## Welcome to Inaugural Louisiana Antibiotic Stewardship Summit

## Antibiotic Stewardship: Current State of Affairs

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No disclosures

# Objectives

- •To demonstrate regional differences in antibiotic use
- •To outline the sources of inappropriate antibiotic use
- •To show the consequences of inappropriate antibiotic use

# Perfect antimicrobial

- Kills the offending microbe
  Does not kill all microbes
- •Does not kill you

## Penicillin

### Fleming's original plate:



colonies

Che New Hork Eimes

## Fungus kills bacterium

Fleming's bad technique saves millions

## Scope of the problem

- Clinic
- Hospital
- Farming





Evidence for regional differences in antibiotic use

### Community Antibiotic Prescriptions per 1,000 Population by State - 2016

Each year 270.2 million antibiotic prescriptions are written in the United States; equivalent to 836 antibiotic prescriptions per 1,000 persons.



### Antibiotic prescribing per 1000 persons by state (sextiles) in 2011 for all ages (A) and persons aged ≤2 (B), 3–64 (C), or ≥65 (D) years.



Lauri A. Hicks et al. Clin Infect Dis. 2015;60:1308-1316

Published by Oxford University Press on behalf of the Infectious Diseases Society of America 2015. This work is written by (a) US Government employee(s) and is in the public domain in the US.

Clinical Infectious Diseases

### Antibiotic Use in 2012

Source: IMS Health



Center for Disease Dynamics, Economics & Policy (cddep.org)



Center for Disease Dynamics, Economics & Policy (cddep.org)





### Antibiotic Report Louisiana

Time Period: 10/1/2016-9/30/2017 Data Source: Medicare Part D Fee for Service Claims



Prescriptions per 1000 pt months





Broad Spectrum

### Abx prescriptions/1000 pt mos covered



Broad Spectrum Narrow Spectrum



#### From: Estimating National Trends in Inpatient Antibiotic Use Among US Hospitals From 2006 to 2012

JAMA Intern Med. 2016;176(11):1639-1648. doi:10.1001/jamainternmed.2016.5651



#### Figure Legend:

Mean DOT per 1000 Patient-days by US Census Division Between January 1, 2006, and December 31, 2012Across all hospitals, the mean DOT per 1000 patient-days by census division were estimated by generalized estimating equation models controlling for year, case mix index, average patient age, bed size category, teaching status, urban or rural facility location, proportion of surgical discharges, average comorbidity score, facility geographic location, critical care setting, and proportion of inpatient-days in which the International Classification of Diseases, Ninth Revision Clinical Modification diagnosis code was related to an infection. DOT indicates days of therapy.<sup>18</sup>





#### Figure Legend:

Mean DOT per 1000 Patient-days for All AntibioticsAcross all hospitals, the change in mean DOT per 1000 patient-days were estimated by generalized estimating equation models controlling for case mix index, average patient age, bed size category, teaching status, urban or rural facility location, proportion of surgical discharges, average comorbidity score, facility geographic location, critical care setting, and proportion of inpatient-days in which the International Classification of Diseases, Ninth Revision, Clinical Modification diagnosis code was related to an infection. Data points represent mean DOT per 1000 patient-days for each antibiotic class, and the whiskers represent 95% Cls. DOT indicates days of therapy.

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### Local ED data July 2017 to March 2018



#### JAMA Internal Medicine September 2018 Volume 178, Number 9 1267

## ED data July 2017 to March 2018



# How many Abx prescriptions are inappropriate???

# Prevalence of inappropriate Abx use in outpatient settings 2010-2011



Fleming-Dutra KE JAMA. 2016;315(17):1864-1873.

Prevalence of inappropriate Abx use in outpatient settings 2010-2011

% inappropriate Abx per condition



Fleming-Dutra KE JAMA. 2016;315(17):1864-1873.

# Consequences of Abx overuse

### C difficile

Rate of discharges per 100,000 persons



HCUPnet, Healthcare Cost and Utilization Project. Agency for Healthcare Research and Quality, Rockville, MD. https://hcupnet.ahrq.gov/.



Overall rates of Vancomycin Resistant Enterococcus showed a significant increase over the years.

Infectious Disease Epidemiology Section Office of Public Health



#### % Resistant (invasive isolates) --- Aminoglycosides - Aminopenicillins ---- Carbapenems --- Cephalosporins (3rd gen)

Antibiotic Resistance of *Escherichia coli* in East South Central

Center for Disease Dynamics, Economics & Policy (cddep.org)

### Antibiotic Resistance of *Streptococcus pneumoniae* in United States



## Other complications of Abx (over)use

- ADRs 143,000 ED visits annually
  - Shehab et al Clin Infect Dis 2008
- Issues with specific Abx
  - Macrolides and sudden cardiac death
  - FQ and tendon rupture
- C diff infection 1/3 of all cases from community; Prior Abx major risk factor

Sanchez GV MMWR Recomm Rep 2016;65(No. RR-6):1–12. DOI: <u>http://dx.doi.org/10.15585/mmwr.rr6506a1</u>

# Why is that???

Perhaps changes in microbiota

### Issues

- Developing resistant strains
  - S. aureus and P. aeruginosa
- Selecting for already present resistant strains
  - C. difficile
- Encouraging colonization with resistant strains
  - Ordered microbiota protect us from colonization

### Taur, Clin Infect Dis. 2012 Oct;55(7):905-14



**Diversity vs Domination** 

# We are becoming less diverse...

In terms of our microbiota





Blaser MJ Science. 2016 April 29; 352(6285): 544–545.

# THINK OF Antibiotics as Chemotherapy!



## U.S. ANTIBIOTIC AWARENESS WEEK November 12–18, 2018

www.cdc.gov/antibiotic-use

## What is required to make an impact?



# Impact of controlling antibiotics

An inpatient example

### **Targeted antibiotics by DDD/discharge**



E coli all



Pseudomonas aeruginosa



## What is required to make an impact?



