[Testing and sequencing of sewage ramped up to help tackle COVID-19 outbreaks](#)

- The programme is currently providing insights to local health protection teams across England on the variants first identified in India and South Africa
- Previous support has involved working with Bristol local authority to investigate the presence of the variant first identified in Brazil and launch surge testing to stop the spread
- Testing sewage for COVID-19 and variants now covers more than two thirds of the population of England

A government-led programme to test sewage for traces of COVID-19 has ramped up genomic sequencing to help rapidly detect outbreaks of variants of concern.

The Environmental Monitoring for Health Protection (EMHP) Programme, led by the Joint Biosecurity Centre (JBC), a part of the newly-formed UK Health Security Agency (UKHSA), has reached a new milestone of testing wastewater for COVID-19 and variants across more than two thirds of the population in England. A new laboratory in Exeter opened last month dedicated to analysing wastewater, making it one of the biggest wastewater processing labs in the world.

Analysts from the JBC are using this insight to help build a better picture of where the virus is circulating, particularly asymptomatic COVID-19 infections that may otherwise go undetected.

Increased genomic sequencing of these sewage samples will provide more clues to where variants of concern may be circulating undetected in communities. It can pick up evidence of variants from infected people and continue to monitor sewage after surge testing has ended in an area. This helps provide reassurance the variant is no longer circulating in that community.

The JBC shares this insight with local authorities, NHS Test and Trace and Public Health England who take action to prevent outbreaks. Insights from the programme have already been used in Bristol and Luton to provide timely understanding of the spread of variants in their communities and help to provide reassurance that local outbreak control measures are working.

Wastewater sequencing is another tool to shield communities against the threat of new variants, as the country follows the roadmap out of national restrictions.

Chief Executive of the UK Health Security Agency Dr Jenny Harries said:

> This innovative programme supports the work of Public Health

England and NHS Test and Trace to help us understand where the
virus may be circulating undetected.

Sequencing wastewater samples provides an additional detection
system for variants of concern, enabling us to respond more
effectively to outbreaks and better protect citizens.

Programme lead at the Joint Biosecurity Centre Dr Andrew Engeli said:

Testing wastewater for traces of COVID-19 gives us an overall
picture of national and local infection rates and is a great
complement to the work that happens in the wider NHS Test and Trace
programme.

As infections fall and we head out of national restrictions,
analysing wastewater to detect variants early on is important to
help local authorities and NHS Test and Trace act quickly to stop
variants from spreading in communities.

Wastewater samples are taken from around 500 locations in England and sent to
the EMHP Laboratory at Exeter Science Park. Environment Agency scientists
analyse the samples to quantify the amount of COVID-19 present. Some of these
samples are then sent to other university labs, working with the Centre for
Environment, Fisheries and Aquaculture Science (CEFAS), or to CEFAS
laboratory partners who sequence the samples to identify variants.

The EMHP programme is a non-invasive way of providing insight for potential
spikes in infection in an area. Testing takes place at sewage treatment works
and the sewage network across England to understand infection levels at both
national and local scales.

Without the need to rely on individuals coming forward for swab tests,
monitoring in a catchment area is able to pinpoint outbreaks to smaller areas
and neighbourhoods. There are also pilots analysing the wastewater from
specific institutions such as within the food supply chain and prisons. It is
not possible to trace back the samples of COVID-19 to specific individuals
and no personal information is collected.

Environment Agency Chief Executive James Bevan said:

From the start of the pandemic, the Environment Agency has
supported the nation's efforts to tackle COVID-19. The join-up
between our scientists in the Environment Agency, water companies,
government colleagues, public health officials and the academic
community has delivered results that have had a real impact in the
fight against the virus.

We can learn a huge amount about community health from wastewater
monitoring, and the benefits of this programme will last for years

to come.

Chief Scientific Adviser at the Department for Environment, Food and Rural Affairs (DEFRA) Professor Gideon Henderson said:

> Rapid ramping up of laboratory capacity has been fundamental to the success of the wastewater COVID-19 programme. This has only been possible through teamwork between government departments and agencies — the Environment Agency and CEFAS — and universities, and demonstrates the broad strength of UK science.
>
> The resulting laboratory infrastructure allows early detection of outbreaks and powerful tracking of variants from genomic sequencing. It will continue to provide valuable information as social distancing restrictions ease and to monitor for future disease.

Scientists and academics from across the UK are collaborating on their findings, coordinated by the Joint Biosecurity Centre, and sharing data to build up a picture of cases across the UK. Wastewater testing carried out by Environment Agency scientists and their counterparts across the UK is one of a number of tools used to closely monitor the evolution of COVID-19, from symptomatic testing to surveillance studies and genomic sequencing of new variants. It will also play a crucial role in tracing other viruses in the future, including the flu, and understanding the impact viruses may have on local NHS systems.

The EMHP programme is led by the Joint Biosecurity Centre in the UK Health Security Agency, in collaboration with DEFRA, the Environment Agency, CEFAS, water companies, Water UK and academic partners. The programme is coordinated with similar programmes run by the Northern Ireland Executive, Scottish Government and Welsh Government.

Portfolio lead at CEFAS David Smith said:

> Following the extraction and detection of COVID-19 RNA in wastewater, samples are transported a short distance to the University of Exeter Sequencing Facility where we have developed new methods to detect and quantify specific COVID-19 variants.
>
> In the coming months, we will be scaling up the number of samples sequenced by CEFAS and the University of Exeter. This will further widen the surveillance for variants and help inform the nationwide response as they emerge.

Case study Bristol

Director for Communities and Public Health in Bristol, Christina Gray, said:

We are very pleased to be participating in the developing wastewater sampling technology. It proved particularly useful when we investigated variants of concern in the city and were undertaking surge testing. This technology helped us to be confident that the picture we were seeing through testing results was a true reflection of the spread of infection, and that there was not a pool of undetected infection that we were unaware of.

Going forward, it will be interesting to see how this technology can develop to support efforts to detect and contain infectious pathogens. For example, when we get to a stage where we wind down routine testing, this method could potentially provide an effective means of identifying rising infection and assist us in taking prompt public health action.

Case study Luton

Director of Public Health at Luton Council, Lucy Hubber said:

The additional detail from targeted wastewater analysis acts as an extra layer of reassurance around the effectiveness of local outbreak control measures. Given the fast-changing position regarding variants of concern, the timely information we have received from genome sequencing has been critical in our understanding of transmission.

Luton Borough Council accessed insights from wastewater monitoring through a programme delivered by the JBC in partnership with a range of partners including Thames Water.

The Council was experiencing relatively low testing uptake for both rapid lateral flow testing and polymerase chain reaction (PCR) testing, along with consistent positive case rates being reported across 5 areas.

Daily sampling of wastewater was carried out across these locations in the town, which was then processed and analysed with JBC support to outline levels of COVID-19 and to identify areas of concern.

The wastewater monitoring data helped Luton Borough Council in understanding that increases in cases were unlikely to be from general community transmission, but rather from limited person-to-person transmission. These insights informed their forward outbreak management response and helped the council with decisions to stand up targeted testing at ward level, and in applying targeted communications on the importance of twice-weekly testing.

Concerns regarding local impact of international travel identified via epidemiological data and outbreak management process, led to the Council requesting genome sequencing of the positive wastewater samples as a proactive approach in identifying variants of concern (VOC) or variants under investigation (VUI).

None of Luton's testing data – from symptomatic testing, key location testing or wastewater – has yet identified the presence of a VOC. However it is an area that the council remains focused on as surrounding authorities have reported VOCs within their localities. In this instance, wastewater monitoring has acted as an early warning system before cases are detected through individual testing.

Early data that the council has received has acted as an additional method of monitoring levels of the virus within the identified Lower Layer Super Output Areas (LSOAs). It has also provided reassurance that, based on the wastewater data, VOCs have not been identified to date.

The data has provided an extra level of insight to inform the local COVID-19 response. It has also acted as a safety net for Public Health colleagues. Community leaders can be assured that the Public Health team is covering as many bases as possible to ensure the safety of the town, and that reactive interventions are timely, as and when required.

Please contact Amanda.Murrell@luton.gov.uk for interviews related to the Luton case study.
Please contact Caitlin Scott at newsdesk@bristol.gov.uk for interviews related to the Bristol case study.