

Collaboration on SARS-CoV-2 environmental surveillance in sewage and water environments

Project description

This project aims to transfer Australian innovation in the environmental surveillance of SARS-CoV-2 to support the Governments of five countries in the Mekong sub-region (including Vietnam, Cambodia, Laos, Myanmar, and Thailand) to prepare, respond and recover from the COVID-19 pandemic.

This transfer will support each Government's efforts to monitor SARS-CoV-2 prevalence in water environments (primarily sewage and stormwater), to inform COVID-19 control strategies of the Governments and add to their COVID-19 resilience planning toolbox.

Through developing cost-effective earlier warning detection systems for COVID-19 outbreaks in each country, the project will support long term strengthening of health security, systems, stability, social cohesion and economic recovery across the Mekong sub-region.

Background and context

Water Research Australia (WaterRA) is leading a collaborative Australia-wide investigation to integrate sewage testing with health data for SARS-CoV-2. Regular testing is currently taking place in 'nodes' set up across Australia in partnership with relevant health and water agencies. This project will form the Mekong node of the *Collaboration on Sewage Surveillance for SARS-CoV-2 "ColoSSoS"* project.

International and Australian experience shows that these methods can provide a sensitive means of detecting the presence of SARS-CoV-2 being shed into the sewer to help identify infections prior to clinical cases being reported. As such, these provide a useful tool for early warning of re-emergence, second wave or hotspots. In addition, the tools can be used to monitor the effect of COVID-19 control measures and follow the drop and disappearance of the virus from the community. In combination with evidence from clinical testing and other monitoring, environmental testing provides a useful additional tool to inform health authorities and support COVID-19 pandemic control strategies.

Objectives

The objective is to transfer Australian innovation to monitor SARS-CoV-2 in sewage, wastewater and stormwater to Vietnam, Cambodia, Laos, Myanmar, and Thailand to inform COVID-19 Government controls by:

- Sharing best practices on sampling and testing SARS-COV-2 in sewage, wastewater and stormwater.
- Developing tools to integrate data from this project with data from testing individuals to assist Governments of Vietnam, Cambodia, Laos, Myanmar, and Thailand determine the prevalence of COVID-19 and the effect of restrictions.
- Supporting metropolitan, rural and remote communities, and at-risk communities where health infrastructure is limited, by helping best target response investments.
- Supporting routine environmental surveillance for pathogens to provide early warning, enabling governments to implement response actions more quickly and efficiently.
- Facilitating a Mekong knowledge hub for practitioners to gain access to the knowledge generated and share experiences in implementation of the methods.

Supported by:



Australian Government



Methodology and Timeline

This project will be split into two phases. Phase 1 activities include:

1. Weeks 1-4: Establish partnerships and governance arrangements:

- a. Project Management Unit to oversee the day to day delivery of the project
- b. Formation of Project Coordinating Committees (PCC) for each country made up of health and water ministries, R&D agencies, and water utilities. The PCCs will be determined by the existing COVID-19 Surveillance Steering Committee established in each country and coordinate country activities ensuring methods design are integrated within the broader surveillance and response measures of each country. AWA and their partner Associations will provide secretariat for the PCC.
- c. Formation of one on one partnerships and mentoring between:
 - i. Australian and partner labs in Mekong Countries.
 - ii. Australian water utilities and Mekong water utilities.
 - iii. Australian health agencies and Mekong health agencies.

These one on one partnerships will be facilitated by AWA and WRA and report into the PCCs.

- d. Formation of a Mekong Knowledge Hub (MKH) of methods practitioners from each country to share knowledge and tools developed among these communities of practice and support wider communication of the outputs and outcomes. Members of the MKH will be nominated by each Country PCC during their first meeting.

2. Weeks 5-18: Design protocols, training programs and sampling pilots:

- a. Tailor a routine environmental surveillance and sampling protocol for each country in consultation with the PCCs.
- b. Refine laboratory analysis and testing protocols to suit each country approach.
- c. Design processes for Evaluating and Integrating data into Government's broader surveillance methods.
- d. Communication with Governments including health and COVID-19 control teams.

3. Weeks 19-22: Framework and roadmap for each country to implement Phase 2:

The report will set out Phase 2 activities between researchers, utilities, health labs, and public officials, including delivery of environmental surveillance capacity building and training programs and transfer environmental surveillance tools, pilot the program across priority zones as determined in partnership with the partners in each country during Phase 1.

Outputs

Outputs of the Phase 1 activities include:

1. Governance and meeting schedules agreed and implemented by project partners.
2. Agreements established with all project partners setting out roles and responsibilities for the project delivery.
3. SARS-CoV-2 environmental surveillance training videos and modules.
4. Written protocols translated into Vietnamese, Khmer, Laotian, Myanmar and Thai.
5. Data analysis software and spreadsheet tools.
6. Publications such as fact sheets, procedures, industry journal articles and scientific reports.
7. Surveys of SARS-CoV-2 in wastewater.

The benefits of the outputs arising will be two-fold:

1. Environmental surveillance of SARS-CoV-2 combined with epidemiological findings provides a reliable tool that assists Governments to:

- Determine the prevalence of COVID-19 and SARS-CoV-2 infection;
- Assess the influence of control strategies;
- Provide early warning of rising prevalence;
- Track of reduced prevalence over time, and
- Detect hotspots and outbreaks.

2. Understanding of the disease occurrence in metropolitan, rural and remote communities, to assist the state government to best target response efforts and investment.

Therefore, the protocols and know-how generated will be translated and tailored to best support the Vietnam, Cambodian, Laos, Myanmar, and Thai Government's responses to COVID-19.

Outcomes and beneficiaries

The outcomes and beneficiaries include:

1. Enhanced capacity of Mekong Countries in environmental surveillance for SARS-CoV-2 (and other pathogens);
2. Early warning and detection of COVID-19 outbreaks;
3. Lower cost to detect COVID-19 outbreaks and follow viral prevalence in the community;
4. Reduced health and economic impacts of COVID-19 in our region;
5. More rapid return to normality and reduced economic impacts;
6. Improved approaches to inform trends and estimates of COVID-19 and SARS-CoV-2 community prevalence, and
7. More rapid return to normality and reduced economic impacts.

Q&A

Why undertake environmental surveillance for SARS-CoV-2?

- To provide cost-effective non-invasive community prevalence surveillance to follow trends in SARS-CoV-2 shedding in the community and to provide early warning of rising infection rates
- To provide another piece of data to help inform COVID control strategies that sits alongside other data (such as from clinical testing)
- To align with international norms (the approach is in use globally)
- To help provide evidence of levels of SARS-CoV-2 in the country or region to help inform decisions on travel between other countries and regions

Where is environmental surveillance for SARS-CoV-2 being undertaken?

- Globally in most OECD and many non-OECD countries

Where are samples taken from?

- Samples are collected at sewage treatment plants, in sewers at sewer access points, from environmental samples such as stormwater, from buildings and at industrial sites

What happens to the results?

- The results are assessed as part of the broader body of evidence from clinical testing, contact tracing and border movement information
- They help inform responses to help assess risks and guide COVID control strategies

Why can't this be started quickly

- The work can only be done by labs with specialist capability in virus sewage testing
- It takes a long time for administrative processes to get going (funding and contracts)
- After that, the methods need to be set up, staff need training, reagent and equipment needs to be sourced, and methods need proving and validating
- It's important that the results are of high quality and that the work isn't delivered so quickly that quality suffers

When will this end?

- The level of testing will drop once widespread immunity is in place, e.g. following vaccination
- These testing will probably go on for many years even after vaccination, as is done for other viruses - we still routinely test polio in environmental samples - to help keep an eye out for re-emergence or for novel strain evolution
- We still regularly test for norovirus and adenovirus and others to follow their pandemic and seasonal peaks and watch for novel strains

How do the water, sewer and stormwater services providers fit in?

- Only these water services providers know the sewer and stormwater networks to guide where to sample.
- Only they know and which areas and parts of the community are represented by each sample point, or which samples points to pick to best capture population groups
- They know their system hydraulics and flow patterns to help guide when to sample and whether to composite samples
- Only they and their contracted labs and samplers can sample due to health and safety risks from such sampling

How are samples being taken?

- Sampling uses standard microbiology sampling bottles
- Sampling can be enhanced by using autosamplers to composite samples - manual compositing can be used rather than automatic compositing depending on what is available
- Samples must be refrigerated once collected, as per normal microbiology sampling

How do you know when to take a sample?

- Samples are best taken at a time that maximises capture of water flows representative of domestic use of showers, bathing, nasal irrigation, tooth-brushing, clothes washing and use of toilets and other habits – so in a sewer this is often when the morning peak reaches the sampling points
- For shift workers at industrial sites that time can be tailored to suit

Who can do the testing?

- This is highly specialist work with lots of traps for beginners so should only be done by the experts
- The mostly means ISO/IEC 17025 accredited labs with longstanding experience in virus testing of wastewater, e.g. for polio testing
- Those are mostly utility or health agency labs with longstanding experience testing wastewater

What's critical to success for this work?

- Collaboration is required between water services providers utilities and health agencies and commercial and government labs and research agencies
- People need to work together in the public interest to mobilise collectively in the interests of public health and ultimately the economy to help get the testing going to help support the national surveillance effort
- They need get the work going in good time but without compromising technical quality
- In particular the health/utility/lab collaboration needs to be exceptional
- International collaboration is of great value since there are many things in common globally in this effort

For further information please view the following resources:



<https://www.abc.net.au/news/2020-09-05/sa-new-coronavirus-cases-in-wastewater-and-hotel-quarantine/12633414>



www.theage.com.au/national/victoria/scientists-to-test-sewage-for-years-to-track-covid-bug-20200502-p54p90.html



<https://www.abc.net.au/news/2020-09-09/why-victoria-is-using-sewerage-testing-to-help-detect-covid-19/12645276>



Testing sewage for traces of coronavirus, ABC News



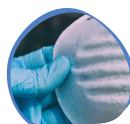
<https://www.abc.net.au/news/2020-09-05/covid-in-apollo-bay-victoria-wastewater/12633756>



Ballarat Courier, Ballarat, 7 May 2020



Looking To The Sewers For Early Coronavirus Warning, Sept 2020



smartwatermagazine.com/news/water-research-australia/waterra-sewage-surveillance-collaboration-support-australias-covid-19



Wastewater tests for COVID launching in bid to spot outbreaks early, newsGP, Sept 2020



Sunday Times, Perth, 24 May



twitter.com/9NewsSyd/status/1257226786791972865?s=20



COVID-19 weekly surveillance reports including wastewater NSW



www.sheppnews.com.au/news/2020/05/05/1159097/gv-water-testing-for-covid-19-in-shepparton-sewerage



Wastewater monitoring - coronavirus (COVID-19) in Victoria

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