Looking Beyond the Classic Foodborne Pathogens

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Post-antibiotic era in medicine
The Classics...

**Drug-Resistant Campylobacter**

- **310,000** DRUG-RESISTANT CAMPYLOBACTER INFECTIONS PER YEAR
- **1,300,000** CAMPYLOBACTER INFECTIONS PER YEAR
- **13,000** HOSPITALIZATIONS
- **120** DEATHS

**Drug-Resistant Non-Typhoidal Salmonella**

- **1,200,000** SALMONELLA INFECTIONS PER YEAR
- **100,000** DRUG-RESISTANT SALMONELLA INFECTIONS PER YEAR
- **$365,000,000** IN MEDICAL COSTS PER YEAR

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**Threat Level: Serious**

This bacteria is a serious concern and requires prompt and sustained action to ensure the problem does not grow.
Looking beyond the classic foodborne pathogens…
METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS (MRSA)

- **Threat Level:** Serious
  - This bacteria is a serious concern and requires prompt and sustained action to ensure the problem does not grow.
  - **80,461** severe MRSA infections per year
  - **11,285** deaths from MRSA per year
  - Staph bacteria are a leading cause of healthcare-associated infections

EXTENDED SPECTRUM β-LACTAMASE (ESBL) PRODUCING ENTEROBACTERIACEAE

- **Threat Level:** Serious
  - This bacteria is a serious concern and requires prompt and sustained action to ensure the problem does not grow.
  - **26,000** drug-resistant infections
  - **1,700** deaths
  - **140,000** enterobacteriaceae infections per year
  - **$40,000** in excess medical costs per year for each infection
Colonizing Opportunistic Pathogens

COPs

Staphylococcus aureus
Klebsiella pneumoniae
Escherichia coli
2014 WHO Report:

Globally, resistance among *E. coli*, *K. pneumoniae* and *S. aureus* to commonly used antibacterial drugs exceeds 50% in many settings.
Paradigm shift
METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS (MRSA)

- **80,461** severe MRSA infections per year
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**Threat Level**: Serious

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Staph bacteria are a leading cause of healthcare-associated infections.
Livestock-associated MRSA CC398

• ST398 – discovered in Dutch swine herds in early 2000’s

• Disproportionately infects farmers, livestock workers, and veterinarians

• Currently, up to 40% of MRSA cases in Denmark, the Netherlands, and regions of Germany are caused by CC398
EXTENDED SPECTRUM
\(\beta\)-LACTAMASE (ESBL) PRODUCING
ENTEROBACTERIACEAE

**NUMBERS**

- **26,000** DRUG-RESISTANT INFECTIONS
- **1,700** DEATHS
- **140,000** ENTEROBACTERIACEAE INFECTIONS PER YEAR

**COSTS**

- **$40,000** IN EXCESS MEDICAL COSTS PER YEAR FOR EACH INFECTION

**THREAT LEVEL**

SERIOUS

This bacteria is a serious concern and requires prompt and sustained action to ensure the problem does not grow.
Is it possible that foodborne *E. coli* are causing UTIs?
Urinary Tract Infections (UTIs):

- 8 - 10 million UTIs annually
- *E. coli* is the leading cause of UTIs
  - extra-intestinal pathogenic *E. coli* (ExPEC)
- *K. pneumoniae* is the second leading cause
- Antibiotics are key treatments
septicemia (blood)
pyelonephritis (kidney)
cystitis (bladder)
Flagstaff, AZ
Population: 65,870
Distance to Phoenix: 147 mi
Major Grocery Store Chains: 9
Hospitals: 1
Flagstaff, AZ
Sample Collection

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E. coli is a Common Contaminant of Retail Meats
Antibiotic Resistance is Common Among *E. coli* from Retail Meats
Human UTIs

Meat
Colistin

Emergence of plasmid-mediated colistin resistance mechanism MCR-1 in animals and human beings in China: a microbiological and molecular biological study

Yi-Yun Liu*, Yang Wang*, Timothy R Walsh, Ling-Xian Yi, Rong Zhang, James Spencer, Yohei Doi, Guobao Tian, Baolei Dong, Xianhui Huang, Lin-Feng Yu, Danxia Gu, Hongwei Ren, Xiaojie Chen, Luchao Lv, Dandan He, Hongwei Zhou, Zisen Liang, Jian-Hua Liu, Jianzhong Shen

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