On-Campus Wastewater Sampling for SARS-CoV-2

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Wastewater-Based Epidemiology

How does it work?
Fecal Shedding of SARS-CoV-2

1. INFECTION
   An individual becomes infected with COVID-19 and can be symptomatic or asymptomatic.

2. FECAL SHEDDING
   Fragments of the virus are released in the feces of infected individuals.

3. WASTEWATER DETECTION
   Fragments of the virus are detected downstream in wastewater.
Building-Level Isolation of Viral Signal

UPSTREAM SITE 1
Monitors building A

UPSTREAM SITE 2
Monitors building A and B

UPSTREAM SITE 3
Monitors building C

DOWNSTREAM SITE
Monitors building A, B and C

Sewer configuration allows us to target individual buildings and group them together.
Where is on-campus sampling taking place?
Campus Buildings Under Wastewater Surveillance

North Campus:
- Ron Eydt Village (REV)
  - All quads
  - General complex
- Mackenzie King Village (MKV)
- Tutor House Complex (TH)
- Village 1 (V1)
  - All quads
  - General complex
- Federation Hall (FED)
- University Clubs (UC)

South Campus:
- Claudette Miller Hall (CMH)
- Eby Hall (EH)
- Beck Hall (BH)
- Waterloo Court (WAT)
- Woolwich Court (WOL)
- Wellesley Court (WEL)
- Wilmot Court (WIL)
- UWP General Complex
How do we know where a positive signal may have originated from?
Scenario tables for each sampling site were established to target which buildings a positive signal may have originated from. Sewer configuration places limitations on building specificity. Therefore, some buildings must be treated as a group.

<table>
<thead>
<tr>
<th>Scenario No.</th>
<th>Description</th>
<th>Interpretation</th>
<th>Target Buildings [Population Targeted]</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>SM148-UWP (+)</td>
<td>Confirmed Signal (+)</td>
<td>WOL BH</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Possible Signal (?)</td>
<td>WAT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Excluded Signal (-)</td>
<td>N/A</td>
</tr>
<tr>
<td>4.2</td>
<td>SM148-UWP (-)</td>
<td>WAT</td>
<td>WOL BH [825]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N/A</td>
<td>WAT [250]</td>
</tr>
</tbody>
</table>
How often is wastewater being tested?
Sampling Frequency

Sampling takes place 3 times per week (Monday, Wednesday, Friday).

Samplers are deployed for 24 hour periods.

For example, a sampler deployed on Sunday at 8AM will be collected on Monday at 8AM. The results for the sample will represent that 24 hour period.

The Housing Team and Safety Office would be notified Monday night of the results for each sampling site.
Can we tell how many people are infected based on wastewater data?
Both symptomatic and asymptomatic individuals who are infected with COVID-19 will shed fragments of the virus via their feces. The rate at which these fragments are shed is highly variable from person to person. The stage at which a person is infected also influences shedding rate, where peak shedding occurs about 5 days after infection, then begins to plateau.

For these reasons, there is no way to tell how many people have contributed to the magnitude of a positive signal. For example, one person shedding at a high rate could theoretically produce the same signal magnitude as 20 people shedding at lower rates.
What does a positive result really mean?
Interpreting Positive Results

A positive result means:
- At least one person who used the bathroom in a given building (or buildings) within the 24 hour sampling period is actively infected with COVID-19.

A positive result does NOT tell us:
- How many people are infected
- Who is infected (i.e. specific person or persons, staff, student, visitor)
- If the infected person(s) is/are symptomatic or asymptomatic
- The stage of the infection
How accurate are the results?
The PCR test used to analyze wastewater samples is highly specific for detecting COVID-19 gene fragments. It is the same type of test used to confirm clinical cases. Quality assurance and quality controls ensure that a positive signal has originated from the wastewater sample and not some other source (i.e. lab contamination).

The chances of a false positive result are extremely rare and unlikely. It is much more likely to miss a positive result.
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