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Sewage surveillance of COVID-19

Bridging Science to Practice

Towards a Water-wise World
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• The value of sewage surveillance for SARS Coronavirus 2
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Sewage Surveillance for other viruses

Poliovirus
- absence of virus circulation in (unvaccinated) population
- early warning outbreaks

Adenovirus, norovirus, rotavirus, parechovirus, enterovirus, astroviruses, hepatitis A and E viruses
- early warning outbreaks
- virus circulation in population
- virus genotypes circulating in population
SARS 2 pandemic 2019/20

Proportion of people with COVID-19 have diarrhea and shed virus with stool

SARS Coronavirus 2 detectable in sewage?

Sewage surveillance to complement health surveillance?
Sewage surveillance: tool to study virus circulation? Early warning?
Sewage sampling at WWTP inlet: surveillance of large populations
Is it sensitive enough?
Concentration and purification of SARS-CoV-2 from sewage

Extraction of virus RNA
RT-qPCR against 4 targets (CDC N1, N2, N3; Corman et al. 2020 E)
Concentration and RT-PCR controls
Sewage surveillance at WWTP in the Netherlands

- Clear increase in reported cases coincides with increase in concentration in wastewater
- Two other WWTP: virus detected in wastewater 6 days before first reported case
- Now national surveillance (RIVM)
Location of institutes (planning) sewage surveillance of COVID-19
How could we use these data?

Trends in virus circulation in communities?

- Trends/changes: early warning virus circulation starts?
  - Yes: appears to be sensitive and fast enough

- Trends/changes: early warning virus circulation increases again as we move out of lockdown?
  - Maybe: how far does RNA signal drop as prevalence in community drops?
  - Correlation with health surveillance datasets: virus/disease/antibody surveillance of the community?
  - What level of RNA signal rise or drop is informative?
Health risk to workers?

- No epidemiological signals SARS1, SARS2
- No case reports SARS1, SARS2
- What we detected ≠ infectious virus
- Are SARS-CoV 2 shed in stool infectious?
  - Limited evidence indicates: not very
- Survival in wastewater?
  - Virus is not robust in wastewater
  - Limited evidence SARS1: 2d 20°C, 2w 4°C
  - Limited evidence: not/low in effluent
- Advice: standard personal protection is safe
Health risk downstream?

- No epidemiological signals SARS1, SARS2
- No case reports SARS1, SARS2
- What we detected ≠ infectious virus
- Are SARS-CoV 2 shed in stool infectious?
  - Limited evidence indicates: not very
- Survival in water?
  - Wastewater? CSOs?
  - Virus is not robust in warm water
  - Beach safety checked with safety plan and faecal indicator bacteria
  - SARS-CoV-2 less robust than the other, known waterborne viruses (such as Norovirus).
  - Safely managed beaches = risks of faecal contamination managed = risk of SARS-CoV-2
Is drinking water safe?

• YES

• How can we say that?
• Because we know about other viruses…
• … that survive better in sewage and water…
• … are more resistant to disinfection…
• … and have confirmed that our drinking water supply systems can adequately remove/inactivate these
With the help of:

Dutch Water Authorities