Can We Build the Perfect One Health AMR Intersection
2017 NIAA Antibiotic Symposium

- What are the Major Gaps in Knowledge or Translation?

- How Do We Find the Answers to What We Don't Know?
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• What are the Major Gaps in Knowledge or Translation?
The Antimicrobial Resistome

The resistome comprises all the antimicrobial resistance genes and their precursors in pathogenic and non-pathogenic bacteria (including antibiotic-producing bacteria)

ancient, diverse and widespread

Genes Move Laterally Through the Resistome

AMR genes do not respect boundaries

Very large gene pool

Major Gaps

• How do resistance mechanisms evolve over time?
  – Origins of resistant genes/organisms
    • Resistome
  – Diverse selection pressures (heavy metals, disinfectants, other)
  – Establishment and sustainability

• How is resistance transferred and how often
  – Mobile elements (plasmids, transposons, integrons)
    • Mobilome
  – Gene linkage (chimeras)
Major Gaps

• What is the contribution of the normal microbiomes to antimicrobial resistance?
  – Disruption consequences
  – Return of susceptible populations
  – Innocent bystanders

• What factors contribute to the selection and dissemination of resistant microbes
  – Appropriate PK/PD parameters
    • Dose, frequency of dose, route of administration, duration
    • Optimize therapy while minimizing resistance development
  – Organism and host factors
Major Gaps

• How important is the environmental dimension of antimicrobial resistance?
  – Anthropogenic impacts in soil and water
  – What can be done?

• What are the niches where pathogens and environmental organisms co-exist
  – What drives gene exchange in the environment?
  – Are there bottlenecks or can we create ones to prevent gene transfer
    • CTX-M beta-lactamases in *Kluyvera*
    • qnr genes in waterborne *Vibrio, Shewanella* and *Aeromonas*
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• How Do We Find the Answers to What We Don't Know?
Finding Answers

• Strengthen the Knowledge base
  – Identify and prioritize data gaps
    • Research, stewardship, infection prevention and control, diagnostics, product development, alternatives, integrated surveillance, education/outreach, national policy and guidance, risk analysis
  • Share and align priorities where possible
  – Publish findings to various audiences in a timely manner
  – Use data to formulate science based public health policy
    • Develop metrics for success
    • Reevaluate over time
  – Seek international harmonization and coordination where possible
  – Coordinate and direct resources collaboratively
Finding Answers

• Create strategic public-private partnership(s) and coordinated road maps
  – Bridge different sectors and disciplines – gather and integrate information
  – Strengthen partnerships and leverage resources
    • Academia
    • Industry
    • Federal government
    • Professional organizations
    • Consumer advocacy organizations
    • Citizens
  – Global consortiums where appropriate
  – Develop funding mechanisms
  – Action plans – move knowledge to implementation
Building a One Health AMR Roundabout

The Future is Round