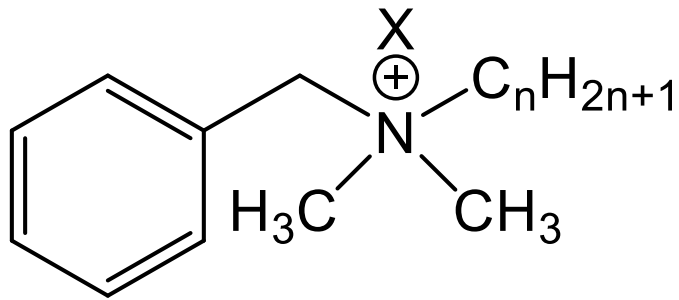


*C&EN
Penn Medicine
National Guard*

Quaternary ammonium compounds (QACs)

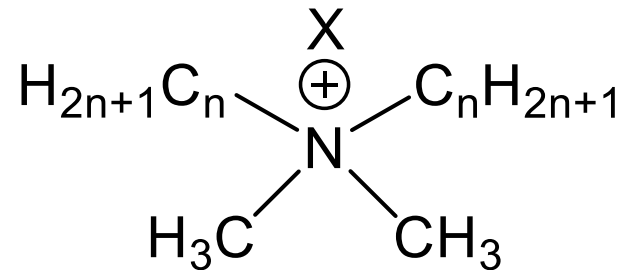
- U.S. EPA **List N** has 430 products listed effective for SARS-CoV-2
- QACs are active ingredients in ~200 products
- Have been in use for decades
- Cationic surfactants, used in cleaning products, biocides, personal care, medical and pharmaceutical products, textiles.

Three major QAC groups



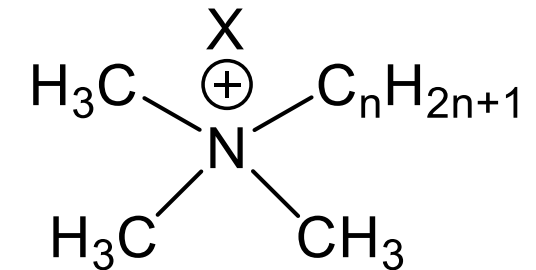
n=6, 8, 10, 12, 14, 16, 18

Benzylalkyldimethyl
ammonium compounds (BACs)



n=8, 10, 12, 14, 16, 18

Dialkyldimethyl ammonium
compounds (DDACs)



n=8, 10, 12, 14, 16, 18

Alkyltrimethyl ammonium
compounds (ATMACs)

X = chloride or bromide

Environmental occurrence and toxicity

- Detected in wastewater, sludge, surface waters, sediments, soils
- Birth defects, lipid metabolism, developmental toxicity, asthmagens
- Human exposure pathways and health effects are unknown.

Objectives

- Investigate the occurrence of 19 QACs in residential dust
- Compare the levels in dust collected before and during the outbreak of COVID-19
- Evaluate the effects of using disinfecting products and disinfection frequency on the levels of QACs in the indoor environment

Study design

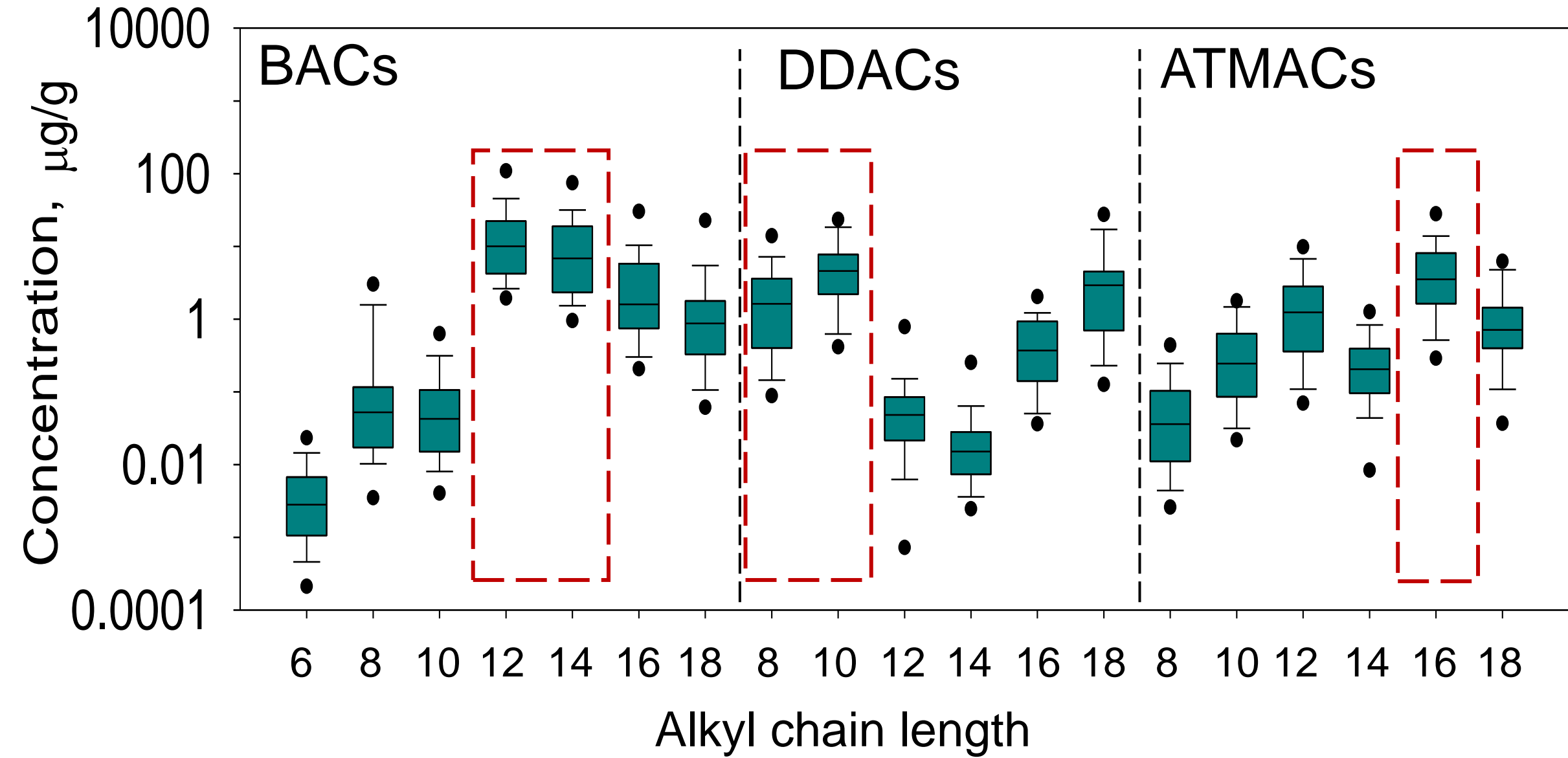
Sample collection (all near Bloomington, IN)

- Dust collected before the pandemic (2018-2019, n=21)
- Dust collected during the pandemic (June 2020, n = 40)
- Disinfecting products (sprays and wipes, n = 7)

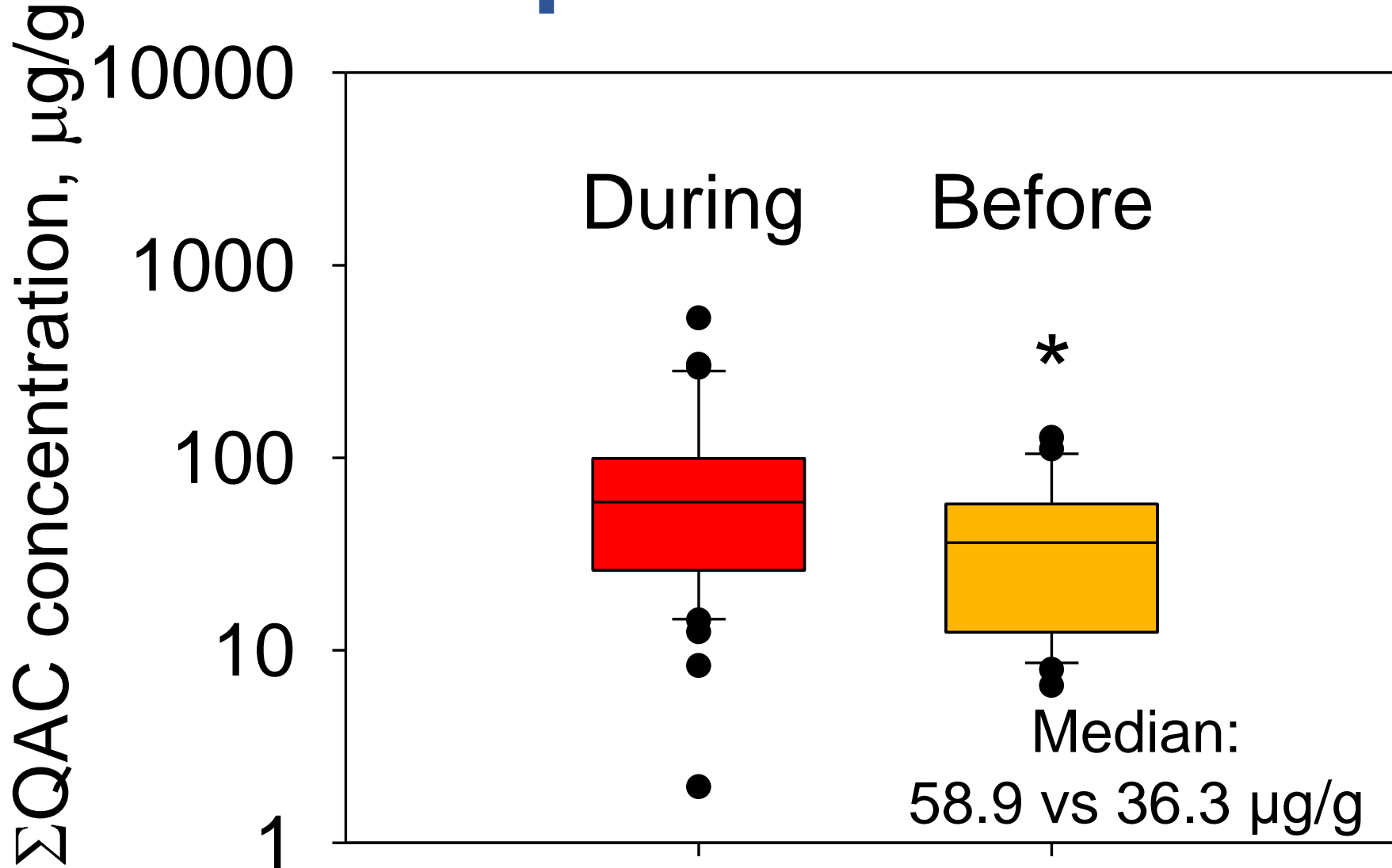
Survey information

- Products used in homes
- Disinfecting practices (before vs. during the pandemic)
- Disinfection frequency (during the pandemic)

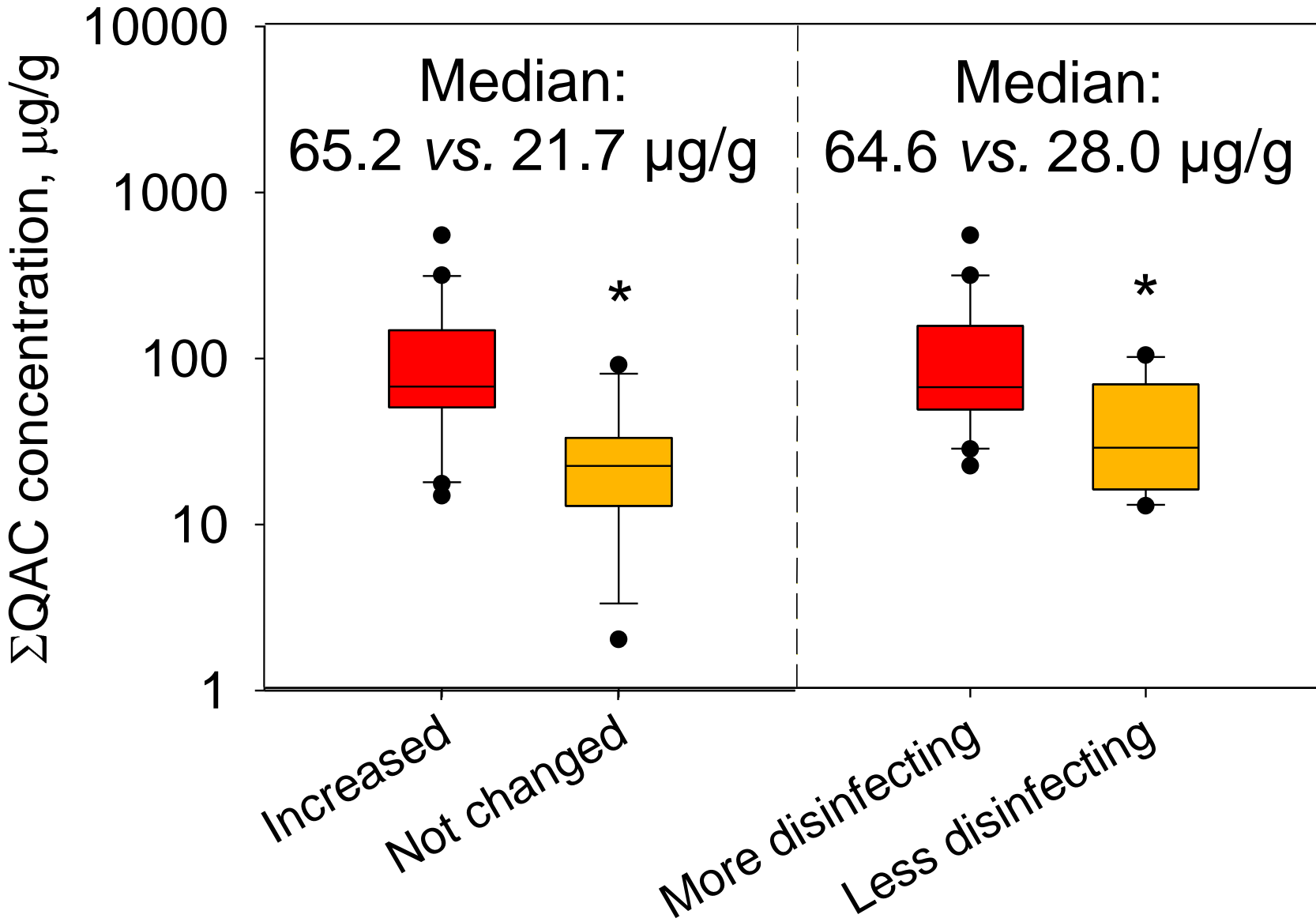
Concentrations



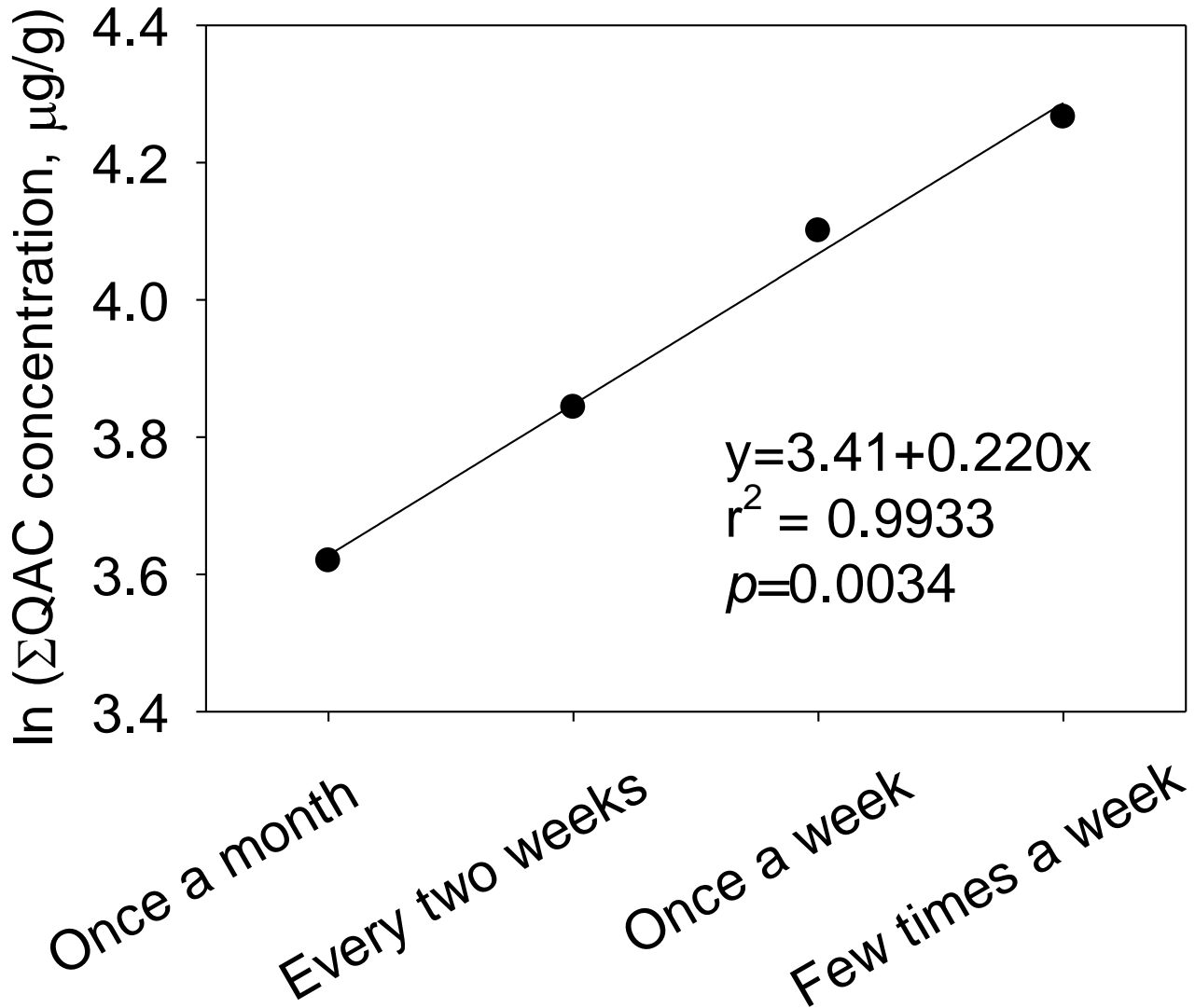
QAC levels are higher during the pandemic



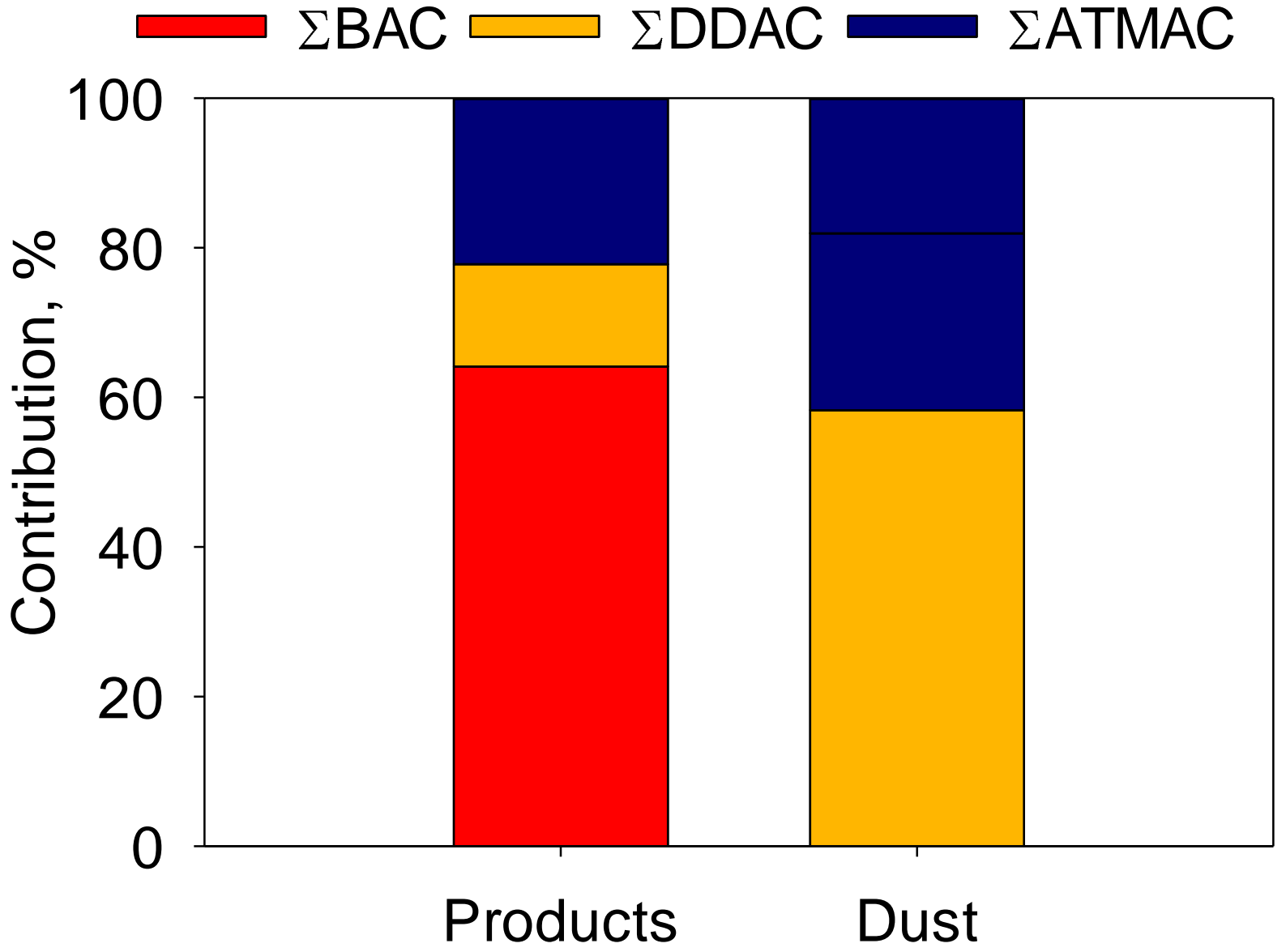
The effect of disinfecting practices



The effect of disinfecting practices



Disinfecting products may be a significant source



Conclusions

- The indoor exposure to QACs is widespread.
- QAC levels are significantly higher in dust collected during the pandemic.
- QAC levels are significantly higher in homes with higher disinfecting frequencies.
- Disinfecting products can be a significant source of QACs in homes.

Acknowledgements



<http://www.MapMyEnvironment.com>

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