Innovative Approaches to Preventing Infections and Improving Antibiotic Use

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PACCARB
Presidential Advisory Council on Combating Antibiotic-Resistant Bacteria

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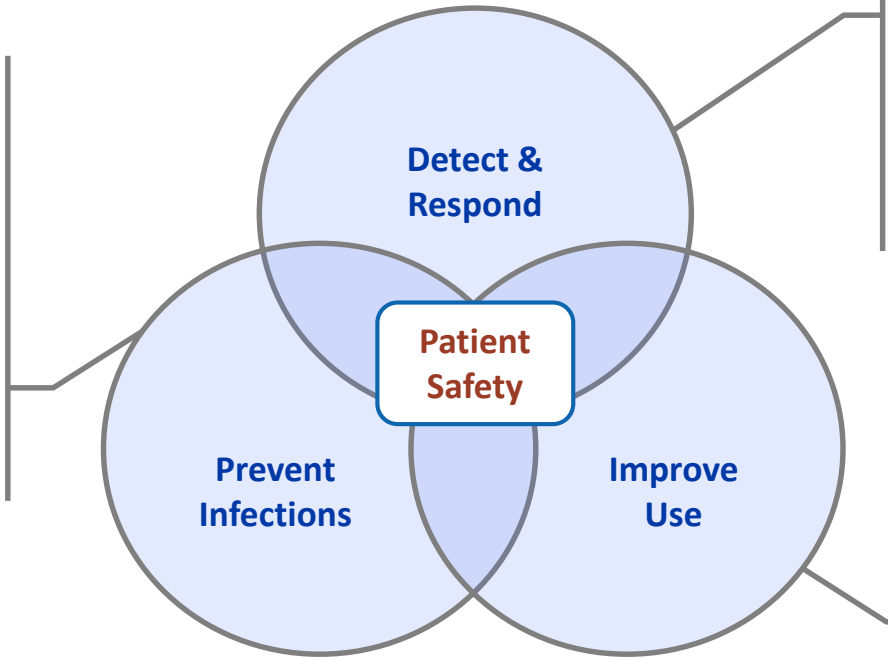
Public Meeting, September 19, 2016

CDC Applies Innovation Across Activities to Protect Patients, Preserve Antibiotics

- Identify infection control improvements and innovations
- Evaluate how best options and opportunities for improving environmental cleaning methods
- Understand transmission in and between facilities
- Leveraging microbiome for AR prevention

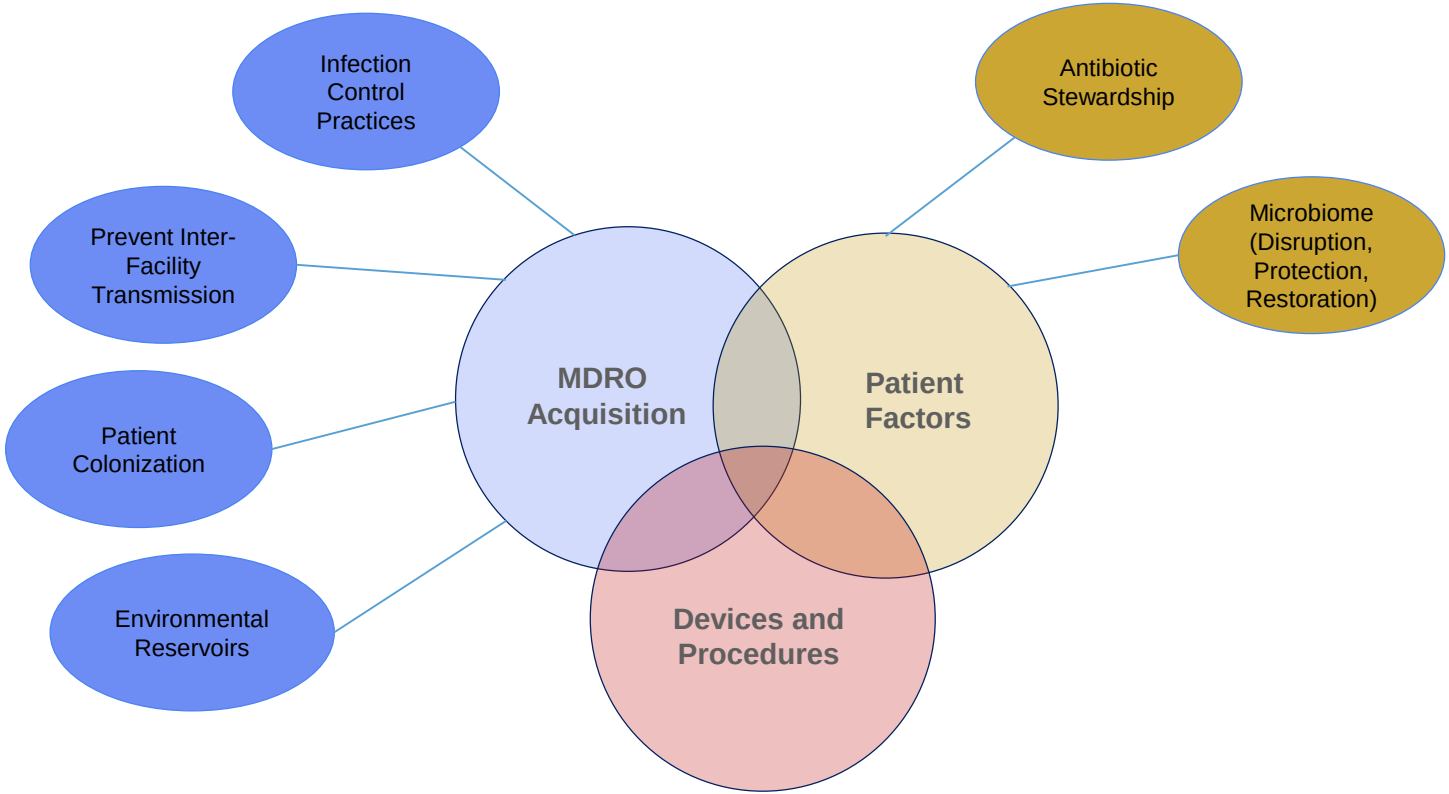


- Drive earlier recognition of AR with regional labs
- Support diagnostic development for stronger, earlier diagnoses with AR Isolate Bank

- Identify ways to measure microbiome disruption
- Support drug and diagnostic development for improved use with AR Isolate Bank

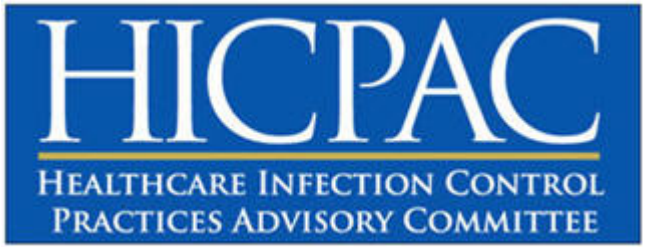
Innovation: CDC continually improves and develops innovative approaches to maximize public health impact

Factors Responsible for AR HAIs and Strategies to Prevent Them



HICPAC: Putting Innovations into Practice

- Soliciting advice from 14 external infection control experts through the Healthcare Infection Control Practices Advisory Committee (HICPAC).
- HICPAC provides advice on the practice of infection control and strategies for surveillance, prevention, and control of HAI/AR and related events in U.S. healthcare settings. The group also weighs in on periodic updating of existing CDC guidelines and development of new CDC guidelines.
- Members include infection control experts from U.S. healthcare systems; ex-officio members from AHRQ, CMS, FDA, HRSA, NIH, VA; and liaisons like AHA, IDSA, NACCHO.



CDC Innovation: Examples of New Awards

Over $30 Million in new AR research and innovation awards in FY 2016:

- Pragmatic cluster-randomized trial to evaluate strategies to enhance judicious antibiotic prescribing in patients hospitalized with pneumonia and urinary tract in acute care hospitals
- Multicenter randomized clinical trial to assess the impact of an automated space-time statistical outbreak detection tool to detect hospital-based outbreaks compared to routine methods for detecting and containing outbreaks.
- Multicenter randomized controlled trial of early discontinuation of empiric antibiotics started for possible respiratory infections among patients on mechanical ventilation
- Testing innovative strategies for improving use of personal protective equipment, hand hygiene and environmental cleaning
- Large regional interventions to prevent MDRO transmission and infection (Orange County, Chicago)
- Standardizing assessment of environmental contamination
- Understanding biofilm development
- Pathogen-specific risk factor/intervention impact studies
  - Adherence to recommended antibiotic treatment regimens (CDI, sepsis)
  - Broad spectrum antibiotic usage for empiric treatment of sepsis
- Assess role of food as source of MDR E. coli that cause UTIs
- Assess risk of acquiring CRE from exposure to contaminated plumbing and sewage in the environment
- Understand genomics of AR origin and spread in nursing homes

What Could it Look Like in Practice? Together, Innovations Preventing *C. difficile* Infections

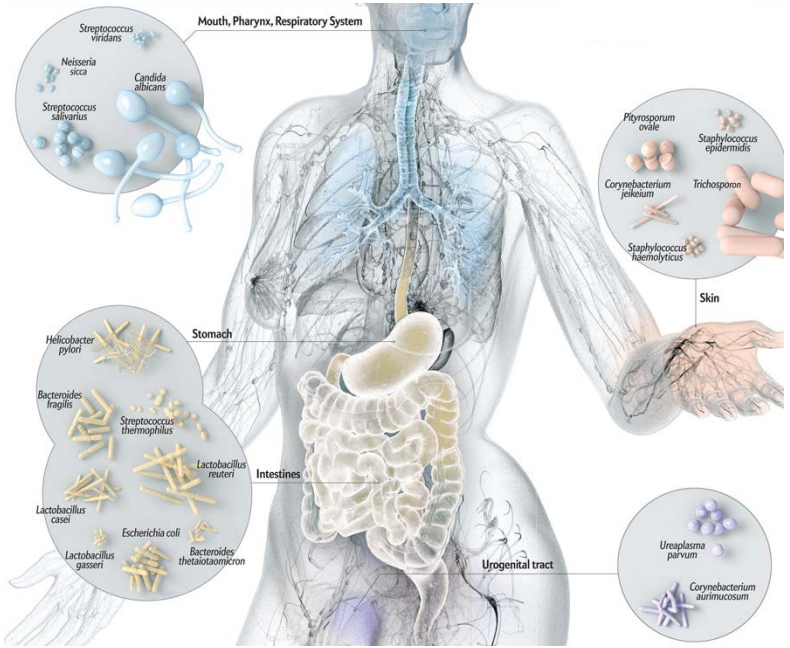
- Transmission
  - Whole genomic sequencing to determine role of colonized patients
  - Role of acquired resistance in transmission of specific strains
  - Determine community sources of transmission
  - Mitigate hospital environmental transmission
  - Evaluate social network measures of healthcare facility connectedness on CDI incidence
- Microbiome susceptibility
  - Developing Microbiome Disruption Indices (MDIs) that predict risk for CDI
  - Novel protection and restoration strategies
  - Improving antibiotic stewardship including CDI-specific strategies
  - Prevent overtreatment of CDI through improved diagnostics

What Could it Look Like in Practice? Together, Innovations Preventing CRE Infections

- Transmission
  - Whole genome sequencing (and metagenomics) to understand transmission dynamics, from horizontal gene transmission in an individual patient's microbiome, to plasmid and strain transmission within a facility (LTACH) or across the nation
  - Understand and mitigate environmental reservoirs (sink drains, hoppers, sewage)
  - Innovative strategies to improve overall effectiveness of contact precautions
  - Developing and testing regional interventions that leverage knowledge of patient-sharing networks and cluster detection to prevent inter-facility spread
- Microbiome susceptibility
  - Develop MDIs that predict risk for colonization and infection
  - Novel protection and restoration strategies
  - Improving implementation of antibiotic stewardship to reduce unnecessary exposures that cause cumulative microbiome disruptions that lead to colonization and infection

A Quick Overview of the Microbiome – Role in AR

- Research on the microbiome is a central component to drive innovations that will protect patients.
- The microbiome is a community of germs in and on your body (e.g., skin, gut, oral and respiratory systems, urogenital tract).
- A healthy microbiome helps protect you from infection.
  - “Antibiotic pressure”=pressure on the microbiome



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Remember: You don’t become resistant to antibiotics, but the bacteria in and on your body can.

01

A healthy microbiome helps protect you from infection. Improved antibiotic use and a healthy microbiome can keep us and our communities well.

02

Antibiotics disrupt your microbiome, wiping out both good and bad bacteria.

03

Resistant bacteria—like MRSA, CRE, and C.*difficile*—can take advantage of this disruption and multiply.

04

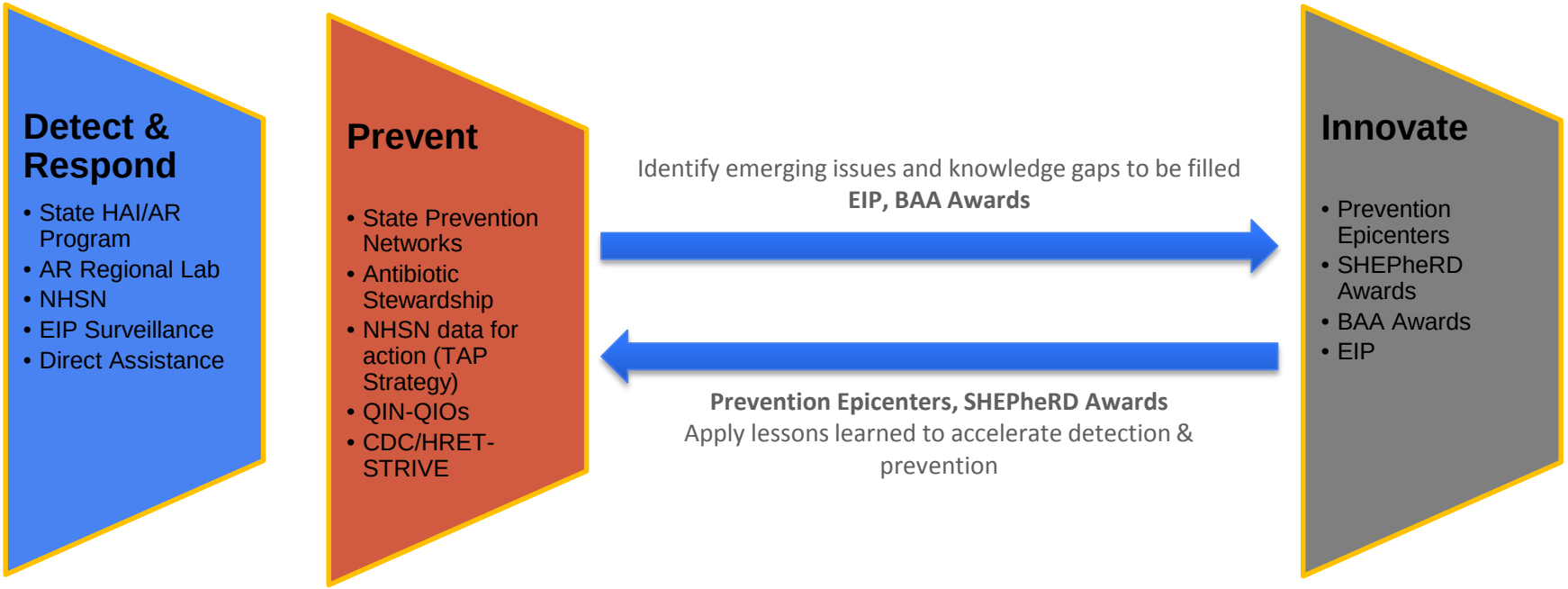
With this overgrowth, your body is primed for infection. Once colonized, you can easily spread the resistant bacteria with others.

Improve Use: Applied Research to Protect the Microbiome & Antibiotics

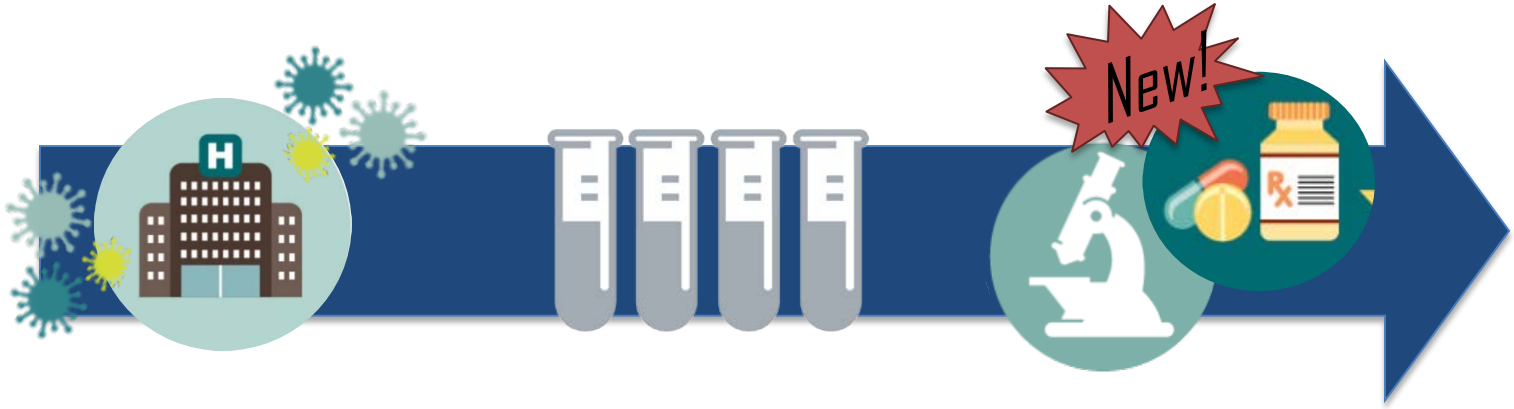
- Predict impact of new and old antibiotics on the microbiome, determine risk of disruption (i.e. determine each antibiotics specific disruptive potential).
- Determine how to tailor antibiotic stewardship to a patient's microbiome and/or to a specific population of patients (e.g., hospital unit, doctor's office).
- Develop and test microbiome diagnostics and protocols:
  - Develop diagnostics that will measure and monitor a patient's risk for colonization.
  - Develop diagnostics that will measure and monitor a patient's risk for transmission, and assess enhanced infection control triggers.
- Support development of therapeutics that will restore and protect the microbiome when antibiotics must be used.

States Leveraging HAI/AR Innovations from Diverse Research Approaches

States leveraging and connecting multiple resources to decrease AR transmission and prevent infections



CDC & FDA AR Isolate Bank



CDC gathers resistant bacteria through surveillance/outbreak programs.

CDC analyzes the bacteria's resistance and shares with researchers, private sector.

Today, the AR Isolate Bank includes 398 unique isolates on 11 panels, like *C. auris* and *mcr*-1.

New diagnostic tests and antibiotic drugs are developed using standardized panels and data.

Since July 2015, CDC has processed 211 orders.