

Antimicrobial Stewardship: Implications for the Infection Preventionist

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Objectives

- Summarize history of Antimicrobial Stewardship initiative
- Describe the Infectious Diseases Society of America guidelines for Antimicrobial Stewardship.
- Define the role of Infectious Diseases pharmacists involvement in Antimicrobial Stewardship.
- Outline the role of Infection Prevention on Antimicrobial Stewardship.
- Identify the collaborative opportunities for Infection Prevention and Antimicrobial Stewardship.
- Illustrate patient benefit of appropriate antimicrobial use and infection prevention programs.

Historical Perspective: Antibiotic Resistance

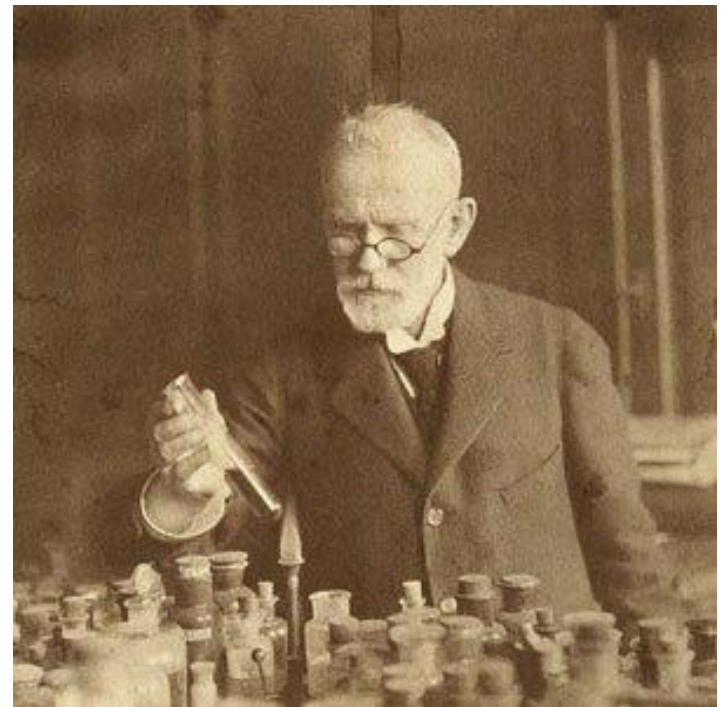
"The greatest possibility of evil in self-medication is the use of too small doses so that instead of clearing up infection the microbes are educated to resist penicillin and a host of penicillin-fast organisms is bred out which can be passed to other individuals and from them to others until they reach someone who gets a septicaemia or pneumonia which penicillin cannot save."

(Alexander Fleming - 1945)

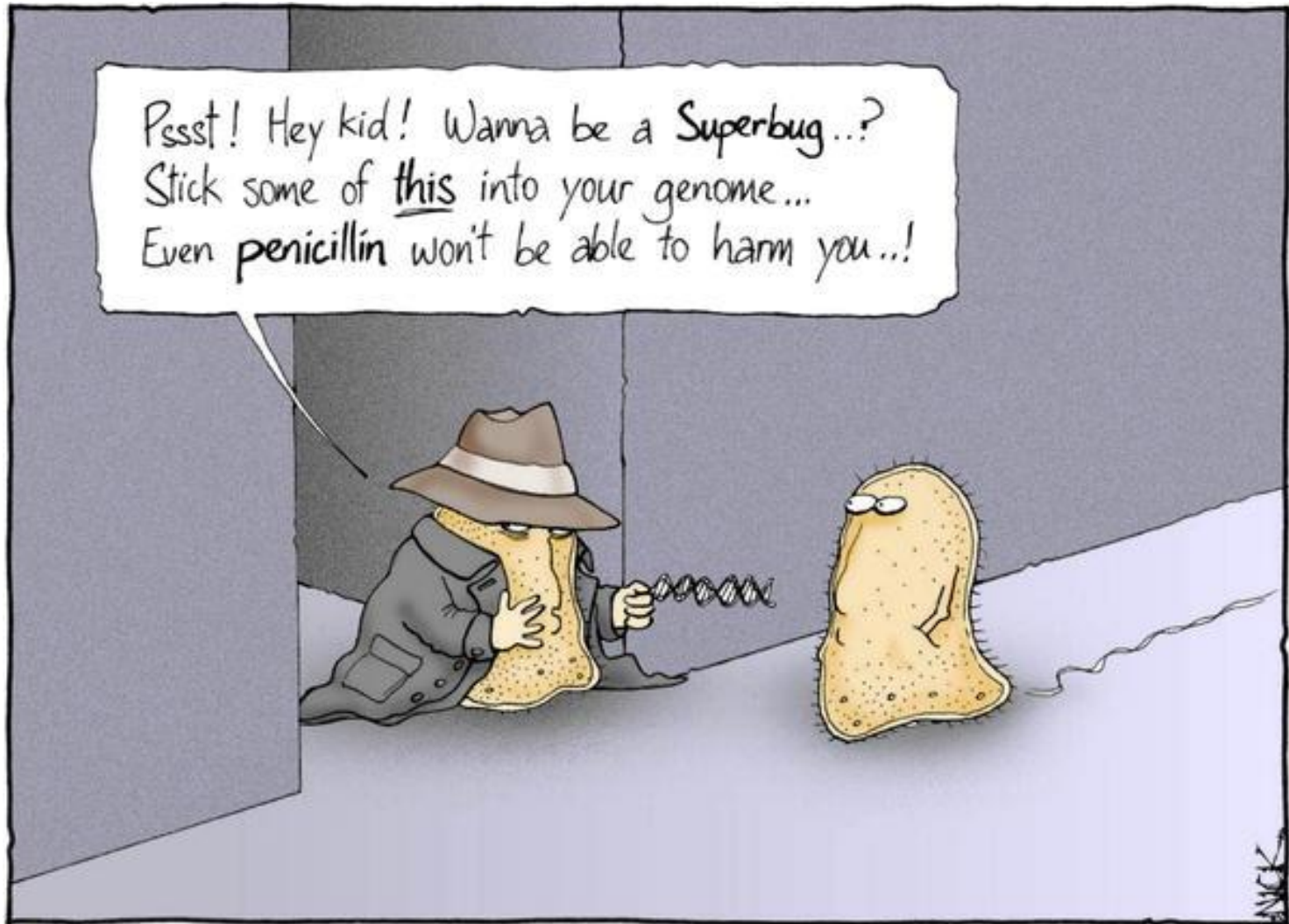


Historical Perspective: Antibiotic Resistance

Despite coining the term “magic bullet” - Paul Ehrlich stated that “Drug resistance follows the drug like a faithful shadow.”



- Paul Ehrlich 1854-1915



It was on a short-cut through the hospital kitchens that Albert was first approached by a member of the Antibiotic Resistance.

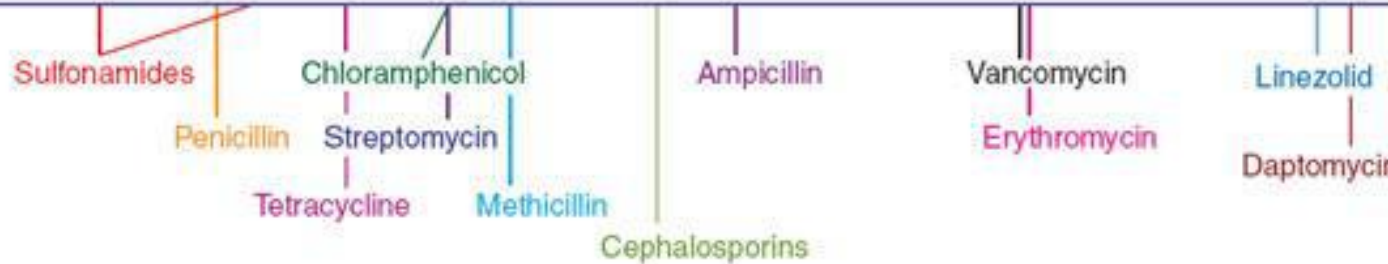
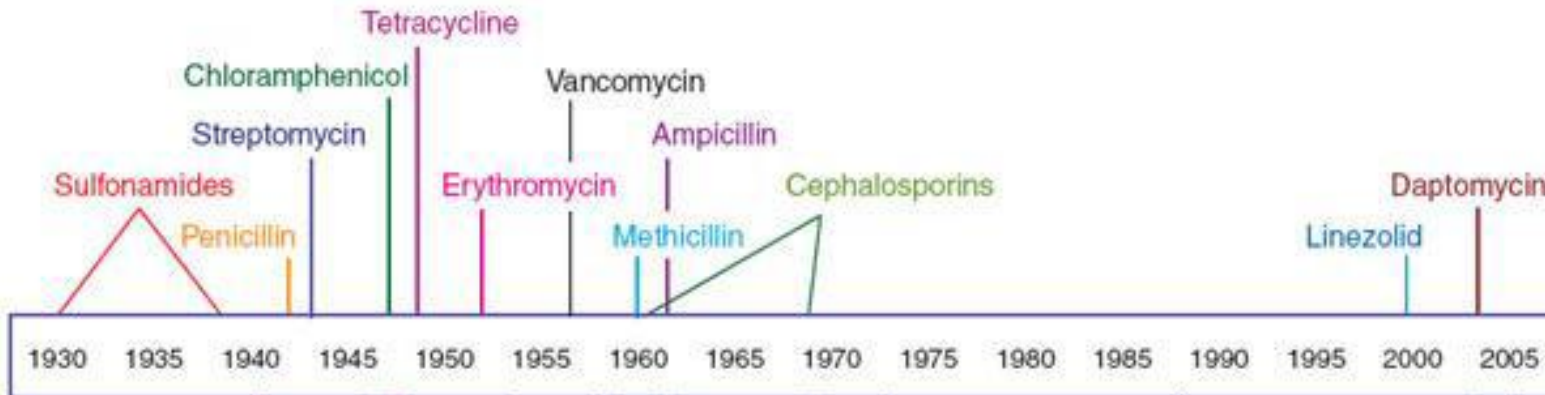


Causes of Antibiotic Resistance

- Use of suboptimal concentrations of antimicrobials
- Inappropriate antibiotic use
- Exposure to broad spectrum antibiotics
- Exposure to microbes carrying resistant genes
- Lack of hygiene in clinical environments
- Use of antibiotics in foods/agriculture

Antibiotic Resistance Timeline

Antibiotic deployment



Antibiotic resistance observed

Carbapenems

Glycylcyline

Current Perspective: Antibiotic Resistance

“The threat of untreatable infections is real. Although previously unthinkable, the day when antibiotics don’t work is upon us. We are already seeing germs that are stronger than any antibiotics we have to treat them.”



- Arjun Srinivasan, MD, Associate Director for Healthcare Associated Infection Prevention Programs, Division of Healthcare Quality Promotion, US Centers for Disease Control and Prevention

Antimicrobial Resistance

BAD BUGS, NO DRUGS

As Antibiotic Discovery Stagnates ...
A Public Health Crisis Brews

"Infectious diseases physicians are alarmed by the prospect that effective antibiotics may not be available to treat seriously ill patients in the near future. There simply aren't enough new drugs in the pharmaceutical pipeline to keep pace with drug-resistant bacterial infections, so-called 'superbugs.'"

*Joseph R. Dalovisio, MD
IDSA President*



Bad Bugs, No Drugs

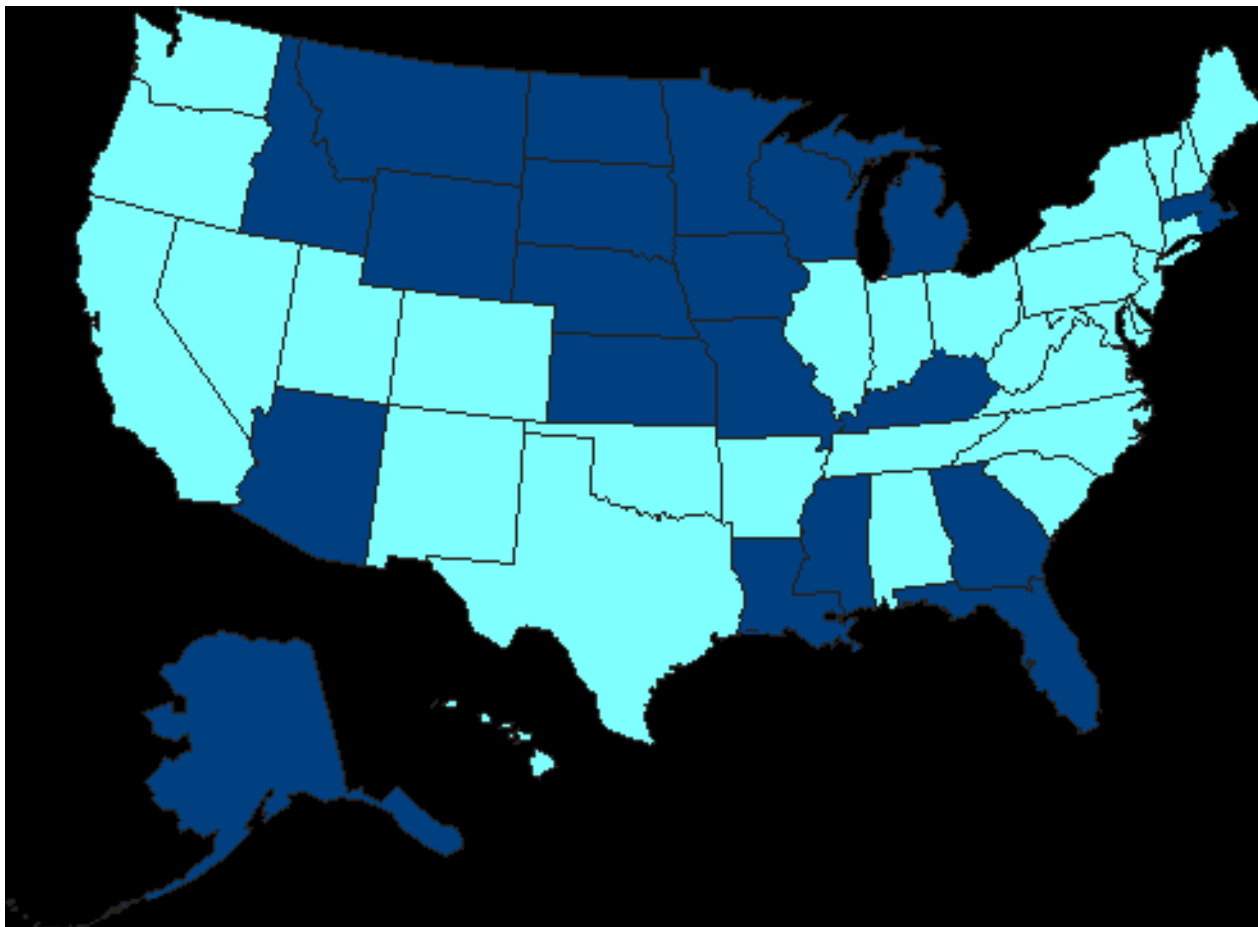
■ IDSA

- White paper from IDSA to Capitol Hill – growing public health crisis
- Expressed concerns with dwindling pipeline of new antibiotics
 - Resistant bacteria causes infections indiscriminately
 - 2 million people acquire healthcare associated infections (HAI) annually; 90,000 die
 - Increases healthcare costs - ≈\$5 billion annually
 - Pharmaceutical Industry – lack of incentives
 - Minimal profit
 - 10-20 years & \$800 million -1.7 billion to bring a drug to market
 - National and global security implications
 - Decreased new drug discovery and increasing antibiotic resistance are increasing threats to the US public health

HAI Estimated Cases US 2002

Antibiotic Resistant Bacteria	Estimated Cases
Methicillin-resistant <i>S. aureus</i>	102,000
Methicillin-resistant CNS	130,000
Vancomycin-resistant enterococci	26,000
Ceftazidime-resistant <i>P. aeruginosa</i>	12,000
Ampicillin-resistant <i>E. coli</i>	65,000
Imipenem-resistant <i>P. aeruginosa</i>	16,000
Ceftazidime-resistant <i>K. pneumoniae</i>	11,000

States Required to Report HAI to NHSN

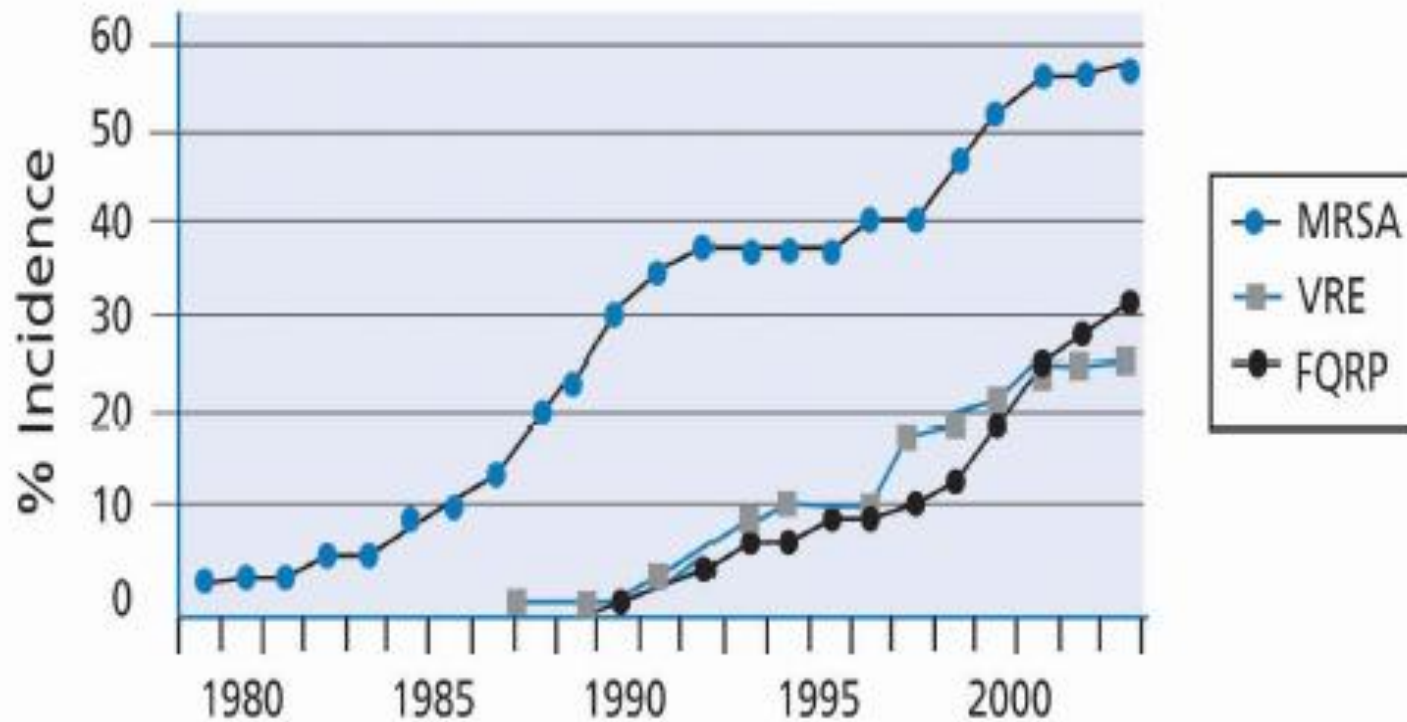


HAI Estimated Cases

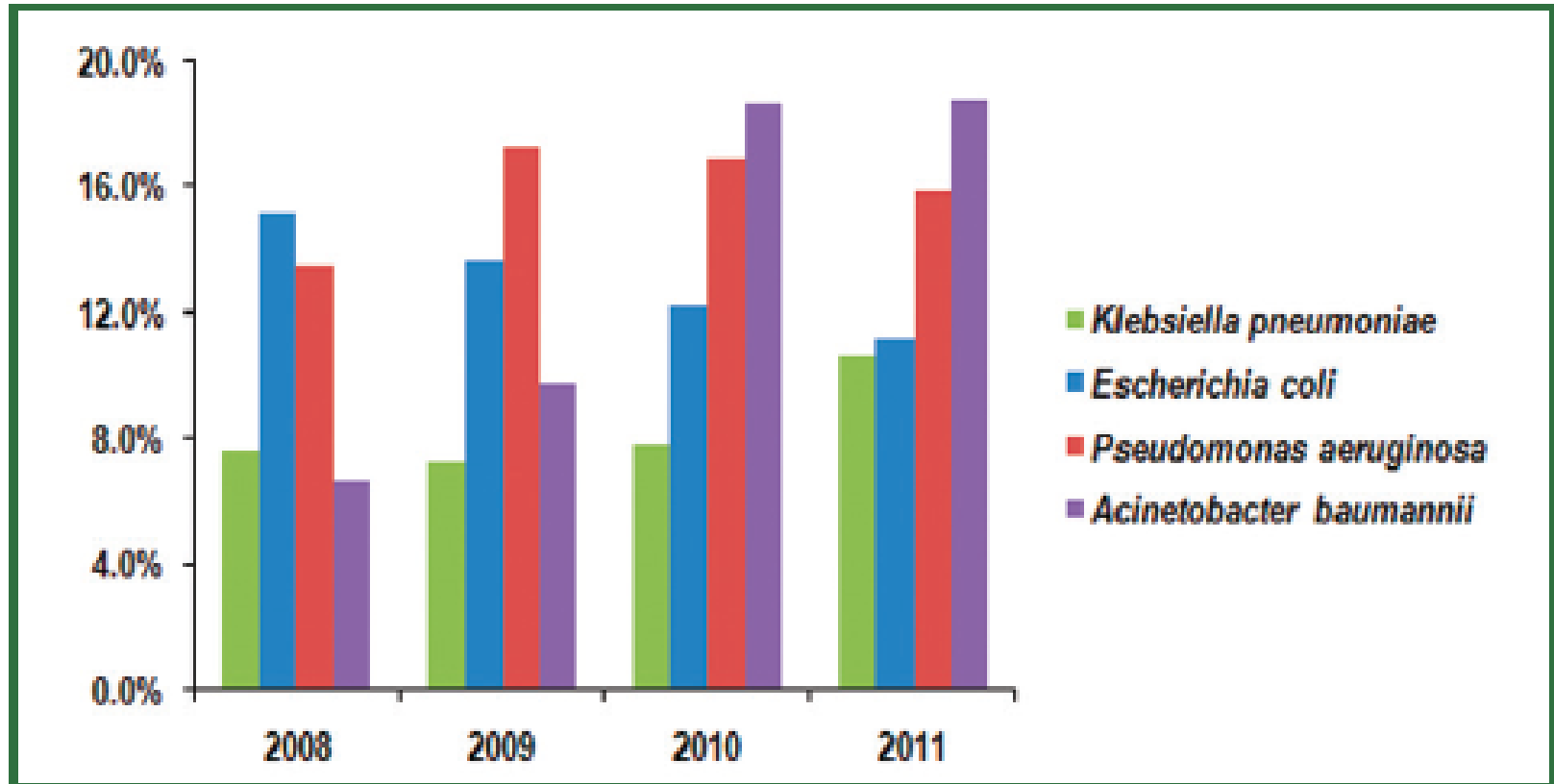
US: Jan 2006-Oct 2007

Bacteria	Estimated Cases
<i>S. aureus</i>	4,913
CNS	5,178
<i>Enterococcus</i> spp.	4,093
<i>P. aeruginosa</i>	2,664
<i>Acinetobacter baumannii</i>	902
<i>E. coli</i>	3,264
<i>Klebsiella</i> spp.	2,315
<i>Candida</i> spp.	3,628

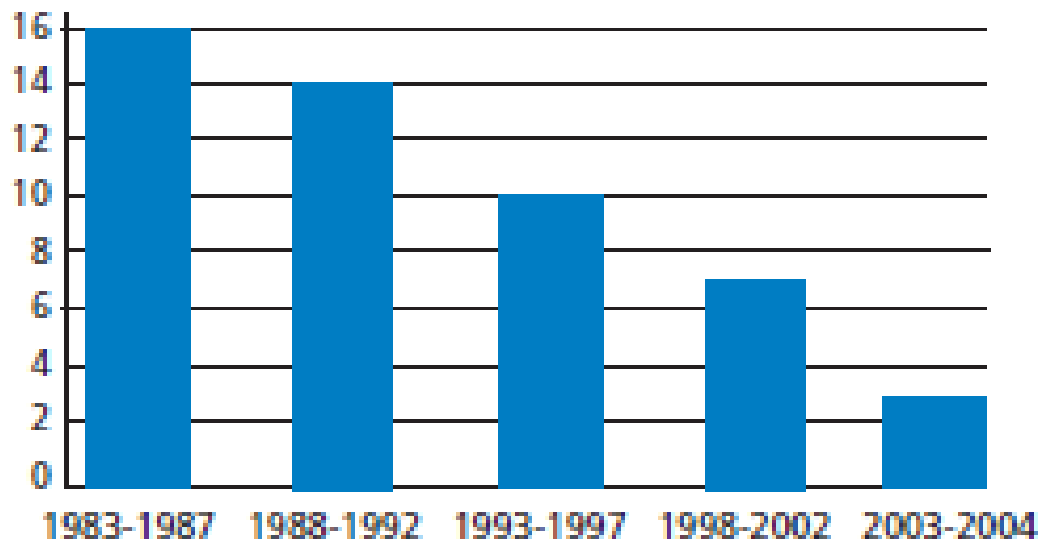
Resistance implications: Gram-positives



Resistance implications: Gram-negatives



Antimicrobial Approvals, 1983-2004



■ Total # New Antibacterial Agents (5 year Intervals)

Source: Spellberg et al., *Clinical Infectious Diseases*, May 1, 2004 (modified)

Out of 506 agents in development – approximately 5 in pipeline

How do we prevent infections?



Best Mechanism for Infection Prevention

STOP **SUPERBUGS**



**SCRUB
EM!**

Single most effective measure to prevent infection is proper hand washing

Germ Farm




Scrub'em!



Other Mechanisms for Infection Prevention

- Primary method utilized by health-care facilities
 - Infection Prevention
- Additional method utilized by limited health-care facilities
 - Stewardship



Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America Guidelines for Developing an Institutional Program to Enhance Antimicrobial Stewardship

**Timothy H. Dellit,¹ Robert C. Owens,² John E. McGowan, Jr.,³ Dale N. Gerding,⁴ Robert A. Weinstein,⁵
John P. Burke,⁶ W. Charles Huskins,⁷ David L. Paterson,⁸ Neil O. Fishman,⁹ Christopher F. Carpenter,¹⁰ P. J. Brennan,⁹
Marianne Billeter,¹¹ and Thomas M. Hooton¹²**



Antimicrobial Stewardship Program (ASP): Overview

- IDSA/SHEA guidelines published in 2007
- Endorsed by
 - American Academy of Pediatrics
 - American Society of Health-Systems Pharmacists
 - Infectious Diseases Society for Obstetrics & Gynecology
 - Pediatric Infectious Diseases Society
 - Society for Hospital Medicine
 - Society of Infectious Diseases Pharmacists

ASP Guideline Goals

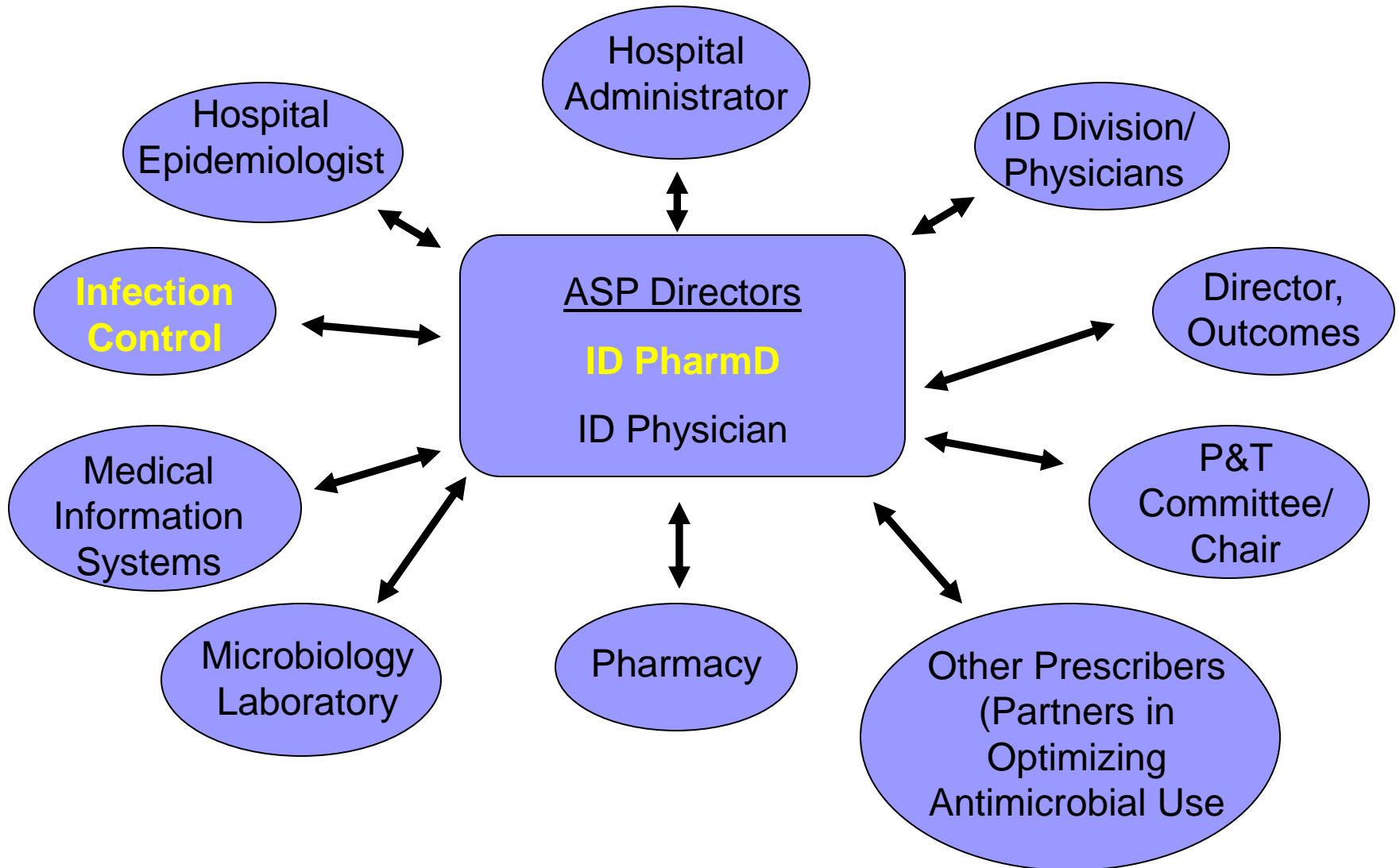
■ Primary

- Optimize outcomes while minimizing unintended consequences with antibiotic use
 - Toxicity
 - Selection of pathogenic bacteria (eg, *C. difficile*, MDR)
 - Increased resistance

■ Secondary

- Reduce cost of healthcare while maintaining quality of care

ASP Team



ASP Role

- Strategy 1: Prospective Audit with Intervention and Feedback
 - Concurrent review of patients receiving antimicrobials
 - Inappropriate orders discussed with antimicrobial stewardship team member(s) and prescriber
- Strategy 2: Formulary Restriction
 - Limits prescribing authority but increases control of antibiotic use and costs
- Other strategies:
 - Pathways/guidelines
 - Order Sets
 - Antibiotic Cycling/switch
 - IV/PO switch
 - Education

What does the “stewardship” initiative mean for health-care?

- Depends on site
 - Example for MOST comprehensive = California

Senate Bill No. 739

CHAPTER 526

An act to add Article 3.5 (commencing with Section 1288.5) to Chapter 2 of Division 2 of the Health and Safety Code, relating to health facilities.

[Approved by Governor September 28, 2006. Filed with
Secretary of State September 28, 2006.]

What is CA SB 739?

- By 1/1/2008, California Department of Public Health (CDPH) take all of the following actions to protect against HAI in general acute care hospitals (includes surveillance, prevention and reporting)
 - Process to evaluate judicious antibiotic use
 - create an oversight committee to monitor responsibilities of quality improvement activities

Issues implementing SB 739

- Mandates that each acute care hospital should have an Antimicrobial Stewardship Program (ASP)
 - Only state with this legislation
- Adequate number of trained individuals to perform stewardship
 - ID pharmacists
 - Physician champion with appropriate background

Other Stewardship Initiatives

- CMS Quality Measures
 - “Section 1: Systems to prevent transmission of MDROs and promote antibiotic stewardship, Surveillance”
 - 31 elements for assessment
 - Multidisciplinary process in place to review antimicrobial utilization, etc.
 - Antibiotic orders include indication
 - Mechanism for antibiotic review after 72 hours
 - HAI monitoring by Infection Prevention



Role of Infection Prevention

- Prevention of infections within hospital
 - Monitor infection trends and develop interventions
 - Reporting appropriate data to public health agencies
 - Tracking of HAI to minimize transmission
 - Establish infection prevention practices
 - Monitoring and Isolation of patients with positive surveillance cultures
 - Education for infection prevention



Role of ID Pharmacist

- Provide cost-effective pharmaceutical care in patients on targeted antimicrobials
- Monitor/evaluate appropriate use of antimicrobials
- Provide PK/PD services to maximize therapy
- Assist in preparation of yearly antibiogram
- Provide hospital education on antimicrobial use and policies

Collaborative ASP/IP Role

- Mutual goals:
 - Prevent HAI
 - Prevent spread of infections between patients
 - Monitor resistance trends within facility
 - Antibigram
 - Develop mechanisms to reduce development of MDROs
 - Appropriate treatment (including length of therapy) to minimize collateral damage



Enhanced Collaboration

- ID pharmacist (or ASP designated pharmacist) inclusion in Infection Control team/committee
- Joint review of MDRO/HAI patients to evaluate appropriateness of IP and ASP measures
- Data sharing to identify additional opportunities for IP or ASP interventions

Collaboration Example: *C. difficile*

- IP – Infection control considerations
 - Isolation
 - hand washing
- ASP – review current medications
 - Recommend stopping of anti-diarrheals, proton pump inhibitors, etc
 - Recommends potential discontinuation or de-escalation of antimicrobials
 - Reviews *C. difficile* treatment for appropriateness and provides any required interventions

Collaboration Example: CAUTI

- IP – monitoring per NHSN requirements
 - Devise days
 - Patient days
 - Culture results
 - Identification of potential cause / development of plan to reduce future occurrences
- ASP – review of antimicrobial therapy
 - Treatment appropriateness (e.g., asymptomatic bacteriuria)
 - Negative sequelae attributable to antimicrobial therapy

“Different Thinking”

- Think outside the “drug” box!
 - There is more to preventing infection than just using drugs (antimicrobials).

- Pharmacists don’t just count pills!
 - Per the World Health Organization Global Strategy for Containment of Antimicrobial Resistance:
“The **most effective infection control team consists** of a physician, a microbiologist, infection control nurses, **pharmacist(s)** and hospital management representatives...”



Additional Opportunities

- Patient Safety

- Emphasize stewardship if related to patient safety
- Involvement of hospital quality group

- CDC's Get Smart: Know When Antibiotics Work

- Increase public awareness
- Outreach to clinicians/clinics

Barriers

- ASP team members
 - ID pharmacists – limited number
 - ID physician involvement
- Other groups
 - Placing blame for resistance on outpatient settings
 - Lack of support/buy in from all physician groups
- Mandates for stewardship
 - National level
 - Appropriate oversight agency (FDA, CDC, CMS, etc)
 - State level
 - Advocates
 - Resources


Summary/Conclusions

- Multi-drug resistant pathogens are increasing while the development of new antimicrobials are dwindling.
- Imperative to preserve the effectiveness of our currently available antimicrobials
- Antimicrobial Stewardship and Infection Prevention programs have increased efforts to minimize and appropriately treat infections.
- Collaborative efforts should be maximized to increase the likelihood of achieving greatest benefit.



Questions/Comments

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