Om Sumukhayanamaha

Antimicrobial Stewardship In Resource Limited Setting

Prof Gunturu Revathi

Consultant Clinical Microbiologist

The Aga Khan University Hospital

4th IPNET Kenya Conference

17th – 22th November

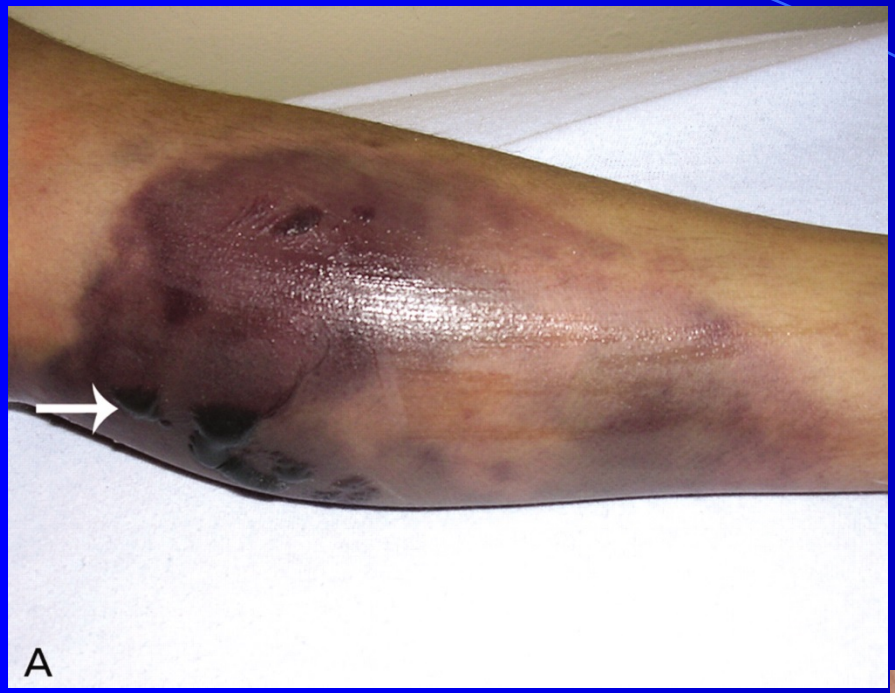
Enashipai Resort & Spa

Naivasha

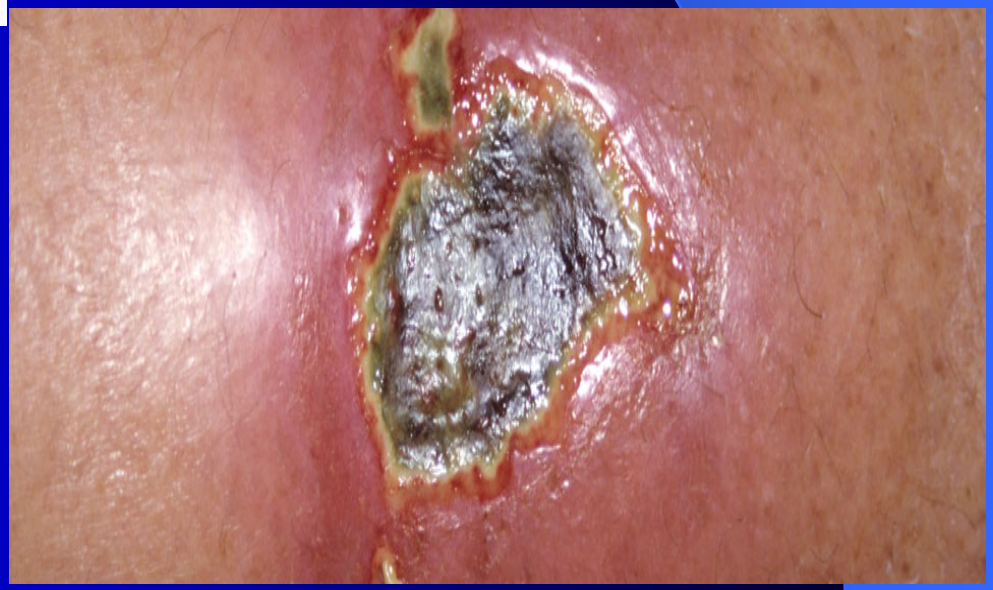

BACTEC 9050
BACTEC MGIT 960
brother
BD


Central
Nurse Station

Is this disease…..



really the same as this disease?



Bordetella parapertussis Outbreak in Southeastern Minnesota in 2014

San Diego, California - September 20, 2015 – Study reports that an outbreak of *Bordetella parapertussis* occurred in 2014 in Southeastern Minnesota, in the months of October through December. This research is presented at ASM's 55th Interscience Conference of Antimicrobial Agents and Chemotherapy (ICAAC/ICC).

Pertussis, commonly known as "whooping cough," has been on the rise in the United States and globally over the past 25 years. It is a disease that stems most notably from an infection with a bacterium called *Bordetella pertussis*. It is predominantly seen in children and starts similarly to a common cold. However, in most cases a serious cough develops with coughing spells that can be so bad as to cause vomiting and the hallmark gasping for air, which often causes a "whooping" sound in young children. The cough may be persistent, lasting for weeks, giving it the name "100 days cough." Due to vaccination of children against pertussis, the

.

***Bordetella parapertussis*, a relatively rare and antigenically distinct cousin of the pathogen *B. pertussis*, can present a clinical picture very similar to classical whooping cough.**

Vaccination against *B. pertussis* does not protect against infection caused by *B. parapertussis*.

JOURNAL OF CLINICAL MICROBIOLOGY, July 2003, p. 3064–3069 Vol. 41, No. 7
0095-1137/03/$08.00+0 DOI: 10.1128/JCM.41.7.3064–3069.2003

Invasive Disease Due to Nontypeable *Haemophilus influenzae* among Children in Arkansas

Joshua M. O'Neill,[1]* Joseph W. St. Geme III,[2] David Cutter,[2] Elisabeth E. Adderson,[3] Juliana Anyanwu,[3] Richard F. Jacobs,[1] and Gordon E. Schutze[1,4]

Department of Pediatrics[1] and Department of Pathology,[4] University of Arkansas for Medical Sciences/Arkansas Children's Hospital, Little Rock, Arkansas; Departments of Pediatrics and Molecular Microbiology, Washington University School of Medicine, St. Louis, Missouri[2]; and Department of Infectious Disease, St. Jude Children's Research Hospital, Memphis, Tennessee[3]

Received 11 October 2002/Returned for modification 5 November 2002/Accepted 6 May 2003

In this study, we reviewed cases of invasive disease due to nontypeable *Haemophilus influenzae* among children hospitalized at Arkansas Children's Hospital from 1993 to 2001. A total of 28 cases were examined, including 21 associated with bacteremia and 4 associated with meningitis. Of the patients examined, 86% were ≤4 years of age, and 68% had underlying medical conditions. Characterization of the bacterial isolates by multilocus sequence type genotyping revealed significant overall genetic diversity, similar to the diversity in the general population structure for nontypeable *H. influenzae*. However, four separate pairs of isolates were closely

EDITORIAL COMMENTARY

Emergence of Nonvaccine Serotypes following Introduction of Pneumococcal Conjugate Vaccine: Cause and Effect?

Matthew R. Moore and Cynthia G. Whitney

Respiratory Diseases Branch, Centers for Disease Control and Prevention, Atlanta, Georgia

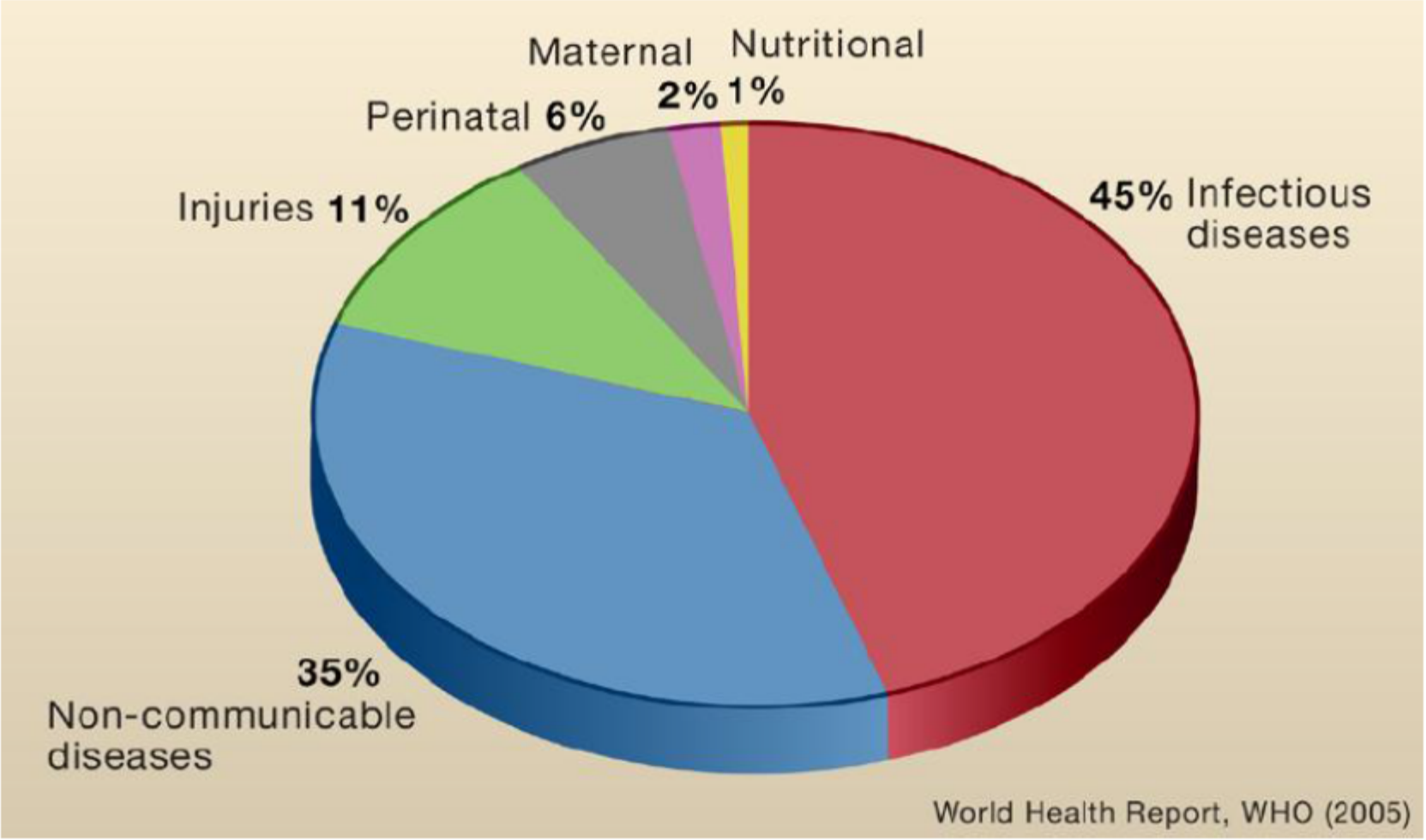
(See the article by Muñoz-Almagro et al. on pages 174–82)

Case Study

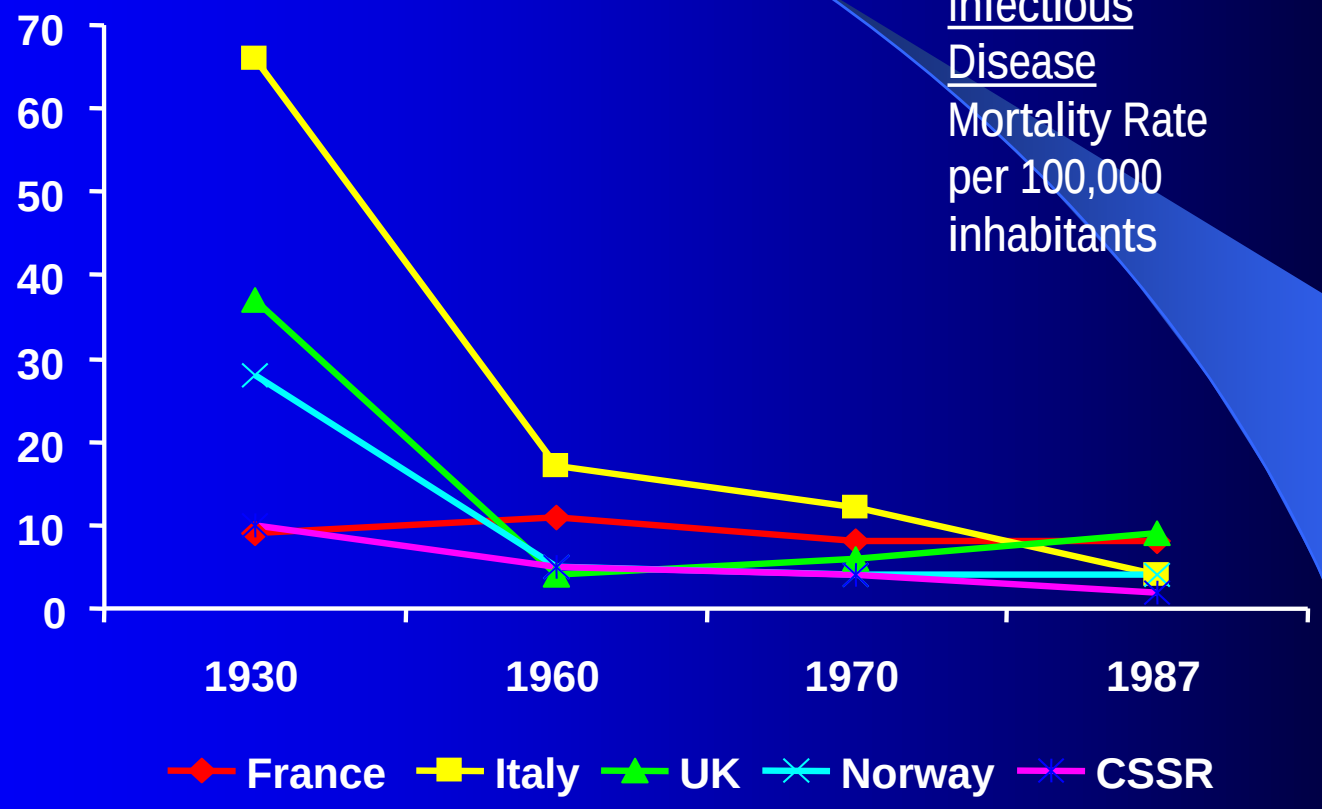
Mr X a 62 year old retired bank executive living in Nairobi.
He was rushed to the CCU at midnight due to chest discomfort and sweating.
Being managed for hypertension for 4 years. BP is under control.
Developed Urinary tract infection symptoms 18 months ago was diagnosed as obstruction due to enlarged prostate. Treated with antibiotic for 7 days.
Active UTI diagnosed by microscopy and culture 3 times after the first attack. Patient received different antibiotic for each episode. The patient has had an indwelling urinary catheter for some time now.
Culture has grown again Multiresistant E. coli.

Do we need to give an antibiotic now?
How long?
Which agent?
What is the way forward?

Leading causes of mortality in low-income countries, 2004



The remarkable success of antibacterial agents



G. Caselli "L'évolution à long terme de la mortalité en Europe. In: European population - II - Demographic dynamic - Blum A., Rallu J.L. (eds.), John Libbey Eurotext (Paris), 1991, p 111-164

“Drug resistance follows the drug like a faithful shadow.”

- Paul Erhlich 1854-1915

MICROBIOLOGY AND MOLECULAR BIOLOGY REVIEWS, Sept. 2010, p. 417–433
1092-2172/10/$12.00 doi:10.1128/MMBR.00016-10

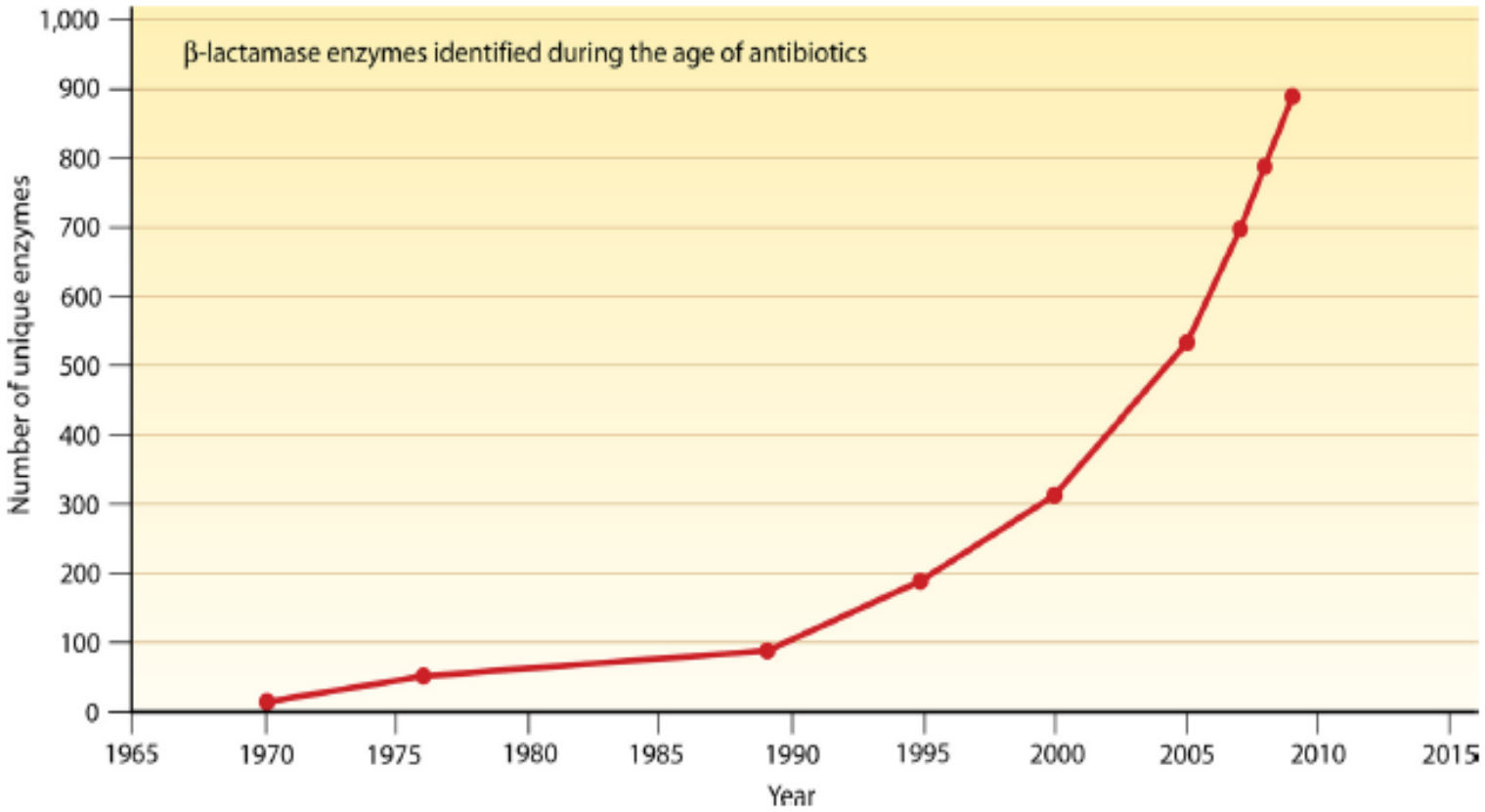
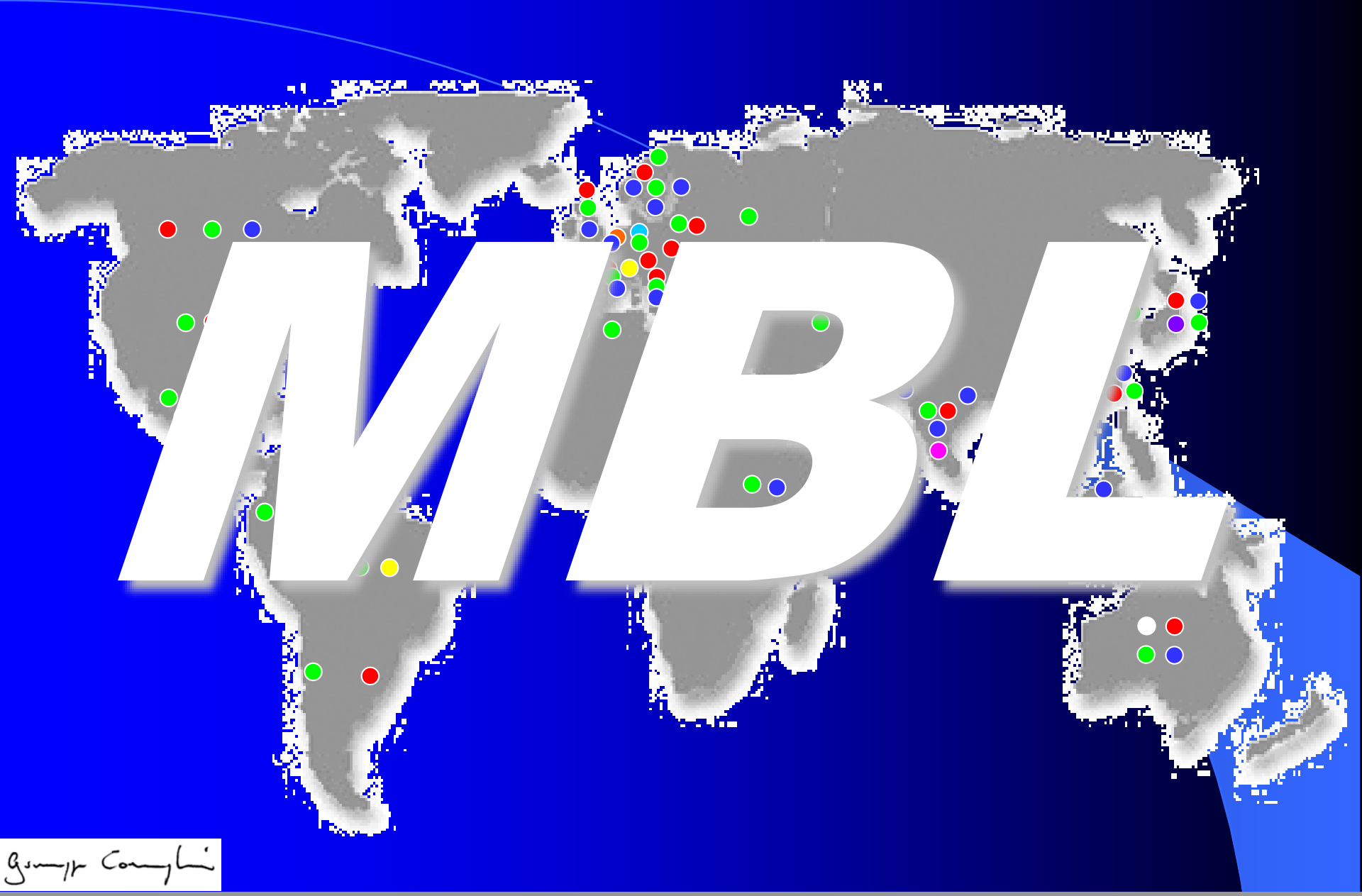


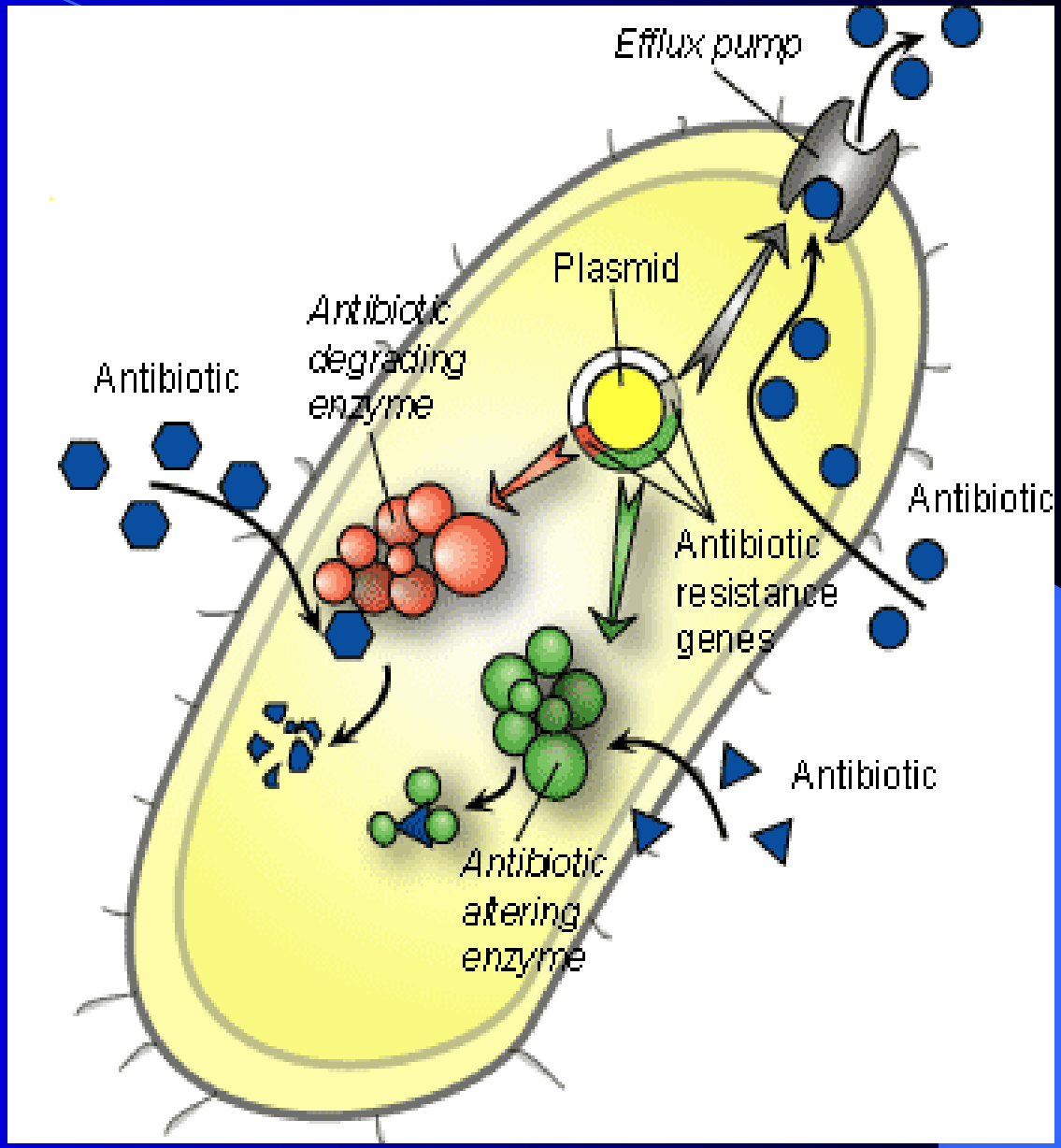
FIG. 2. Numbers of unique β-lactamase enzymes identified since the introduction of the first β-lactam antibiotics. (Up-to-date numbers are courtesy of Karen Bush.)



IMP (1992) VIM (1999) SPM-1 (2002) GIM-1 (2004) SIM-1 (2005) AIM-1 (2008) KHM-1 (2008) NDM-1 (2008) DIM-1 (2009)

Mechanisms of Resistance

- Enzymatic inhibition
- Decreased uptake
- Increased export
- Altered target
- Metabolic bypass



Antibiotic resistance on a par with terrorism threat

The crisis caused by resistance to antibiotics is a threat on a par with terrorism and global warming, according to England's chief medical officer Dame Sally Davies.

Be part of the first

WORLD ANTIBIOTIC AWARENESS WEEK

16 to 22 November 2015

World Health Organization

Why we need a global campaign

Antibiotic resistance is one of the biggest threats to global health today.

It is rising to dangerously high levels in all parts of the world, compromising our ability to treat infectious diseases and undermining many advances in health and medicine.

Only about one-quarter of countries currently have national plans to tackle antibiotic resistance. However, political attention is growing and in May 2015 a global action plan to tackle antimicrobial resistance was endorsed by governments at the World Health Assembly. Objective 1 is to 'improve awareness and understanding of antimicrobial resistance through effective communication, education and training'.

To help achieve this, WHO is leading a **global campaign on antibiotic resistance**, working closely with the Food and Agriculture Organization of the United Nations (FAO) and World Organisation for Animal Health (OIE).

Many countries and regional bodies have run antibiotic resistance-awareness campaigns to-date. WHO aims to build on this success and reach a global audience.

The first World Antibiotic Awareness Week will be held from 16 to 22 November 2015.
It will be marked with proactive media outreach, engagement with the public through social media and local awareness-raising events around the world.

Partners—such as UN agencies, ministries of health and agriculture, non-governmental organizations, human and animal health professionals' groups and others—**are invited to join the campaign** and help raise awareness and understanding of this urgent problem, and spark changes needed to ensure antibiotics are used only when necessary and as prescribed by a health professional.

The evolving threat of antimicrobial resistance

Options for action

World Health Organization

A Matter OF Life AND Death

The Economics of Antibiotic Resistance

BY RAMANAN LAXMINARAYAN

EUROPEAN COMMISSION
Community research

The Antibacterial Drug Pipeline is virtually empty

COOPERATION

The antimicrobial agents - unique drugs .

Efficacy is higher than others in reduction of morbidity and mortality.

Antibiotics are the only group of drugs with ecological effects,

Contribute to the emergence and spread of microbial resistance.

Finally, they are used by almost all medical specialties.

Appropriate use of antimicrobials is highly complex

because of the important advances in the management of infectious diseases and the wide spread of antibiotic resistance.

Factors contributing to increased resistance

- Overuse of antimicrobials
- Use of broad spectrum agents
- Low dosages
- Improper frequency
- Extended duration of therapy
- Prophylactic use

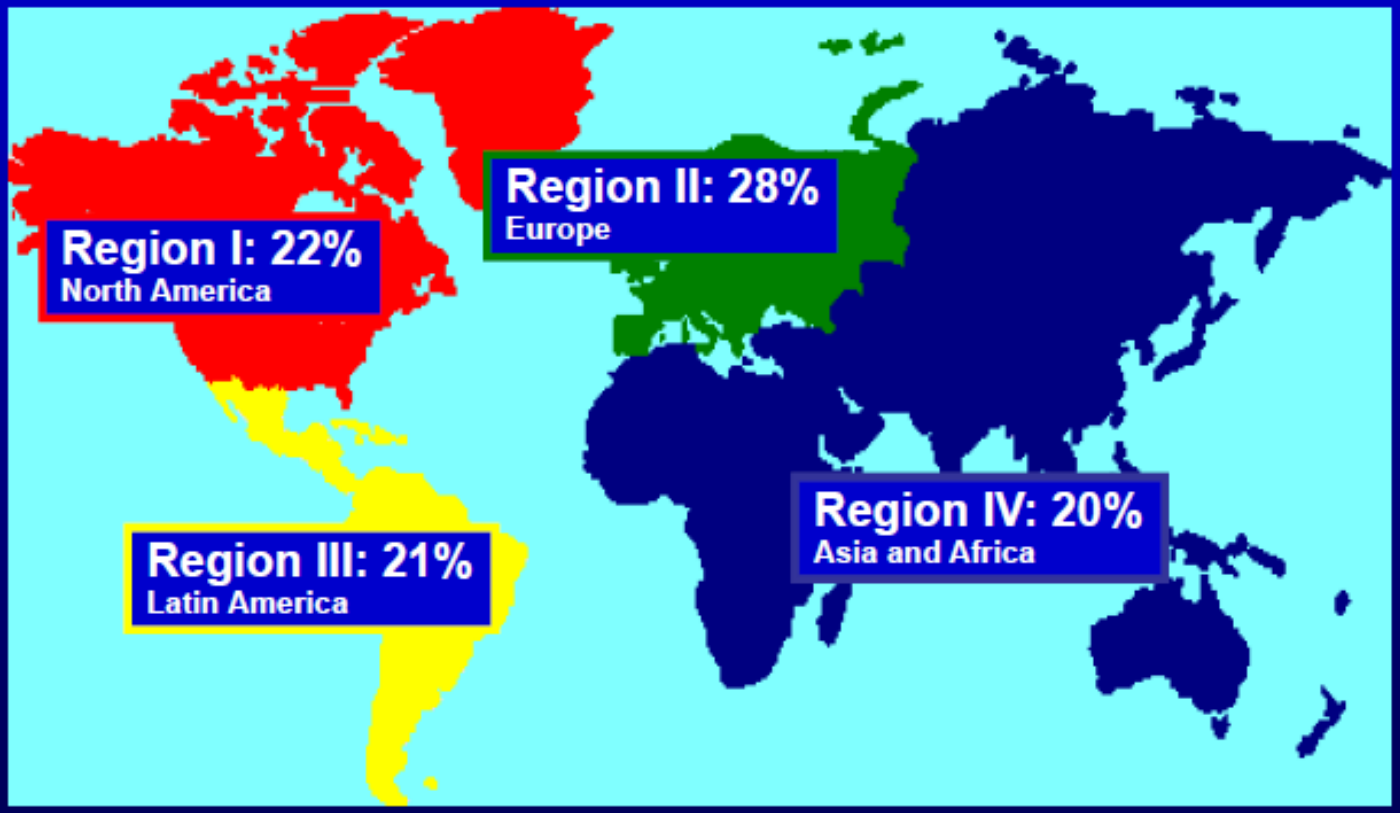
Situations where antimicrobials are used excessively

- Acute Upper respiratory tract infections.
- Acute gastroenteritis.
- Acute urinary tract infection.
- Surgical prophylaxis.
- Pyrexia of unknown origin.
- Undiagnosed fever in the immune-suppressed.

Community-Acquired Pneumonia: Atypical Pathogens

Worldwide Incidence of Atypical Pathogens

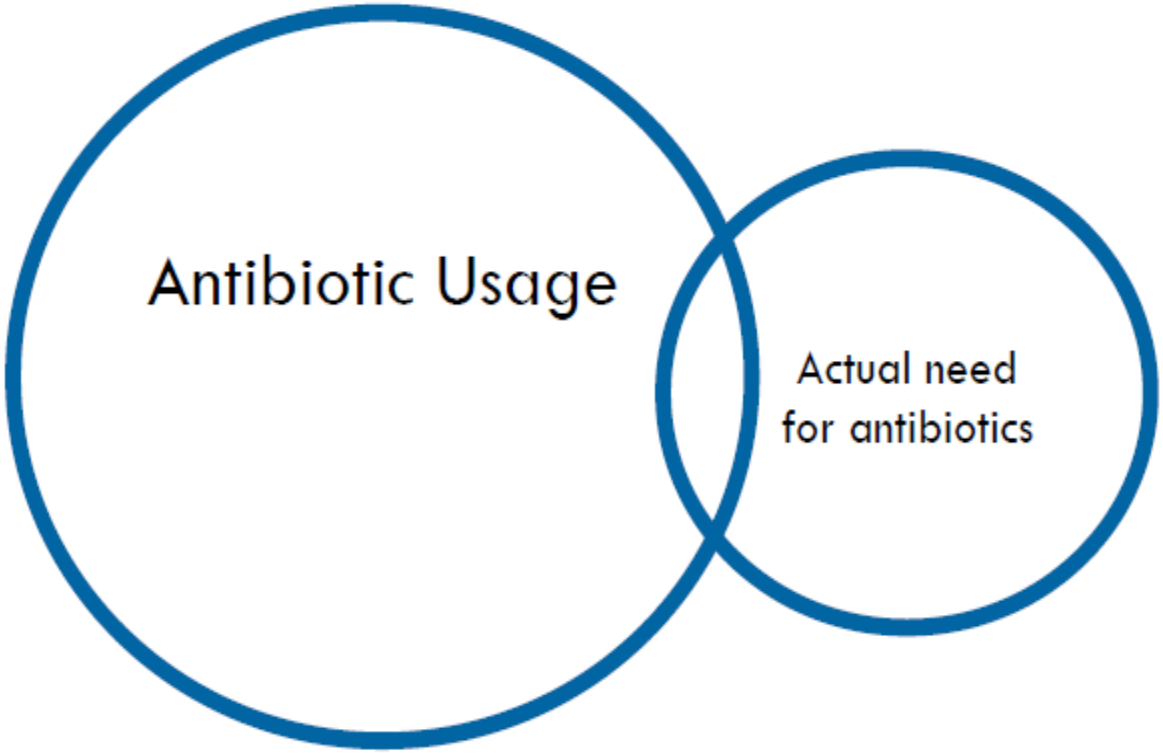
University of Louisville Infectious Diseases Atypical Pathogens Reference Laboratory Database



Arnold FW, et al. *Am J Respir Crit Care Med.* 2007;175:1086-1093.

Tragic Paradox in Developing countries Kenya is no exception

The problem: mismatch between antibiotic usage and need



The solution: 1) reduce antibiotic usage 2) align reduced usage with actual need

Major areas of concern

- Lack of emphasis on specific diagnosis / Clinical misdiagnosis,
- Inadequate health care infrastructure
- laboratory capability and diagnostic accuracy

- Lack of emphasis on lab diagnosis of infectious diseases – clinician apathy and a culture of syndromic approach
- Concept that microbiology is expensive and time consuming
- Perceptions that Lab results can not be trusted - Justified indeed!

Laboratory Medicine in Africa • **CID 2006:42 (1 February)** • 377

Laboratory Medicine in Africa: A Barrier to Effective Health Care

Cathy A. Petti,[1,2] Christopher R. Polage,[2] Thomas C. Quinn,[3,4] Allan R. Ronald,[5] and Merle A. Sande[1]

[1]Departments of Medicine and Pathology, University of Utah School of Medicine, and [2]ARUP Laboratories, Salt Lake City, Utah; [3]Department of Medicine, Johns Hopkins School of Medicine, Baltimore, and [4]Laboratory of Immunoregulation, National Institute of Allergy and Infectious Diseases, Bethesda, Maryland; and [5]Faculty of Medicine, University of Manitoba, Winnipeg, Canada

(See the editorial commentary by Bates and Maitland on pages 383–4)

Providing health care in sub-Saharan Africa is a complex problem. Recent reports call for more resources to assist in the prevention and treatment of infectious diseases that affect this population, but policy makers, clinicians, and the public frequently fail to understand that diagnosis is essential to the prevention and treatment of disease. Access to reliable diagnostic testing is severely limited in this region, and misdiagnosis commonly occurs. Understandably, allocation of resources to diagnostic laboratory testing has not been a priority for resource-limited health care systems, but unreliable and inaccurate

AMR surveillance data in Kenya

POOR LABORATORY CAPACITY IN CLINICAL MICROBIOLOGY

- Few qualified clinical microbiologists
- Many laboratories are unsupervised by qualified pathologists
- Result: inadequate quality control or quality assurance programs for antibiotic susceptibility testing

ANTIMICROBIAL AGENTS AND CHEMOTHERAPY, Feb. 2011, p. 934–936 Vol. 55, No. 2
0066-4804/11/$12.00 doi:10.1128/AAC.01247-10

Detection of NDM-1-Producing *Klebsiella pneumoniae* in Kenya[▽]

Laurent Poirel,[1] Gunturu Revathi,[2] Sandrine Bernabeu,[1] and Patrice Nordmann[1]*

Service de Bactériologie-Virologie, INSERM U914 Emerging Resistance to Antibiotics, Hôpital de Bicêtre, Assistance Publique/Hôpitaux de Paris, Faculté de Médecine Paris Sud, K.-Bicêtre, France,[1] and Department of Pathology, The Aga Khan University Hospital, Nairobi, Kenya[2]

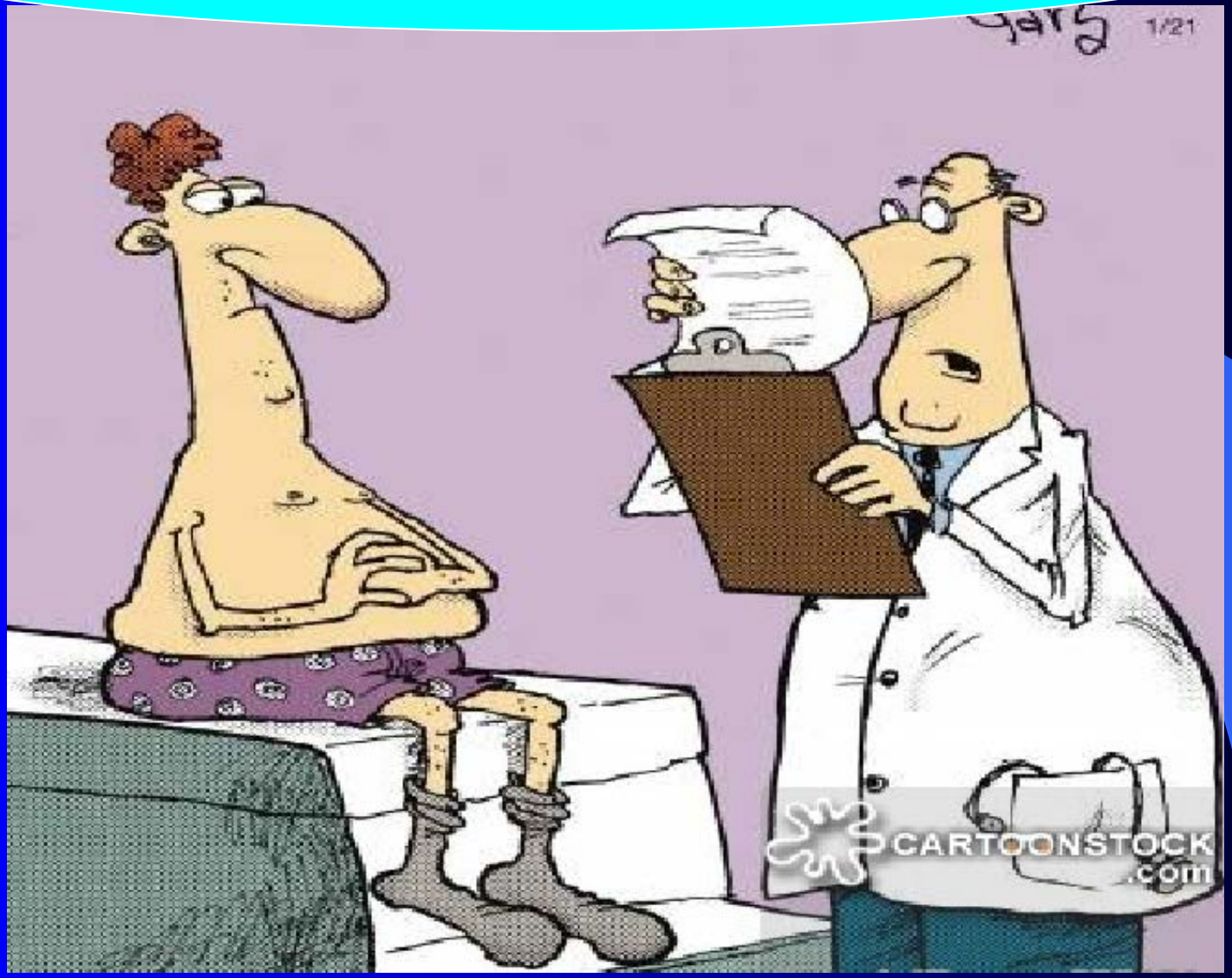
Received 9 September 2010/Returned for modification 24 October 2010/Accepted 21 November 2010

Seven carbapenem-resistant NDM-1-positive *Klebsiella pneumoniae* isolates were recovered from patients hospitalized between 2007 and 2009 in different wards at a referral and tertiary care center in Nairobi. Most of the isolates were obtained from urine. All isolates carried the bla_{NDM-1} carbapenemase gene previously reported from India, Pakistan, and the United Kingdom. These isolates were clonally related and expressed many other resistance determinants, including β-lactamases CTX-M-15, OXA-1, OXA-9, CMY-6, and aminoglycoside resistance methylase RmtC. This work corresponds to the first report of NDM-1 producers in Africa.

Why is there an “increase” in the diagnosis of Enteric Fever (Typhoid)?

- Motivated by money-making ideas e.g. to sell the Widal Test kits
- Increased unprofessionalism
- Presence of many fake laboratories & quacks
- Presence of fake reagents
- Lack of supervision/prosecution

I AM CONCERNED ABOUT THE HIGH LAVELS OF BLOOD WE FOUND IN YOUR BLOOD TEST



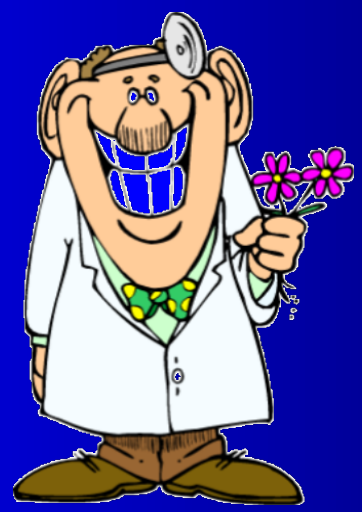
Pressures on the primary care physician

Peer groups / prescribing and pharmacy advisors

Pharmaceutical representatives

(Industry spends 35% of profits on marketing)

Regulatory control mechanisms



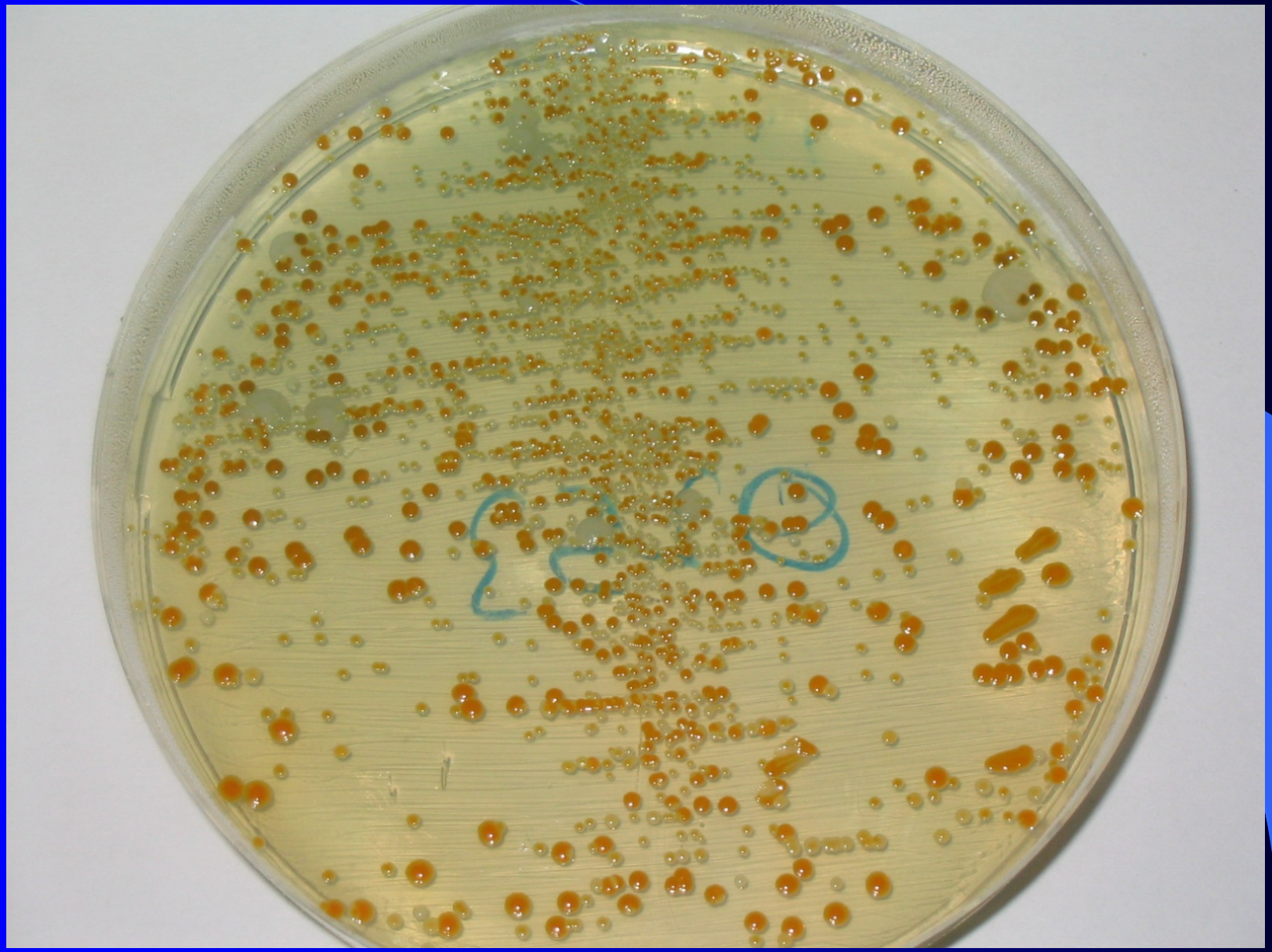
Patients' demands

and

physician aspirations

Hospital experts, formularies and guidelines

HEAVY MIXED GROWTH OF THREE TYPES OF COLONIES



Knowledge Gaps

- Almost nothing known about antibiotic resistance in the community
- What drives antibiotic prescribing? UNKNOWN!
- Antibiotic treatment guidelines: how are they used and how effective they in patient treatment? UNKNOWN!
- Staff in many hospitals lack access to guidelines, even if they know about their existence

- Total absence of any kind of surveillance system for general antibiograms.

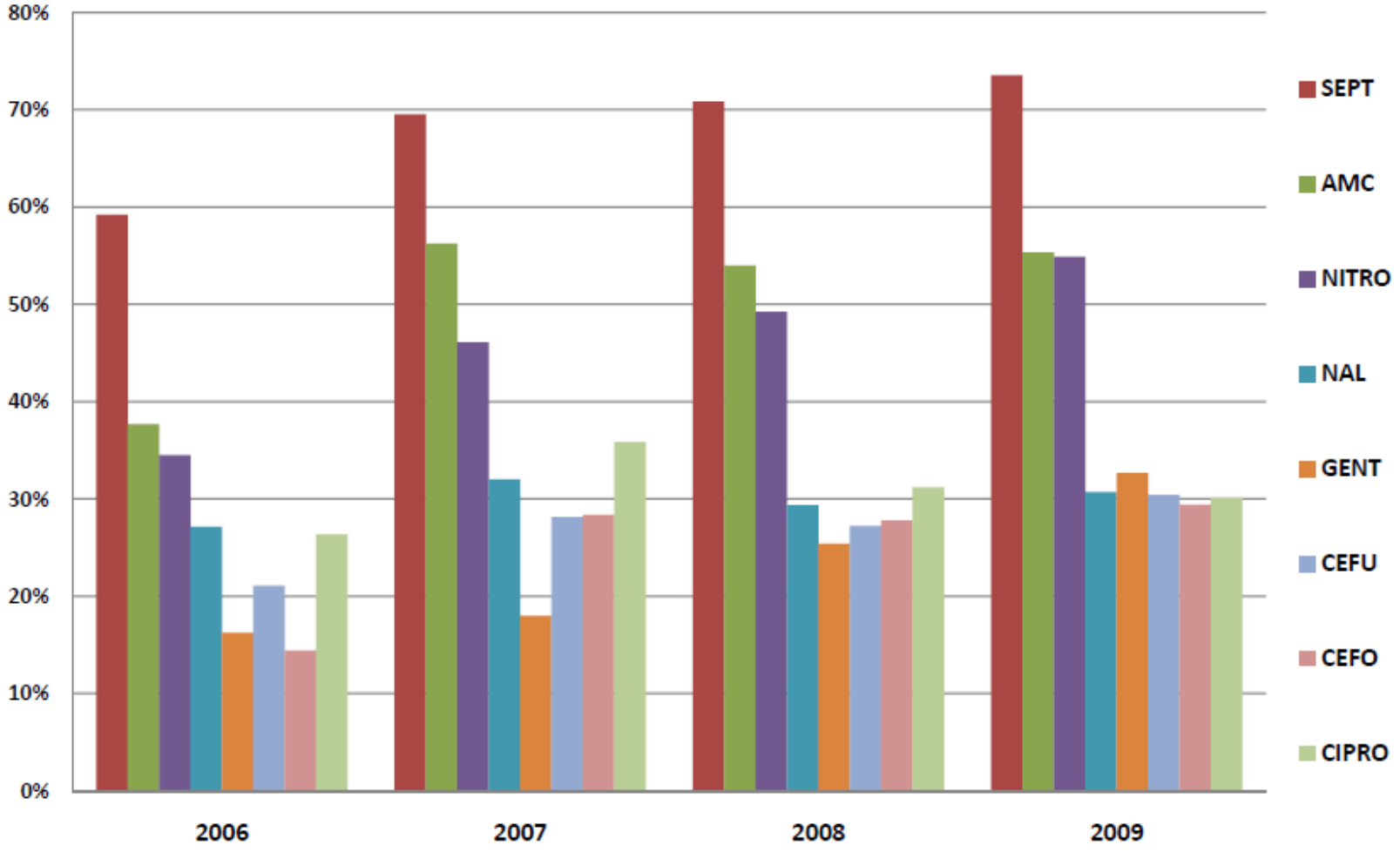
- The ongoing HIV pandemic opportunistic infections populations on septrin and fluconazole prophylaxis.

Antimicrobial resistance concerns all microbes.

Viral pathogens – HIV with ARV resistance, Influenza viruses with resistance etc/

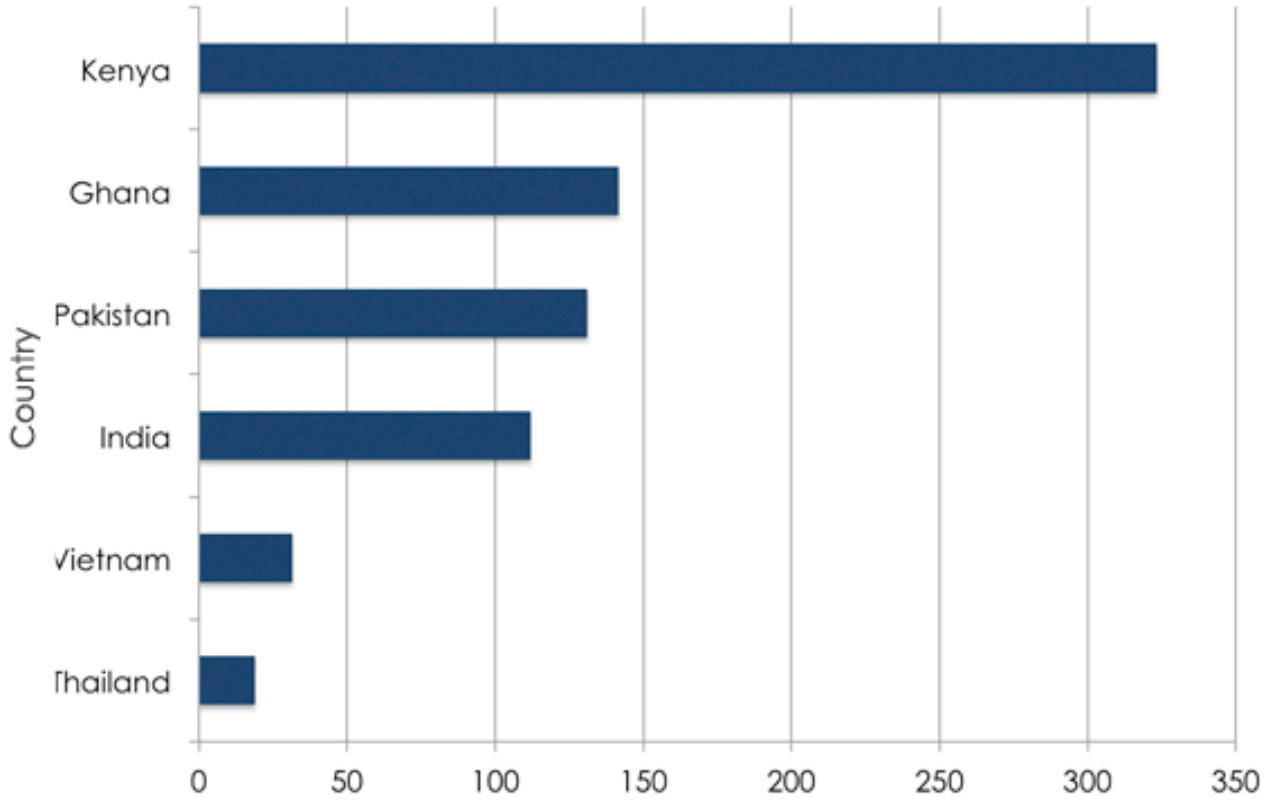
Bacteria – Gram negative, gram positive, MDRTB,XDR TB, H.Pylori - numerous examples.
Parasites – Malaria, the most important example.
Fungi – Antifungal resistant Candida, AmphoB resistant Cryptococci etc….

Klebsiella spp resistance patterns



Courtesy: Aga Khan University Hospital

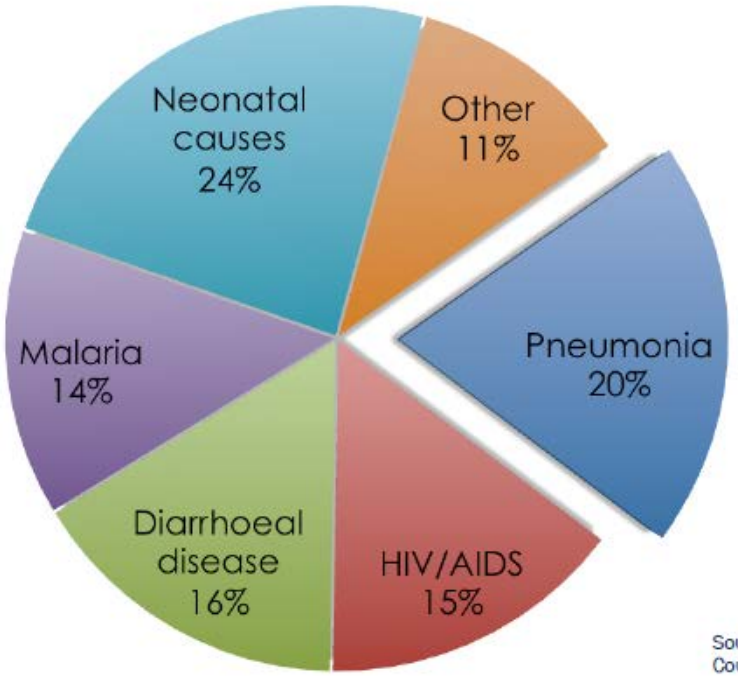
The pneumococcal disease burden is high in parts of the developing world



CDDEP THE CENTER FOR Disease Dynamics, Economics & Policy
WASHINGTON DC • NEW DELHI

Center for Disease Dynamics and Policy.
http://www.cddep.org/tools/pneumococcal_disease_burden_high_parts_developing_world. Accessed 12th June 2013

Mortality in Kenyan Children Under 5 Years (2000-2003)

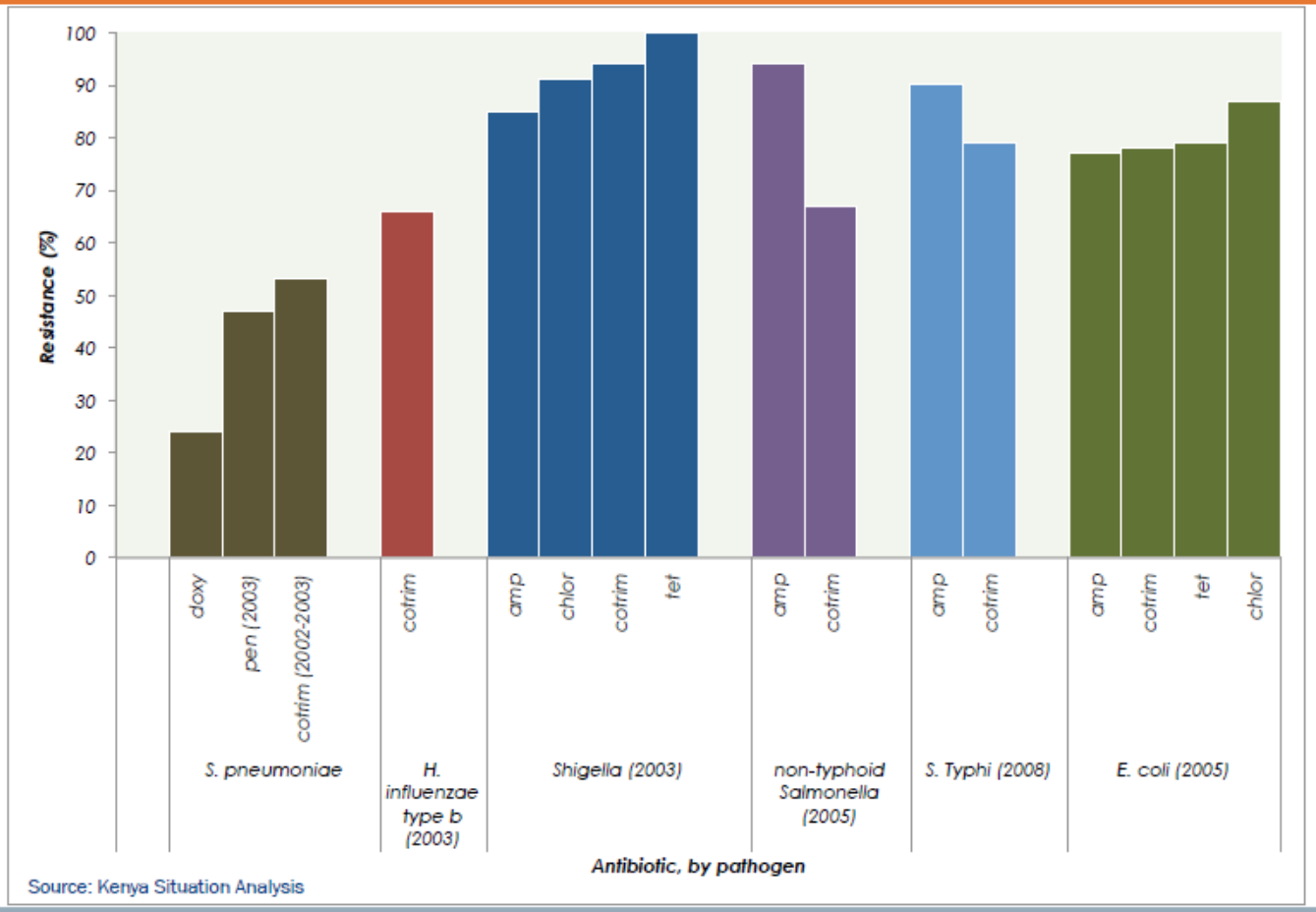


Source: World Health Organization. Kenya: Country Health System Fact Sheet 2006,

CDDEP THE CENTER FOR Disease Dynamics, Economics & Policy WASHINGTON DC • NEW DELHI

Global Antibiotic Resistance Partnership

Antibiotic Resistance in Kenya



Source: Kenya Situation Analysis

CDDEP THE CENTER FOR Disease Dynamics, Economics & Policy WASHINGTON DC • NEW DELHI

Global Antibiotic Resistance Partnership

ANTIBIOTIC STEWARDSHIP

IN YOUR FACILITY WILL

DECREASE

- ANTIBIOTIC RESISTANCE
- C. DIFFICILE INFECTIONS
- COSTS

INCREASE

- GOOD PATIENT OUTCOMES

PROMOTE ANTIBIOTIC BEST PRACTICES— A FIRST STEP IN ANTIBIOTIC STEWARDSHIP

- ENSURE ALL ORDERS HAVE DOSE, DURATION, AND INDICATIONS
- GET CULTURES BEFORE STARTING ANTIBIOTICS
- TAKE AN "ANTIBIOTIC TIMEOUT" REASSESSING ANTIBIOTICS AFTER 48–72 HOURS

ANTIBIOTIC STEWARDSHIP PROGRAMS ARE A "WIN-WIN" FOR ALL INVOLVED

A UNIVERSITY OF MARYLAND STUDY SHOWED ONE ANTIBIOTIC STEWARDSHIP PROGRAM **SAVED A TOTAL OF $17 MILLION** OVER EIGHT YEARS

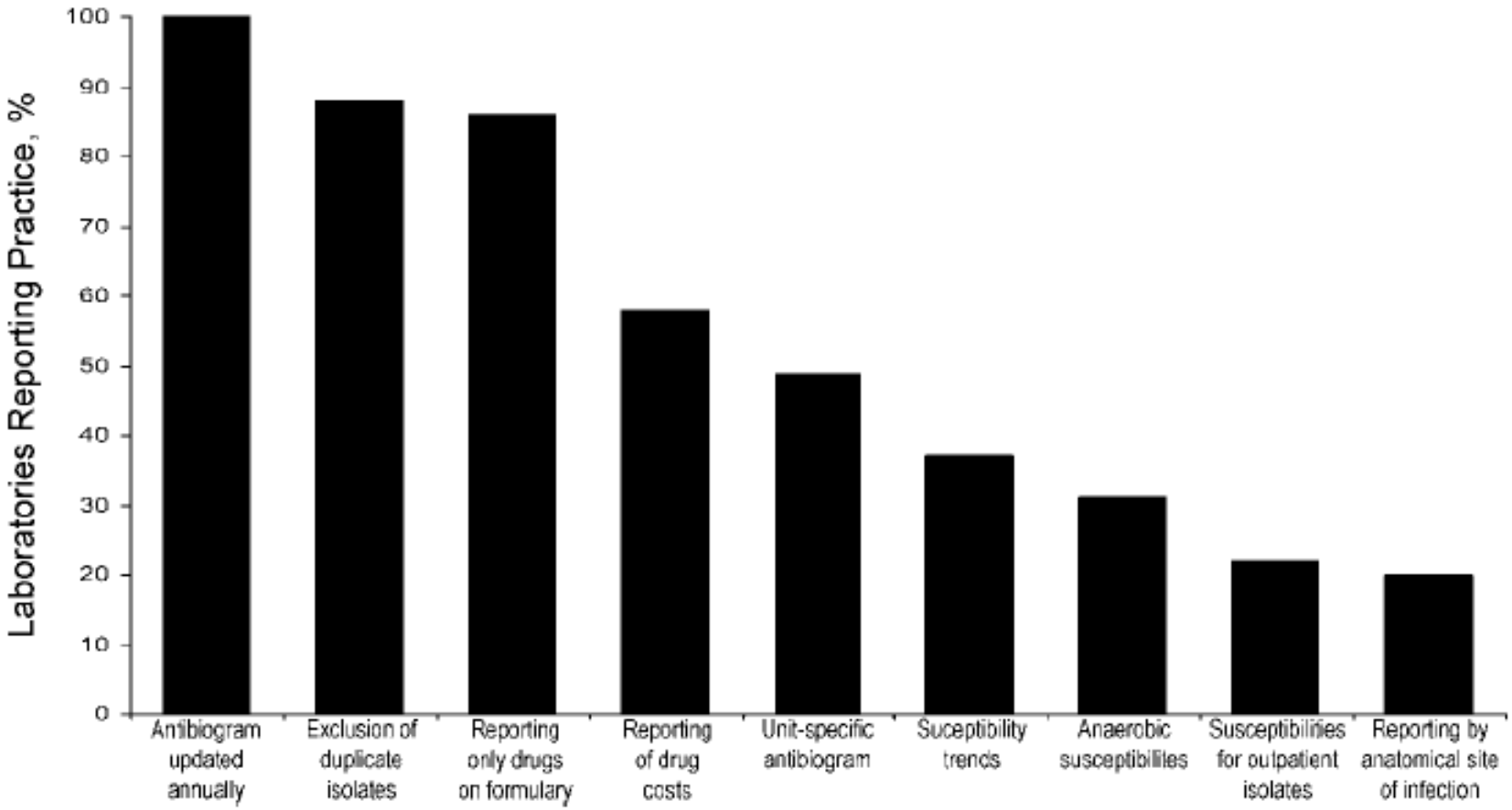
ANTIBIOTIC STEWARDSHIP HELPS **IMPROVE PATIENT CARE AND SHORTEN HOSPTIAL STAYS,** THUS **BENEFITING PATIENTS AS WELL AS HOSPITALS**

Interventions designed to facilitate smart use of antibiotics are collectively referred to as antimicrobial stewardship.

The premise of the smart use of antibiotics is appropriate antibiotic use, knowing how when and which antibiotic to use

Anti-bio-gram Analysis

ABGM Variability in 65 US hospitals



Analysis and Presentation of Cumulative Antimicrobial Susceptibility Data (Antibiograms) Substantial Variability Across Medical Centers in the United States. Infect Control Hosp Epidemiol Apr2006; 27:409-412

Human microbiome research has shown that the use of antibiotics can disrupt the normal array of microbes that live in and on our bodies.

Suspected etiology for -

Childhood Obesity
Autoimmune conditions
Chronic inflammatory conditions

HOSPITAL MICROBIOME

A new hypothesis says that hospital-acquired infections are being driven not only by the existence of harmful microbes but also by the absence of helpful species in the environment due to disinfectant use

Evidence-based medicine (EBM) is the new *mantra*.

It recommends that the best available evidence be used to aid clinical decision-making and policy.

EBM has changed medical practice.

also raise many questions.

Randomized controlled trials (RCT) - the cornerstone of EBM.

Extrapolating knowledge from RCTs to individual patients across different settings - a big problematic issue

extrapolations require much more evidence, which is often unavailable

Evidence is needed for

Efficacy (“Can it work?”),

Effectiveness (“Does it work in practice?”)

Efficiency (“Is it worth it?”)

All of these need to be considered.

Most trials test for efficacy in ideal situations using

- **Detailed protocols,**
- **Carefully selected patients**
- **Placebo controls,**
- **Good treatment compliance**
- **And intensive follow-up**.

These ideals - rarely achievable in routine clinical practice in resource poor settings with

Poor diagnostic accuracy,

Poor patient compliance

And partial patient coverage

HULTON/GETTY

Parachutes reduce the risk of injury after gravitational challenge, but their effectiveness has not been proved with randomised controlled trials

Medscape Medical News

Proton-Pump Inhibitors May Boost Death Risk in Inpatients

Marcia Frellick

November 12, 2015

Proton-pump inhibitors are commonly used in hospitals to prevent gastrointestinal (GI) bleeding, but may increase the risk of dying both for those who start use in the hospital and for those have used them before admission and continue use in the hospital, new data show.

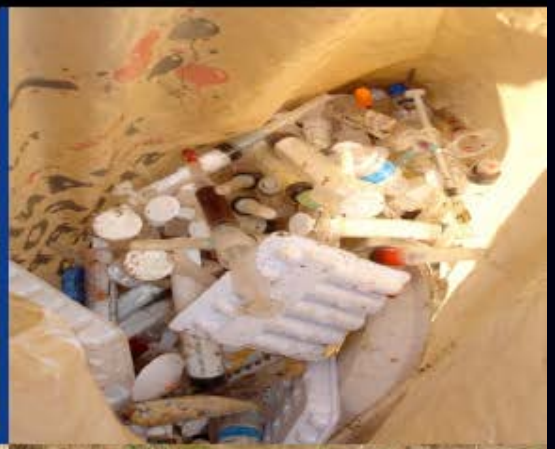
Matt Pappas, MD, MPH, from the Veterans Affairs Ann Arbor Healthcare System and the Department of General Internal Medicine at the University of Michigan Health System in Ann Arbor, and colleagues say the increased risk for death comes because reducing acid in the stomach increases the risk for infections, especially pneumonia and *Clostridium difficile* (CDI), both of which pose a serious risk to hospitalized patients.

"Our new model allows us to compare that increased risk with the risk of upper GI bleeding. In general, it shows us that we're exposing many inpatients to higher risk of death than they would otherwise have — and though it's not a big effect, it is a consistent effect," Dr Pappas said in a university news release. The authors

Figure 43-2 Organizational structure of a comprehensive antimicrobial management program. (Adapted from John JF Jr, Fishman NO. Programmatic role of the infectious diseases physician in controlling antimicrobial costs in the hospitals. Clin Infect Dis. 1997;24:471.)

Scenarios in Facilities without IPC program







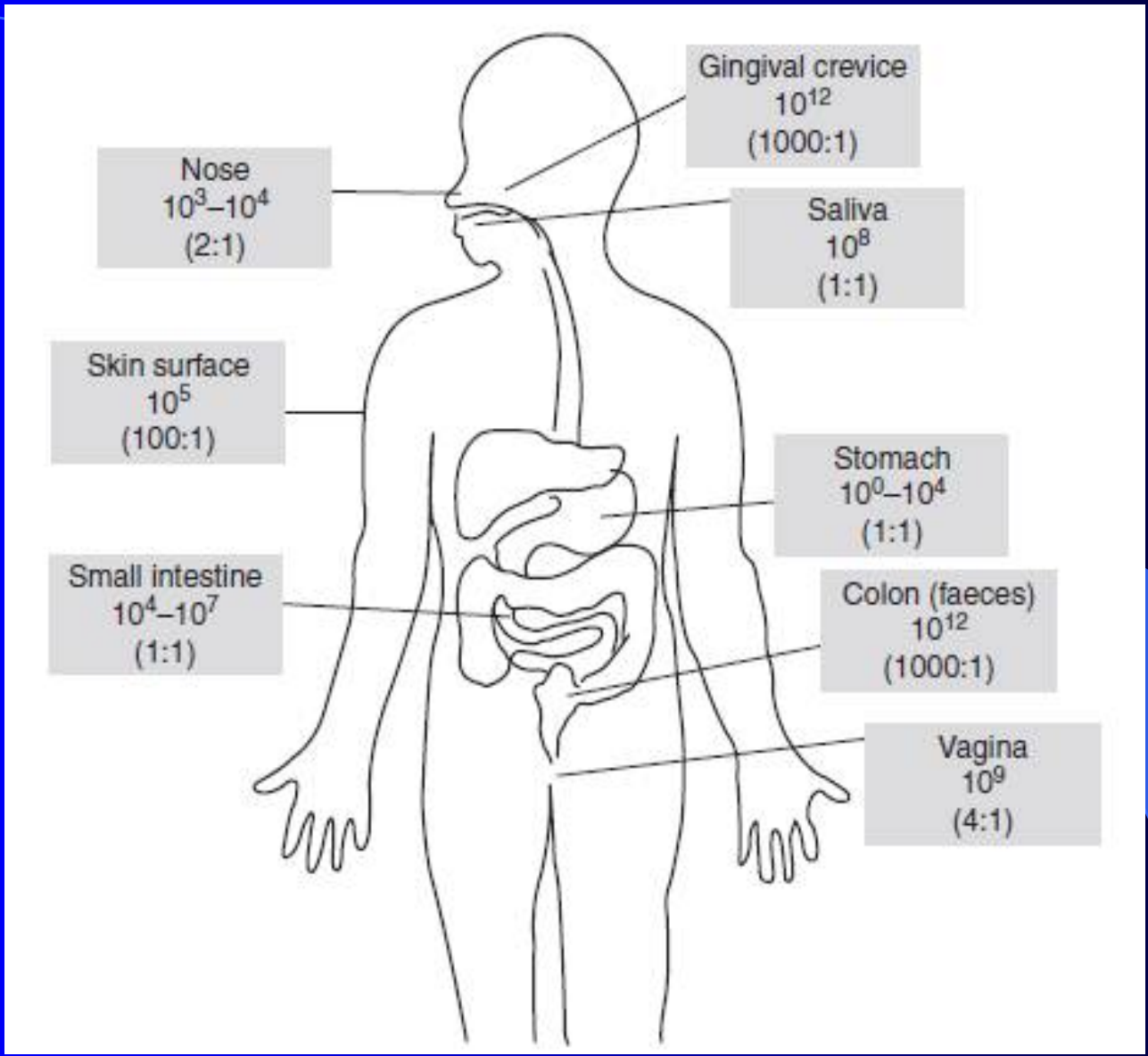


AMR ⇄ IPC

- Poor or absent IC practices, especially in intensive care units, results in cross-transmission of antibiotic-resistant bacteria.
- Resistant bacteria prompts even greater antibiotic use by physicians.
- Perception of knowledge by physicians of poor sterilization, disinfection, or patient care practices prompts increased antibiotic use (e.g., broad spectrum and prolonged surgical prophylaxis in an effort to prevent infections).

Strong public health fundamentals

- infectious disease surveillance
- laboratory detection
- epidemiologic investigation



No. of bacteria which colonize different parts of the body with (anaerobic: aerobic) ratio.

Implementation of AMS programmes in African countries considered essential

The shortage of both human and material resources will significantly impact upon their success.

There is a need to apply the principles of AMS while developing practices which will work in Africa.

Where do you want to begin?

ICU?

HDU?

NICU?

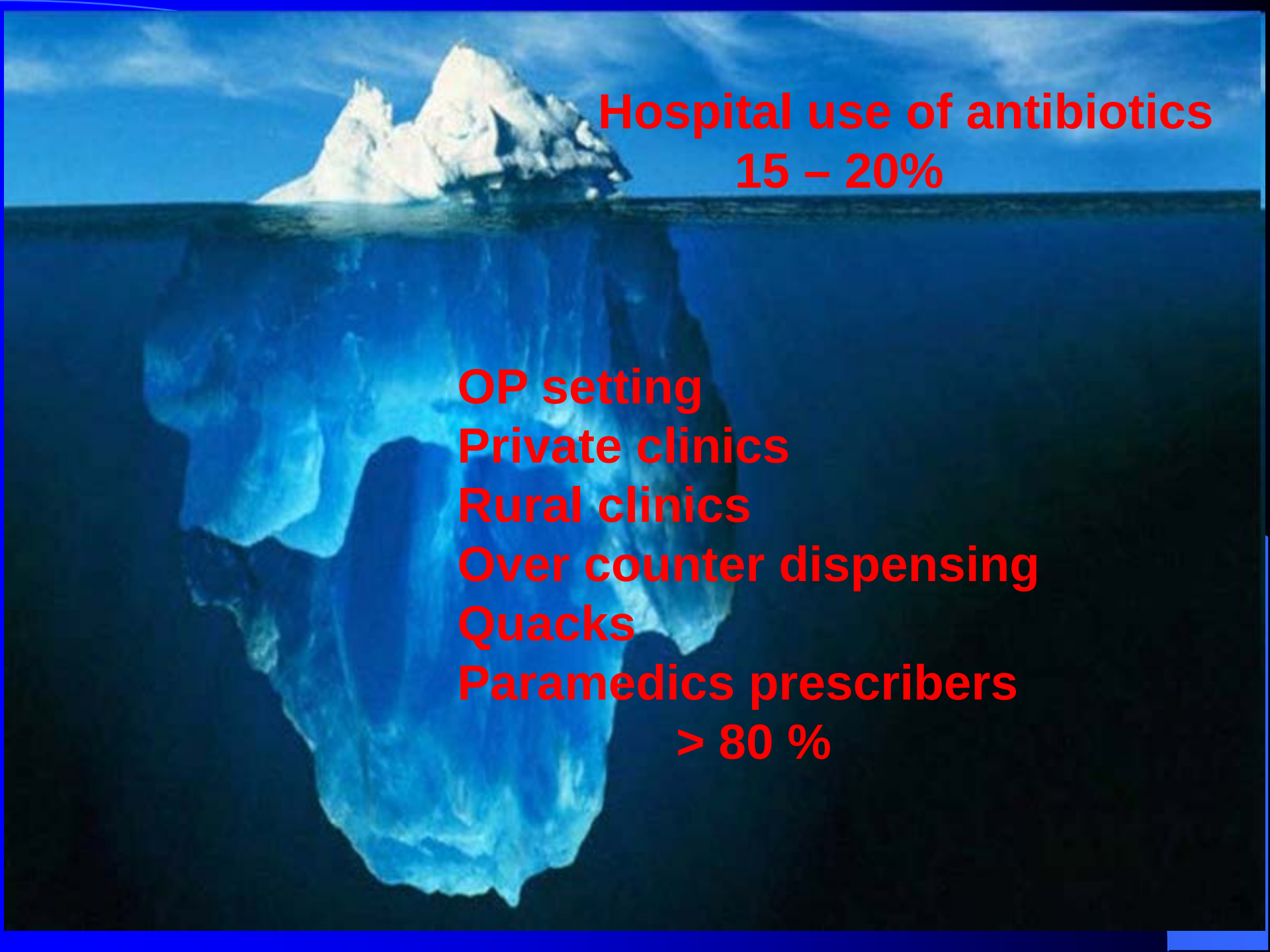
CT theater?

Oncology wards?

There is much controversy on appropriate use and misuse of antibiotics

How to define misuse?

Primary care accounts for about 80% to 90% of all antibiotic prescriptions, mainly for respiratory tract infections, UTI and GE


Hospital use of antibiotics
15 – 20%
OP setting
Private clinics
Rural clinics
Over counter dispensing
Quacks
Paramedics prescribers
> 80 %

What can we do?

Not prescribe

ceftriaxone for sore throat

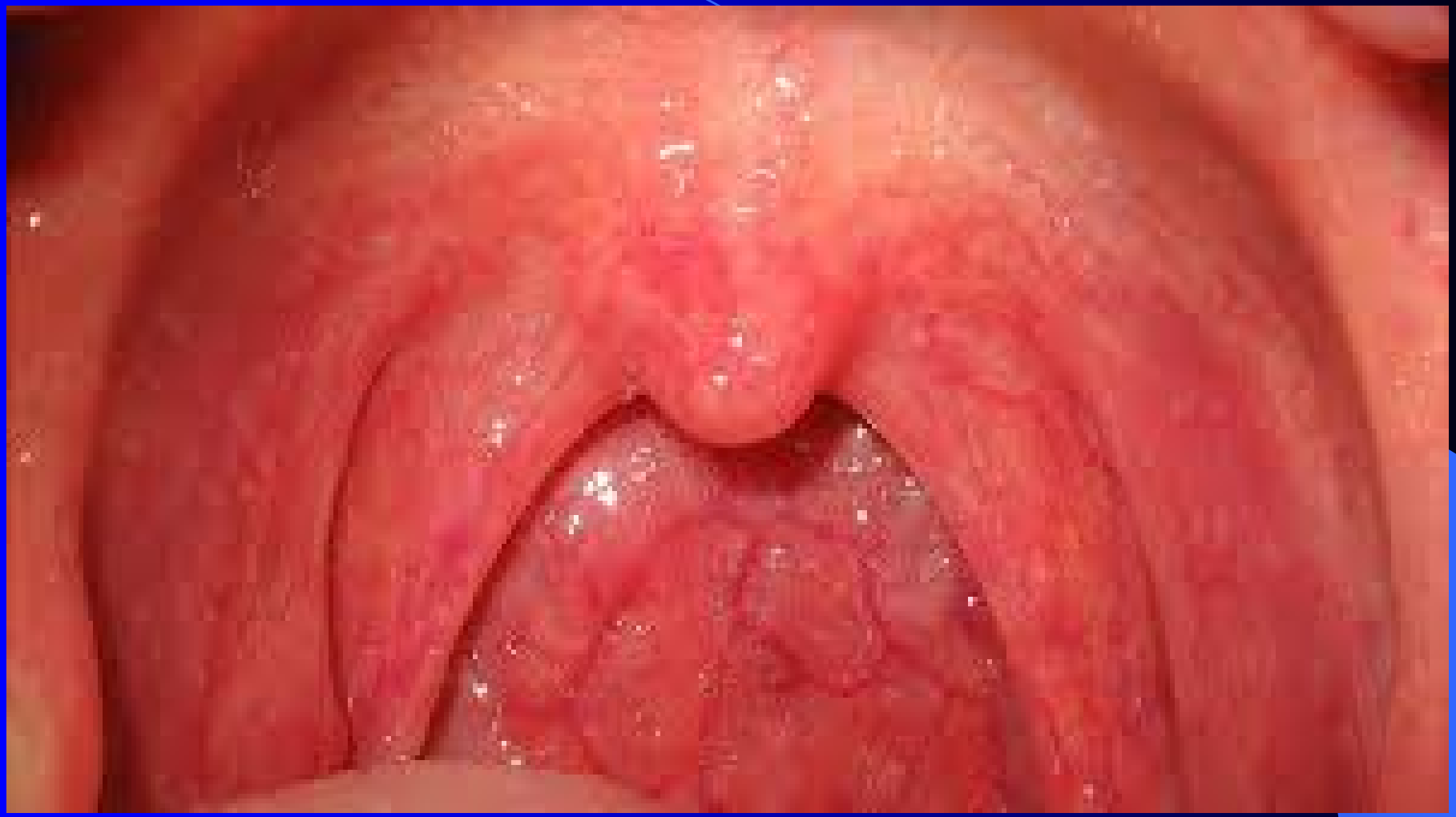
cefuroxime for GE

ciprofloxacin for every fever

Situations where antimicrobials are used excessively

- Acute Upper respiratory tract infections.
- Acute gastroenteritis.
- Acute urinary tract infection.
- Surgical prophylaxis.
- Pyrexia of unknown origin or undiagnosed fever
- Undiagnosed fever in the immune-suppressed.

Treating a viral URTI with antibiotic.



Diarrhoea is one of the two common clinical conditions leading to massive misuse of antibiotics.(ARTI being the other condition).

Approach to laboratory Diagnosis

Rapid testing

1.Microscopy for faecal leucocytes, RBC, Ova and Cysts.

2.Direct antigen detection tests for Rota and Adeno virus.

MICROSCOPIC FINDINGS

Invasive dysentery

WBC + + +

RBC + + +

Fever, parasites & other features

Inflammatory diarrhoea

WBC + + +

Fever

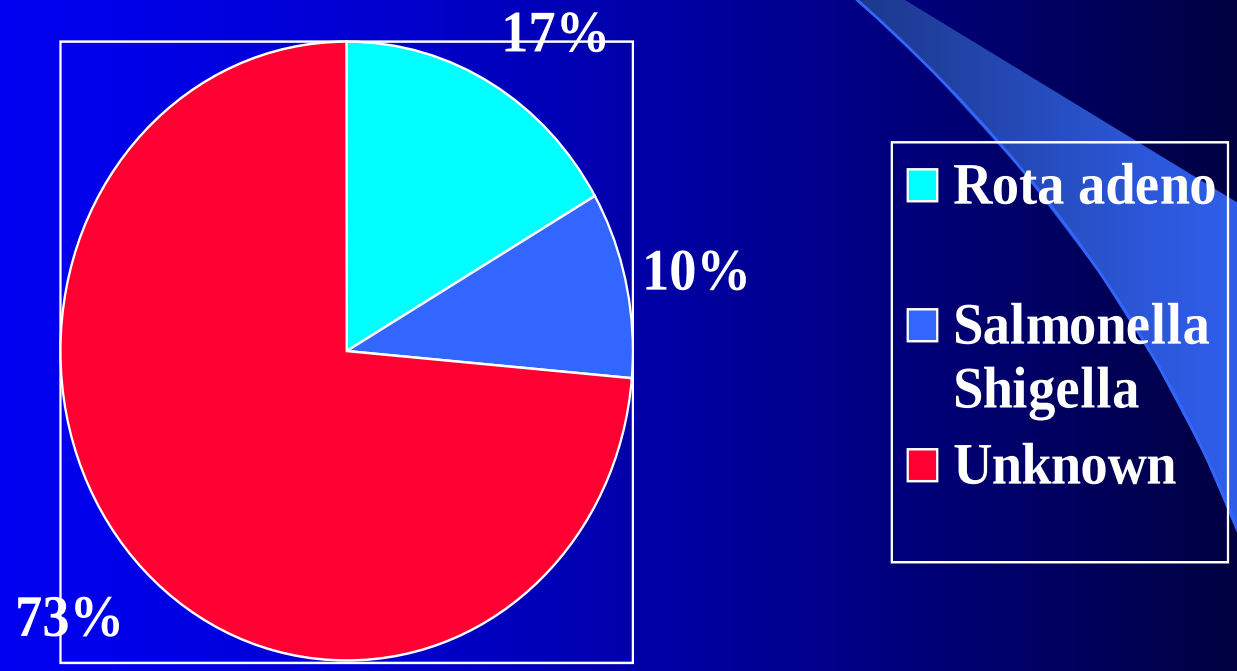
No fever

Non-inflammatory diarrhoea

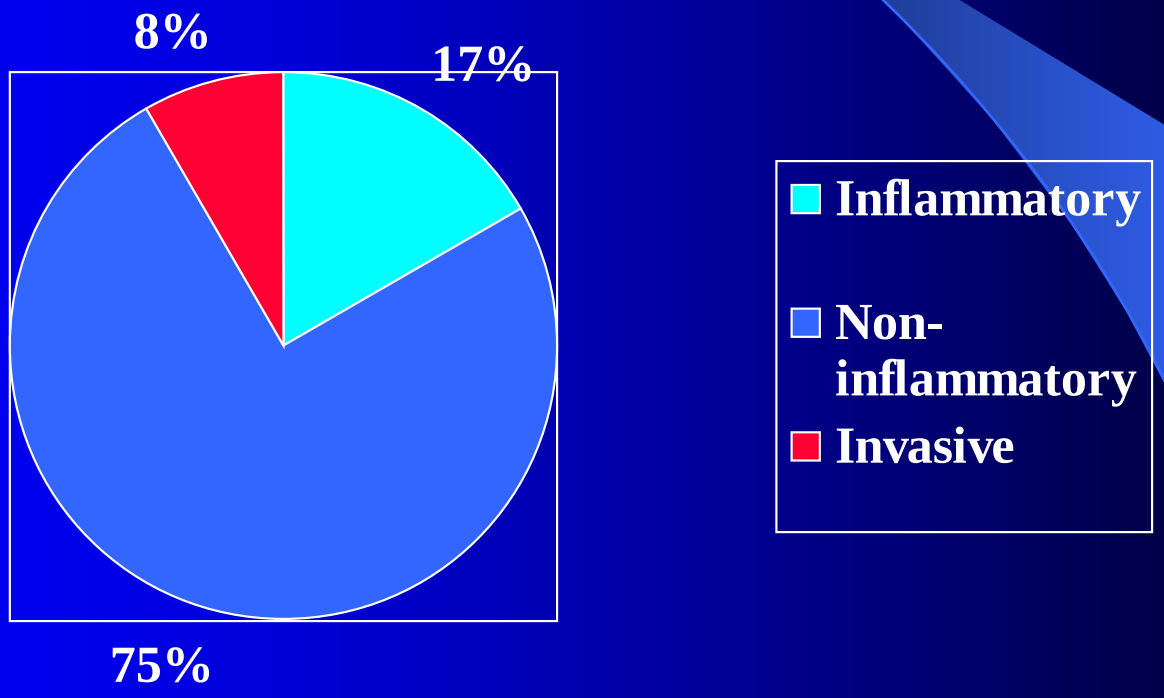
No WBC

Only fluid replacements

PROPORTION OF DETECTABLE PATHOGENS IN NON-INFLAMMATORY CHILDHOOD DIARRHOEAS



ANALYSIS OF 1,200 CONSEQUTIVE DIARRHOEAL STOOL SAMPLES OVER 3 MONTHS, CHILDREN BELOW 10 YRS



Stool Exam -

Watery sample, pale yellowish brown color, mucous or blood not seen

Microscopy results

WBC – 3-5/ HPF

RBC – Nil

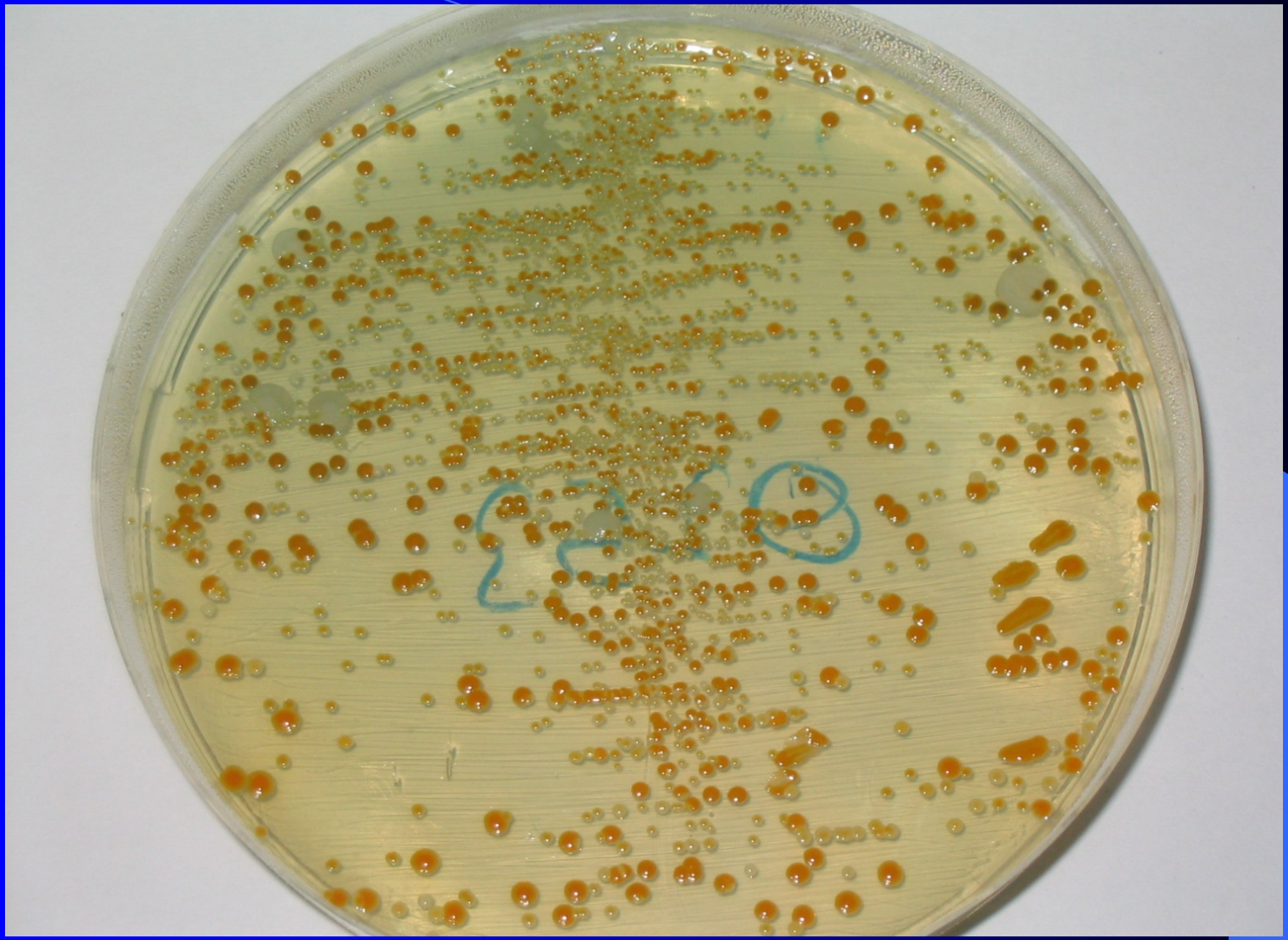
No ova or cysts seen

Treating acute non inflammatory GE with a cephalosporin

CLINICAL CHALLENGES

1. Mixed infections showing viral antigen plus fecal WBC and RBC in stool findings.
2. Immunocompromised children with diarrhoea.
3. Children with invasive diarrhoea prone to bacteremia in need of constant monitoring.
4. Repeated attacks of non-inflammatory diarrhoeas in children.

HEAVY MIXED GROWTH OF THREE TYPES OF COLONIES



Urinary tract infections (UTI) frequent in older people, children and women.
The spectrum of UTI ranges from symptomatic bacteriuria to bacteremic infection.
UTI with bacteremia has a high mortality in the older population, with studies reporting a 28 day mortality of 5%.
UTI is over diagnosed and incorrectly diagnosed 40% of times.
Bacteruria is common in the elderly.

Realization -

Majority of infections are self-limiting

Heal by themselves.

Catheter causes colonisation

Elderly females have bacteruria

Home Remedies for Urinary Tract Infection

Delayed prescription

Patient information leaflets

Communicating with patients is key

patient satisfaction in primary care settings depends more on effective communication than on receiving any prescriptions

Physician Education on

Effective communication

Professional medical advice impacts patients' perceptions and attitude much more

OPEN ACCESS Freely available online

PLOS ONE

Changing Use of Surgical Antibiotic Prophylaxis in Thika Hospital, Kenya: A Quality Improvement Intervention with an Interrupted Time Series Design

Alexander M. Aiken[1,2], Anthony K. Wanyoro[3,4], Jonah Mwangi[3], Francis Juma[3], Isaac K. Mugoya[5], J. Anthony G Scott[1,2,6]*

1 London School of Hygiene and Tropical Medicine, London, United Kingdom, **2** Kenya Medical Research Institute-Wellcome Trust Research Programme, Kilifi, Kenya, **3** Thika Level 5 Hospital, Thika, Kenya, **4** Kenyatta University, Nairobi, Kenya, **5** Ministry of Public Health and Sanitation, Nairobi, Kenya, **6** Nuffield Department of Clinical Medicine, John Radcliffe Hospital, Oxford University, United Kingdom

Message From Local Microbiology Practice to Surgeons

1. Clinically significant MRSA is very low / rare – use cloxacillin
2. MDR Gram Negative Bacilli are much more common
3. Anaerobic cover is provided by several antibiotics

Cephalosporins
Co- Amoxy clav
Meropenem
Imipenem
Tazo- piperacillin

Redundant anaerobic coverage

- Amoxicillin/clavulanate
- Ampicillin/sulbactam
- Cefotetan
- Cefoxitin
- Clindamycin
- Doripenem
- Ertapenem
- Imipenem
- Meropenem
- Metronidazole
- Moxifloxacin
- Piperacillin/tazobactam
- Ticarcillin/clavulanate
- Tigecycline

Use of multiple drugs against anaerobes – not necessary + risk for additional drug toxicities.

No data or guidelines support the use of two anti-anaerobic drugs in clinical practice

Exceptions:

1. Metronidazole can be added to another agent with anaerobic activity when being used to treat Clostridium difficile infection.

2. Clindamycin can be added to another agent with anaerobic activity when being used for the treatment of necrotizing fasciitis.

ANTIMICROBIAL RESISTANCE INVITED ARTICLE

George M. Eliopoulos, Section Editor

Antimicrobial Resistance and Susceptibility Testing of Anaerobic Bacteria

Audrey N. Schuetz[1,2,3]

[1]Clinical Microbiology Laboratory, Departments of [2]Pathology and Laboratory Medicine, and [3]Internal Medicine, Weill Cornell Medical College/NewYork–Presbyterian Hospital, New York, New York

Infections due to anaerobic bacteria can be severe and life-threatening. Susceptibility testing of anaerobes is not frequently performed in laboratories, but such testing is important to direct appropriate therapy. Anaerobic resistance is increasing globally, and resistance trends vary by geographic region. An overview of a variety of susceptibility testing methods for anaerobes is provided, and the advantages and disadvantages of each method are reviewed. Specific clinical situations warranting anaerobic susceptibility testing are discussed.

Keywords. anaerobe; anaerobic bacteria; resistance; susceptibility; susceptibility test methods.

- Remember -there are certain infections antibiotics can not resolve – due to resistance or advancement of the infective process far beyond a point where the antibiotic could be fully active.
- Antibiotics are unable to resolve certain infections in
- The immunocompromised
- ICU patient populations
- Infected invasive inserts or implants due to biofilms formed by bacteria

Figure 43-2 Organizational structure of a comprehensive antimicrobial management program. (Adapted from John JF Jr, Fishman NO. Programmatic role of the infectious diseases physician in controlling antimicrobial costs in the hospitals. Clin Infect Dis. 1997;24:471.)

Antibiotic Guidelines

Antimicrobial Use Guidelines
University of Wisconsin Hospital
July 1995 to June 1996
Eighth Edition

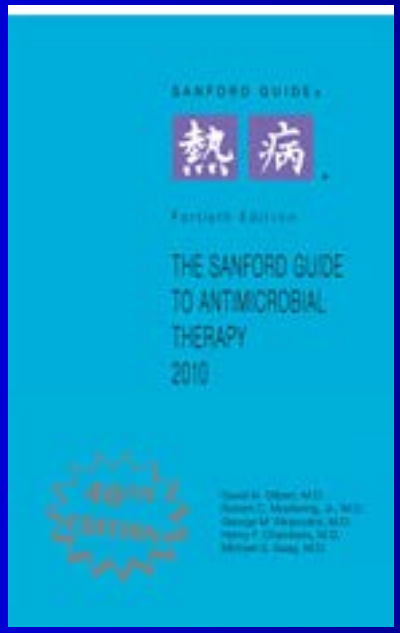
APPENDIX D: SURGICAL PROPHYLAXIS

The generally accepted principles of antimicrobial prophylaxis in surgery involve five considerations.

Guidelines for Antimicrobial Usage

2009-2010

Cleveland Clinic



SGRH

Hospital Infection Control Committee (HICC)

Sir Ganga Ram Hospital

Antibiotic Protocol

(valid upto July,2010)

SGRH Guidelines for Empirical Antibiotic Therapy

Table 3. Implementation of Antimicrobial Stewardship Programs worldwide

North America	67%
Europe	65%
Asia	53%
Oceania	48%
South America	46%
Africa	13%

Why are guidelines not followed?

There are too many of them

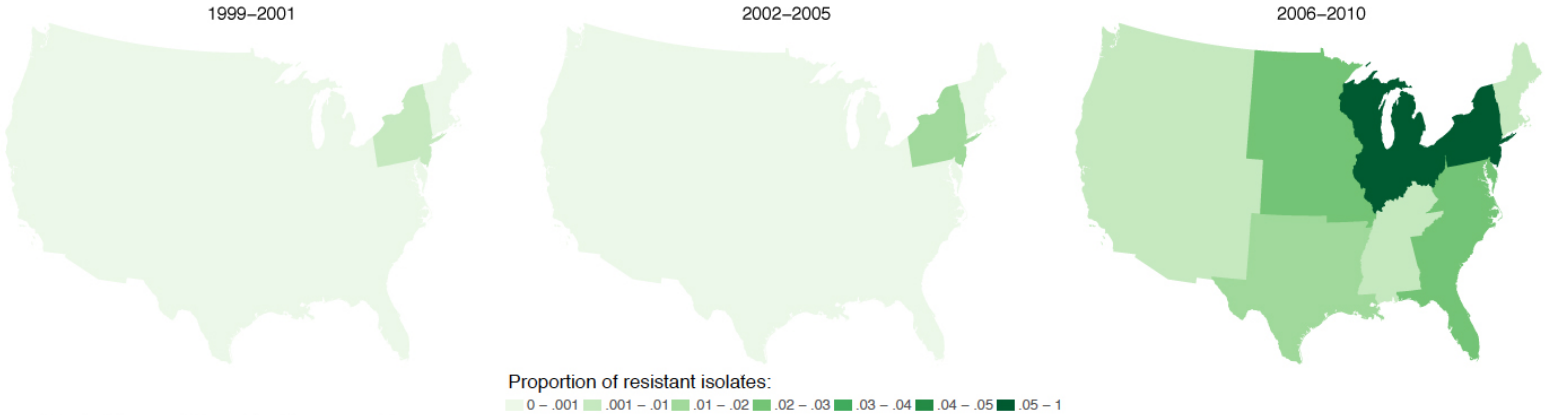
They do not fit my patient

They are based on fiction

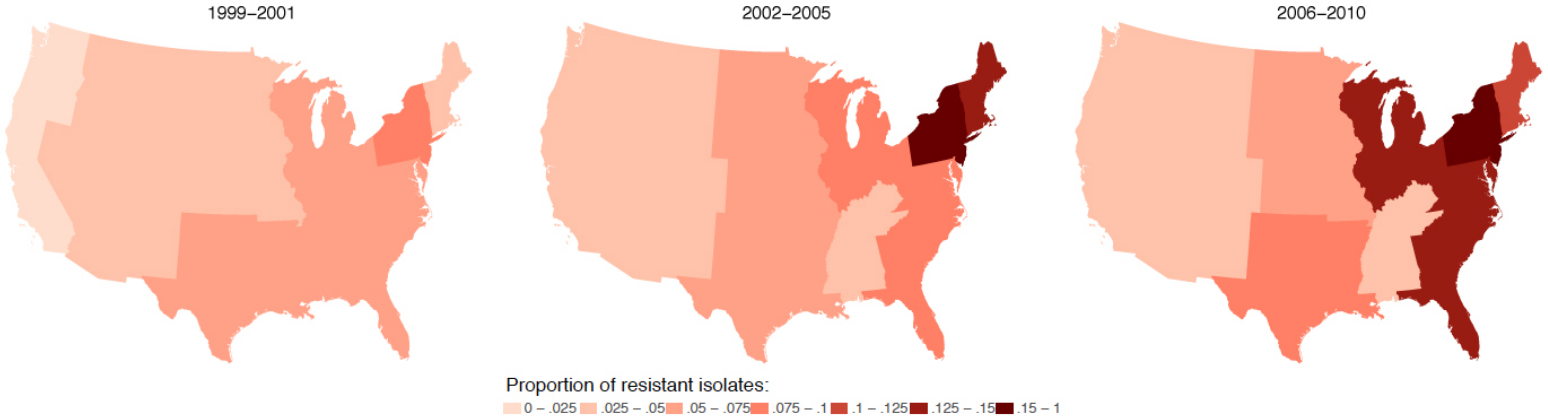
They are made by a bunch of self centered chaps who are not in active practice

Carbapenem and 3rd. gen. cephalosporin resistance among *K. pneumoniae* highest along the East Coast, but present in all regions of the country

Carbapenem



3rd Gen. Cephalosporins

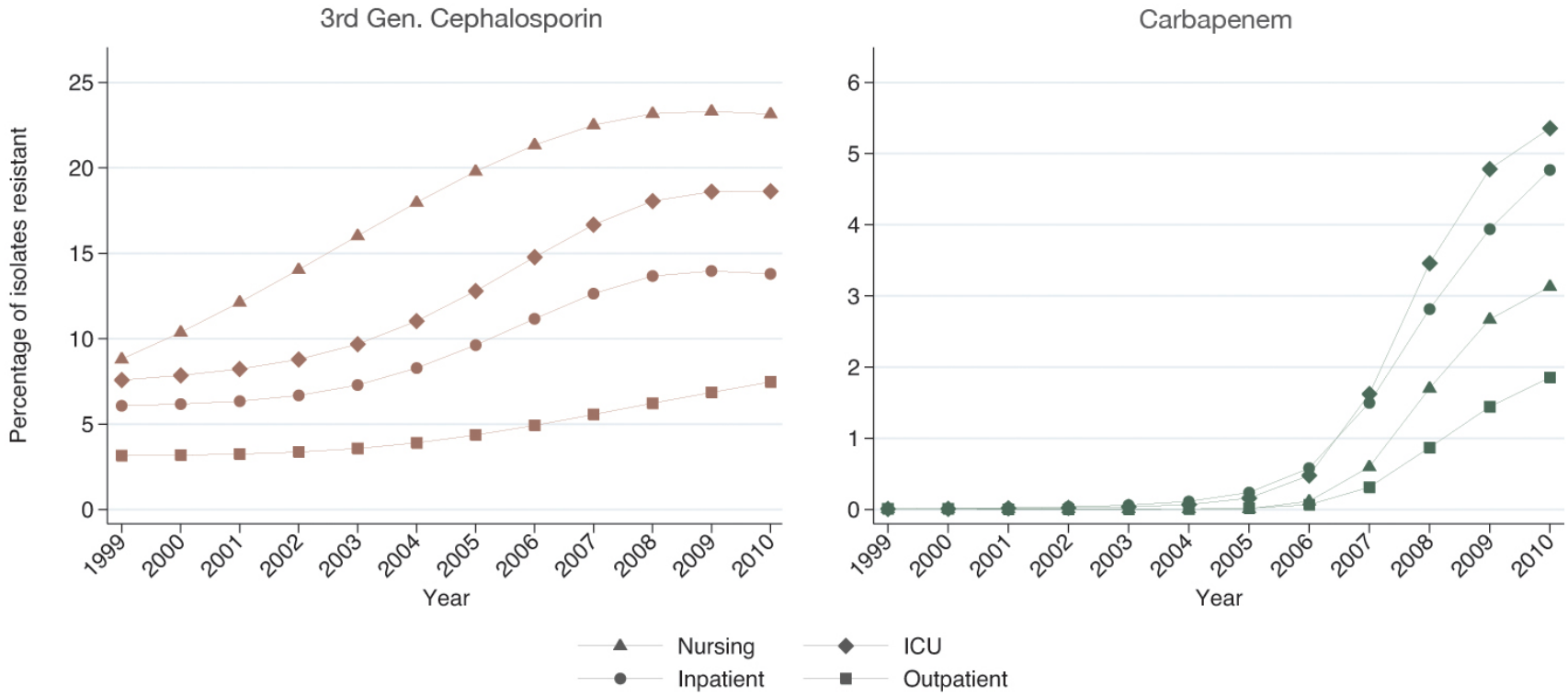


Note: Data for 2010 available through July.

Data source: Braykov NB, Eber MR, Klein EY, Morgan DJ, Laxminarayan R. Trends in Resistance to Carbapenems and Third- Generation Cephalosporins among Clinical Isolates of Klebsiella pneumoniae in the United States, 1999-2010. Infect Control and Hospital Epidemiology. 2013; 34(3)

CDDEP THE CENTER FOR Disease Dynamics, Economics & Policy
WASHINGTON DC • NEW DELHI

Carbapenem and 3rd. gen. cephalosporin resistance among *K. pneumoniae* is increasing in all patient settings

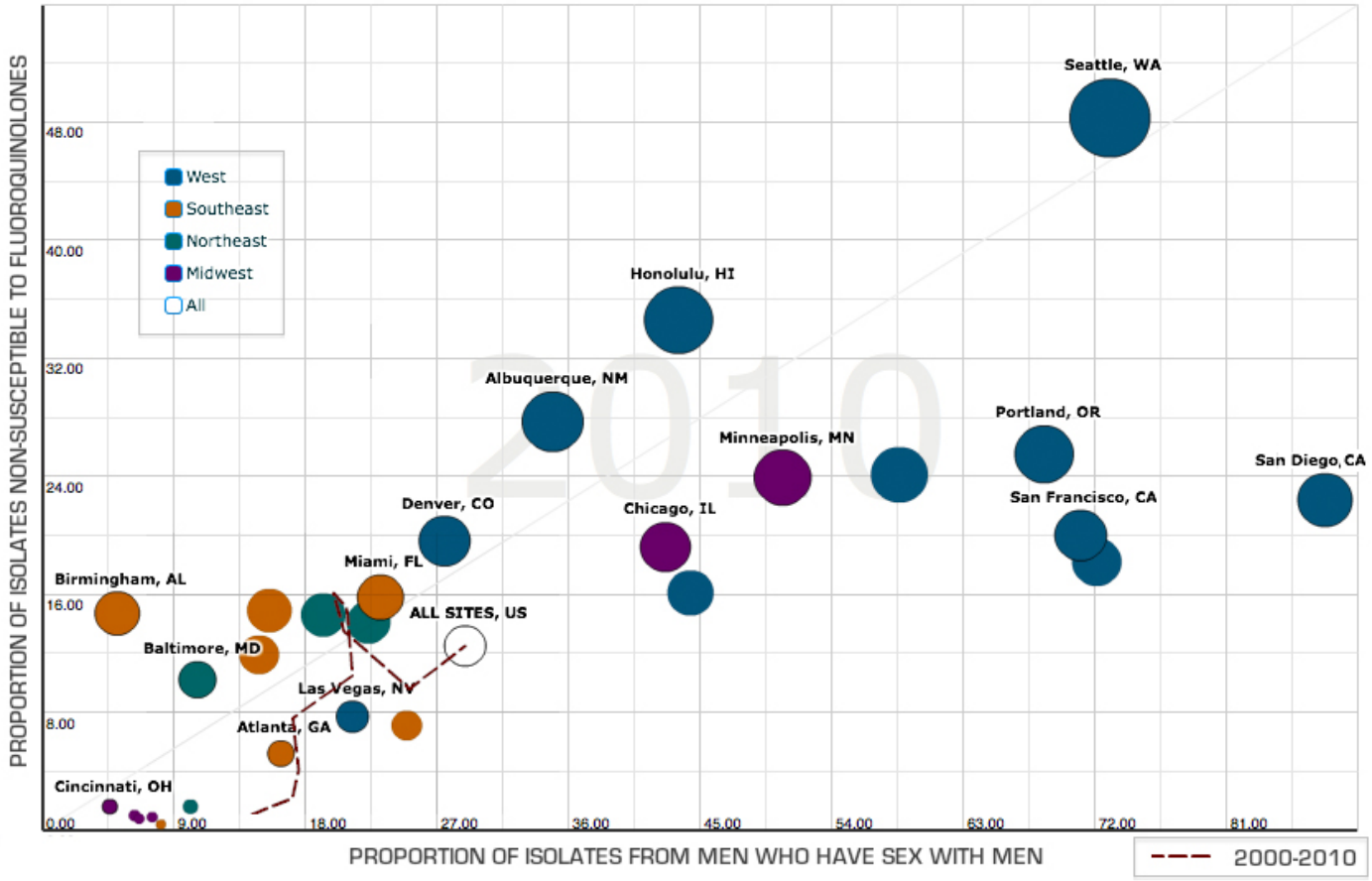


Note: Data for 2010 available through July.

Data source: Braykov NB, Eber MR, Klein EY, Morgan DJ, Laxminarayan R. Trends in Resistance to Carbapenems and Third- Generation Cephalosporins among Clinical Isolates of *Klebsiella pneumoniae* in the United States, 1999-2010. *Infect Control and Hospital Epidemiology*. 2013; 34(3)

CDDEP THE CENTER FOR Disease Dynamics, Economics & Policy
WASHINGTON DC • NEW DELHI

Drug-resistant gonorrhea most common on West coast and among MSM*

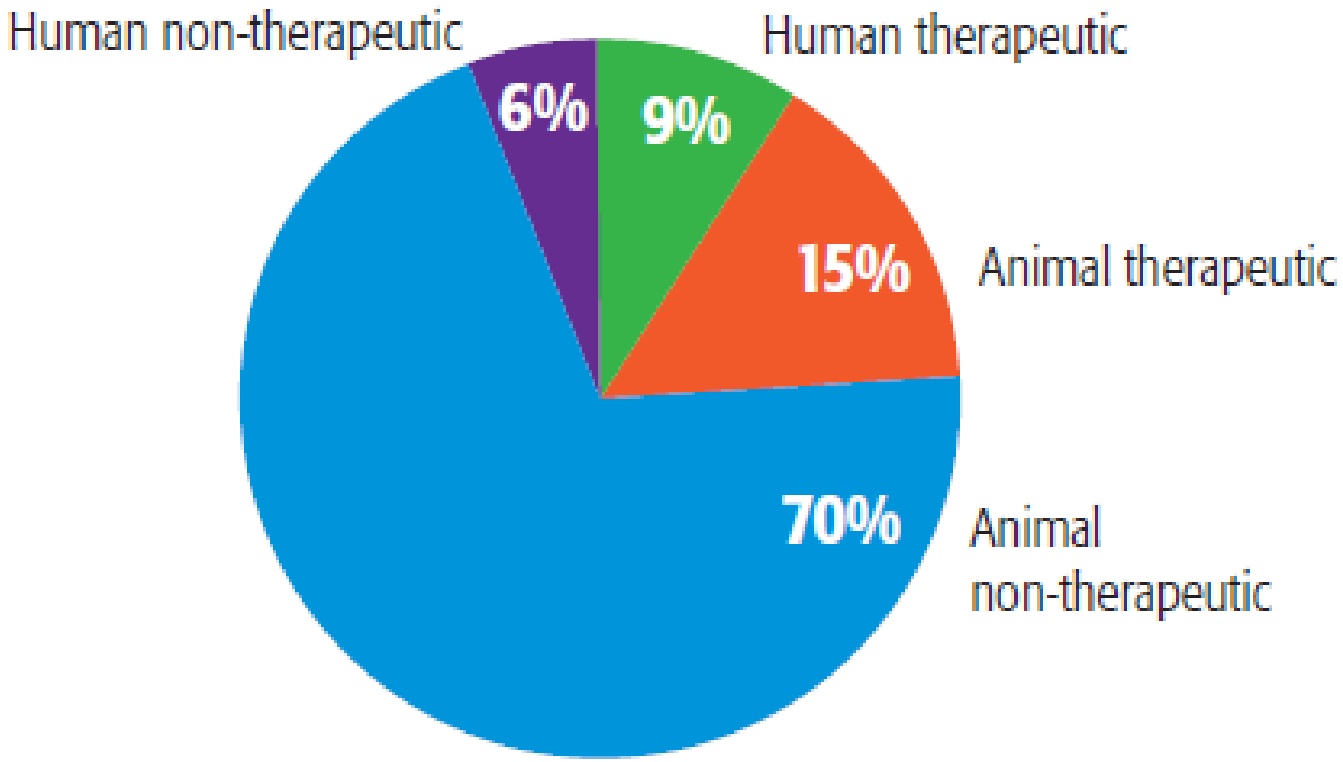


***MSM - men who have sex with men**

Data source: *Centers for Disease Control and Prevention, Gonococcal Isolate Surveillance Program (GISP). GISP Profiles (2008-2010) and Annual Reports (2000-2007)*

CDDEP THE CENTER FOR Disease Dynamics, Economics & Policy
WASHINGTON DC • NEW DELHI

Figure 1. Current use of antibiotics in the United States.

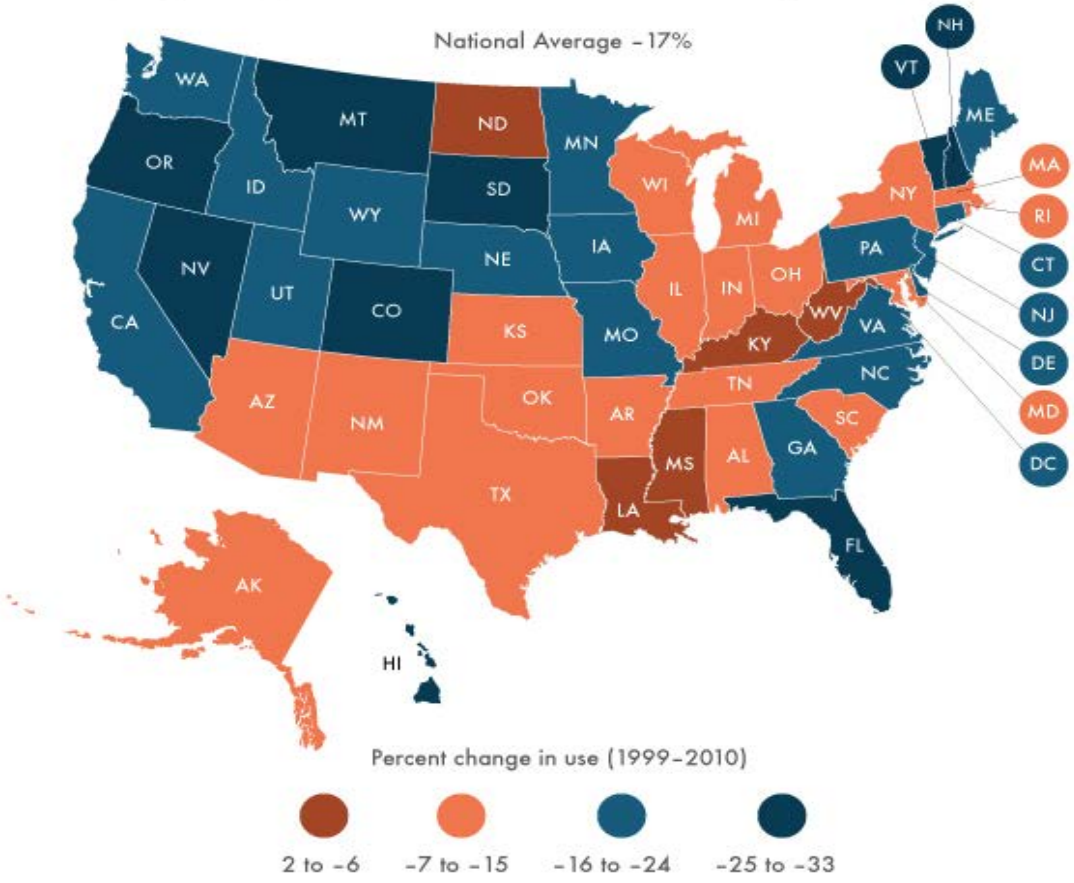


Source: www.pewhealth.org

ANTIBIOTIC USE AND RESISTANCE AT A GLANCE: 1999–2010

THE DECREASE IN PRESCRIBING WAS NOT UNIFORM ACROSS STATES

Widening regional gap: East South Central states are making little progress.



For more information, visit us at **WWW.CDDEP.ORG/RESISTANCEMAP**

Healthcare-associated Infections (HAI)

Healthcare-associated infections (HAI) are infections caused by a wide variety of common and unusual bacteria, fungi, and viruses during the course of receiving medical care.

Medical advances have brought lifesaving care to patients in need, yet many of those advances come with a risk of HAI. These infections related to medical care can be devastating and even deadly. As our ability to prevent HAIs grows, these infections are increasingly unacceptable.

Recent successes in HAI elimination have been very encouraging. Reductions have been demonstrated for other HAIs as well, but much more remains to be done.

Wherever patient care is provided, adherence to infection prevention guidelines is needed to ensure that all care is safe care. This includes traditional hospital settings as well as outpatient surgery centers, long-term care facilities, rehabilitation centers, and community clinics. The information on this website is intended to inform patients and healthcare personnel and help move healthcare systems toward elimination of HAIs.

Response

Healthcare-associated Infections (HAI) topics

HAIs: The Burden
The incidence and economic cost of HAIs...

Types of Infections
Bloodstream, surgical, urinary, pneumonia...

Diseases and Organisms
Pathogens associated with HAIs

Preventing HAIs
Resources toward elimination of HAIs

Monitoring Infections
Surveillance systems

Research
CDC Prevention Epicenters and HAI Research Strategy

24/7 Outbreak Notices

Multistate Meningitis Outbreak

State-based HAI Prevention

CDC's work with state health departments improves HAI tracking and prevention by implementing successful prevention strategies in the entire state and tracking the impact of that strategy across all

Email page link
Print page

Get email updates

To receive email updates about this page, enter your email address:

What's this? Submit

Contact Us:

Centers for Disease Control and Prevention
1600 Clifton Rd
Atlanta, GA 30333

800-CDC-INFO
(800-232-4636)
TTY: (888) 232-6348

New Hours of Operation
8am-8pm ET/Monday-Friday
Closed Holidays

cdcinfo@cdc.gov

The IDSA/SHEA guidelines recommend that local antibiograms with pathogen-specific susceptibility should be updated at least annually to improve optimization of expert-based recommendations for empiric therapy

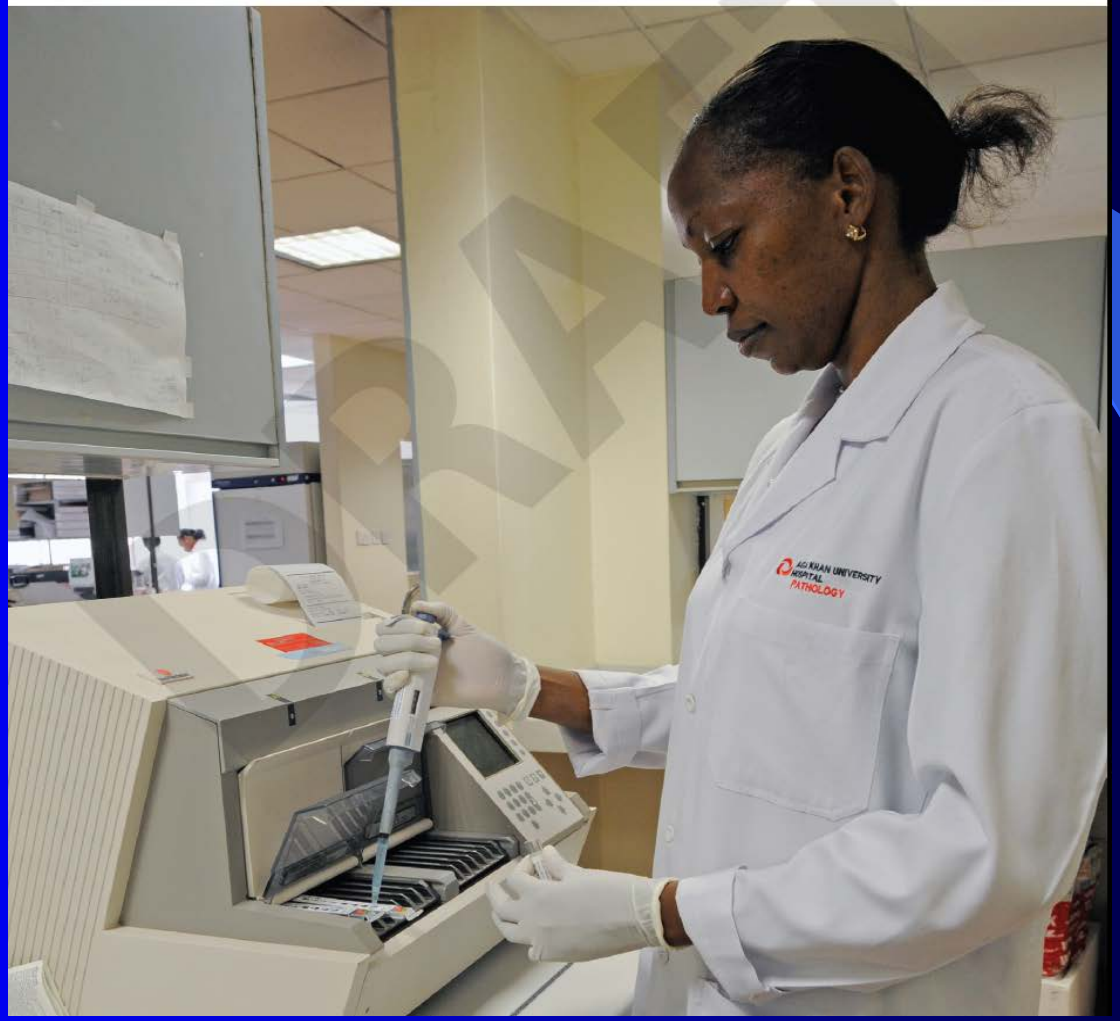
In Resource poor settings

We have facility driven anti-biogram in private sector

The Aga Khan University Hospital

Hospital Accredited by Joint Commission International, USA

Microbiology Spectrum and Susceptibility



Antimicrobial Susceptibilities, 2012-2013

Urine cultures in outpatients, main lab AKUHN (% susceptible)

Organism	Number	Amp	Amox/ Clav	Amikacin	Cipro	Cefotax	Cefurox	Ntfn	Gent	Merop	TMP/ SMX
E. coli 2012	1122	20%	67%	100%	66%	81%	77%	87%	84%	100%	24%
E. coli 2013	1025	21%	68%	100%	65%	78%	75%	86%	83%	100%	26%
E coli total	2147	21%	67%	100%	66%	79%	76%	86%	84%	100%	25%
K peumo 2012	142		56%	99%	85%	72%	70%	N/A	80%	99%	39%
K. pneumo 2013	140		49%	99%	74%	59%	56%		67%	99%	42%
K pneumo total	282		53%	99%	79%	66%	63%		73%	99%	41%
Proteus total	61		89%	100%	93%	98%	97%		90%	100%	30%

Microbiology Newsletter
Sir Ganga Ram Hospital

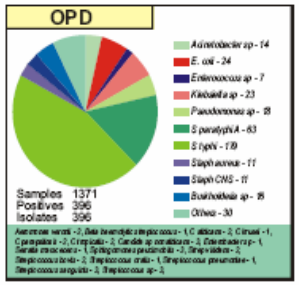
Volume 16, No. 1 Published June 2010

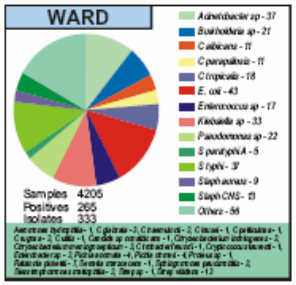
OPD
WARD
ICU

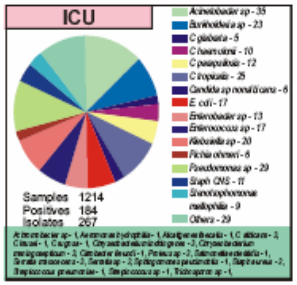
GNB	No. of Isolates	Ampicillin	Ceftriaxone	Ceftazidime	Cefexime	Cefepime	Gentamicin	Amikacin	Nalidixic Acid	Ciprofloxacin	Co-trimoxazole	Chloramphenicol	Piperacillin + Tazobactam	Cefoperazone+ Sulbactam	Ertapenem	Imipenem / Meropenem**	Colistin
S.typhi	**235**	87	100	-	-	-	-	-	6	82	91	93	-	-	-	-	-
	65	89	100	-	-	-	-	-	9	80	88	93	-	-	-	-	-
	5	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-
S.paratyphi A	**59**	88	100	-	100	-	-	-	0	100	100	100	-	-	-	-	-
	7	100	100	-	100	-	-	-	0	100	100	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E. coli	**44**	11	35	-	-	36	61	100	-	23	-	-	70	86	100	100	100
	65	9	23	-	-	27	45	88	-	14	-	-	58	83	92	95	100
	102	2	11	-	-	11	39	84	-	4	-	-	59	72	92	93	100
Klebsiella spp.	**7**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	71	0	1	-	-	1	19	65	-	13	-	-	15	16	36	46	100
	185	0	3	-	-	4	18	46	-	16	-	-	18	20	42	51	100
Enterobacter spp.	**2**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10	0	20	-	-	20	50	60	-	20	-	-	40	50	63	78	-
	27	0	30	-	-	48	53	63	-	33	-	-	52	59	60	63	96
Acinetobacter spp.	**9**	25	71	50	-	67	78	78	-	89	-	-	55	87*	-	52	100
	40	0	3	19	-	22	37	47	-	30	-	-	24	26	-	30	100
	150	2	2	7	-	9	12	22	-	10	-	-	9	16	-	15	99
Pseudomonas aeruginosa	**8**	-	-	87	-	62	63	75	-	75	-	-	75	75	-	75	-
	28	-	-	18	-	19	15	25	-	11	-	-	43	19	-	31	100
	44	-	-	22	-	23	25	34	-	23	-	-	41	26	-	29	100

Fortis Hospital Antibiogram 2007

Antibiotics	*E. coli* Susceptibility %															
	FHVK, n = 459			FHN, n=570			FHVK, n=459					FHN, n=570				
	ICU	IPD	OPD	ICU	IPD	OPD	Blood	Urine	Resp	Pus	Mis	Blood	Urine	Resp	Pus	Misc
Amikacin	74.2	79	87.7	73.8	71.8	88.5	69.7	84.2	83.3	66.7	85.7	65.4	83.6	91.3	73.9	72.7
Ampicillin	6.9	3.2	7.5	4.8	4.3	22.3	14.3	6.8	0	0	0	11.5	17.9	0	0	9.1
Aztreonam	0	12.5	12.5	0	26.7	42.9	0	7.7	0	0	25	100	10	0	66.7	16.7
Cefepime	20.2	24.1	52.4	26.8	26.5	55.5	24.2	41.5	12.5	30.3	7.1	34.6	49.3	30.4	17.4	18.2
Cefaperazone	20	32.4	56.4	-	-	-	25	44.7	0	50	0	-	-	-	-	-
Cefotaxime	28.9	26	50	29.4	17.1	-	40	40.4	0	0	0	50	42.1	0	0	33.3
Ceftazdime	21.2	23.4	52.2	18.6	17.1	50.5	25	41.5	13	30.3	7.1	30.8	42.6	13	8.7	13.6
Cefuroxime	22.5	22	47.8	-	-	100	31	38.1	15	31.3	7.1	-	-	-	-	-
Ciprofloxacin	12.4	12	27.8	4.7	8.6	33.8	18.2	21.6	4.2	15.2	7.1	24	26.3	4.3	8.9	9.5
Gatifloxacin	38.2	35.3	44.1	41.5	38.5	60.8	45.5	41.6	20.8	42.4	7.1	34.6	53.1	39.1	51.1	59.1
Gentamicin	51.7	32.8	51.5	34.9	26.9	55.3	42.9	43.9	37.5	44.4	66.7	50	48.9	34.1	15.9	22.7
Imipenem	100	100	100	90.7	98.9	100	100	100	100	100	100	96.2	99.3	100	97.8	95.5
Levofloxacin	12.8	11.4	30.7	4.8	13.4	36	18.2	22.7	0	17.9	7.1	23.1	29	9.1	11.1	18.2
Meropenem	100	100	100	81.6	96.2	99.4	100	100	100	100	100	82.6	99.3	89.5	88.1	95.5
Netlimicin	67.4	74	83	58.5	15.3	77.1	-	79.2	75	63.6	-	46.2	70.7	77.3	48.9	42.9
Nitrofurantoin	83	83.6	86.2	88.2	82.1	89.1	-	84.8	-	-	100	-	87.3	-	-	-
Norfloxacin	10.6	11.8	28.1	11.8	8.7	34.9	-	20.6	NT	-	0	-	27	-	-	-
Piperacillin	4.7	2	40.9	-	-	75	9.1	63.6	0	3.1	7.1	-	71.4	-	-	-
Piperacillin +Tazobactum	53.9	64.3	74.3	76.2	80.4	89	54.5	69.4	62.5	57.6	57.1	72	86.5	91.3	80.4	71.4
Tobramycin	31.3	22.2	51.3	33.3	37.5	44.8	50	39.6	-	50	0	-	45.5	-	-	-







Percentage Resistance

OPD
WARD
ICU

GPC

	No. of Isolates	Penicillin	Oxacillin**	Ampicillin	Clindamycin	Gentamicin	HLAR* Gentamicin	Vancomycin
Staph aureus	11	92	25	-	0	40	-	0
	9	100	33	-	25	22	-	0
	2	-	-	-	-	-	-	-
Staph CNS	11	78	44	-	56	44	-	0
	13	100	60	-	60	75	-	0
	11	50	20	-	25	20	-	0
Enterococcus sp	7	-	-	43	-	-	57	0
	17	-	-	89	-	-	64	13#
	17	-	-	78	-	-	82	18##

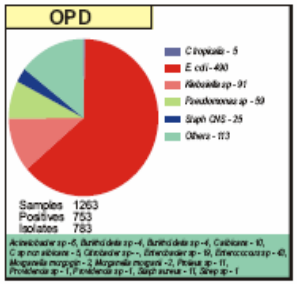
* *Two isolates of GRE (Glycopeptide Resistant Enterococci).*
** *Three isolates of GRE.*
HLAR: High Level Aminoglycoside Resistance.
*** Oxacillin sensitivity can be extrapolated for all β-lactams and β-lactam-inhibitor combinations; and Vancomycin sensitivity for Teicoplanin.*

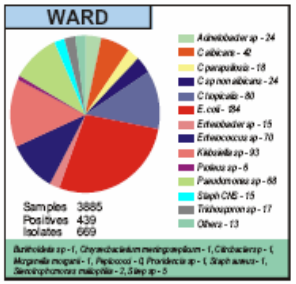
*OPD data for 1 year, (Jan to Dec 2006), included in this issue

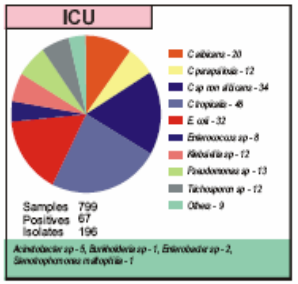
GNB

	No. of Isolates	Ampicillin	Cefuroxime	Ceftriaxone	Ceftazidime	Gentamicin	Amikacin	Nalidixic acid	Ciprofloxacin	Co-trimoxazole	Chloramphenicol	Piperacillin* Tazobactum*	Cefoperazone+ Sulbactum*	Imipenem	Colistin
S. enterica serotype Typhi	179	14	-	0	-	-	-	86	6	23	14	-	-	-	-
	37	19	-	0	-	-	-	95	3	29	18	-	-	-	-
	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S. enterica serotype Paratyphi A	63	0	-	0	-	-	-	98	2	0	0	-	-	-	-
	5	0	-	0	-	-	-	100	0	0	0	-	-	-	-
	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E. coli	24	91	69	71	-	59	22	-	82	-	-	38	25	0	-
	43	93	94	87	-	61	14	-	88	-	-	16	29	0	-
	17	94	83	69	-	58	18	-	80	-	-	17	43	0	-
Klebsiella sp	23	100	87	85	-	75	70	-	89	-	-	79	87	0	-
	33	100	83	90	-	83	39	-	63	-	-	45	46	3**	-
	20	100	100	100	-	92	46	-	92	-	-	65	86	0	-
Pseudomonas sp	18	-	-	-	67	78	77	-	73	-	-	50	73	62	13
	22	-	-	-	67	58	60	-	43	-	-	23	53	33	13
	29	-	-	-	88	95	92	-	92	-	-	78	94	78	8
Acinetobacter sp	14	62	60	55	50	50	57	-	43	-	-	36	40	60	10
	37	85	-	100	100	74	60	-	70	-	-	64	65	57	0
	35	100	-	100	100	89	88	-	88	-	-	89	87	76	4
Burkholderia sp	16	-	-	-	23	-	-	-	-	27	-	-	-	50	-
	21	-	-	-	25	-	-	-	-	74	-	-	-	89	-
	23	-	-	-	25	-	-	-	-	14	-	-	-	94	-
Enterobacter sp	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	13	100	100	78	-	80	64	-	80	-	-	70	67	0	-

*Percentage Resistance may indirectly appear higher than actual, because 2nd line drugs are tested only in multi-drug resistant isolates.
** One isolate.







Percentage Resistance

OPD
WARD
ICU

GPC

	No. of Isolates	Ampicillin	Penicillin	Oxacillin**	Clindamycin	Nitrofurantoin	Gentamicin	HLAR* Gentamicin	Norfloxacin	Vancomycin
Enterococcus sp	43	19	-	-	-	10	-	50	74	5#
	70	60	-	-	-	21	-	65	91	9##
	8	50	-	-	-	25	-	50	100	0
Staph CNS	25	-	87	54	29	0	59	50	69	0
	15	-	100	80	29	0	100	0	100	0
	0	-	-	-	-	-	-	-	-	-
Staph aureus	11	-	70	18	11	0	27	-	50	0
	1	-	-	-	-	-	-	-	-	-
	0	-	-	-	-	-	-	-	-	-

* *Two isolates of GRE (Glycopeptide Resistant Enterococci).*
** *Six isolates of GRE.*
HLAR: High Level Aminoglycoside Resistance.
*** Oxacillin sensitivity can be extrapolated for all β-lactams and β-lactam-inhibitor combinations; and Vancomycin sensitivity for Teicoplanin.*

*OPD data for 1 year, (Jan to Dec 2006), included in this issue

GNB

	No of Isolates	Ampicillin	Cefotaxime	Ceftazidime*	Nalidixic acid	Norfloxacin	Ciprofloxacin	Ofloxacin	Gentamicin	Netilmicin	Amikacin	Piperacillin+ Tazobactum*	Cefoperazone+ Sulbactam*	Imipenem	Co-trimoxazole	Nitrofurantoin
E. coli	490	89	65	64	94	82	80	78	59	47	33	38	36	0	76	25
	184	93	76	64	93	89	90	87	67	50	29	44	47	0	78	18
	32	100	87	67	96	89	89	86	75	50	30	50	63	0	81	16
Pseudomonas sp	59	100	83	40	100	100	78	49	75	61	67	25	45	30	100	92
	68	100	83	84	100	100	90	79	89	84	86	54	83	89	89	92
	13	100	75	67	100	0	78	67	67	63	67	42	44	83	100	100
Klebsiella sp	91	97	67	53	81	80	79	67	63	56	49	55	58	0	73	69
	93	100	83	89	86	74	75	80	68	63	64	68	70	0	75	65
	12	100	73	100	70	70	73	67	67	60	42	64	75	0	67	58
Enterobacter	19	94	56	50	86	75	71	50	61	89	57	56	53	0	78	63
	15	100	71	100	81	73	75	60	65	69	56	53	56	0	82	59
	2	100	50	-	50	50	50	-	50	50	50	50	50	0	50	100
Acinetobacter sp	6	50	50	50	25	25	57	100	29	50	43	29	33	50	40	50
	24	100	60	50	58	50	50	33	74	50	68	43	50	60	73	90
	5	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Proteus sp	11	64	13	0	73	33	20	25	9	9	10	0	0	0	64	73
	6	60	40	40	80	-	33	33	33	50	33	67	0	0	-	60
	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Percentage Resistance may indirectly appear higher than actual, because 2nd line drugs are tested only in multi-drug resistant isolates.

BacLink software

Import & analyze antimicrobial susceptibility data from software / automated ABST instruments

Comp Software

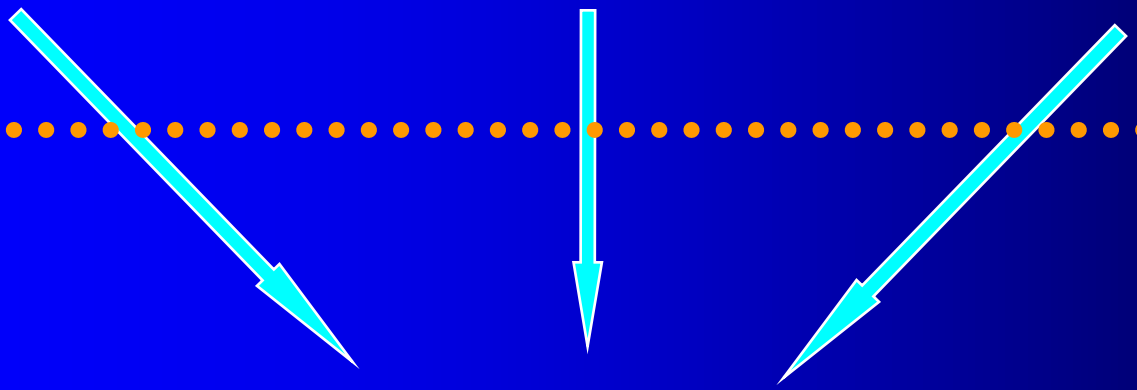
Excel
Access
EpiInfo

Lab Systems

Mysis
MEDITECH magic
ADBakt

Lab Instruments

MIC systems
Disk diffusion readers



BacLink

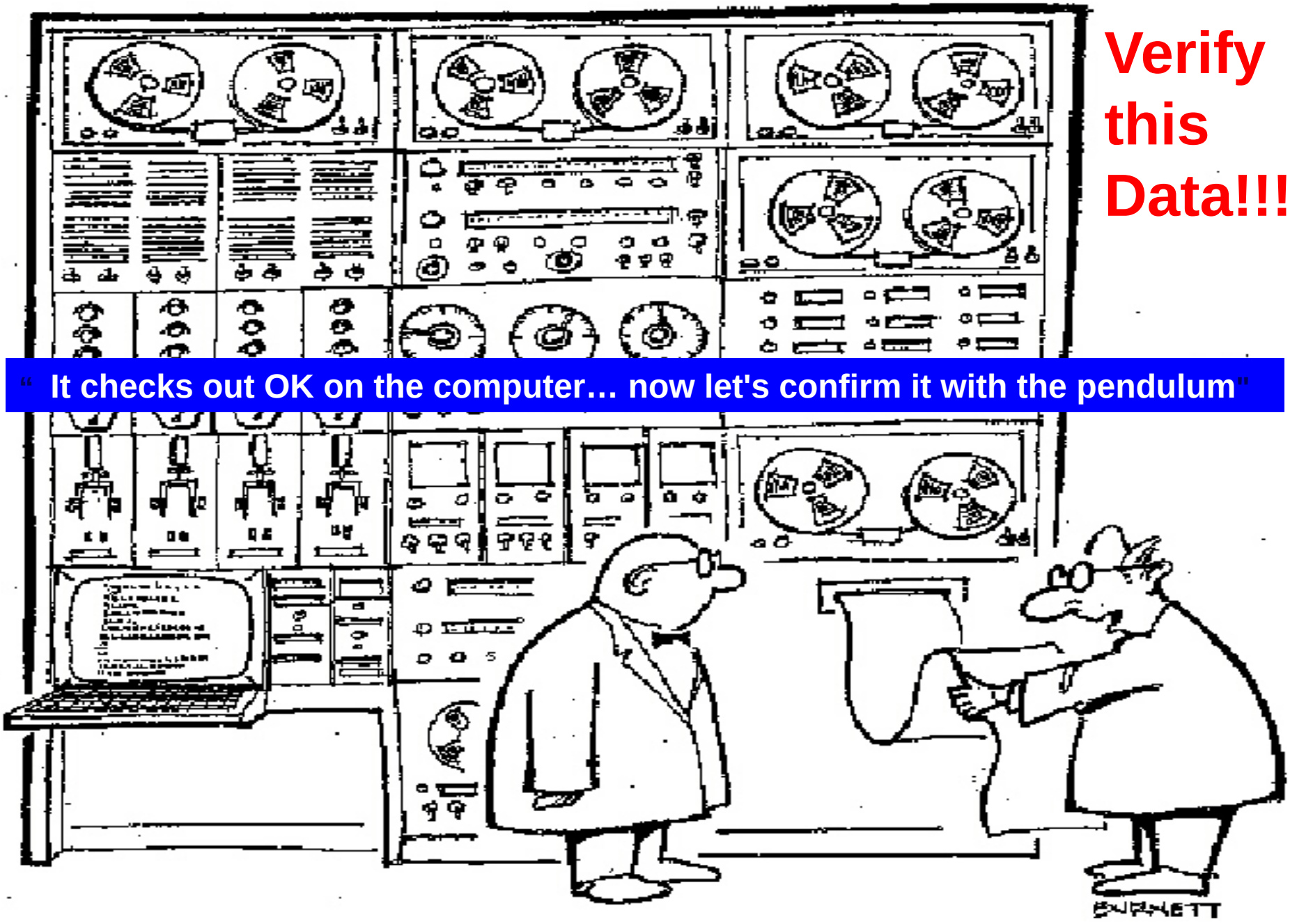
Data Conversion

WHONET

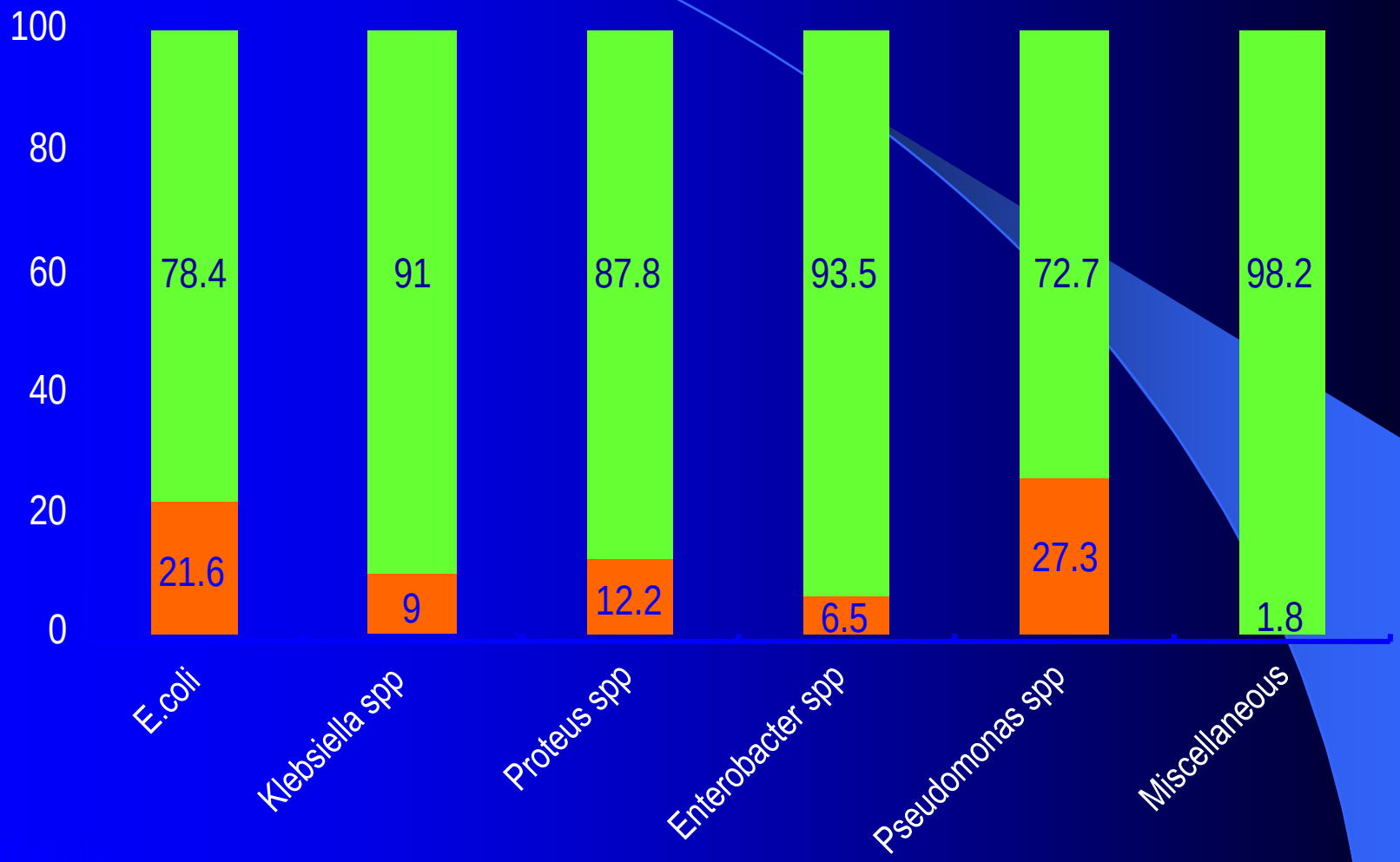
Data analysis

"My diagnostic software is acting up. It says you are pregnant."

Verify this Data!!!



Ciprofloxacin resistance



ID surprises in Kenya

- MRSA is minimal
- No C. diff
- No VRE
- No Legionella
- No listeria spp. extremely rare.
- Minimal GBS in neonatal sepsis
- < 3% PRP


I'VE ALREADY GOT A DIAGNOSIS FROM HOMEDOC.COM...BUT I THOUGHT I'D SEE YOU FOR A SECOND OPINION!
FRAN

WHAT IS CLINICAL CONFIDENCE?

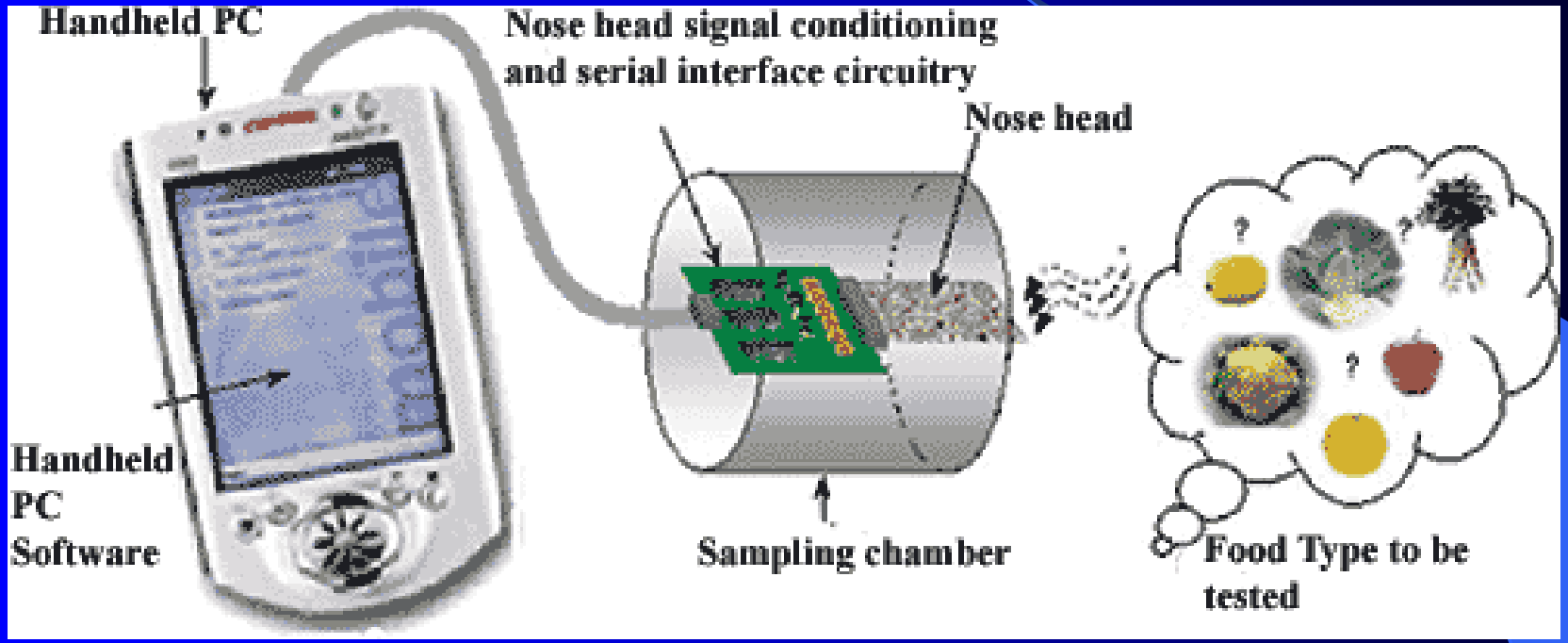
- Ability to treat infections empirically and safely with one agent.
- The option to treat patients in the community rather than hospital.
- To enable patients to return to normal activities sooner and not worry about callbacks or return visits to the office.
- Maintain antimicrobial activity for future empiric use.

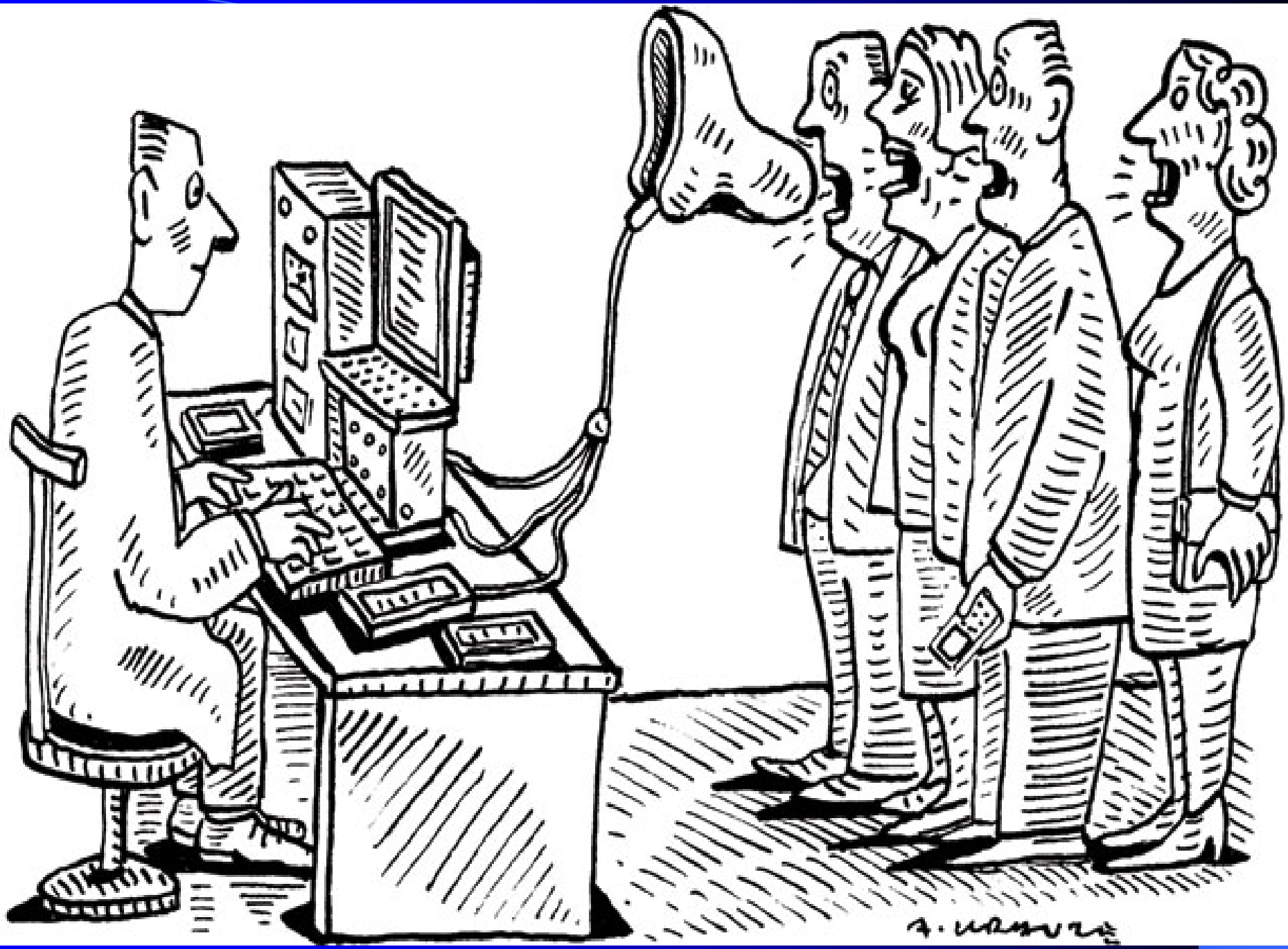
Implementation of AMS programmes in African countries considered essential

The shortage of both human and material resources will significantly impact upon their success.

There is a need to apply the principles of AMS while developing practices which will work in Africa.

E-nose – Electronic Sniffer

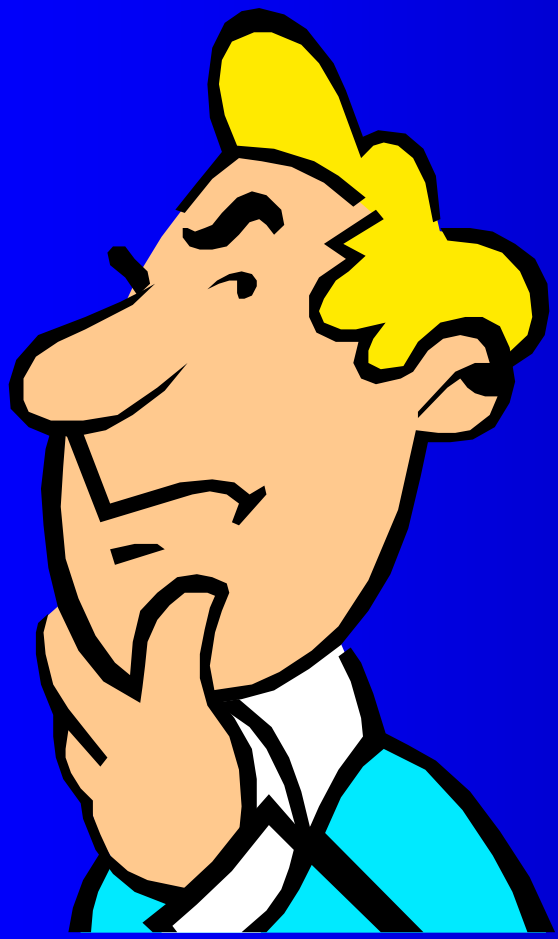




A NEW GENERATION OF
low-cost PCR devices
will drive molecular
diagnostics to the point of
care
mobile phone like devices
Biomeme model (left) Co-
Diagnostics is currently
developing its own mobile
device, **LightPCR™**
expected to retail for under
$500 (US).

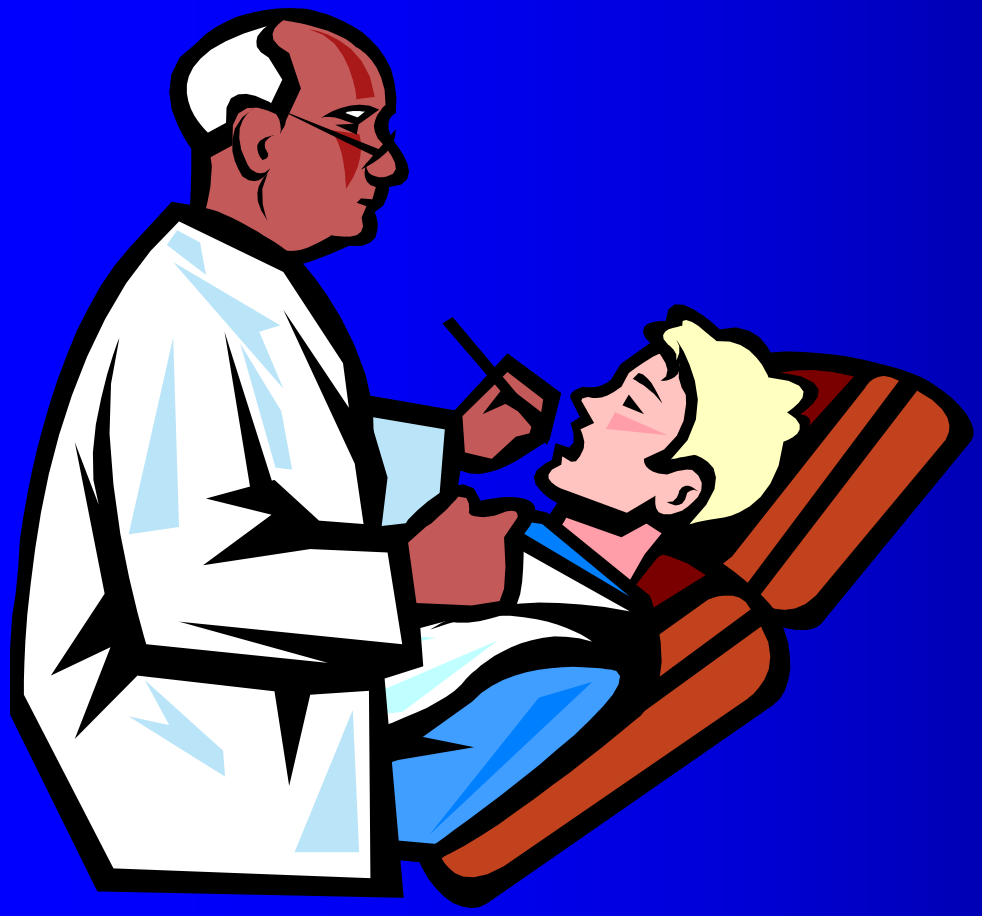
The Doctor's Dilemma

No response to intense antibiotic therapy!!! Lets see if there is any response to intense litigation.



Choose between patient welfare and directives of the healthcare system may be penalties or incentives.

The Patients perspective



Patient expects the best possible care.

Often not informed on the problem of antimicrobial resistance.

Patient may not be convinced about the ecological impact of overuse of antibiotics.

Ethical Perspective

Health insurers or payers- Reducing antibiotic prescriptions or prescribing cheaper antibiotics are attractive targets for cost saving.

Continuous Medical Education Essential Element..

Training and educating health care professionals on the appropriate use of antibiotics

Appropriate selection, dosing, route, and duration of antibiotic therapy.

Extensive collaboration between the antibiotic stewardship and hospital infection prevention and control teams.

Without benchmarks, it is difficult to trac successes and weakness

Raise awareness in Health Authorities

Beginning the work at the health-care facility

Constitution of the Antimicrobial Stewardship team

The need for proper clinical laboratory capabilities

Strategies for controlling antimicrobial use

Implementation of local clinical guidelines.

Educational activities

What Kenya / LMICs need –

Young generation capable of critical thinking and assessment of new knowledge

A critical mass of professionals capable of generating local solutions for global problems

Responsibility of political leaders and Universities


Thank you for your attention