**EDAR 2017**

# 4th International Symposium on the Environmental Dimension of Antibiotic Resistance

**13–17 August 2017**
**Lansing, Michigan**

# Ongoing projects on antibiotic resistance in wastewater and its reuse


**Stopping Antibiotic Resistance Evolution**

**Network of reference laboratories, research centres and rela environmental substances**

**Working Group 5: Wastewater Reuse and Contaminants of Emerging Concern**

**NSF Halting Environmental Antimicrobial Resistance Dissemination (HEARD) PIRE**

**NORMAN COST Action, StARE:** **European Effort for Standardization of Methods for Monitoring ARGs in WWTPs**

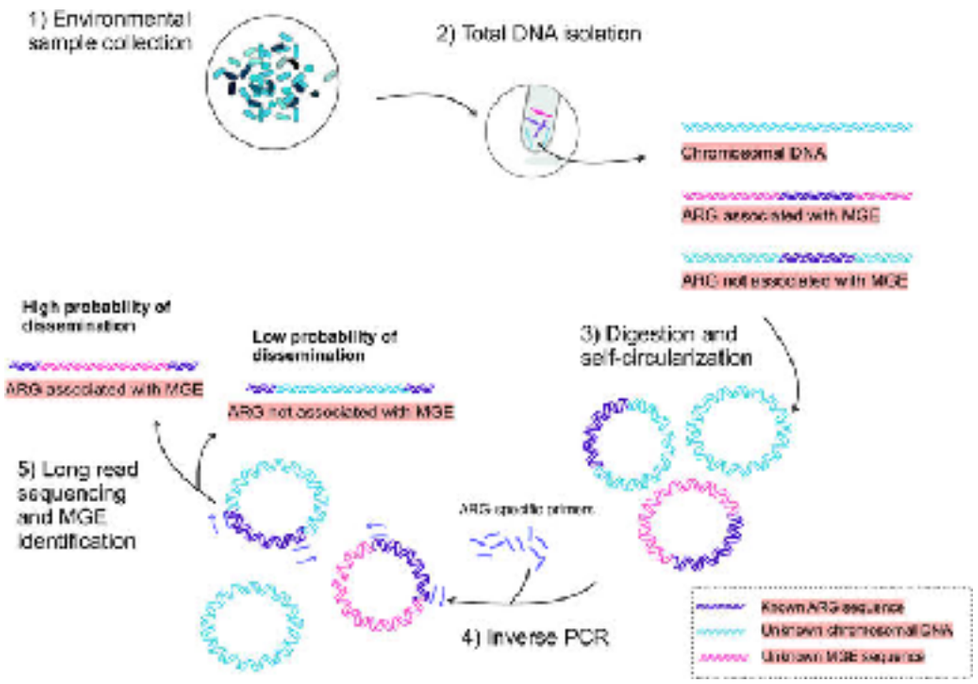
- **Current Targets for qPCR: "Indicator" ARG Concept:**
  - **intI1, sul1, sul2, blaCTX-M, blaTEM, qnrS (of group p1) and ermB, aac, 6-ib-Cr, vanA, mecA, ermF**
- **"Clinical ARGs" of direct health concern, but rarely detected, others can build understanding of how system is operating**
- **Limitations:**
  - **Not directly indicative of live organisms**

## Molecular tools to investigate the ARGs :

✤Inverse PCR

✤Epic PCR

✤ARG-qPCR array (384 genes)




## Available data base

✤ARDB: Antibiotic Resistance Genes Database -2009

✤CARD: Comprehensive Antibiotic Resistance Database - monthly update

✤ARG-AOP- only online for now

✤ Bacmet: antibacterial biocide and metal resistance genes database

# Comprehensive Evaluation of Antibiotics Emission and Fate in the River Basins of China: Source Analysis, Multimedia Modeling, and Linkage to Bacterial Resistance

Zhang et al

*Environ. Sci. Technol.*, **2015**, *49* (11), pp 6772–6782

58 river basins of China


**Table 2. Total Usages of All Antibiotics in China and Other Developed Countries**

| country | year | usage (tons) total | human | animals | DID[a] | ref |
|---|---|---|---|---|---|---|
| China | 2013 | 162000 | 77760 | 84240 | 1.57 | this study |
| UK | 2013 | 1060 | 641 | 420 | 27.4 | 56, 57 |
| USA | 2011/2012 | 17900 | 3290 | 14600 | 28.8 | 58, 59 |
| Canada | 2011 | *b* | 251 | *b* | 20.4 | 60 |
| Europe | 2003 | *b* | 3440 | *b* | 20.1 | 32 |

interagency partnership among CDC & FDA

## How does NARMS help investigators?

- Detects emerging trends of resistance;
- Links enteric illnesses (resistant and susceptible) to specific sources and risk factors;
- Understands the genetic mechanisms that confer resistance and its spread among enteric bacteria;
- Investigates enteric disease outbreaks;
- Educates consumers about foodborne antimicrobial resistance threats and food safety practices that protect against these threats;
- Guides public health priorities
- Provides information and recommendations that promote the judicious use of antimicrobial agents

**United States Department of Agriculture**
Animal and Plant Health Inspection Service

Antimicrobial Use 2017

# European Antimicrobial Resistance Surveillance Network (EARS-Net)

# Take home message

- There is a poor understanding of the environmental factors that alleviate the spread of antibiotic resistance
- Un-targeted Metabolic was under represented
- Connection between gut microbial and sewer microbial and treatment plant
- What should be monitored? Plasmid, integron, transposon, linking the microbial id to the resistant genes

**12,000-75,000 reads**

jpiamr
JOINT PROGRAMMING INITIATIVE
ON ANTIMICROBIAL RESISTANCE