Addressing Antimicrobial Resistance: Importance of a One Health Approach

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3rd Annual COPPOC One Health Lecture

November 2, 2016

EMORY UNIVERSITY

Disclosure

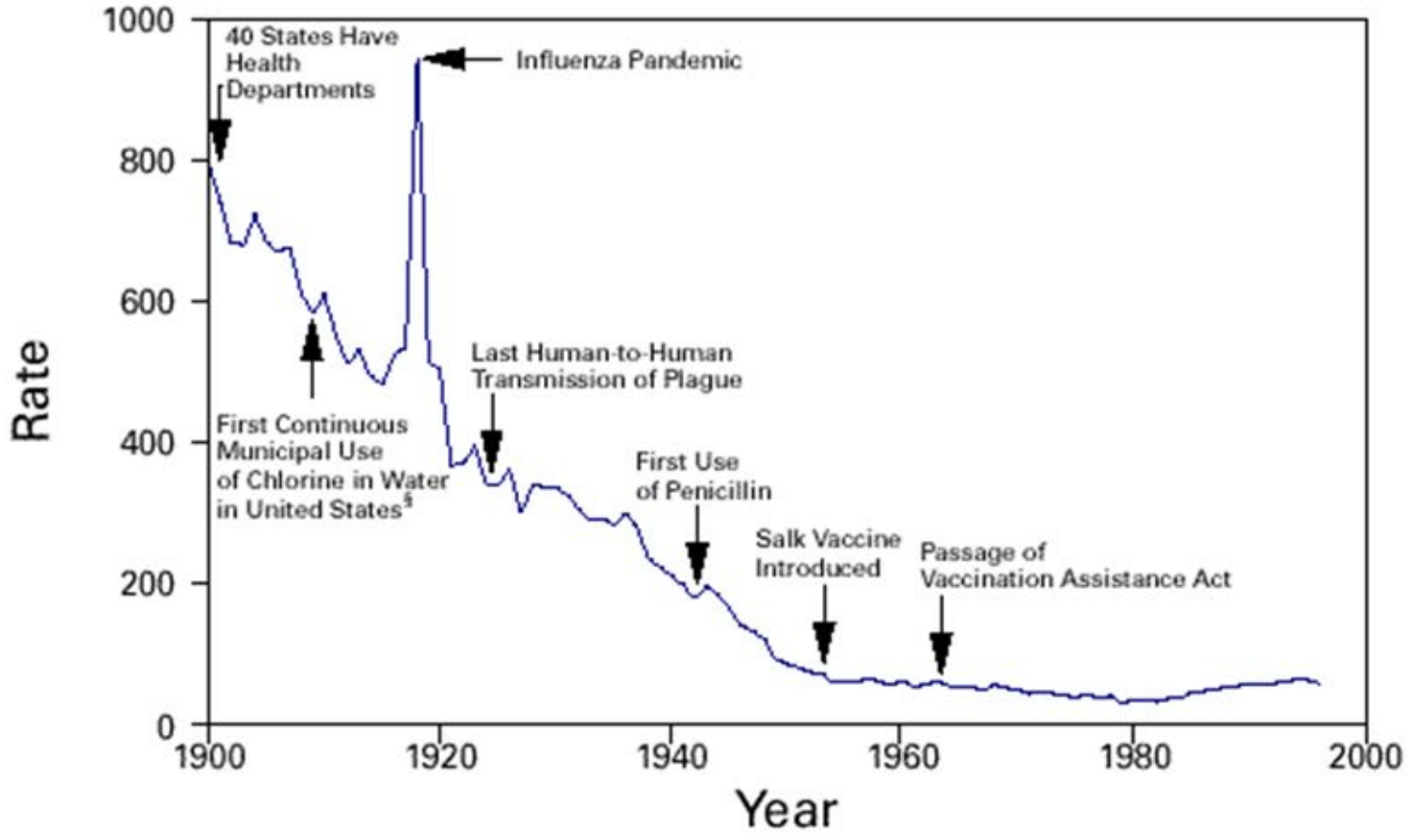
No financial conflicts with this presentation

OUTLINE

- The Problem
- The Challenges
- The Opportunities

Crude Death Rate* for Infectious Diseases

United States, 1900-1996



*Per 100,000 population per year.

†Adapted from Armstrong GL, Conn LA, Pinner RW. Trends in infectious disease mortality in the United States during the 20th century. JAMA 1999:281;61–6.

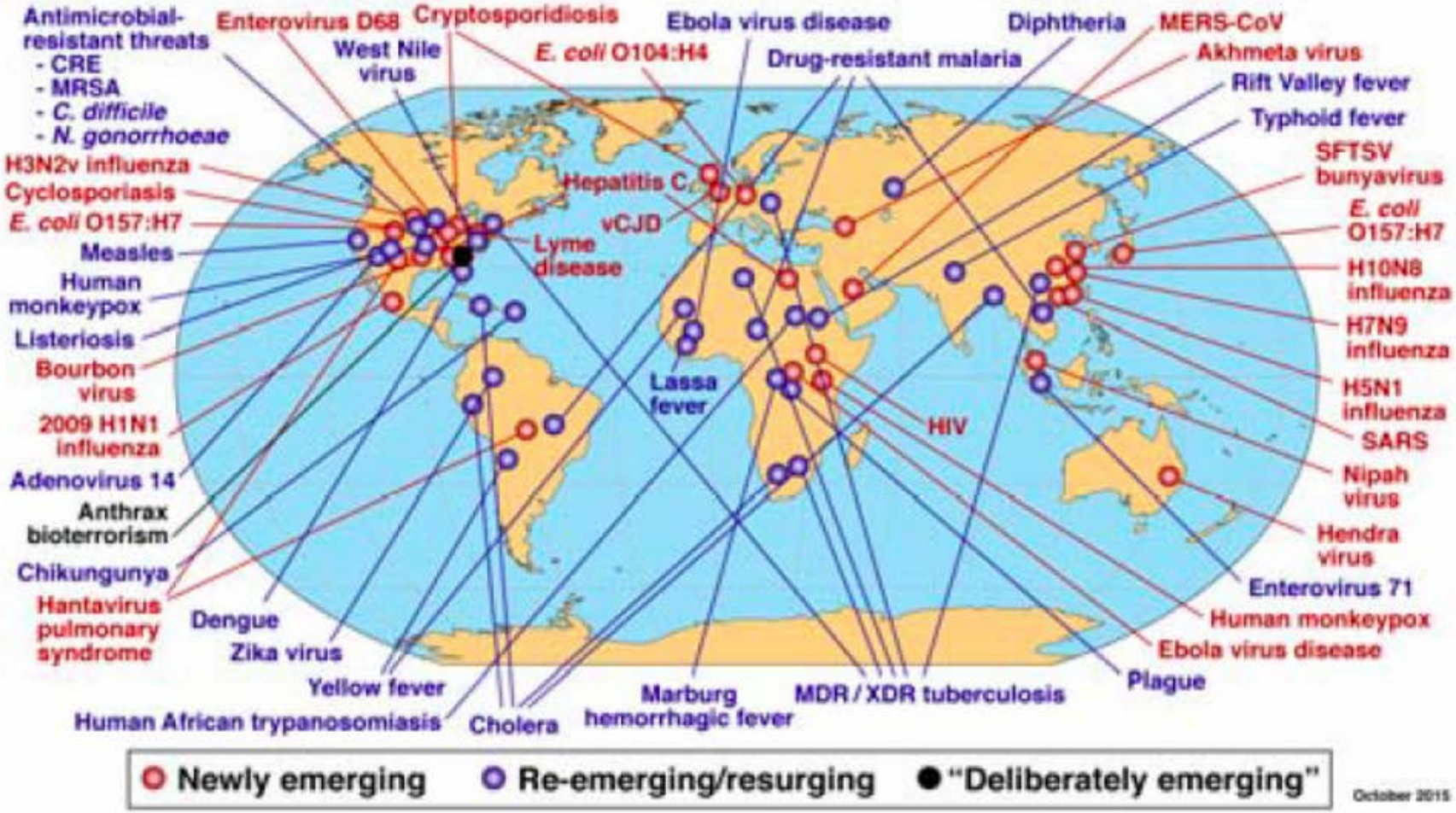
§American Water Works Association. Water chlorination principles and practices: AWWA manual M20. Denver, Colorado: American Water Works Association, 1973.

MMWR 1999;48:621–48

"…One can think of the middle of the twentieth century as the end of one of the most important social revolutions in history, the virtual elimination of the infectious disease as a significant factor in social life."

Burnet, 1962

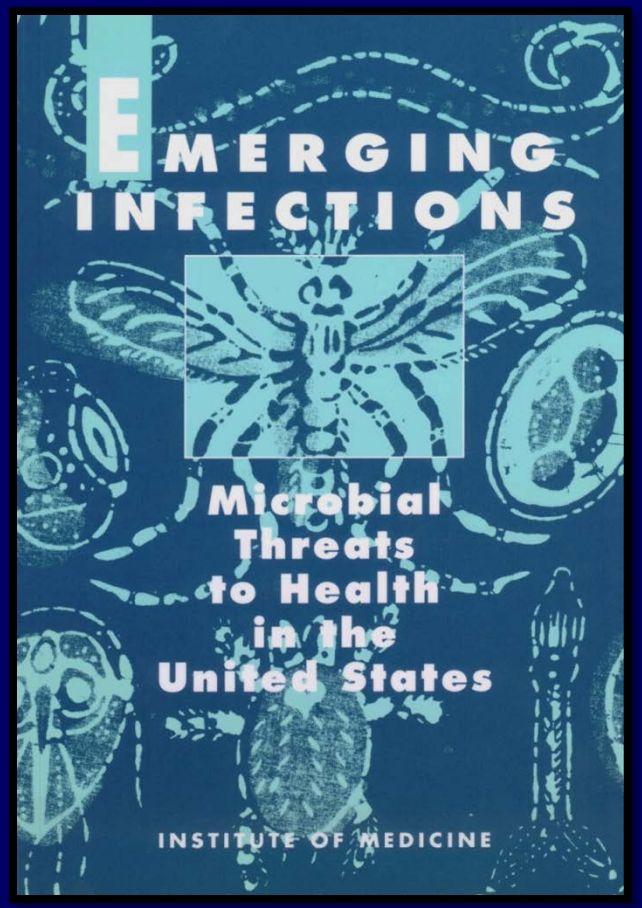
Global Examples of Emerging and Re-Emerging Infectious Diseases



From NIH, NIAID

The Problem

IOM Definition of Emerging Infections



1992

New, reemerging or **drug-resistant infections** whose incidence in humans has increased within the past two decades or whose incidence threatens to increase in the near future.

AMR – The Problem in People

U.S.

- 2M illnesses/yr *
- 8M additional hospital days/yr
- 23,000 deaths/yr
- $21 – 34B/yr in direct healthcare costs
- $55 – 70B/yr in direct and indirect costs

Europe

- 25,000 deaths/yr

Worldwide

- 700,000 deaths/yr now
- 10M deaths/yr in 2050 if current trends continue

* CDC estimates 1 in 5 are caused by organisms from food or animals

Antimicrobial Resistance

Urgent local, national and global challenge

Implications for

- Human health, Animal health, Environmental health

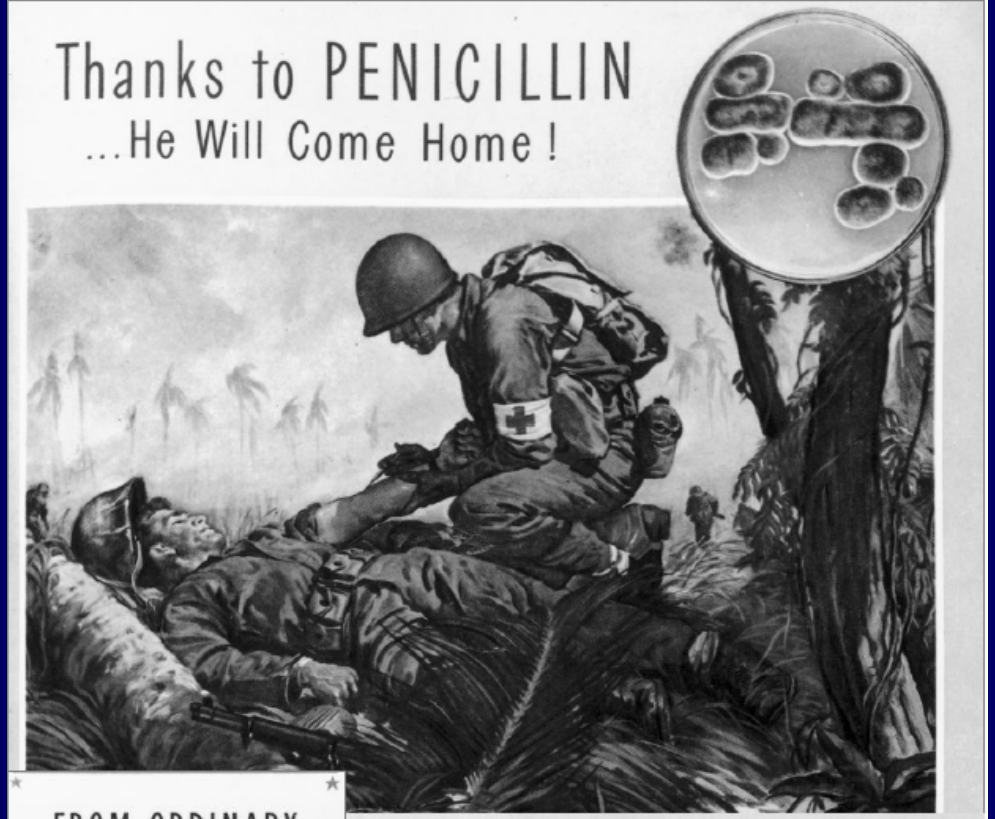
Threat to

- Public health
- Animal health
- National and global security
- National and global economy

Complex, multifaceted problem

- requiring multidisciplinary collaboration and cooperation and national and global commitment and support

Thanks to PENICILLIN
...He Will Come Home!



FROM ORDINARY MOLD—
the Greatest Healing Agent of this War!

On the gaudy, green-and-yellow mold above, called *Penicillium notatum* in the laboratory, grows the miraculous substance first discovered by Professor Alexander Fleming in 1928. Named penicillin by its discoverer, it is the most potent weapon ever developed against many of the deadliest infections known to man. Because research on molds was already a part of Schenley enterprise, Schenley Laboratories were well able to meet the problem of large-scale production of penicillin, when the great need for it arose.

When the thunderous battles of this war have subsided to pages of silent print in a history book, the greatest news event of World War II may well be the discovery and development — *not* of some vicious secret weapon that *destroys* — but of a weapon that *saves* lives. That weapon, of course, is penicillin.

Every day, penicillin is performing some unbelievable act of healing on some far battlefront. Thousands of men will return home who otherwise would not have had a chance. Better still, more and more of this precious drug is now available for civilian use... to save the lives of patients of every age.

A year ago, production of penicillin was difficult, costly. Today, due to specially-devised methods of mass-production, in use by Schenley Laboratories, Inc. and the 20 other firms designated by the government to make penicillin, it is available in ever-increasing quantity, at progressively lower cost.

Listen to "THE DOCTOR FIGHTS" starring RAYMOND MASSEY. Tuesday evenings, C. B. S. See your paper for time and station.

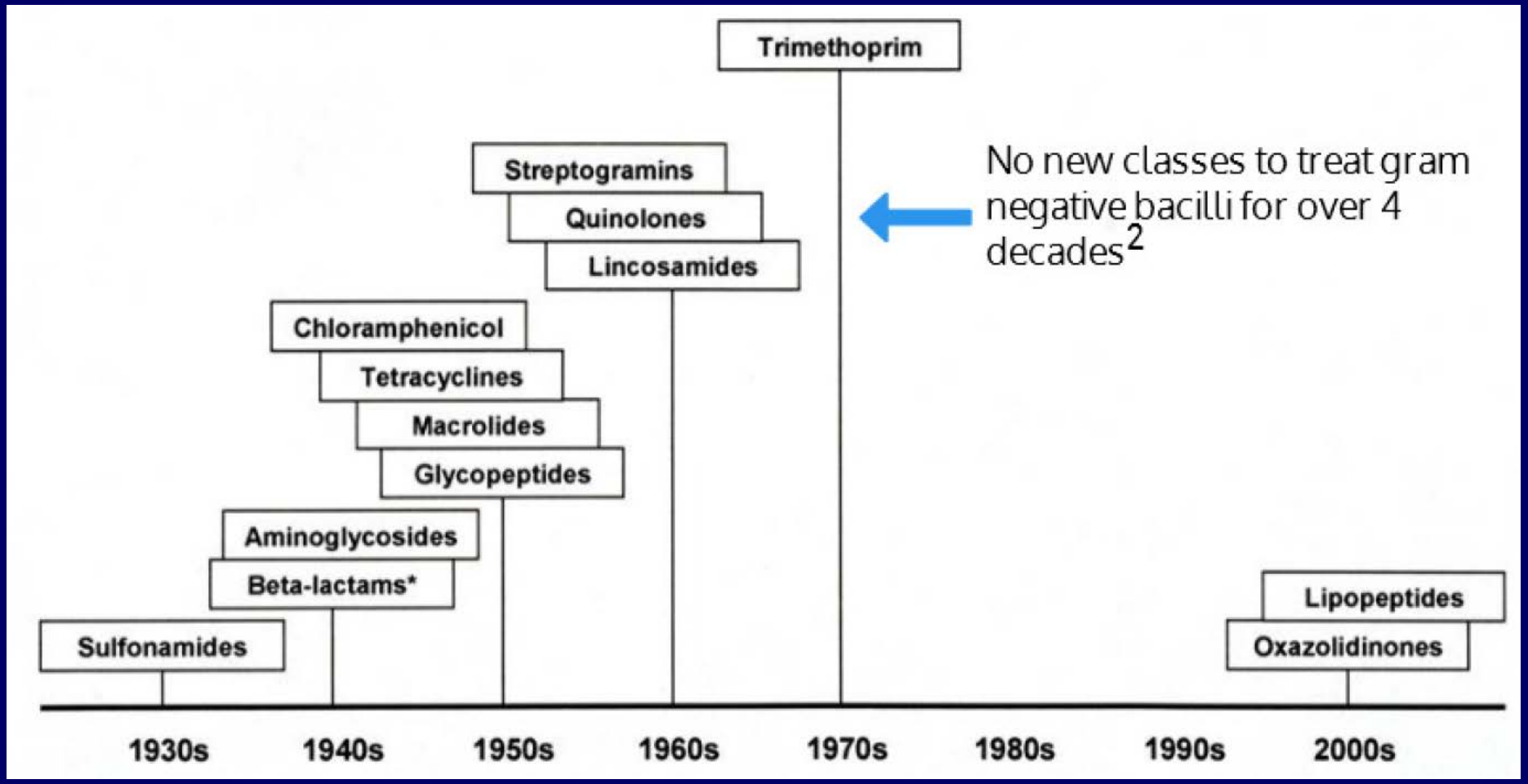
SCHENLEY LABORATORIES, INC.

Lawrenceburg, Indiana

Producers of PENICILLIN-*Schenley*

SCHENLEY LABORATORIES INC.

Antibiotic Introduction Timeline



Penicillin discovered by Sir Alexander Fleming in 1928

IDSA

The Washington Post
March 16, 1993

50 YEARS AFTER THE ADVENT OF PENICILLIN,

DOCTORS FEAR ANTIBIOTICS ARE LOSING THEIR PUNCH

RUNNING OUT OF WONDER DRUGS

BY SANDRA G. BOODMAN

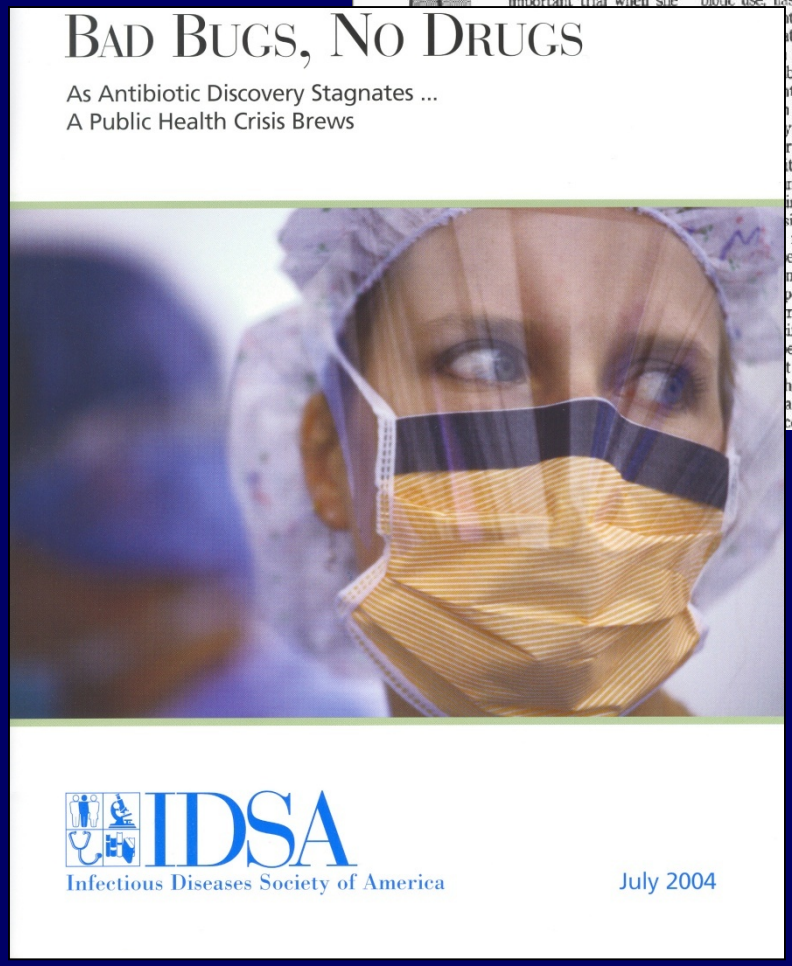
lawyer in Northern Virginia is preparing for an important trial when she

M. Kunin, a professor of internal medicine at Ohio State University and an expert in antibiotic use, has written that an estimated 50 tibiotics are used unnecessarily tely.

30 percent of hospital patients biotics. Cattle are fed large ntibiotics to fatten them for the past, antibiotics—particycline—were routinely given to r months or years to treat acne ltutes in Southeast Asia to prensmission of gonorrhea. Some inue to prescribe antibiotics for sinus infections, colds, flu and illnesses against which such eless.

n, some doctors prescribe unpowerful broad-spectrum drugs row-spectrum medication that ific bacteria would suffice. Othe antibiotics without ever see- or don't perform a culture to he nature of an infection before a drug.

e is another problem. Although



"In 2002, out of 89 new drugs, no new antibiotics were approved."

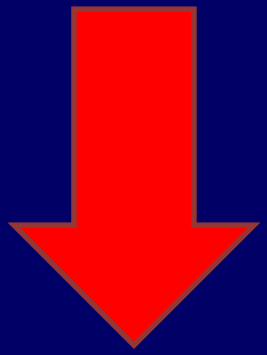
Potential Superbug Impact on Human Medicine

Cancer Patients

Transplant Patients

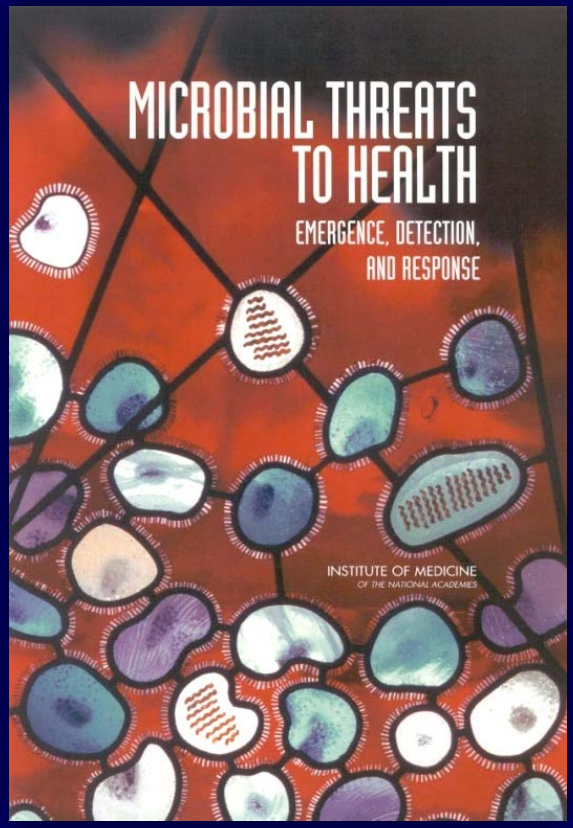
Critical Care Unit Patients
(including Neonates)

Trauma Patients



Return to Pre-Antibiotic Era

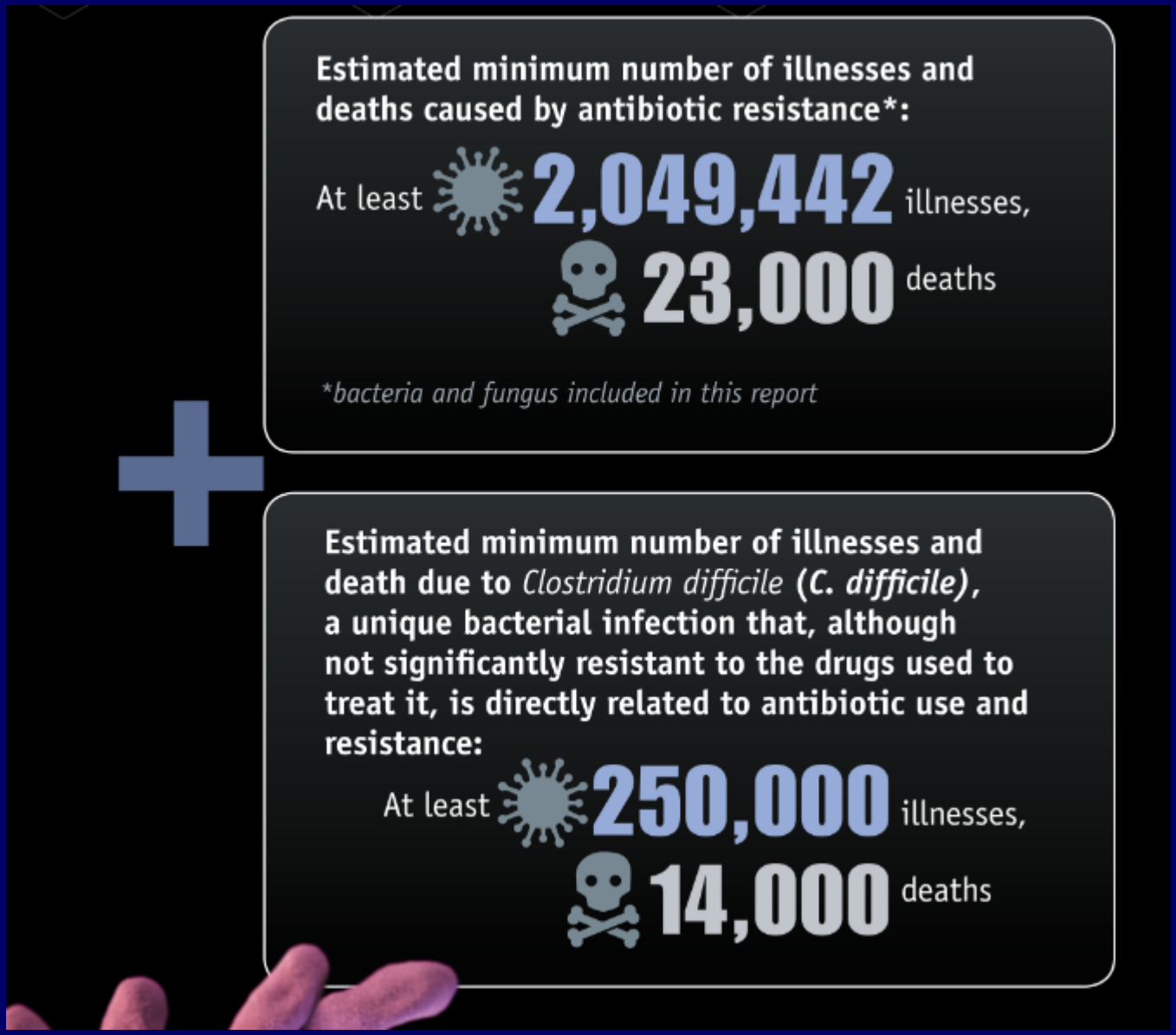
"A robust public health system— in its science, capacity, practice, and through its **collaborations with clinical and veterinary medicine, academia, industry and other public and private partners**—is the best defense against any microbial threat."



2003

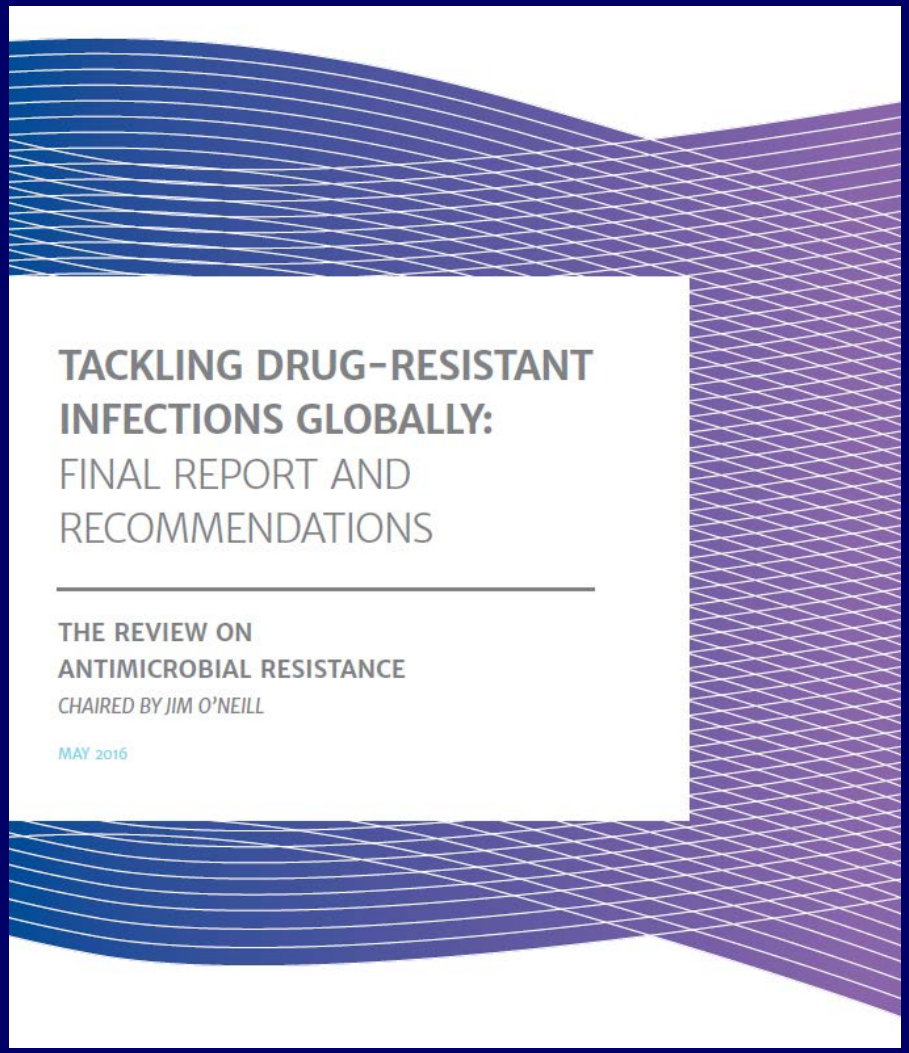

ANTIBIOTIC RESISTANCE THREATS
in the United States, 2013
CDC
U.S. Department of
Health and Human Services
Centers for Disease
Control and Prevention

2013



CDC
2013

$ 55 – 70B in direct and indirect costs



Review on Antimicrobial Resistance

"I find it incredible that doctors must still prescribe antibiotics based only on their immediate assessment of a patient's symptoms, just like they used to when antibiotics first entered common use in the 1950s"

- Lord Jim O'Neill

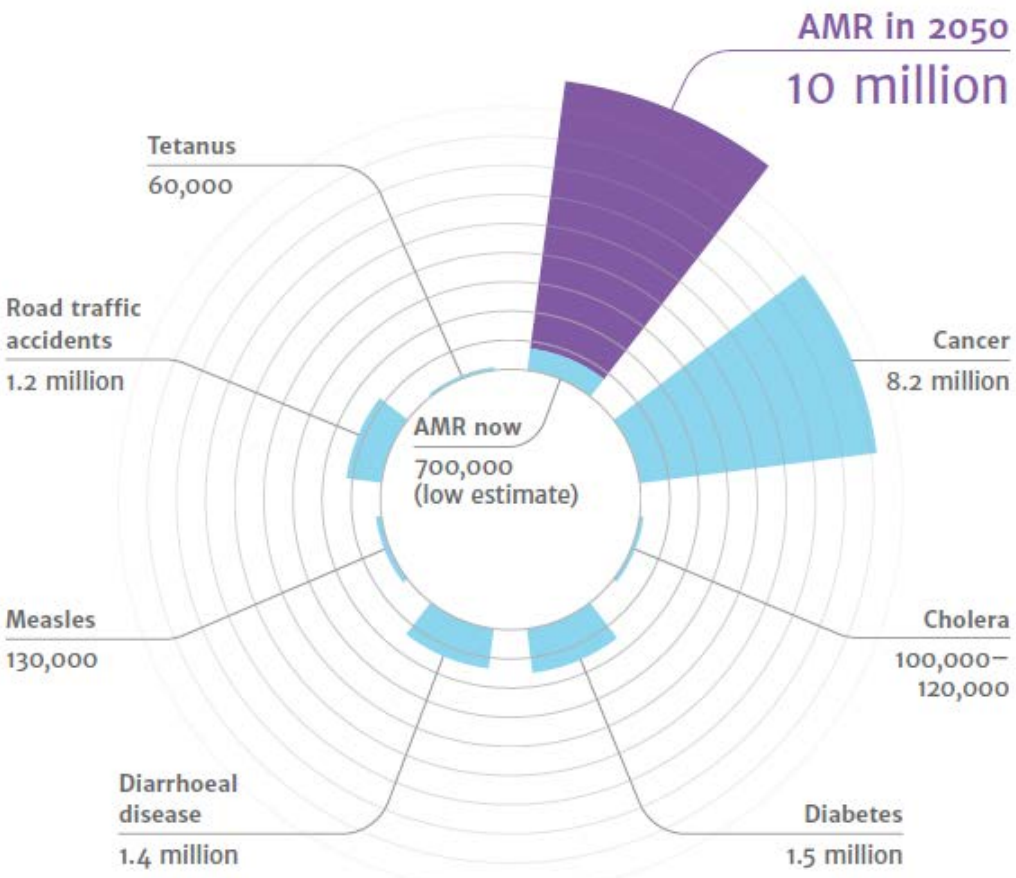
wellcome trust

HM Government

O'Neill Report

https://amr-review.org/sites/default/files/160518_Final%20paper_with%20cover.pdf

DEATHS ATTRIBUTABLE TO AMR EVERY YEAR

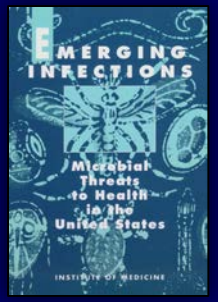


Review on Antimicrobial Resistance

Cumulative economic impact of $100 trillion

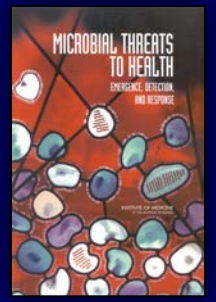
O'Neill Report

https://amr-review.org/sites/default/files/160518_Final%20paper_with%20cover.pdf



The Challenges

Factors Contributing to the Emergence of Infectious Diseases



1992	2003
Human demographics and behavior	**Human susceptibility to infection**
Technology and industry	Climate and weather
Economic development and land use change	**Changing ecosystems**
International travel and commerce	**Poverty and social inequality**
Microbial adaptation and change	War and famine
Breakdown of public health measures	**Lack of political will**
	Intent to harm

Institute of Medicine

Factors in **bold** favor the emergence of antimicrobial resistance

COMBAT DRUG RESISTANCE

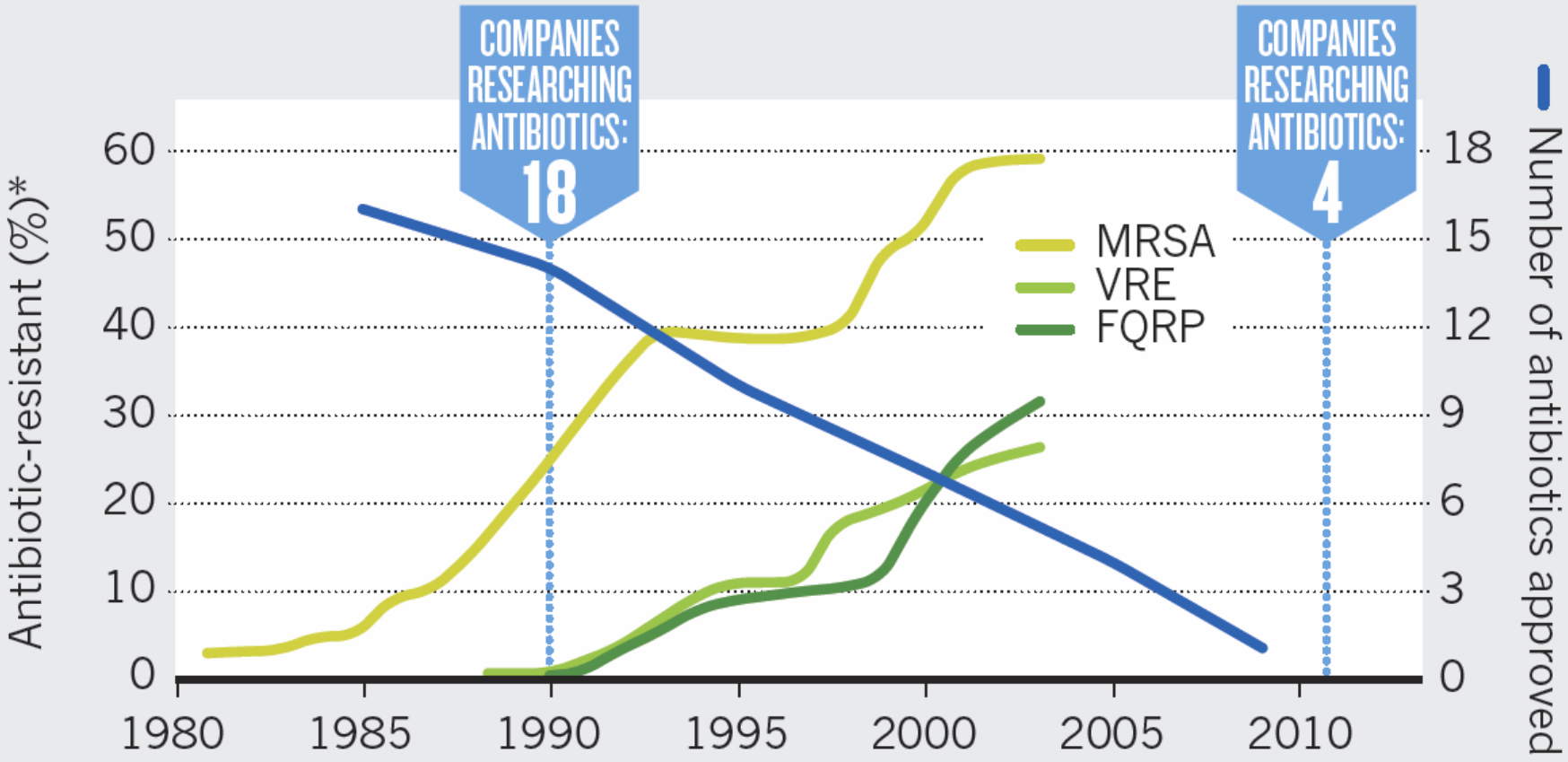
No action today, no cure tomorrow

7 APRIL 2011 **WORLD HEALTH DAY**

World Health Organization

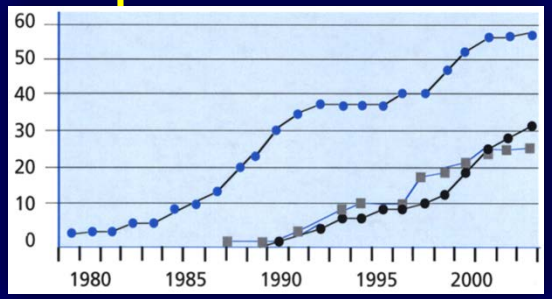
A PERFECT STORM

As bacterial infections grow more resistant to antibiotics, companies are pulling out of antibiotics research and fewer new antibiotics are being approved.



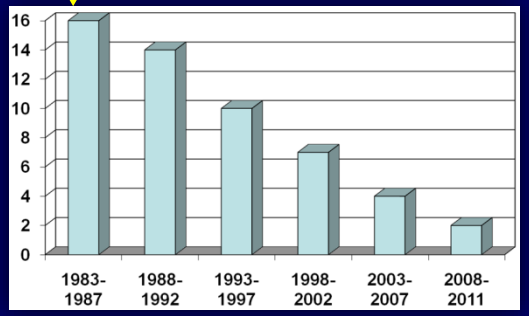
*Proportion of clinical isolates that are resistant to antibiotic. MRSA, methicillin-resistant *Staphylococcus aureus*. VRE, vancomycin-resistant *Enterococcus*. FQRP, fluoroquinolone-resistant *Pseudomonas aeruginosa*.

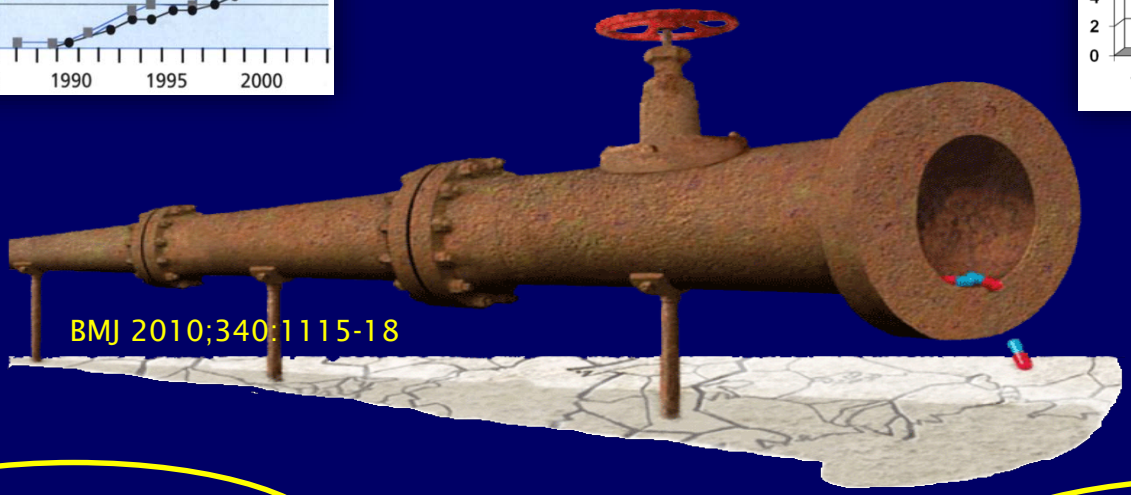
↑ Resistance



World Health Day
April 7, 2011

↓ Drug Approvals





Market Failure

Innovation Gap

Bad Bugs / No Drugs

ESKAPE Bugs

"10 x '20"

"No Action Today,
No Cure Tomorrow"

Combating Antimicrobial Resistance:
Policy Recommendations to Save Lives

World Health Organization

IDSA

CDC AR Threats

Urgent Threats (3)

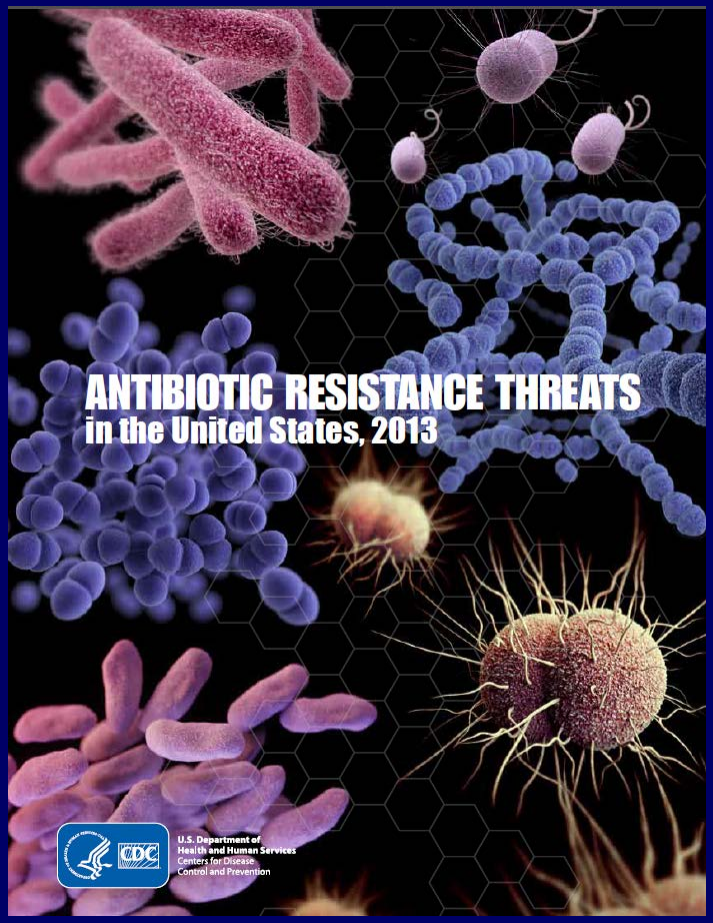
- *C. difficile*
- CRE
- Resistant *N. gonorrhoeae*

Serious Threats (12)

- MDR *Acinetobacter*
- ESBLs
- MDR *P. aeruginosa*
- VRE
- MRSA
- Drug-resistant *S. pneumoniae,* NT *Salmonella, Campy*

Concerning Threats (3)

- VRSA
- Erythro-res GAS
- Clinda-res GBS

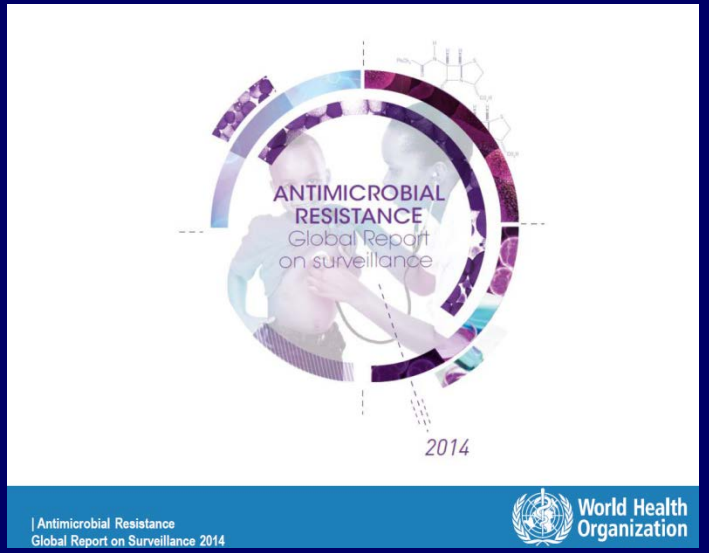


http://www.cdc.gov/drugresistance/threat-report-2013/

WHO AR Priorities

Priority Pathogens

- *E. coli* res to 3rd gen cephalosporins & FQs
- *K. pneumoniae* res to 3rd gen cephalosporins & carbapenems
- MRSA
- Pcn-resistant *S. pneumoniae*
- FQ-resistant *Salmonella*
- FQ-resistant *Shigella*
- *N. gonorrhoeae* with decreased suscept to 3rd gen cephalosporins



http://www.who.int/drugresistance/documents/surveillancereport/en/

Microbial Adaptation and Change

50 YEARS AFTER THE ADVENT OF PENICILLIN,

DOCTORS FEAR ANTIBIOTICS ARE LOSING THEIR PUNCH

RUNNING OUT OF WONDER DRUGS

BY SANDRA G. BOODMAN

"Don't forget to take a handful of our complimentary antibiotics on your way out."

THE NEW YORKER, January 12, 1998

BAD BUGS, NO DRUGS

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

IDSA
Infectious Diseases Society of America

July 2004

"10 x 20"

IDSA AR Priorities

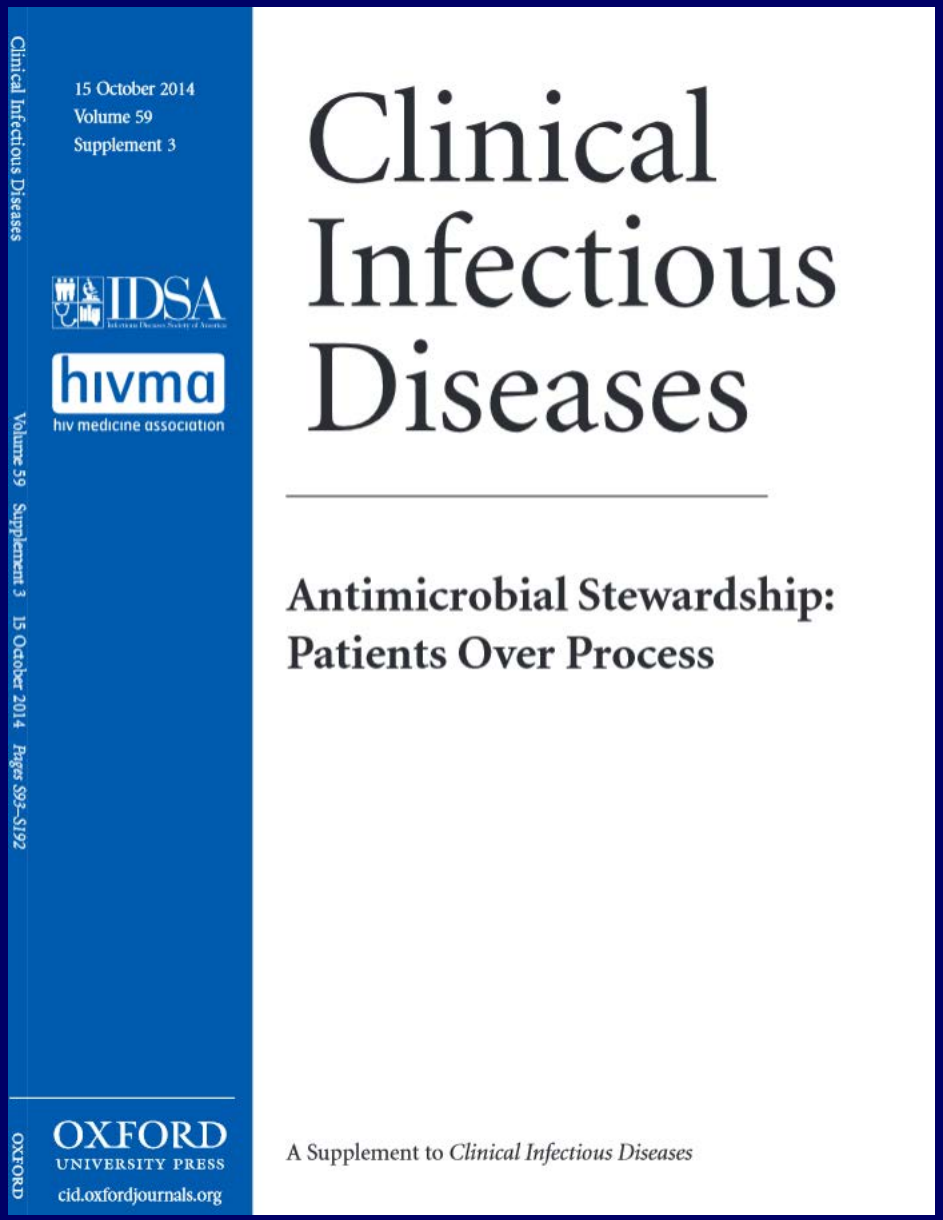
- Drug Development Pipeline
  - Bad Bugs, No Drugs
  - "10 by 20"
- Increased Support for Basic and Translational Research
- Rapid Point of Care Diagnostics
- Surveillance of Use & Resistance
  - Humans and Animals
- Antimicrobial Stewardship
- Regulatory Reform for Clinical Trial Design and New Antibacterial Drug Approval

Preventing Antimicrobial Resistance in Healthcare Settings and the Community

GET SMART | Know When Antibiotics Work

The Five D's

- **Diagnosis** – ensuring the right diagnosis is key to selecting proper therapy
- **Drug** – effective, minimal adverse drug events, least expensive
- **Dose** – adjusted for body size, renal and hepatic function
- **Duration** – evidence-based, when feasible
- **De-escalation** – narrowest spectrum possible, oral when possible



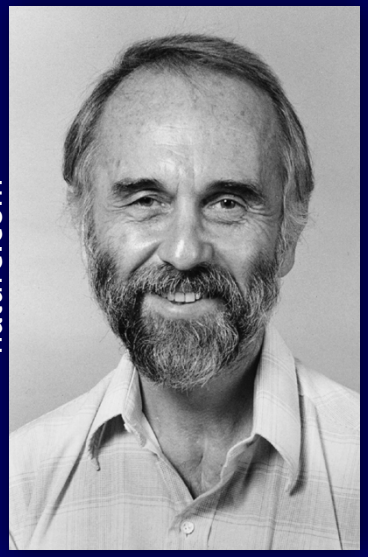
Core Elements

- Leadership commitment
- Accountability (single leader)
- Drug expertise (pharmacist)
- Action (recommendation implementation)
- Surveillance (usage and resistance
- Education (prescribers)
- Data sharing

CALVIN SCHWABE ONE HEALTH PROJECT

UCDAVIS VETERINARY MEDICINE

"Human and animal health are inextricably linked. They always have been. They always will be."



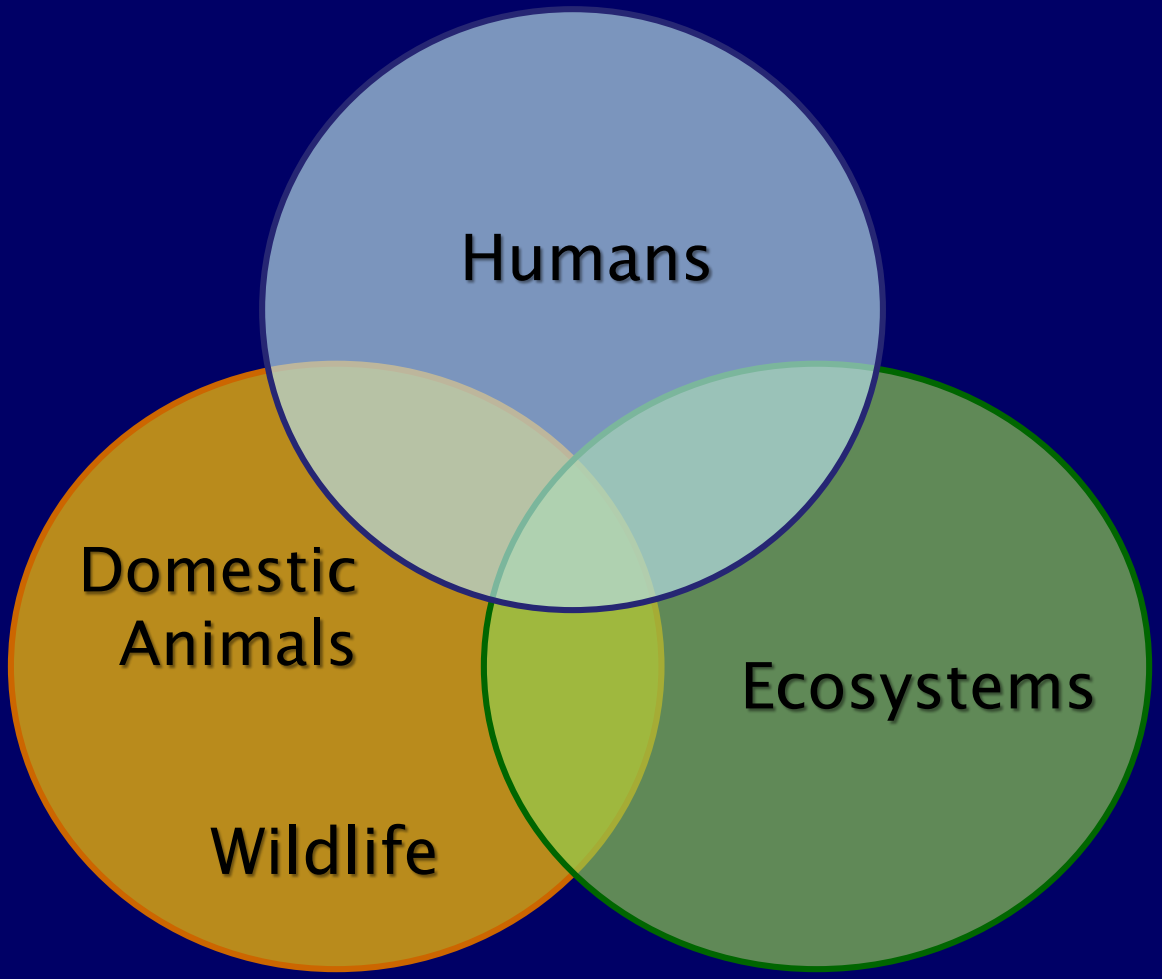
nature.com

Calvin Schwabe
1927 – 2006
Professor of Veterinary Medicine

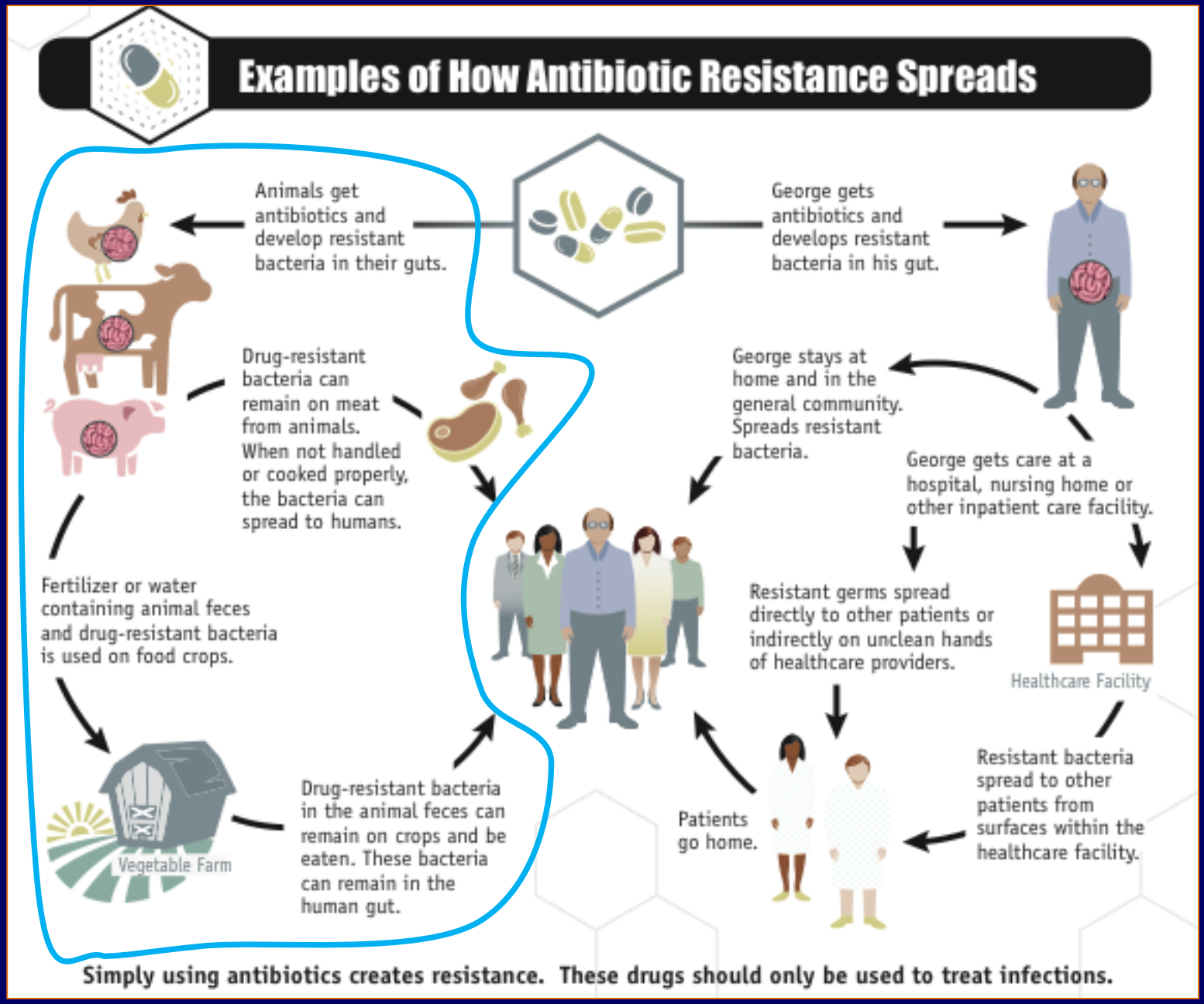
James H. Steele
1913 – 2013
Chief, Veterinary Public Health Division, CDC
Assistant Surgeon General for Veterinary Affairs, USPHS

The Opportunities

"One Health"



http://www.onehealthcommission.org/



CDC AMR in the US 2013

Common Ground for Medical and Veterinary Communities

- Antimicrobial resistance and usage
- Avian, animal, and pandemic influenza
- Other zoonotic diseases including those associated with exotic pet and wildlife trade
- Foodborne disease
- Healthcare-associated infections
- Blood, organ, tissue safety
- Pathogen discovery / new diagnostics
- Drug and vaccine development
- Disease eradication
- Biosafety / Biosecurity
- Bioterrorism / Biodefense

Microbial Adaptation

Emergence of a new antibiotic resistance mechanism in India, Pakistan, and the UK: a molecular, biological, and epidemiological study

Karthikeyan K Kumarasamy, Mark A Toleman, Timothy R Walsh, Jay Bagaria, Fafhana Butt, Ravikumar Balakrishnan, Uma Chaudhary, Michel Doumith, Christian G Giske, Seema Irfan, Padma Krishnan, Anil V Kumar, Sunil Maharjan, Shazad Mushtaq, Tabassum Noorie, David L Paterson, Andrew Pearson, Claire Perry, Rachel Pike, Bhargavi Rao, Ujjwayini Ray, Jayanta B Sarma, Madhu Sharma, Elizabeth Sheridan, Mandayam A Thirunarayan, Jane Turton, Supriya Upadhyay, Marina Warner, William Welfare, David M Livermore, Neil Woodford

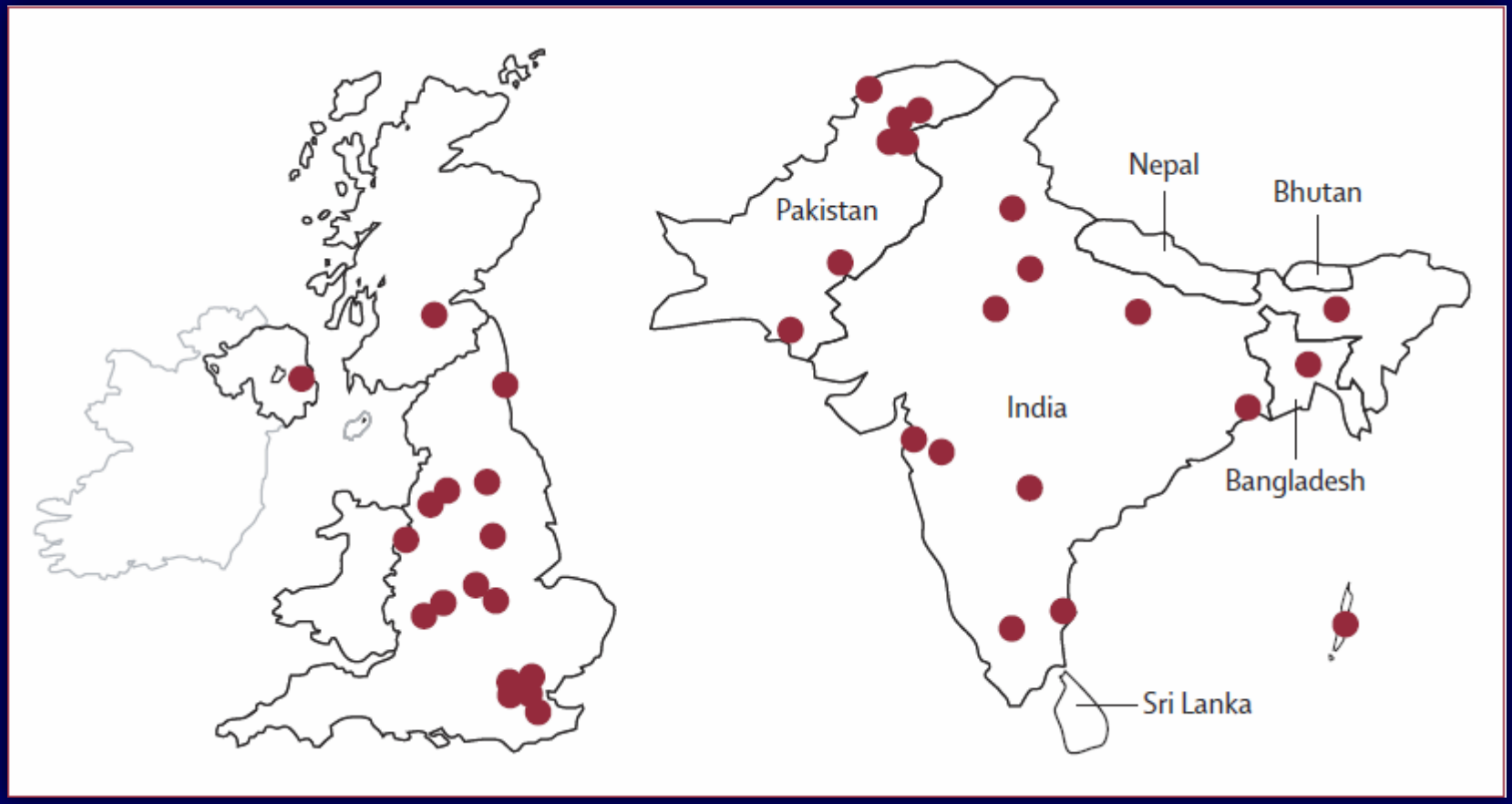
Summary

Background **Gram-negative Enterobacteriaceae with resistance to carbapenem conferred by New Delhi metallo-β-lactamase 1 (NDM-1) are potentially a major global health problem. We investigated the prevalence of NDM-1, in multidrug-resistant Enterobacteriaceae in India, Pakistan, and the UK.**

- NDM-1 (New Delhi metallo-β-lactamase-1) in *Enterobacteriaceae*
- Pan-resistant except tigecycline and colistin
- Clonally diverse strains
- Most on plasmids and transferable
- Some infections associated with medical tourism

Lancet Inf Dis 2010; 10:597–602

Distribution of NDM-1-producing *Enterobacteriaceae* strains in Bangladesh, India, Pakistan, and the UK



Lancet Inf Dis 2010; 10:597–602

Dissemination of NDM-1 positive bacteria in the New Delhi environment and its implications for human health: an environmental point prevalence study

Timothy R Walsh, Janis Weeks, David M Livermore, Mark A Toleman

Summary

Background Not all patients infected with NDM-1-positive bacteria have a history of hospital admission in India, and extended-spectrum β-lactamases are known to be circulating in the Indian community. We therefore measured the prevalence of the NDM-1 gene in drinking water and seepage samples in New Delhi.

Lancet Infect Dis 2011; 11: 355–62

Published Online April 7, 2011

- New Delhi: 171 surface water (SW) and 50 tap water (TW) samples
- NDM-1 gene in 51 (30 %) of SW and 2 of 50 (4%) of TW samples
- NDM-1 gene found in 11 "new" species of bacteria

Lancet Inf Dis 2011; 11:355–362

Colistin resistance: a major breach in our last line of defence

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*

Summary

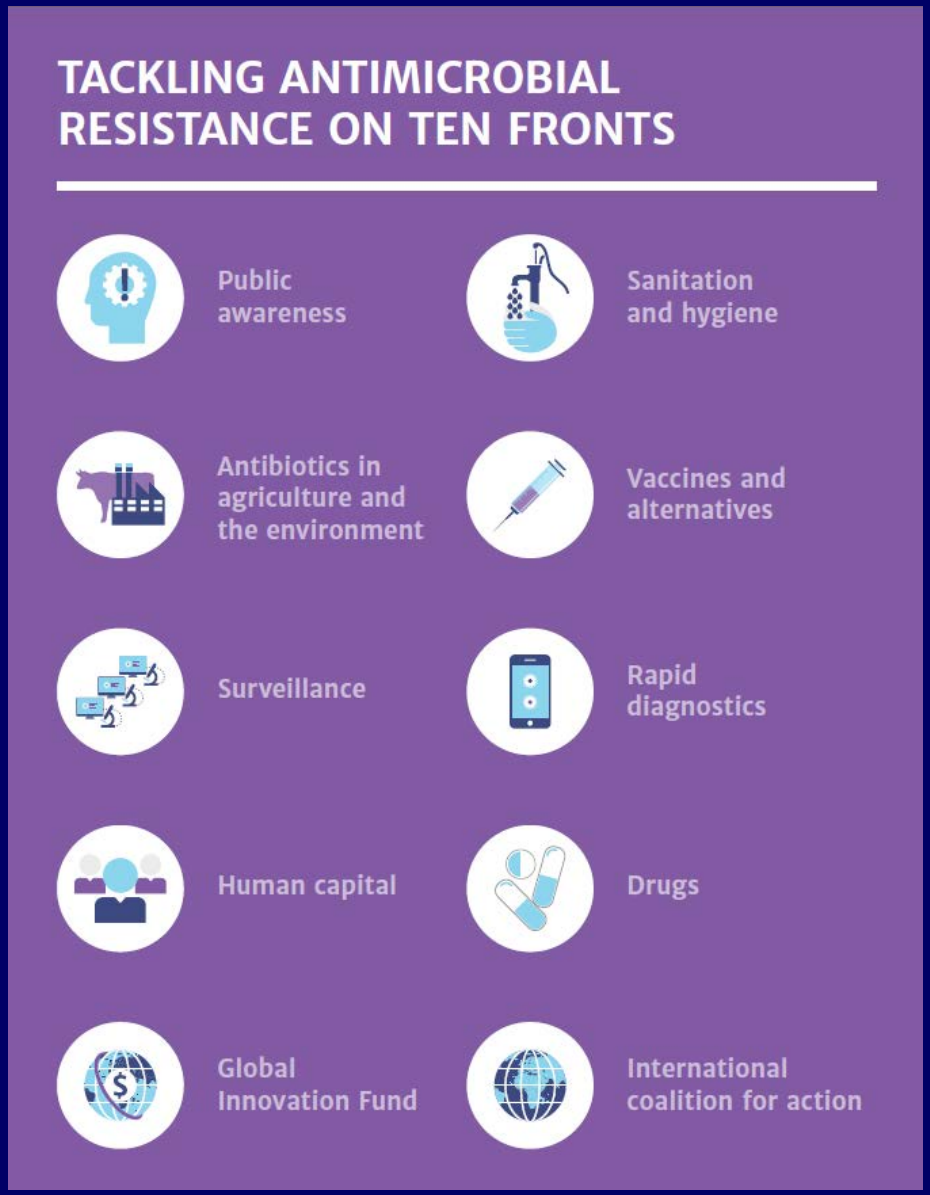
Background Until now, polymyxin resistance has involved chromosomal mutations but has never been reported via horizontal gene transfer. During a routine surveillance project on antimicrobial resistance in commensal *Escherichia coli* from food animals in China, a major increase of colistin resistance was observed. When an *E coli* strain, SHP45, possessing colistin resistance that could be transferred to another strain, was isolated from a pig, we conducted further analysis of possible plasmid-mediated polymyxin resistance. Herein, we report the emergence of the first plasmid-mediated polymyxin resistance mechanism, MCR-1, in Enterobacteriaceae.

Lancet Inf Dis 2016;16:132 and 161–168.

Plasmid-mediated Transferable Polymixin Resistance Mechanism, MCR-1 in *Enterobacteriaceae*

- *E coli* isolate from a pig in China
- Horizontal gene transfer
- Rapid global spread
- Isolates from pigs, retail meats, and humans reported
- 4 reported cases in the US
- Superbug concern

Infectious Disease News, October 2016



Review on Antimicrobial Resistance

O'Neill Report

https://amr-review.org/sites/default/files/160518_Final%20paper_with%20cover.pdf

What we need to do

We propose three broad steps to improve this situation:

1. **10-year targets to reduce unnecessary antibiotic use in agriculture, introduced in 2018 with milestones to support progress consistent with countries' economic development.** In order to reduce global use of antibiotics in agriculture there is a strong case for targets on use at the country level, taking into account countries' production systems.

2. **Restrictions and/or bans on certain types of highly critical antibiotics.** Too many antibiotics that are last-line drugs for humans are being used in agriculture, sometimes without even professional oversight. These need to be the prime focus of efforts to reduce consumption in animals and action should be taken on this now.

3. **Improve transparency** from food producers on the antibiotics used to raise the meat that we eat, to enable consumers to make more informed purchase decisions.

Review on Antimicrobial Resistance

O'Neill Report

https://amr-review.org/sites/default/files/160518_Final%20paper_with%20cover.pdf

HOW SURVEILLANCE CAN IMPROVE HEALTH OUTCOMES

Review on Antimicrobial Resistance

O'Neill Report

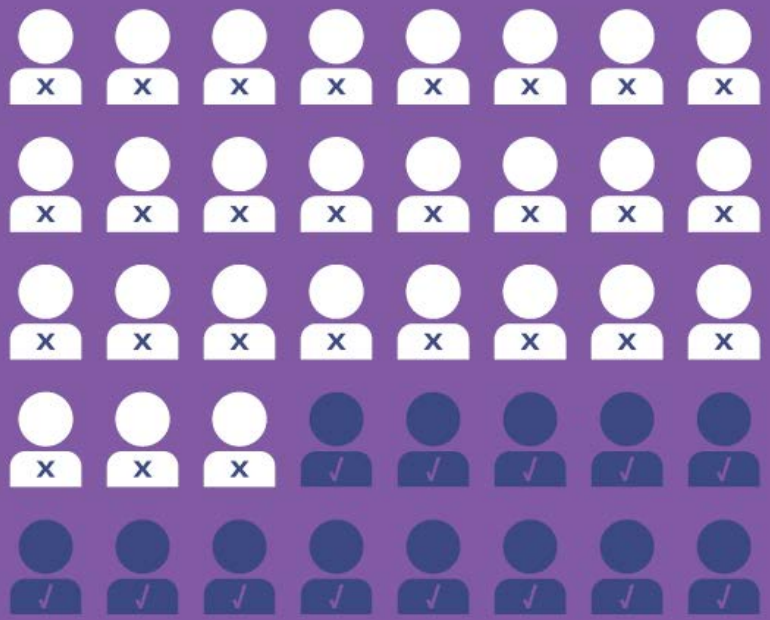
https://amr-review.org/sites/default/files/160518_Final%20paper_with%20cover.pdf

RAPID DIAGNOSTICS WOULD REDUCE UNNECESSARY PRESCRIPTION

Out of 40m people who are given antibiotics for respiratory issues, annually in the US:

27m
get antibiotics unnecessarily

13m
who need antibiotics get them



Data extracted from: Shapiro D J, Hicks L A, Pavia A T, Hersh A L. *Antibiotic prescribing for adults in ambulatory care in the USA*, 2007–09. Journal of Antimicrobial Chemotherapy 2013.

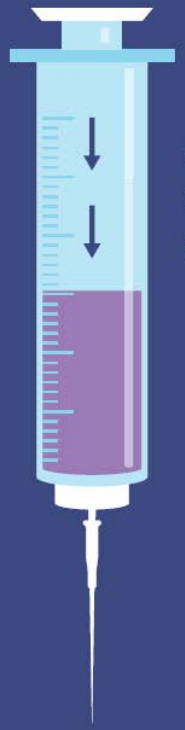
Review on Antimicrobial Resistance

O'Neill Report

https://amr-review.org/sites/default/files/160518_Final%20paper_with%20cover.pdf

INCREASING COVERAGE OF VACCINES CAN REDUCE ANTIBIOTIC USE

Universal coverage by a pneumococcal conjugate vaccine could potentially avert 11.4 million days of antibiotic use per year in children younger than five, roughly a 47% reduction in the amount of antibiotics used for pneumonia cases caused by *S. pneumoniae*.



47%
reduction in antibiotic use

Source: Laxminarayan R, Matsoso P, Pant S, Brower C, Røttingen J, Klugman K, Davies S, Access to effective antimicrobials: A worldwide challenge, Antimicrobials: access and sustainable effectiveness, *Lancet*, 2016, 387: 168–75.

Review on Antimicrobial Resistance

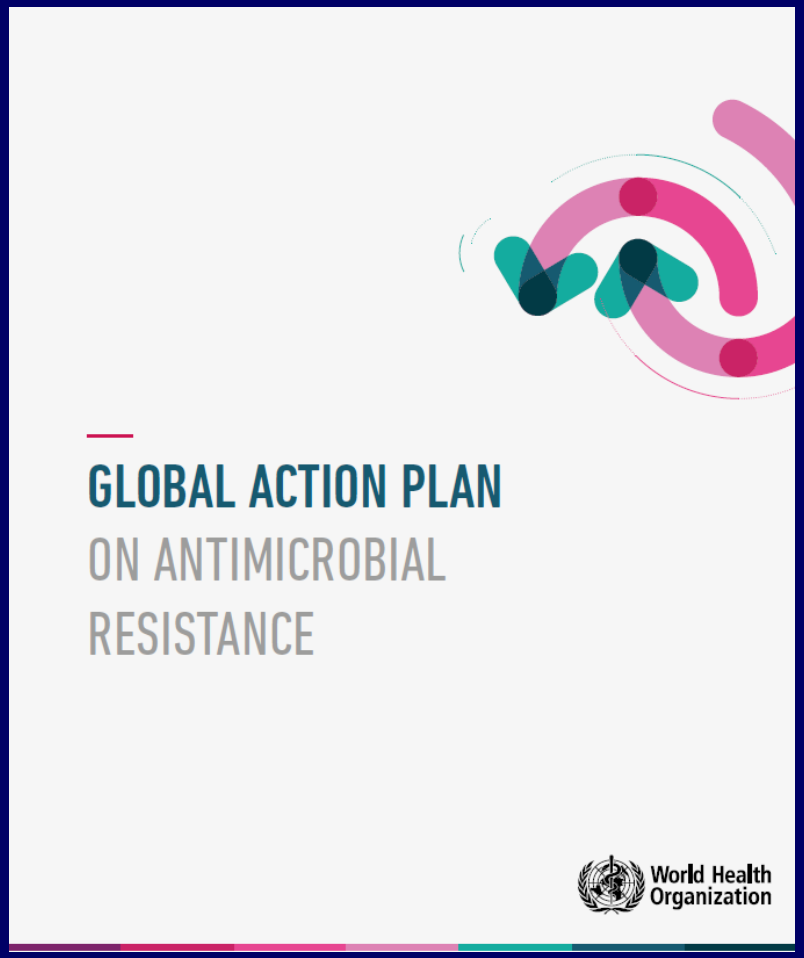
O'Neill Report

https://amr-review.org/sites/default/files/160518_Final%20paper_with%20cover.pdf

Momentum Builds for Action Against AMR: A Timeline

July 2014	UK Commissions Review on Antimicrobial Resistance
Oct 2014	President Obama's Executive Order on CARB
	White House Issues National Strategy on CARB
	PCAST Report to President on CARB
March 2015	White House Issues National Action Plan on CARB
	President Obama Establishes Presidential Advisory Council on CARB
May 2015	World Health Assembly Resolution on AMR
Jan 2016	World Economic Forum: Davos Declaration (Pharma, Biotech, Diagnostics Industries)
May 2016	World Health Assembly Resolution – Supporting WHO Global Action Plan
	G7 Nations Declare AMR International Priority

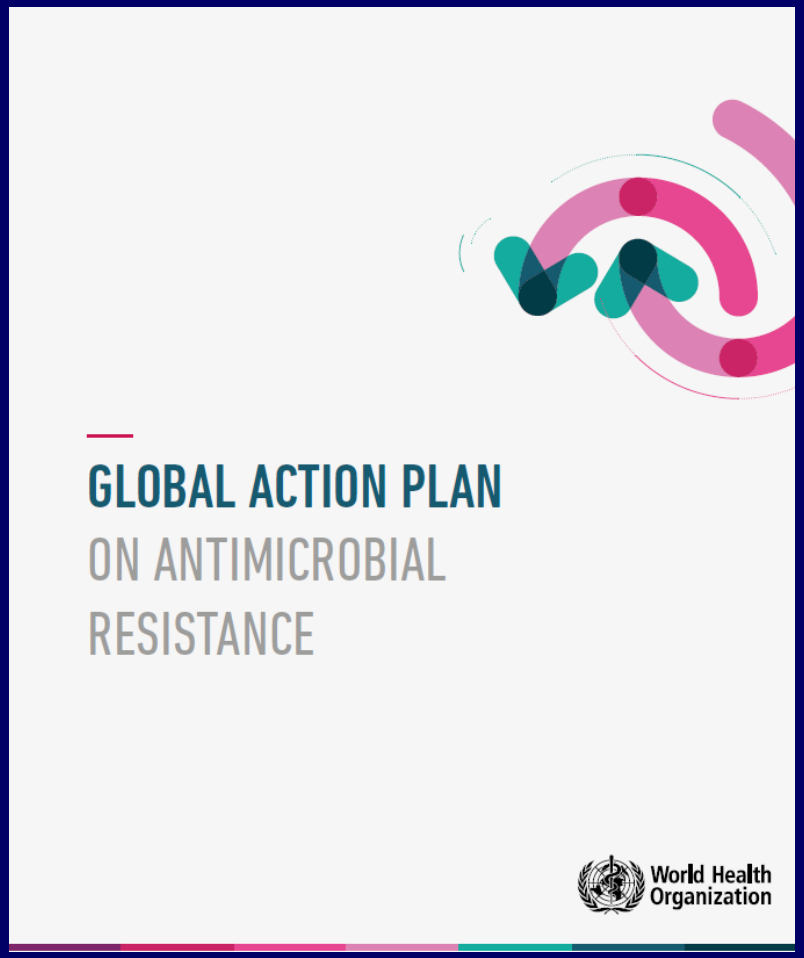
Five Strategic Objectives



2015

- Improve awareness and understanding of antimicrobial resistance through effective communication, education & training
- Strengthen knowledge & evidence base through surveillance & research
- Reduce incidence of infection through effective sanitation, hygiene & infection prevention measures
- Optimize use of antimicrobial medicines in human & animal health
- Develop economic case for sustainable investment that takes account of needs of all countries, & increase investment in new medicines, diagnostic tools, vaccines & other interventions

Framework



2015

- Actions by Member States, Secretariat, & International & National Partners for each objective

"This action plan underscores the need for an effective "one health" approach involving coordination among….. human & veterinary medicine, agriculture, finance, environmental, & well-informed consumers".

➤ Margaret Chan
Director-General, WHO

Momentum Builds for Action Against AMR: A Timeline (con't)

Sept 2016	Wellcome Trust Evidence for Action Report
	G20 Nations Commit to Reducing AMR
	UN High Level Mtg Ratifies UN Declaration on Global Effort on CARB
	Global Antimicrobial Conservation Fund Proposed
	Nine Organizations Launch Conscience of AMR Accountability (CARA)
	World Bank Report: Drug Resistant Infections: A Threat to Our Economic Future

Adapted from APUA Newsletter, Fall 2016

Common Features of Reports, Strategies, & Resolutions

- One Health Approach
- Engagement of Human, Animal, & Environmental Sectors
- Collaboration & Partnerships Among Public & Private Sector Agencies and Organizations
- Innovative Funding Approaches

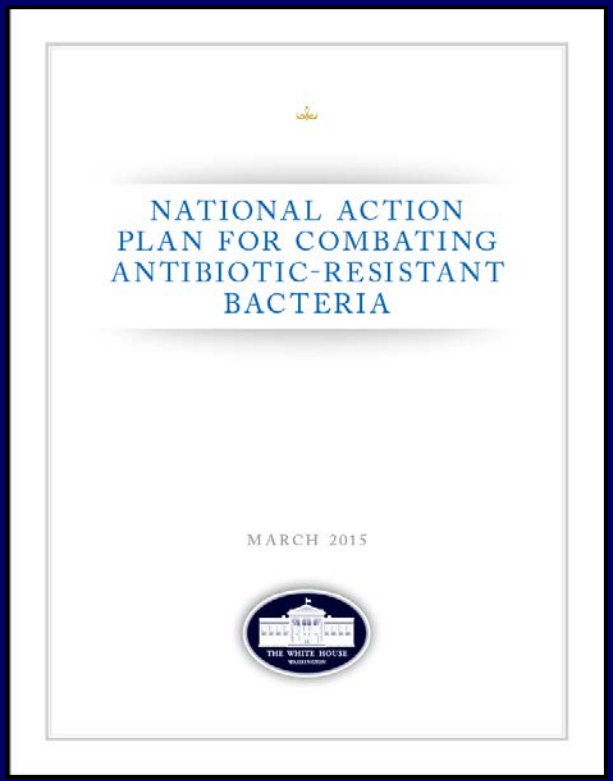
President Obama
Executive Order
Combating Antibiotic-Resistant Bacteria
9/18/14

- National Security Priority
- Interagency Task Force
  - Co-chairs: Secretaries of HHS, USDA, DoD
  - 5 year National Action Plan by 2/15/15
- Presidential Advisory Council
- Stewardship (humans & animals)
- Surveillance (repositories, curated genomic databases)
- Outbreak Response
- New Drugs
- Rapid Diagnostics
- Increased International Cooperation

National Action Plan For Combating Antibiotic-Resistant Bacteria March 2015

Goals

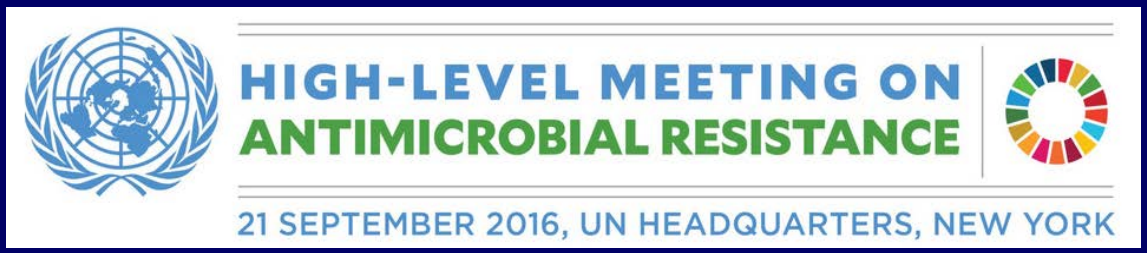
- Slow emergence / prevent spread
  - **Foster antibiotic stewardship**
- **Strengthen "One Health" surveillance**
- Develop rapid diagnostics
- Accelerate basic and applied R&D
  - New antibiotics
  - Other therapeutics
- Improve international collaboration



https://www.whitehouse.gov/sites/default/files/docs/national_action_plan_for_combating_antibotic-resistant_bacteria.pdf

PRESS RELEASE: High-Level Meeting on Antimicrobial Resistance

21 September 2016 in **Media, PGA Press Releases**



- Para 10. "Recognize that the overarching principle for addressing antimicrobial resistance is the promotion and protection of human health within the framework of a One Health approach …"
- Para 12a. "Develop multisectoral national action plans, programmes, and policy initiatives, in line with a One Health approach and the global action plan"
- Para 15. Request that the Secretary General, "in consultation with WHO, FAO, and OIE", establish "an ad hoc interagency coordination group … to provide practical guidance …"

http://www.un.org/pga/71/2016/09/21/press-release-hl-meeting-on-antimicrobial-resistance/

GAPS IN KNOWLEDGE OF ANTIBIOTIC RESISTANCE

LIMITED NATIONAL, STATE, AND FEDERAL CAPACITY TO DETECT AND RESPOND TO URGENT AND EMERGING ANTIBIOTIC RESISTANCE THREATS

Even for critical pathogens of concern like carbapenem-resistant Enterobacteriaceae (CRE) and *Neisseria gonorrhoeae*, we do not have a complete picture of the domestic incidence, prevalence, mortality, and cost of resistance.

CURRENTLY, THERE IS NO SYSTEMATIC INTERNATIONAL SURVEILLANCE OF ANTIBIOTIC RESISTANCE THREATS

Today, the international identification of antibiotic resistance threats occurs through domestic importation of novel antibiotic resistance threats or through identification of overseas outbreaks.

DATA ON ANTIBIOTIC USE IN HUMAN HEALTHCARE AND IN AGRICULTURE ARE NOT SYSTEMATICALLY COLLECTED

Routine systems of reporting and benchmarking antibiotic use wherever it occurs need to be piloted and scaled nationwide.

PROGRAMS TO IMPROVE ANTIBIOTIC PRESCRIBING ARE NOT WIDELY USED IN THE UNITED STATES

These inpatient and outpatient programs hold great promise for reducing antibiotic resistance threats, improving patient outcomes, and saving healthcare dollars.

ADVANCED TECHNOLOGIES CAN IDENTIFY THREATS MUCH FASTER THAN CURRENT PRACTICE

Advanced molecular detection (AMD) technologies, which can identify AR threats much faster than current practice, are not being used as widely as necessary in the United States.

CDC AMR in the US 2013

Collaborative Research Agenda

Some Possible Elements

- Assessment of stewardship approaches in human and animal settings
- Quantitation of relationship between agricultural use and resistance in humans
- Assessment of possible role of food in community transmission of resistant organisms (e.g., CRE, ESBL, MRSA, C. diff)
- Environmental risk assessments of resistant organisms and antibiotic residues
  - Soil, water, human and animal waste

Game Changers

- Culture Independent Diagnostic Testing
- Whole Genome Sequencing
- Bioinformatics
- Healthcare Reform
- Electronic Health Records
- Social Media
- One Health

Ways Forward For Shared Stewardship

- Replace the use of antibiotics when possible
  - Human medicine
    - Prevention—vaccination, infection control, preventive medicine
  - Animal medicine and agriculture
    - Vaccines, immunomodulators, farming practices

Ways Forward For Shared Stewardship

- Reduce the use of antibiotics when possible
  - Human medicine
    - Stewardship programs in healthcare—e.g., automatic stop orders
    - Outpatient physician feedback and prescriber education—e.g., reduce prescribing for URT infections
  - Animal medicine and agriculture
    - Eliminate use of medically important antibiotics for growth promotion

Ways Forward For Shared Stewardship

- Refine the use of antibiotics
  - Human medicine
    - Right drug, right dose, right duration
    - NHSN antibiotic use monitoring as a quality measure
  - Animal medicine and agriculture
    - Require veterinary oversight
    - Decrease use of medically important antibiotics
    - Monitor use in animal agriculture, including development of metrics

Needs for Moving Forward on Shared Stewardship

- Shared commitment
  - Continuing dialogue, willingness to listen
- Better data on use for humans and animals
  - Partnership between USDA, FDA and CDC (equivalent of NARMS for antibiotic usage) in collaboration with healthcare and food and pharmaceutical industries

Conclusions

- Move beyond “the blame game”
- Respond to and leverage Executive Order, CARB National Strategy, and PCAST recommendations
- Identify priorities and develop metrics
- Shared commitment to antimicrobial stewardship
- Shared commitment to development of better data on usage and resistance in various settings
- Development of a collaborative research agenda to improve evidence base
- Shared commitment to communication and collaboration with professional societies, public / private sector partners, and the public

Accessed 10/20/16 -
https://www.onehealthcommission.org/en/eventscalendar/one_health_day/spread_the_word/

EMORY UNIVERSITY SCHOOL OF MEDICINE

Emory Antibiotic Resistance Center

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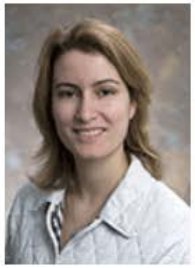
Our mission is to better understand antibiotic resistance to combat this crisis and improve human health.

Watch Video »



Featured Researcher

Nadine Rouphael, MD, Ms

Clinical Trials Experience in Vaccines and Therapeutics

HIGHLIGHTS

CDC awards Emory grant to study antibiotic resistance transmission, medication safety

The Plant-Based Solution To Antibiotic Resistance

Could Ancient Remedies Hold the Answer to the Looming Antibiotics Crisis?

Deadly Superbugs Can Masquerade as Ordinary Bacteria

Christine Dunham selected as an Investigator in the Pathogenesis of Infectious Disease by the

UPCOMING EVENT

Antibiotics as microbiome disruptors, and their consequences

Martin J. Blaser, MD
Muriel G. and George W. Singer Professor of Translational Medicine
Professor of Microbiology
Director, Human Microbiome Program
New York University Langone Medical Center

- Date: Thursday, January 12, 2017
- Time: 4 p.m.

http://www.antibiotics.emory.edu/

Acknowledgements

Emory

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