

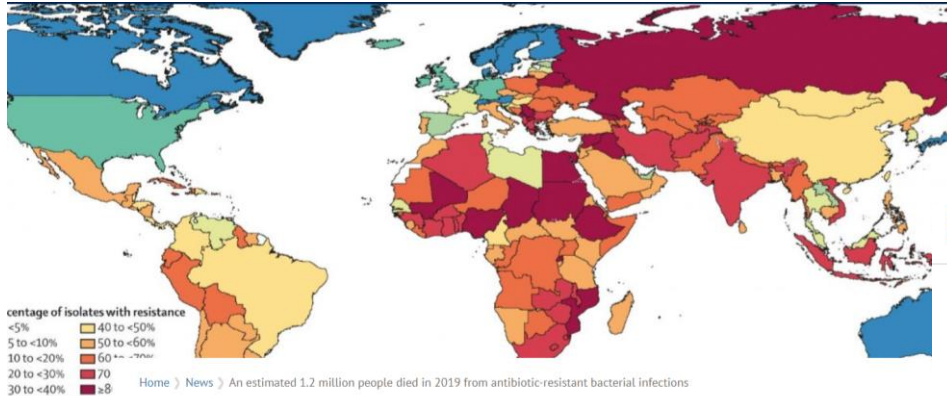
International conference '*Towards a Global  
Wastewater Surveillance  
System for Public Health*',  
Frankfurt, Germany  
15-17 November 2023



## Wastewater-based surveillance of antimicrobial resistance (AMR) in Wales

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## An estimated 1.2 million people died in 2019 from antibiotic-resistant bacterial infections

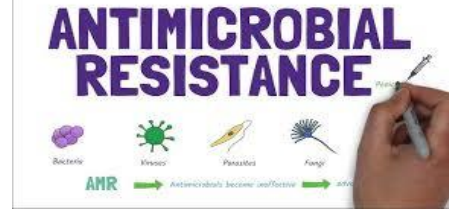
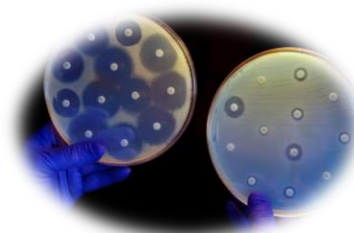
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(Retrieved from Lancet 2022; 399: 629–55)

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## Antibiotic resistance killed more people than HIV or malaria in 2019, says a new study

### 'The New Pandemic Under Construction in Silence': Antimicrobial Resistance Spells Doom in the Covid Age



REUTERS® World > Business > Markets > Sustainability > Legal > Breakingviews > Tech

Healthcare & Pharmaceuticals | COVID-19

## COVID pandemic led to surge in superbug infections, EU agency say

Reuters

November 17, 2022 6:38 PM GMT · Updated a year ago



Increase in people dying from antibiotic-resistant infections post-pandemic, data reveals (UKHSA, 2023)

### When the drugs don't work: can we do anything about antimicrobial resistance?

One little girl's tragic death in an Abuja hospital this summer illustrates a global problem, but one that is worst in Africa where it could kill 4 million people by 2050



A woman holds her sick baby while waiting for a doctor at Gwoza general hospital in Gwoza, north-east Nigeria. Photograph: Stefan Heunis/AFP/Getty Images

### 'You feel powerless': The painful reality of living with Antimicrobial Resistance


In partnership with The European Commission






WHO global action plan on antimicrobial resistance: “Strengthen the knowledge and evidence base through surveillance and research”


WASTEWATER SURVEILLANCE/  
WASTEWATER-BASED EPIDEMIOLOGY  
(WBE)




Comprehensive Health Information About Community.




Unbiased Reflection On The Community’s Health And Lifestyle Habits



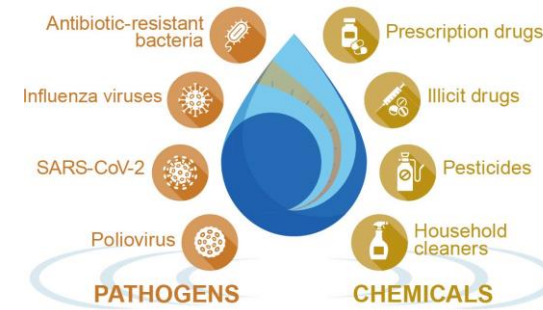
Complementary Approach For Current Infectious Disease Surveillance Systems.



Early Warning System For Disease Outbreaks.



Tracking spread and trend of a disease and changes in infection rates.



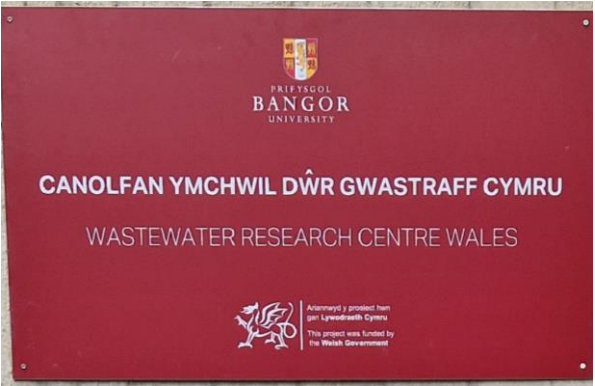
Community monitoring



Prevalence Estimation

Public Health Guidelines Implementation





BANGOR UNIVERSITY WASTEWATER MONITORING PROGRAMME  
EXTENDED TO INCLUDE HOSPITALS AND MONITORING BEYOND  
COVID-19

Posted by The Bangor Aye | Jan 12, 2023 | Health, Bangor News, Bangor University News | 0 ● | ★★★★★

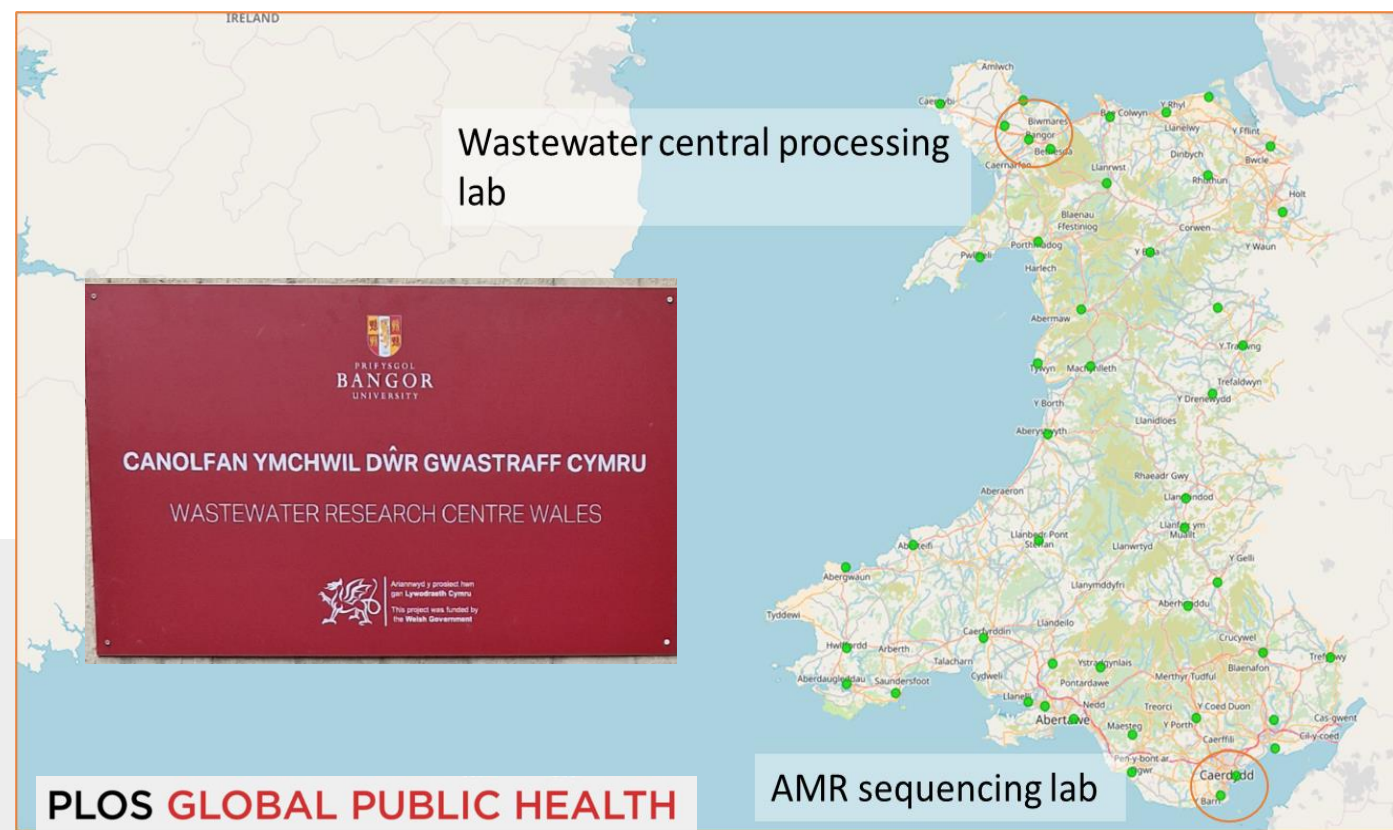


A Welsh Government-led programme to test wastewater for COVID-19 has added communicable diseases and hospitals to its capabilities.

# Wastewater monitoring in Wales (WeWash)



- Extended beyond Covid19 to include Influenza, Norovirus, RSV, Enterovirus, Polio, enteric pathogens and **AMR antibiotic resistant genes (ARGs)**.
- We monitor 47 WWTPs across Wales
- ~75% of Welsh population covered (2.4m people covered).
- Borders protection: Aircraft wastewater samples** identifying variants upon arrival



OPEN ACCESS PEER-REVIEWED  
RESEARCH ARTICLE

## Wastewater-based monitoring of SARS-CoV-2 at UK airports and its potential role in international public health surveillance

Kata Farkas, Rachel Williams, Natasha Alex-Sanders, Jasmine M. S. Grimsley, Igor Pântea, Matthew J. Wade, Nick Woodhall, Davey L. Jones

### THE CONVERSATION

Academic rigour. Journalistic flair.

Arts • Culture • Business • Economy • Cities • Education • Environment • Health • Politics • Society • Science • Tech • Podcasts • Insights



**We tested the wastewater from planes to detect COVID among travellers – here's what we found**

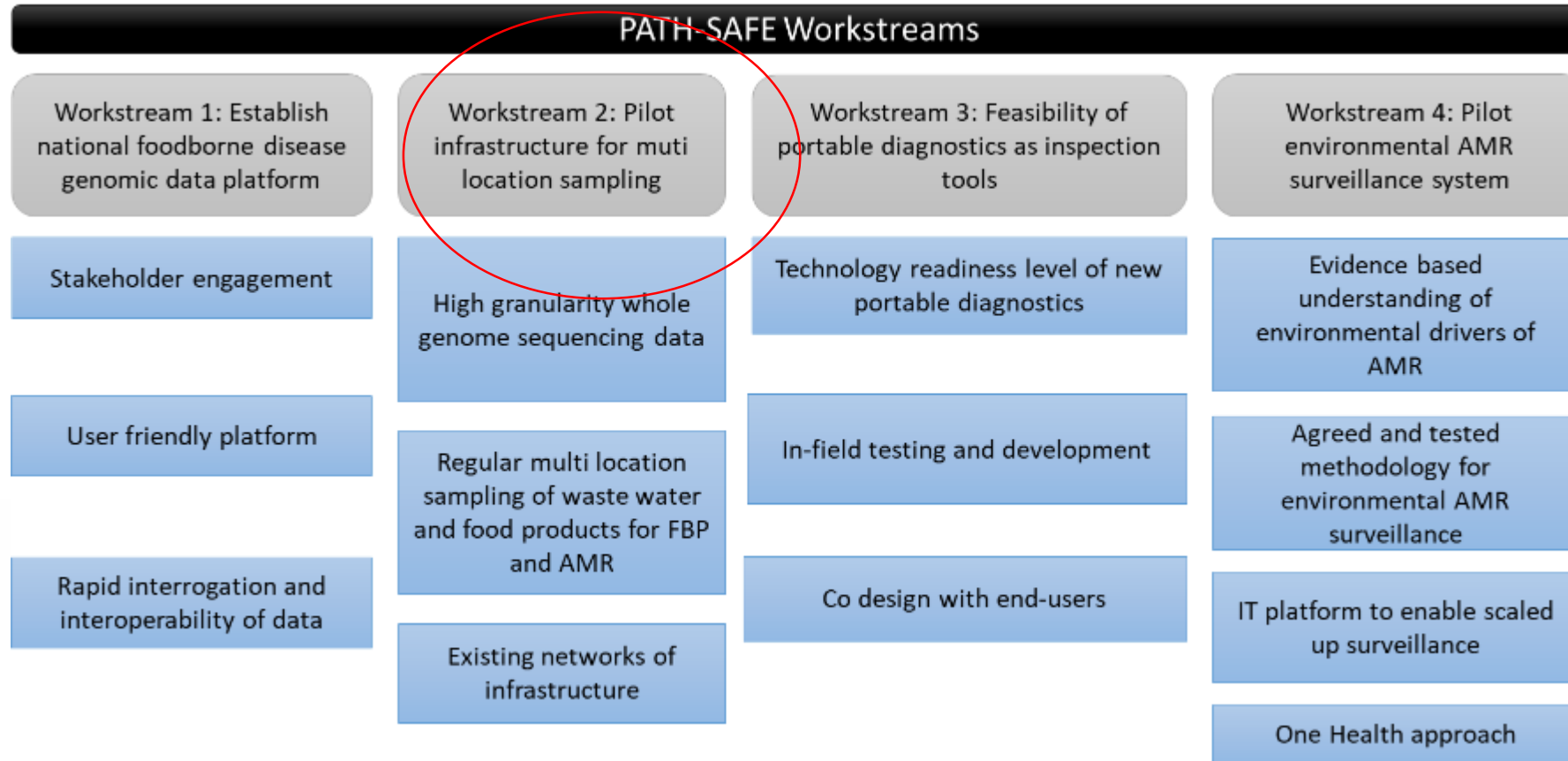
Published: January 24, 2023 12:40pm GMT

## Research Briefing Tackling antimicrobial resistance in Wales

Author: Hannah Roberts  
Date: June 2016

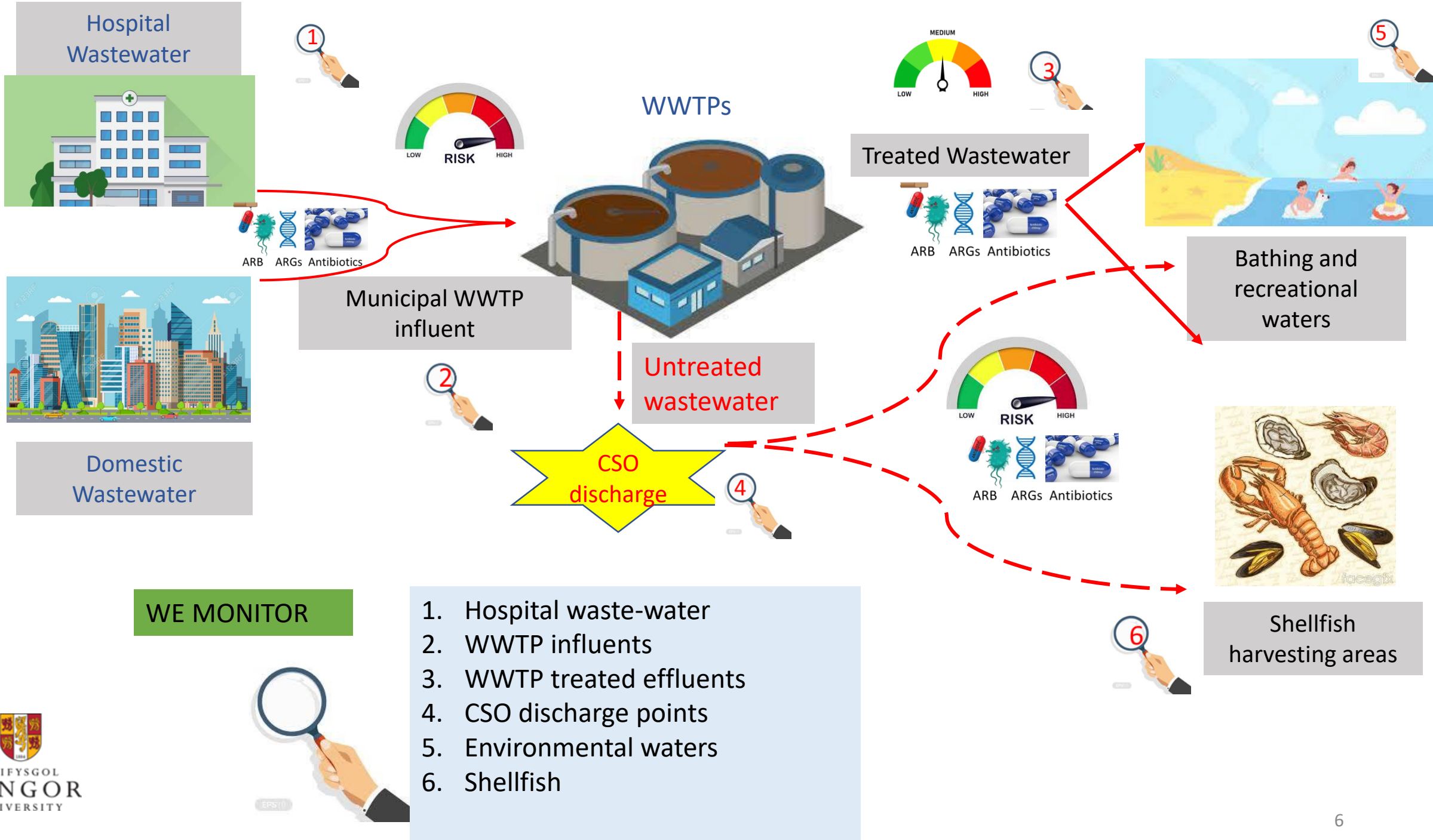
## Pathogen Surveillance in Agriculture, Food and Environment Programme

**PATH-SAFE – UK Govt funded** pilot programme that aims to develop comprehensive surveillance network of foodborne pathogens (FBPs) and AMR in all four nations of the UK



**Bangor pilot study- Predict the risk posed by Norovirus and AMR in coastal waters and entry into the food chain- 3 sites along North Wales coastline; Bangor, Rhyl-Kinmel Bay, Wrexham**





- REFRIGERATED AUTOSAMPLERS
- 24-hour composites

Detection of AMR genes



illumina

**Metagenomics-** Comprehensive overview of the complete resistome

resistomap

**High-throughput qPCR-** Targeted detection of ARGs

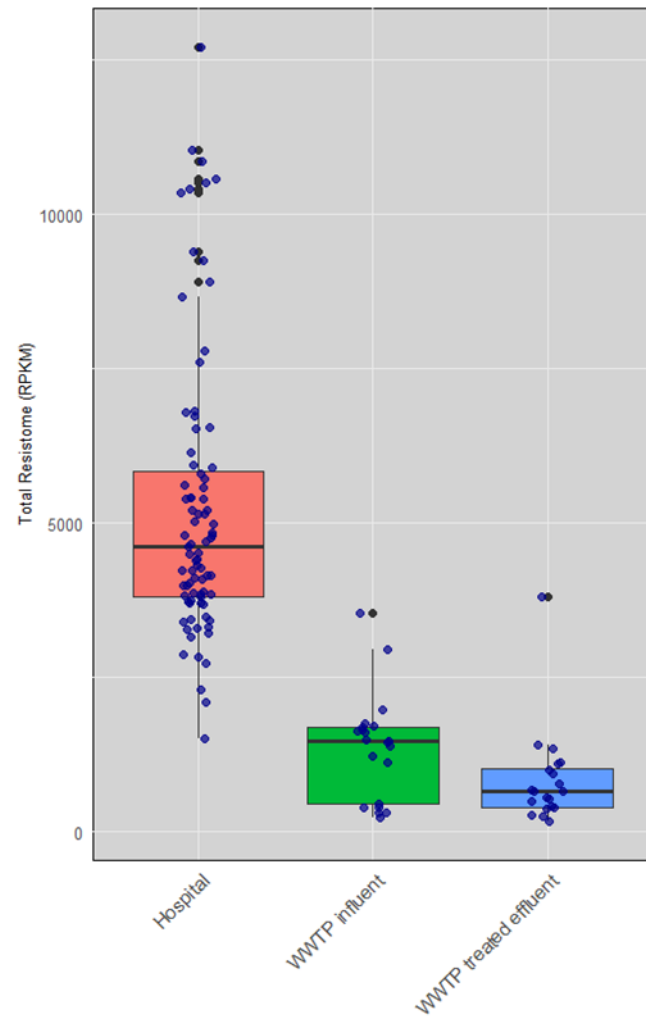


**Monitoring antibiotic residues-** collaboration with University of Bath

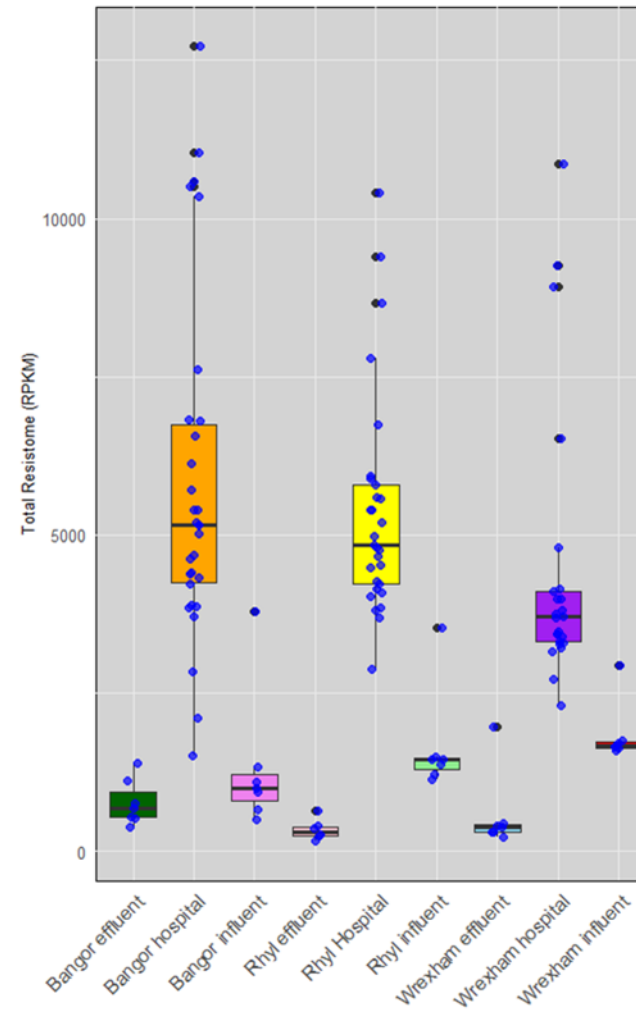


PRIFYSGOL  
BANGOR  
UNIVERSITY

Boxplots of the total AMR Reads Per Kilobase per Million mapped reads (RPKM) per sample, stratified by sample type.



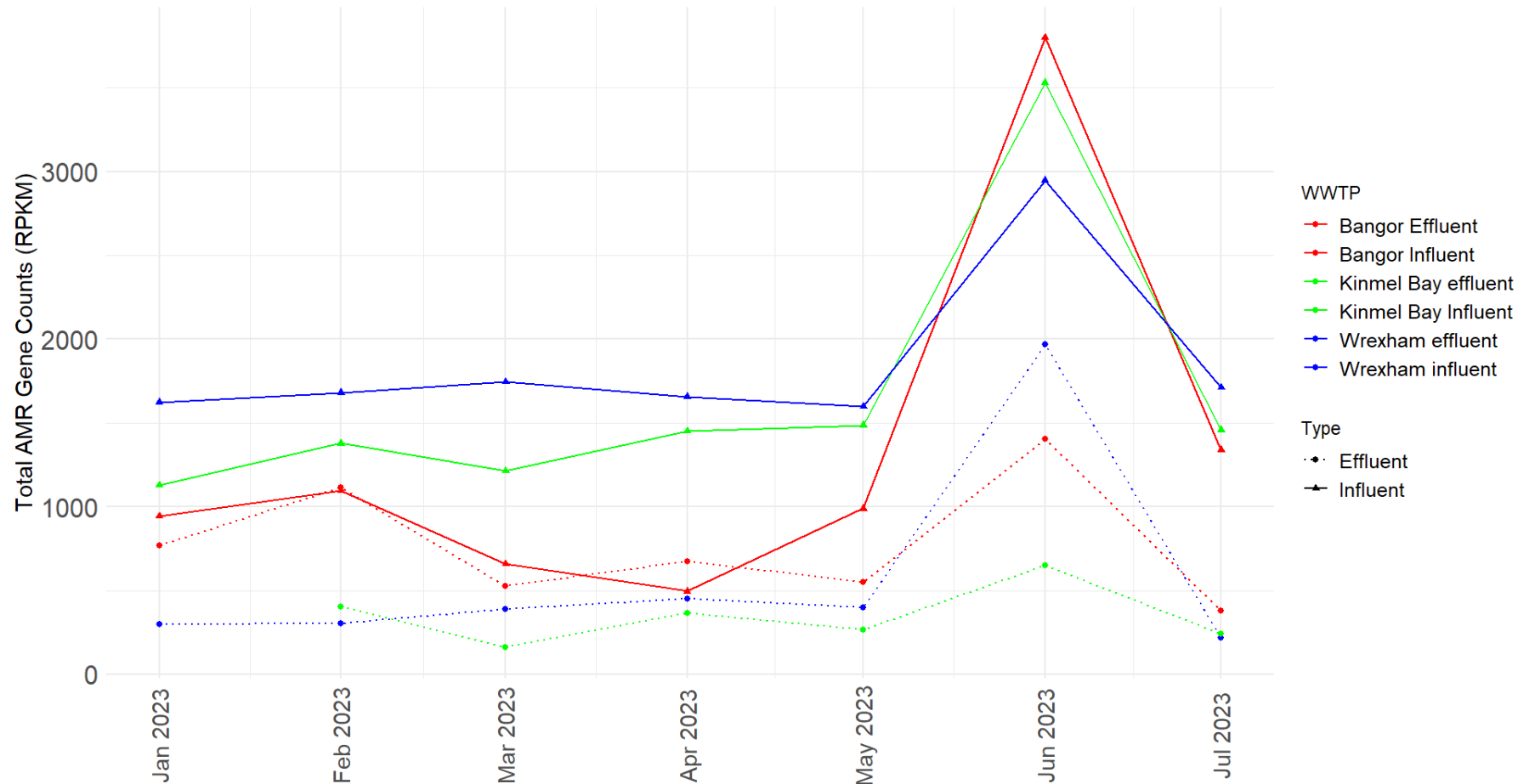
Boxplots of the total AMR Reads Per Kilobase per Million mapped reads (RPKM) per sample, stratified by sampling site.



Total AMR gene abundances varied across 3 sites and sample types

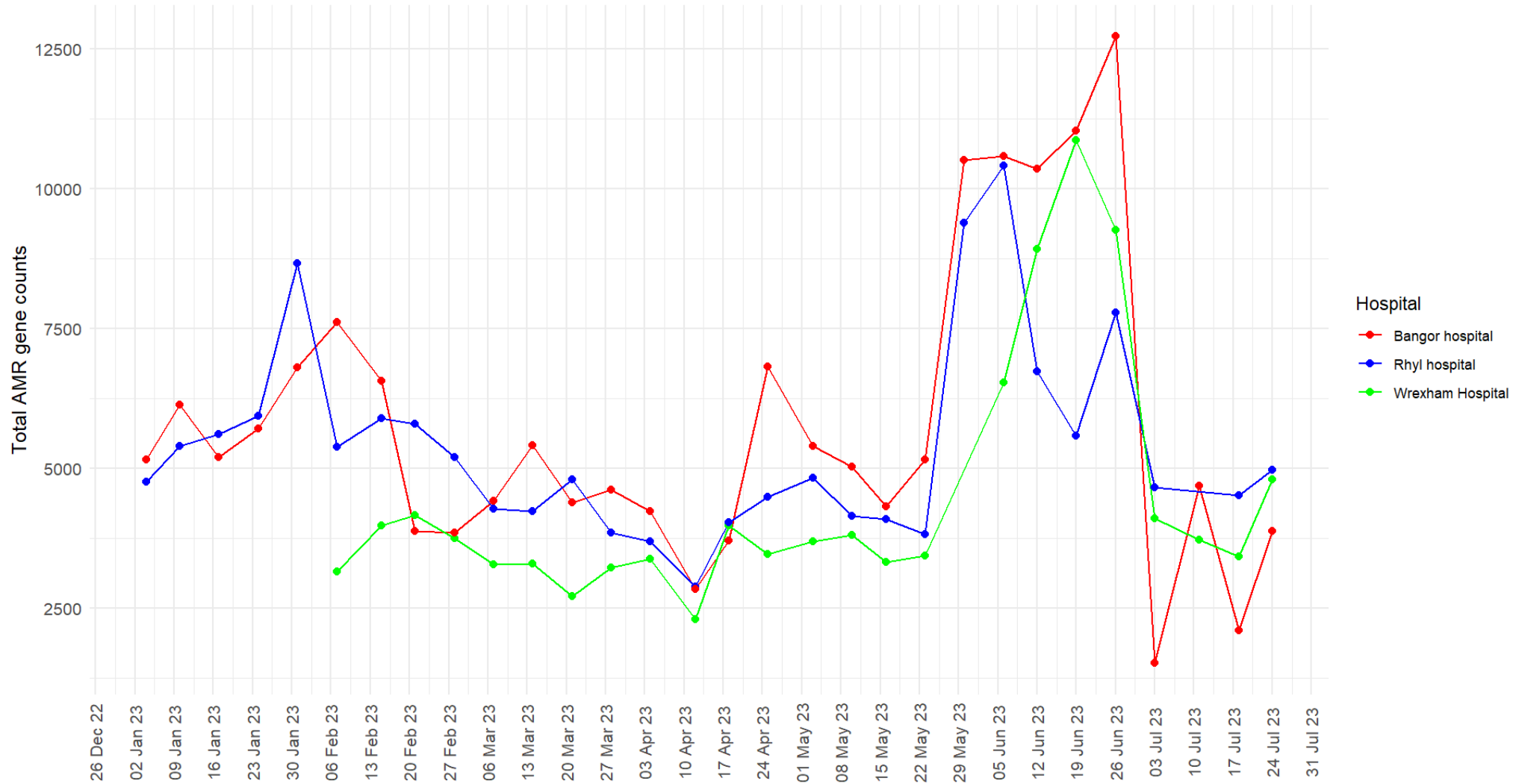


# Temporal trends in abundance of total AMR genes (RPKM) among WWTPs in North Wales



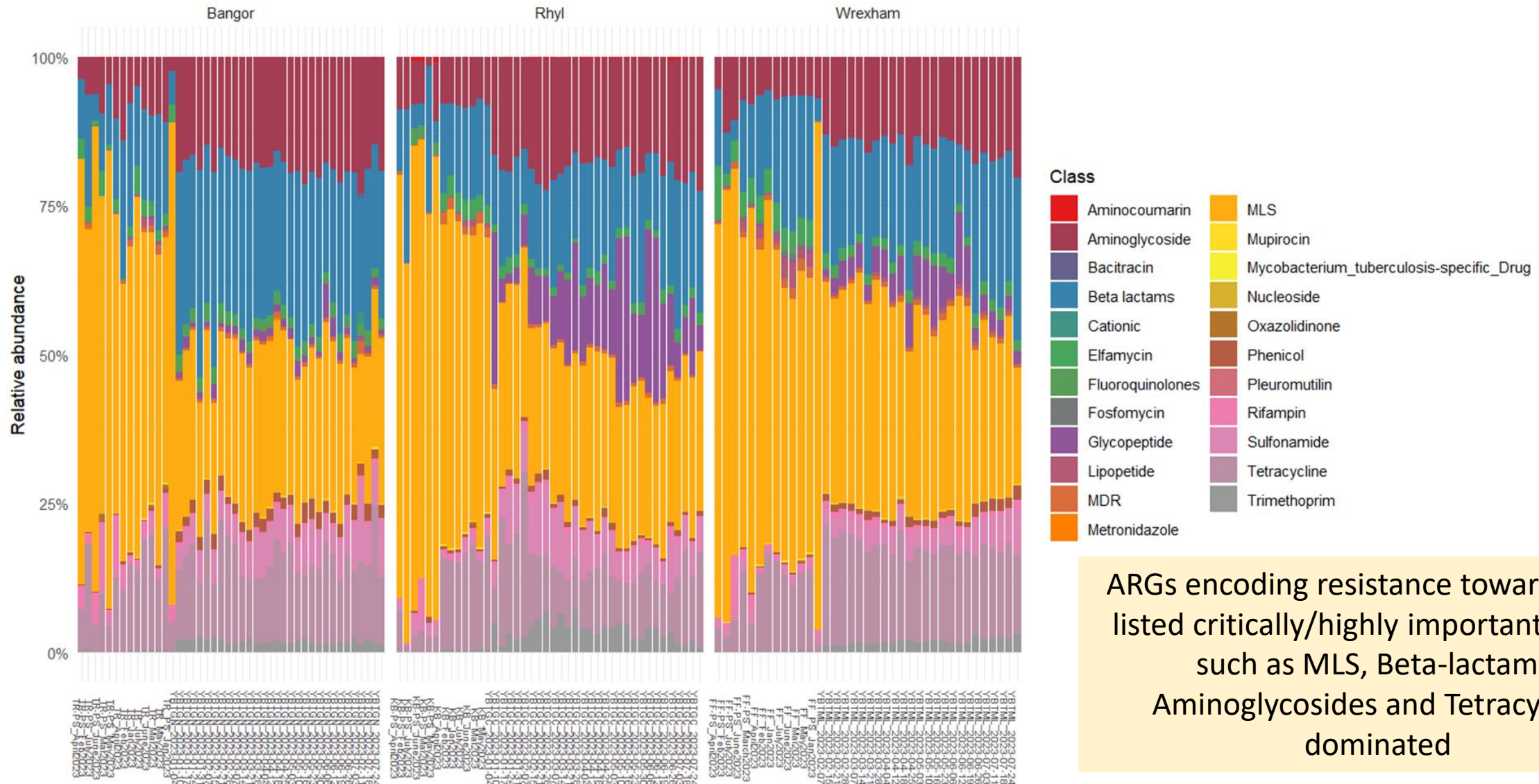
- Overall AMR load consistently higher in the untreated influents compared to treated effluents
- Peak in June

# Temporal trends in the abundance of total AMR genes (RPKM) across hospital sites in North Wales



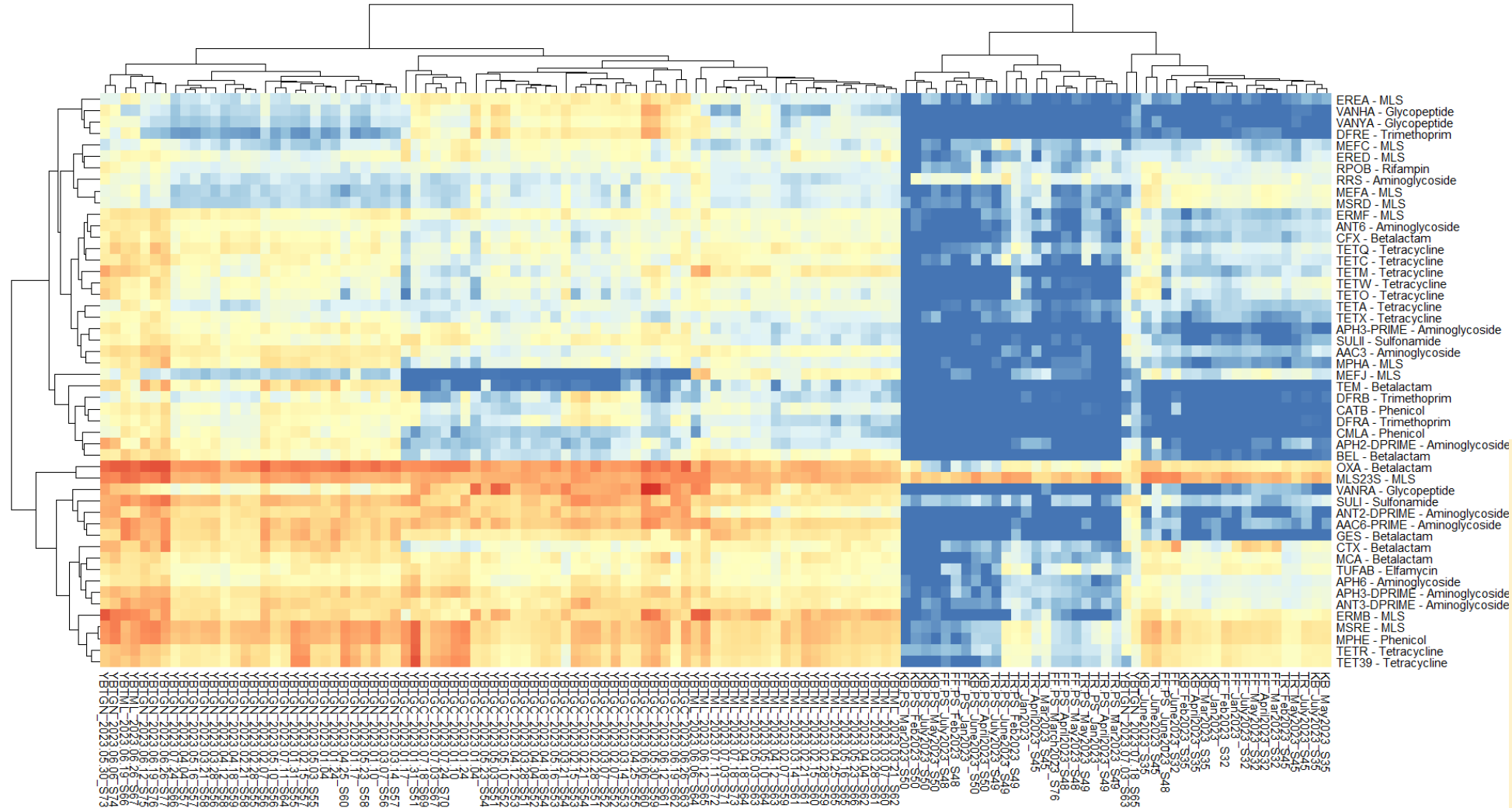
Total AMR gene counts fluctuated over the weeks, with noticeable high peaks in June.

# Relative abundance of AMR genes (RPKM) per class across the sampling sites

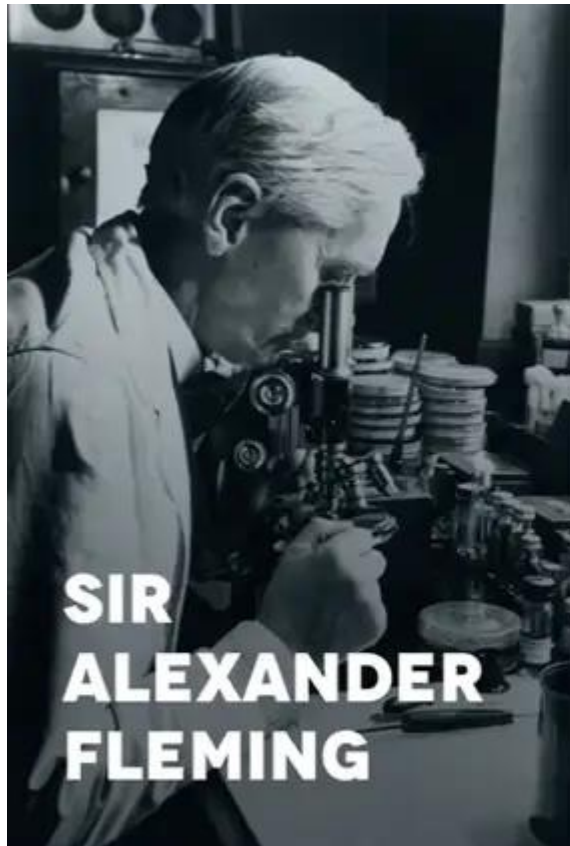




Heatmap showing the 50 most abundant AMR genes among the sampling sites in North Wales based on log transformed RPKM values. Colors scale from red (high abundance) to blue (low abundance).



- Hospitals and WWTPs clustered separately
- Majority of ARG subtypes encoded resistance to MLS, tetracyclines, aminoglycosides and Beta-lactams



**SIR  
ALEXANDER  
FLEMING**

The thoughtless person playing with penicillin treatment is morally responsible for the death of the man who succumbs to infection with the penicillin-resistant organism.



18 - 24 November 2023

*Preventing antimicrobial resistance  
together*

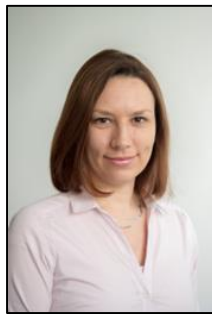


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Davey Jones



Kata Farkas



Rachel Williams



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PATH-SAFE Programme

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Webpages: <https://www.food.gov.uk/our-work/pathogen-surveillance-in-agriculture-food-and-environment-programme>  
<http://www.viraqua.uk/>



**WEWASH - Wastewater Monitoring in Wales**  
@WEWASH3

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**THANK YOU FOR YOUR  
ATTENTION**

