

# Evolutionarily-Informed Community Surveillance of AMR

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Helen Nguyen

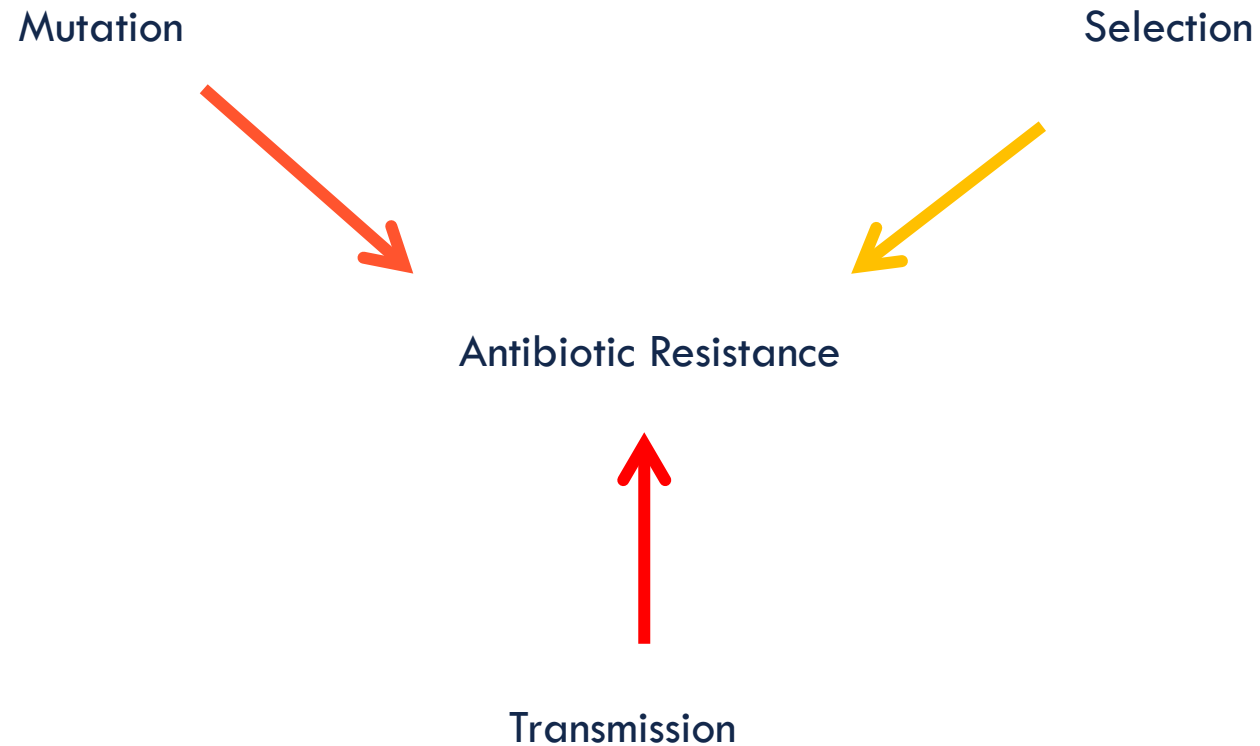


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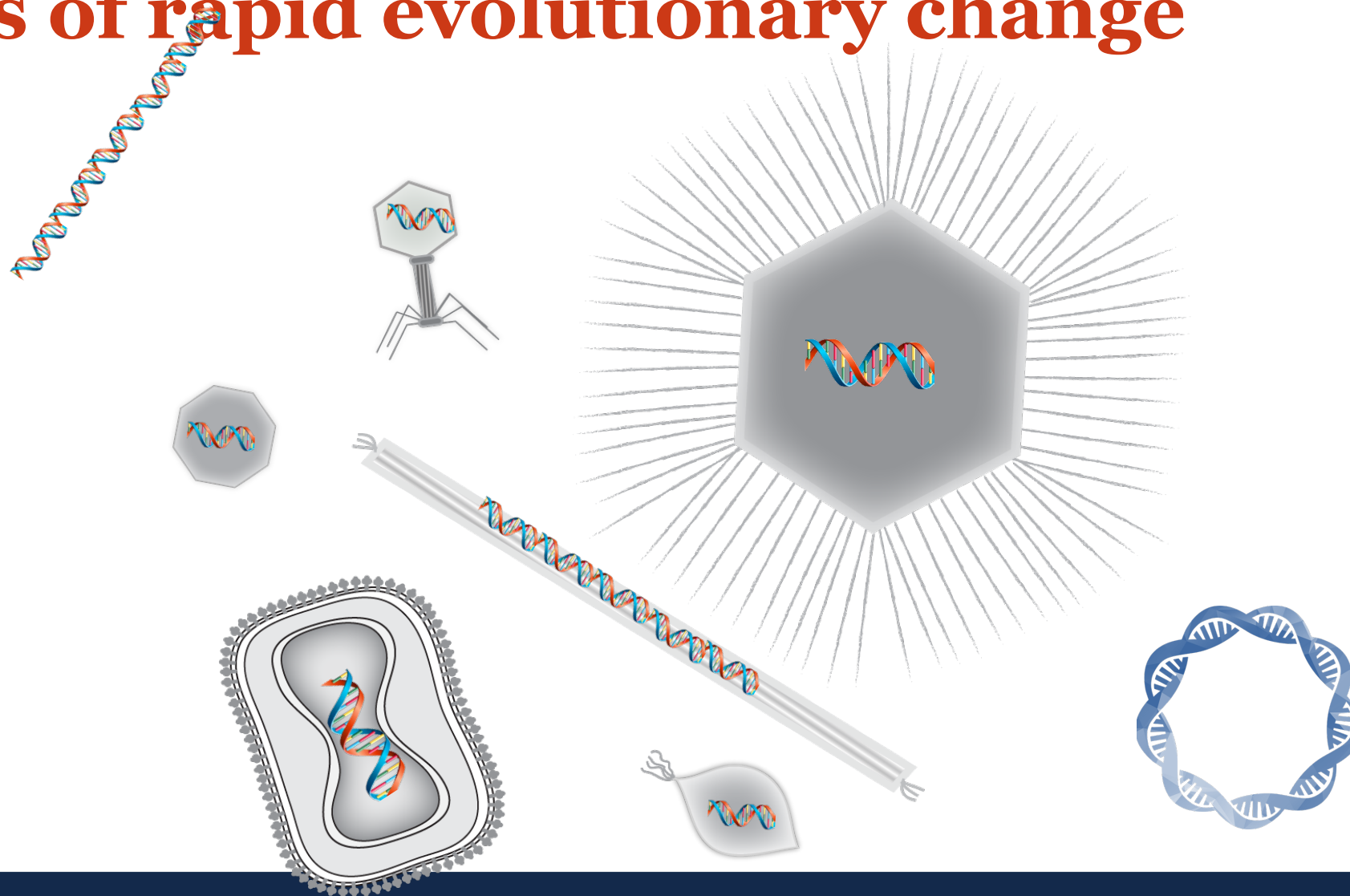
# Pandemic Lessons

1. Context matters! Social-cultural and political conditions impact evolution of host-associated microbes, infectious disease emergence and control.
2. Local dynamics have global consequences
3. Convergent, team science is essential to meet our biggest challenges.

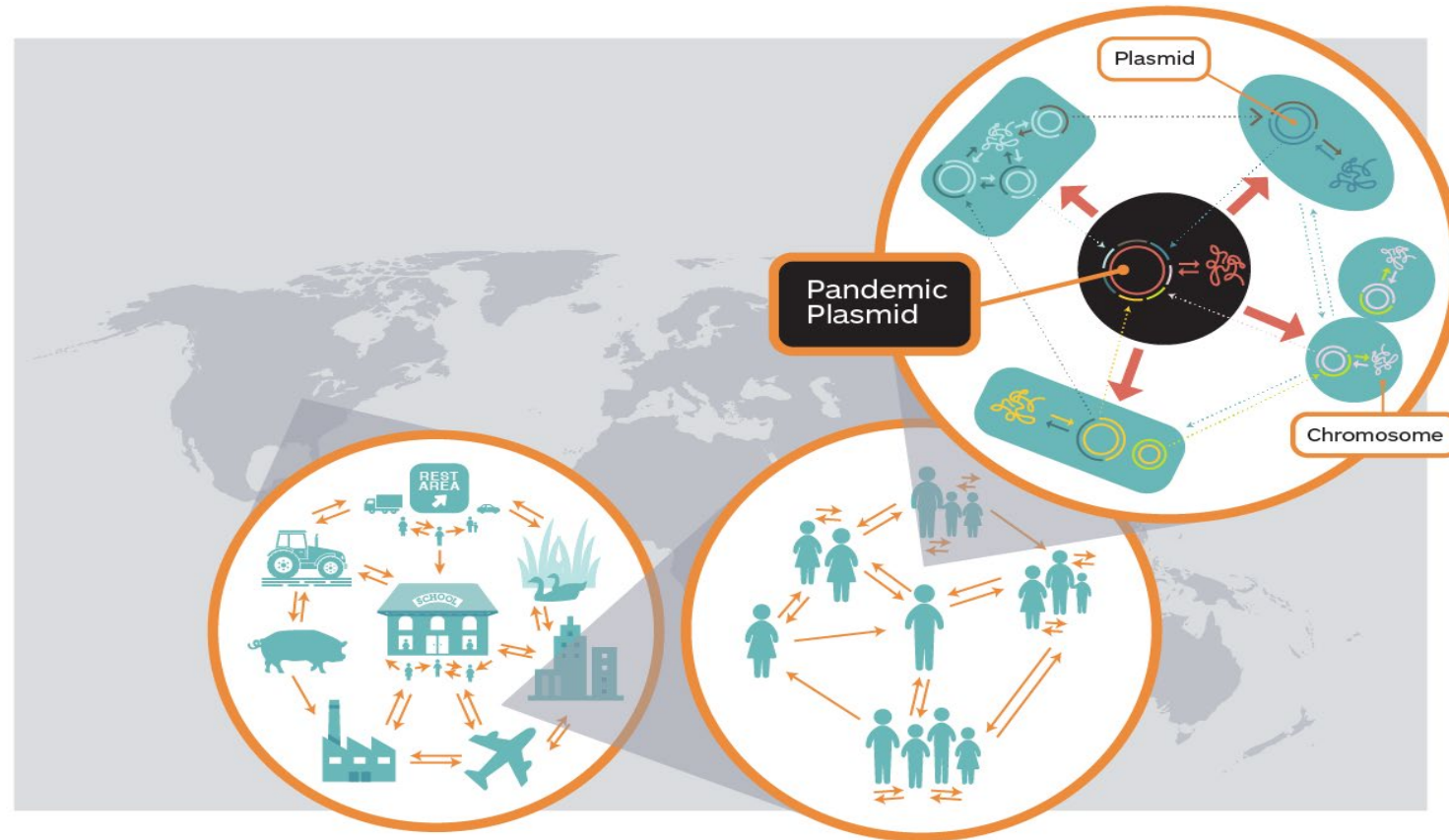
# Antibiotic Resistance Is an Evolutionary Problem



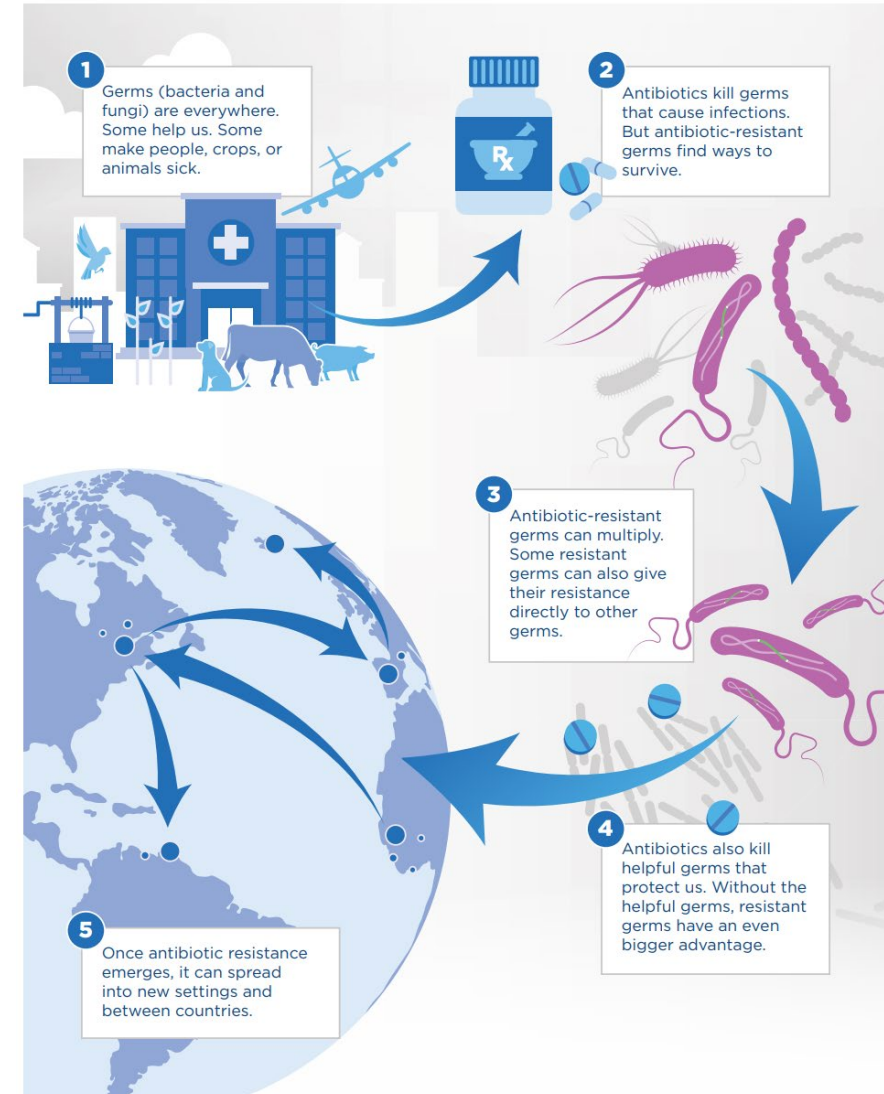
# Evolution is infectious: Plasmids are fundamental agents of rapid evolutionary change



# Multi-Scale Microbial Networks of Antibiotic Resistance Transmission

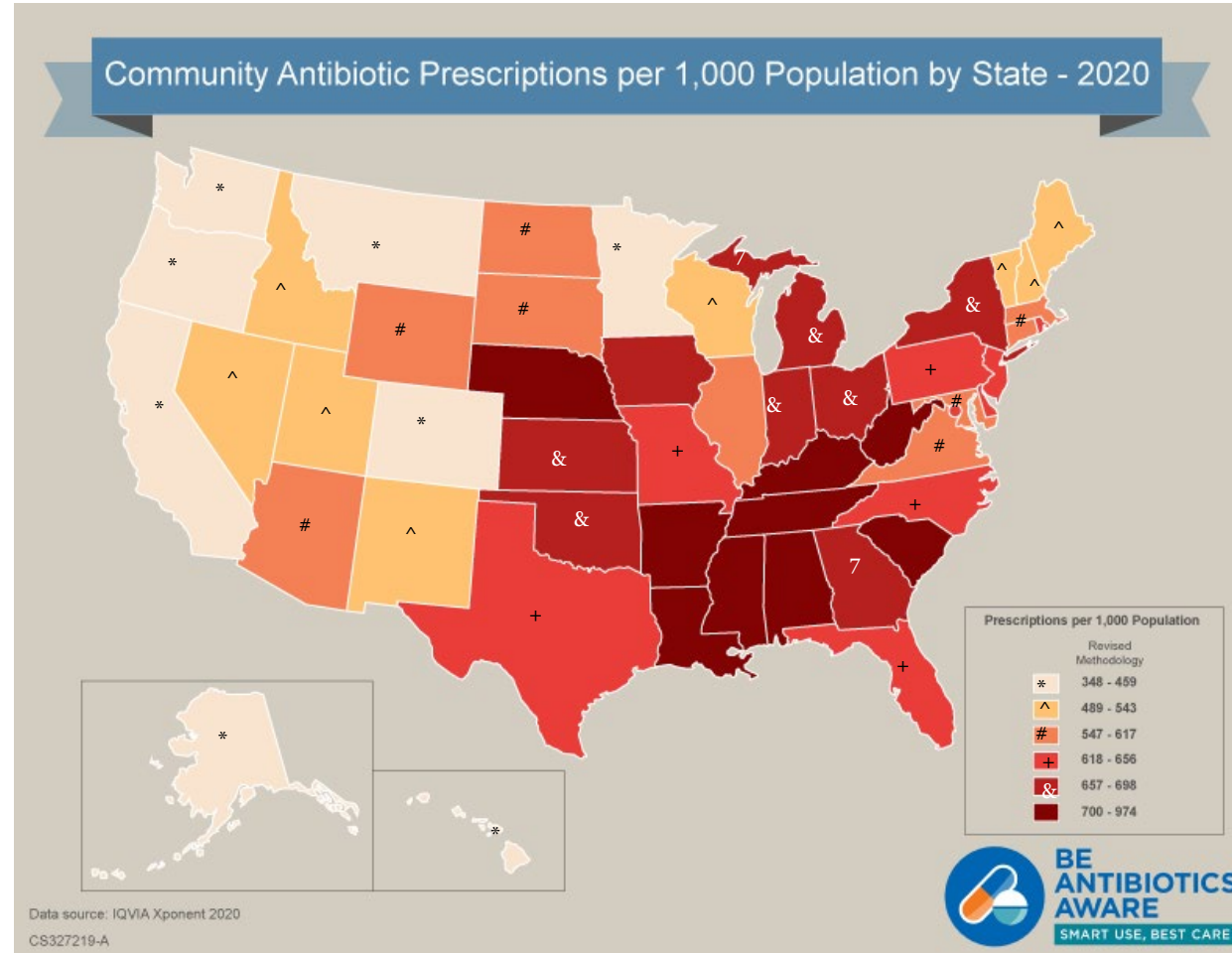


# Once AR is in the clinic it is too late.

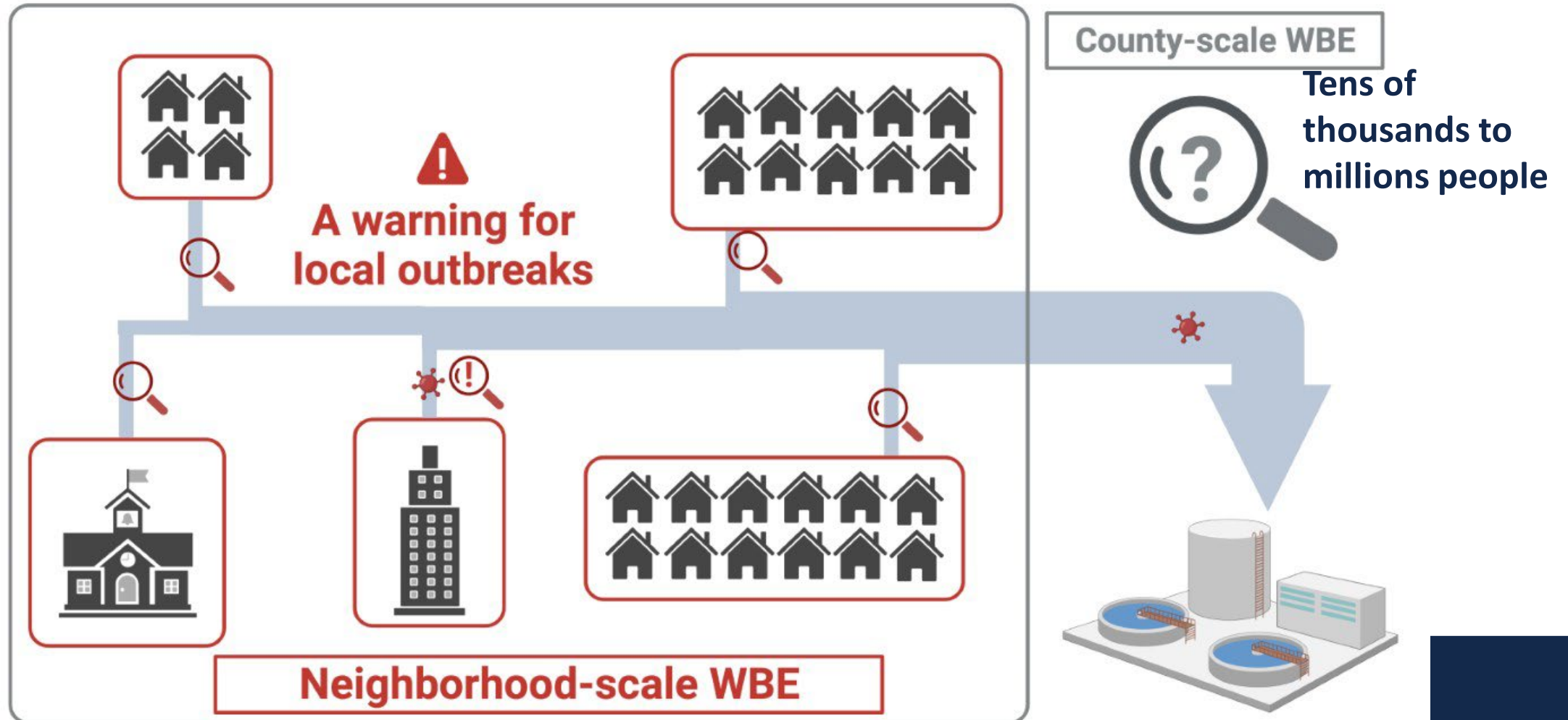




# What scale for surveillance?



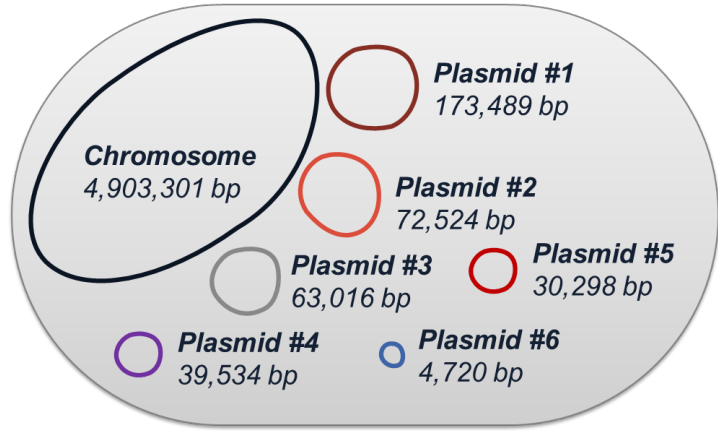
# Monitoring every human being on earth is impractical. We should monitor what we release and around us



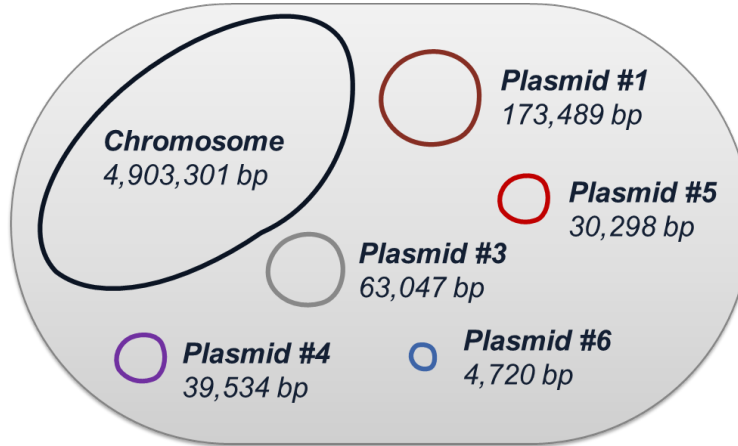


# Tracking emergence of ARG using the complete, composite genome

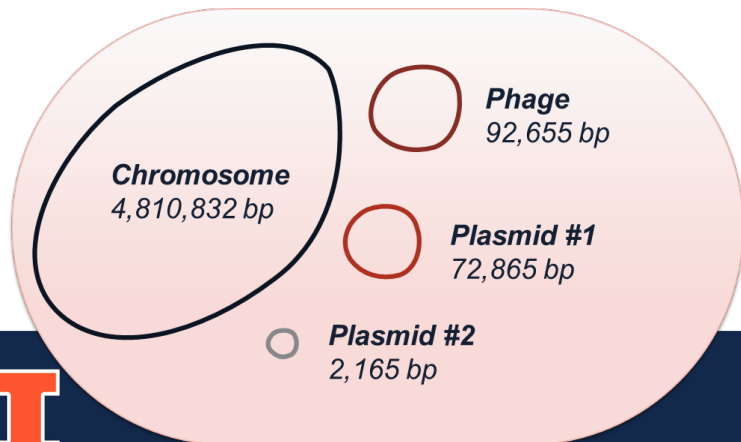
Site 1 pork plant - #1 (ST 23):



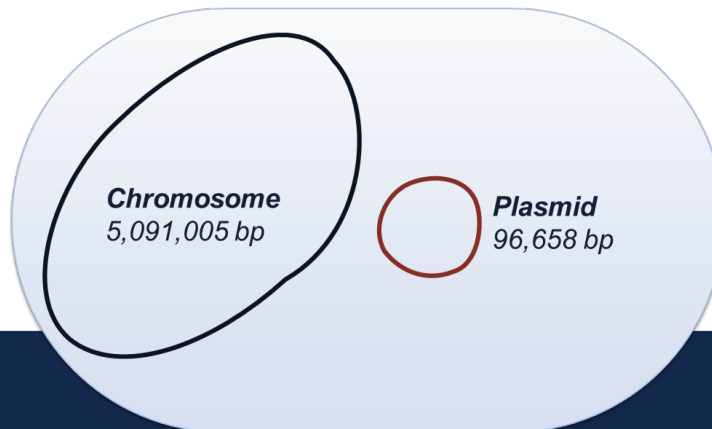
Site 1 pork plant - #2 (ST 23):



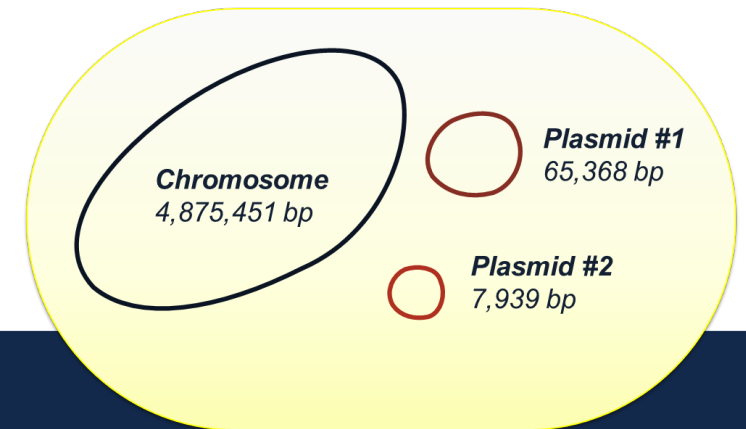
Site 5 Urbana - #1 (novel ST):



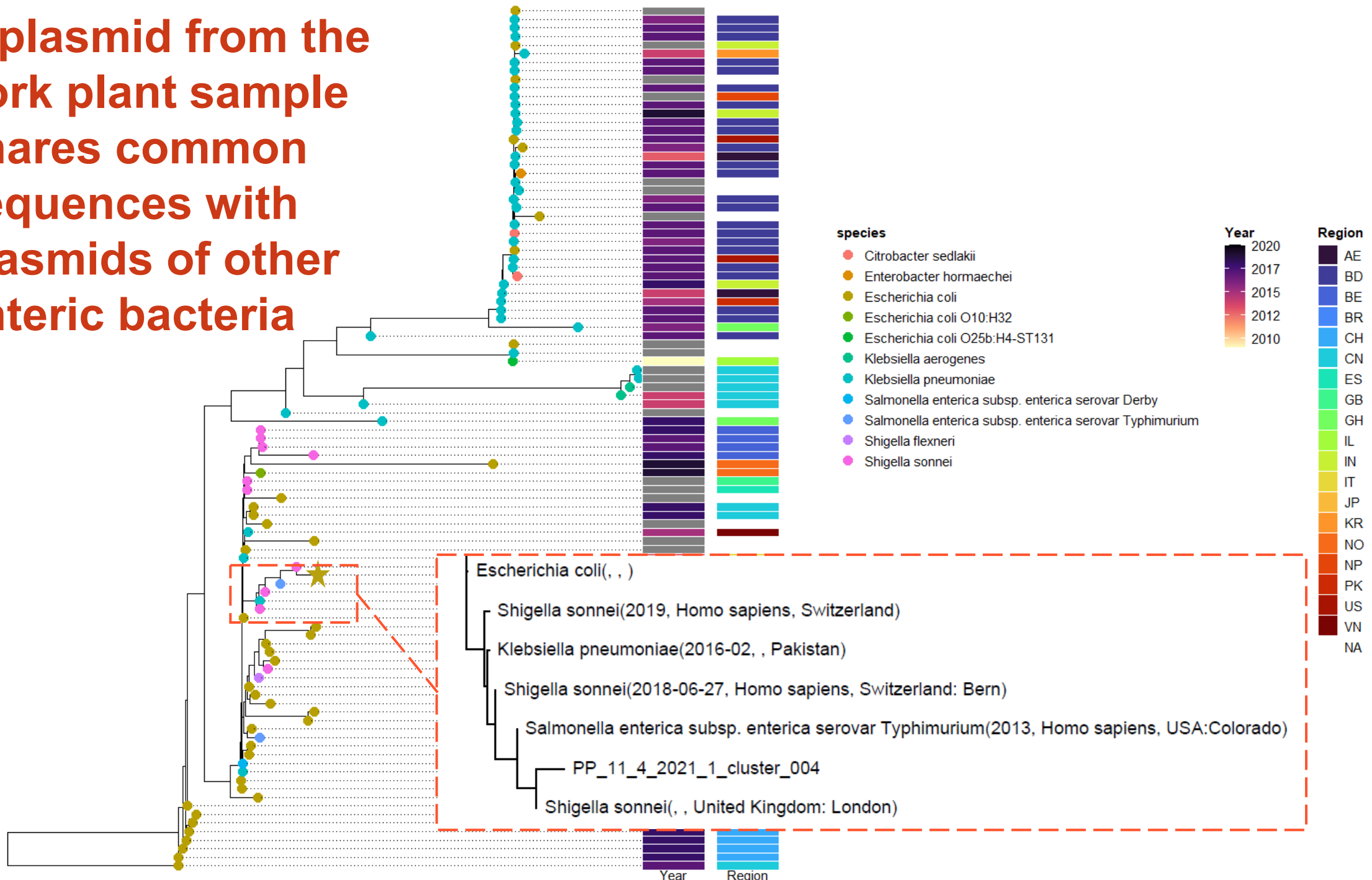
Site 9 Rantoul - #1 (ST 219):



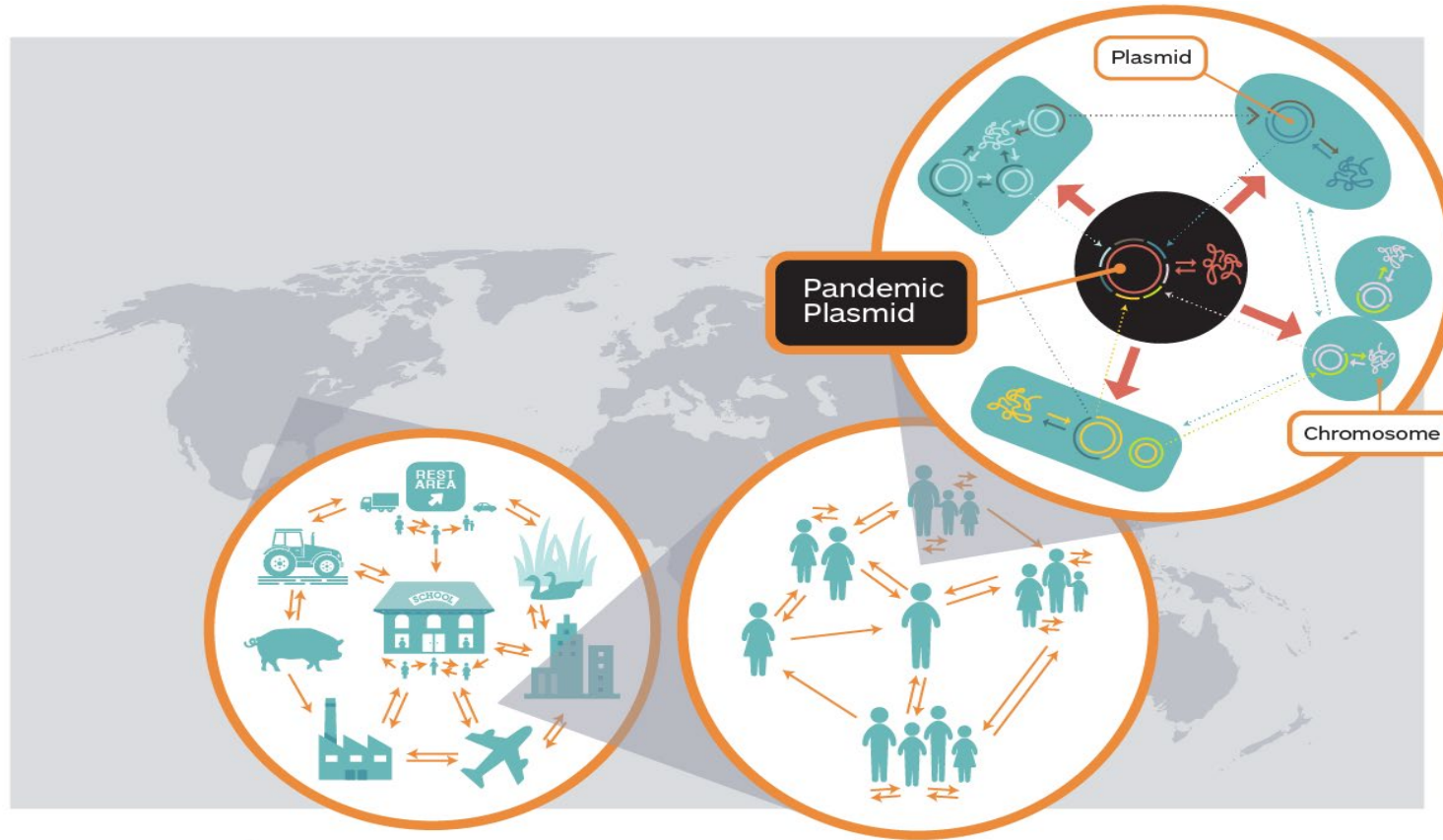
Site 9 Rantoul - #2 (ST 10):



# A plasmid from the pork plant sample shares common sequences with plasmids of other enteric bacteria



# Resistance emergence should be monitored and predicted in the interdependent multi-scale networks



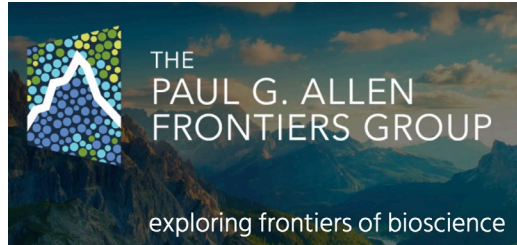
**Target the carrier of resistance before it reaches epidemic proportions.**



# Acknowledgements:

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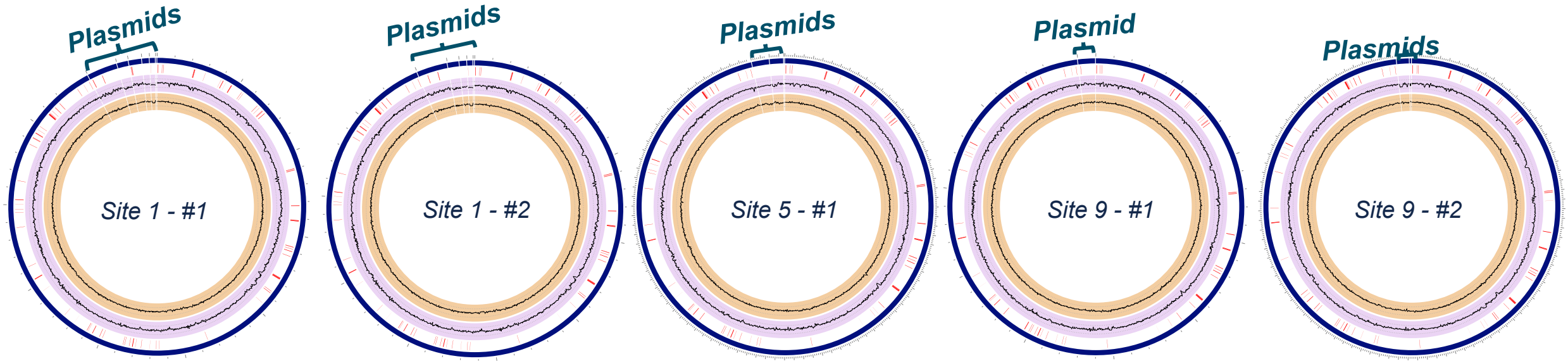


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# Samples from pork plants contain plasmids with ARG



- Macrolide efflux
- Catalase peroxidase (aminoglycoside related)
- Multi-drug resistance
- **Beta-lactamase**
- Aminoglycoside resistance
- Tetracycline efflux

- Macrolide efflux
- Catalase peroxidase (aminoglycoside related)
- Multi-drug resistance

- **Beta-lactamase**

**Beta-lactam antibiotics: penicillins, cephalosporins, cephamycins, monobactams, carbapenems (ertapenem), and others**