Wastewater Surveillance of SARS-CoV-2 Prevalence in Chico State On-Campus Resident Population

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Introduction

Wastewater surveillance is an effective epidemiological tool that can be utilized to track prevalence of SARS-CoV-2 within a given community. SARS-CoV-2 viral shed begins shortly after initial infection and usually precedes symptom onset by several days [1]. Thus, analysis of shed viral RNA in sampled wastewaters can offer advance notice of impending case number increases [2,3]. Additionally, wastewater surveillance is advantageous in that it collects samples from an entire established community, regardless of individuals' symptom presentation or access to healthcare. CSU Chico launched its own wastewater surveillance system in August of 2021 to evaluate the prevalence of SARS-CoV-2 in the on-campus resident population and help inform campus-wide public health measures. Data obtained from this surveillance study have demonstrated trends that illustrate both the efficacy of campus-wide prevention measures and the circulation patterns of the virus during laboratory-confirmed dormitory outbreaks.

Materials & Methods

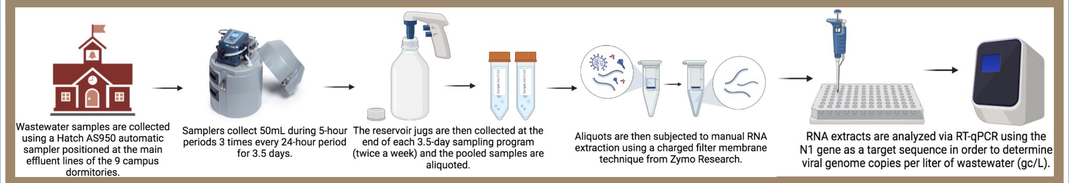


Figure 1. Overview of methods used to collect and extract RNA from the campus dormitories. Trends in gc/L are considered over the span of at least 3 data points to account for inherent variability in these environmental samples.

Results

(A) University Village North (UV North, black): quarantine dormitory for confirmed resident student cases. Samples collected reflect wastewater concentrations of known positive populations and serves as a positive control measure.

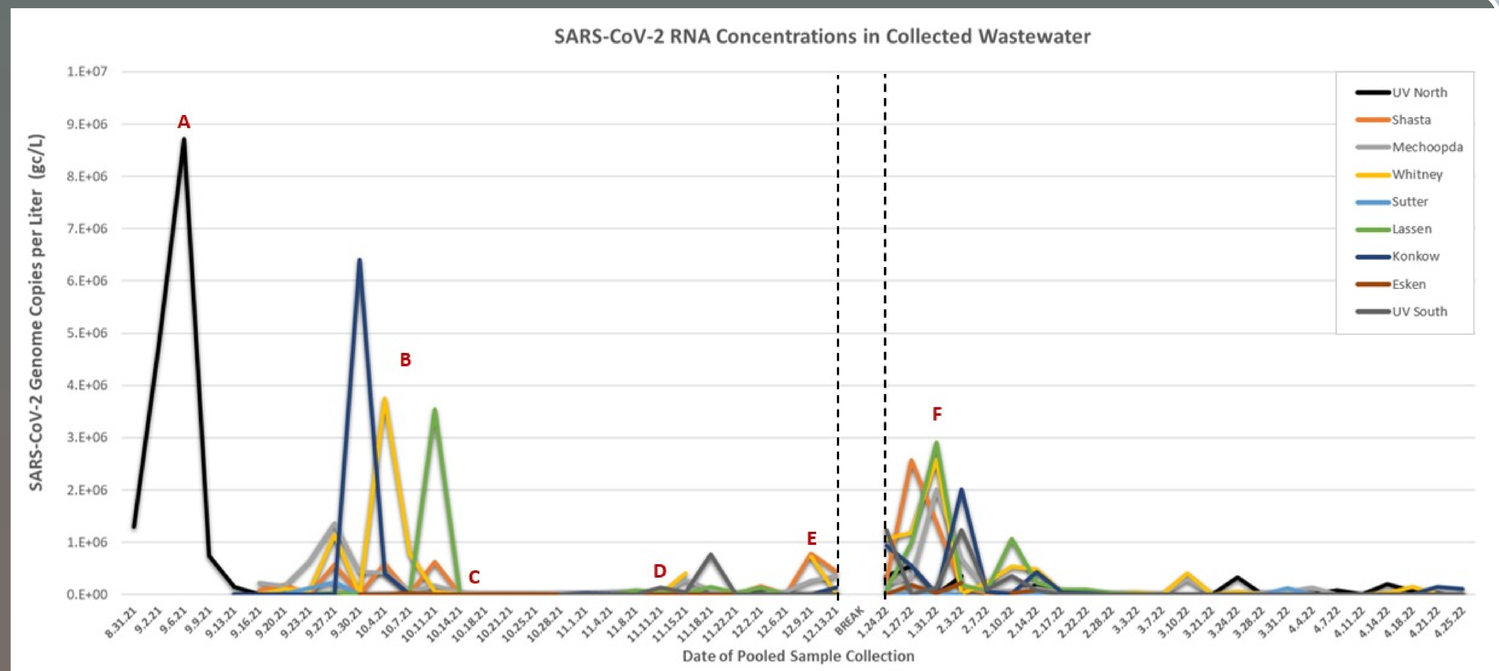
(B) Sporadic sharp increases in concentrations highlight the variability of these environmental samples, thus affirming the value in evaluating data points collectively for trends. Sustained, increased trends were observed during this time and campus pandemic preparedness teams were alerted to such increases.

(C) 10.14.22: Two weeks past the campus-wide vaccine mandate deadline, a time at which campus was afforded a maximally protected student population.

(D) 11.11.22: First observed sustained increase in RNA concentration since 10.14.22 for 4 different dorms, including Whitney (yellow) which was removed for maintenance after 11.15.22.

(E) 12.9.21: Whitney back in use. By this date, several dorms had reports of symptomatic and confirmed cases in residence.

(F) The beginning of the Spring 2022 semester demonstrated expected increases in RNA concentrations for all dorms sampled.



Conclusions

- The dramatic and sustained decrease in RNA concentration observed 2 weeks after the campus vaccine mandate deadline demonstrates the efficacy of Chico State's pandemic policies in decreasing the spread of the SARS-CoV-2 virus
- The predictive power of wastewater surveillance is highlighted in the observed increase in RNA concentrations preceding reports of symptomatic and confirmed positive students
- Increased trends in RNA concentration in early November pre-date the first reported case of Omicron to Butte County by several weeks. Further investigation is needed to evaluate these samples for the presence of SARS-CoV-2 variants of concern
- Increased RNA shed coupled with decreased confirmed cases (as measured by populations within quarantine dorms) observed in early Spring 2022 semester demonstrate the differences in transmissibility and clinical severity of SARS-CoV-2 variants of concern, namely, Omicron.

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References

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