Antibiotic resistance in invasive bacterial infections in low-resources settings

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Kennis / Ervaring / Zorg

Invasive bacterial infections

Bloodstream infection

Europe: 150 cases per 100.000 persons/year

Asia: ???

African children: > 2000 cases per 100.000/year

Laupland, Clin Microbiol Infect 2013

Bloodstream infections (BSI)

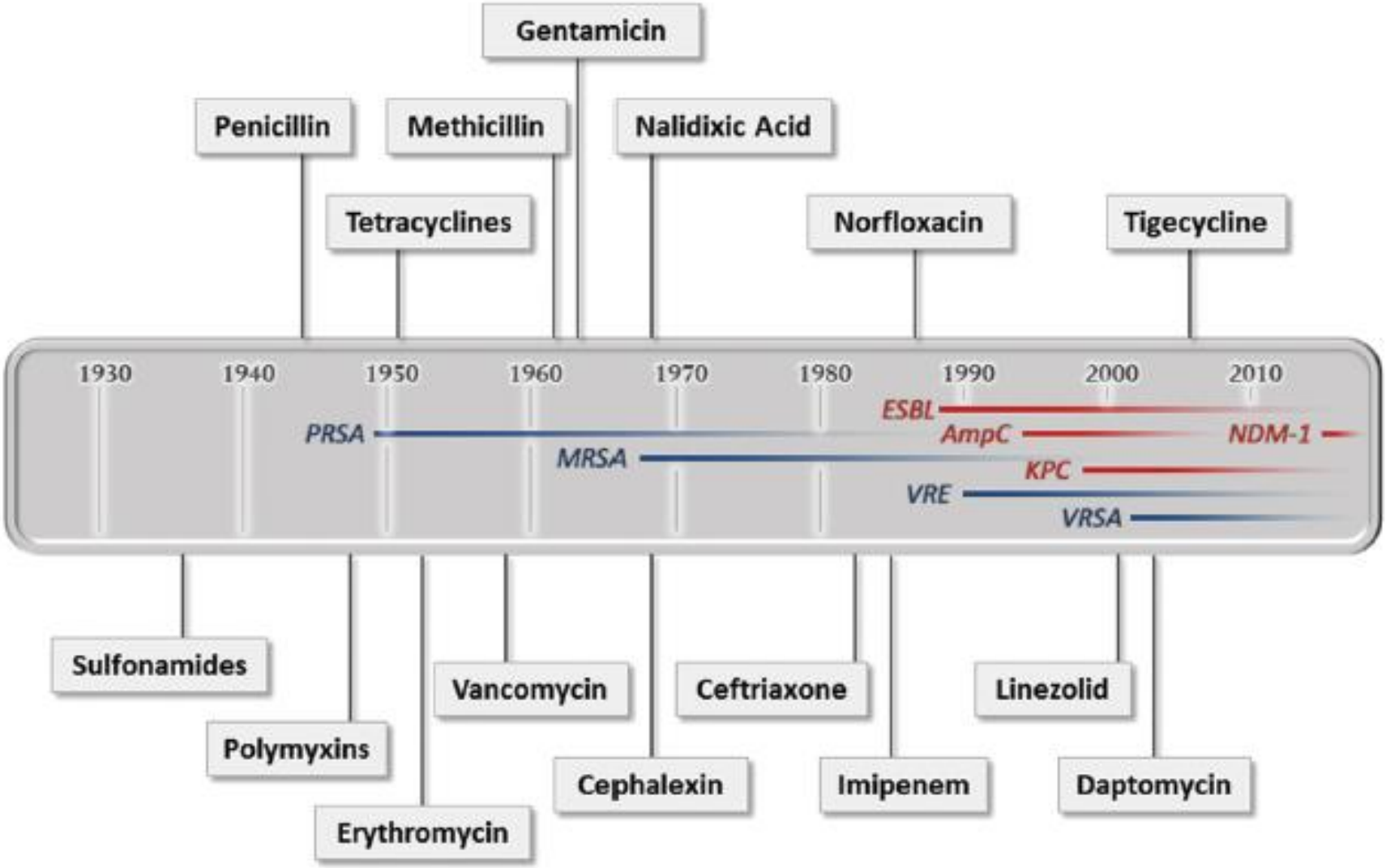
- Mortality is influenced by:
  - Type of bacterium
  - Host health status
  - Type and treatment of infection

Survival chances improve through:

1. supportive (intensive) care

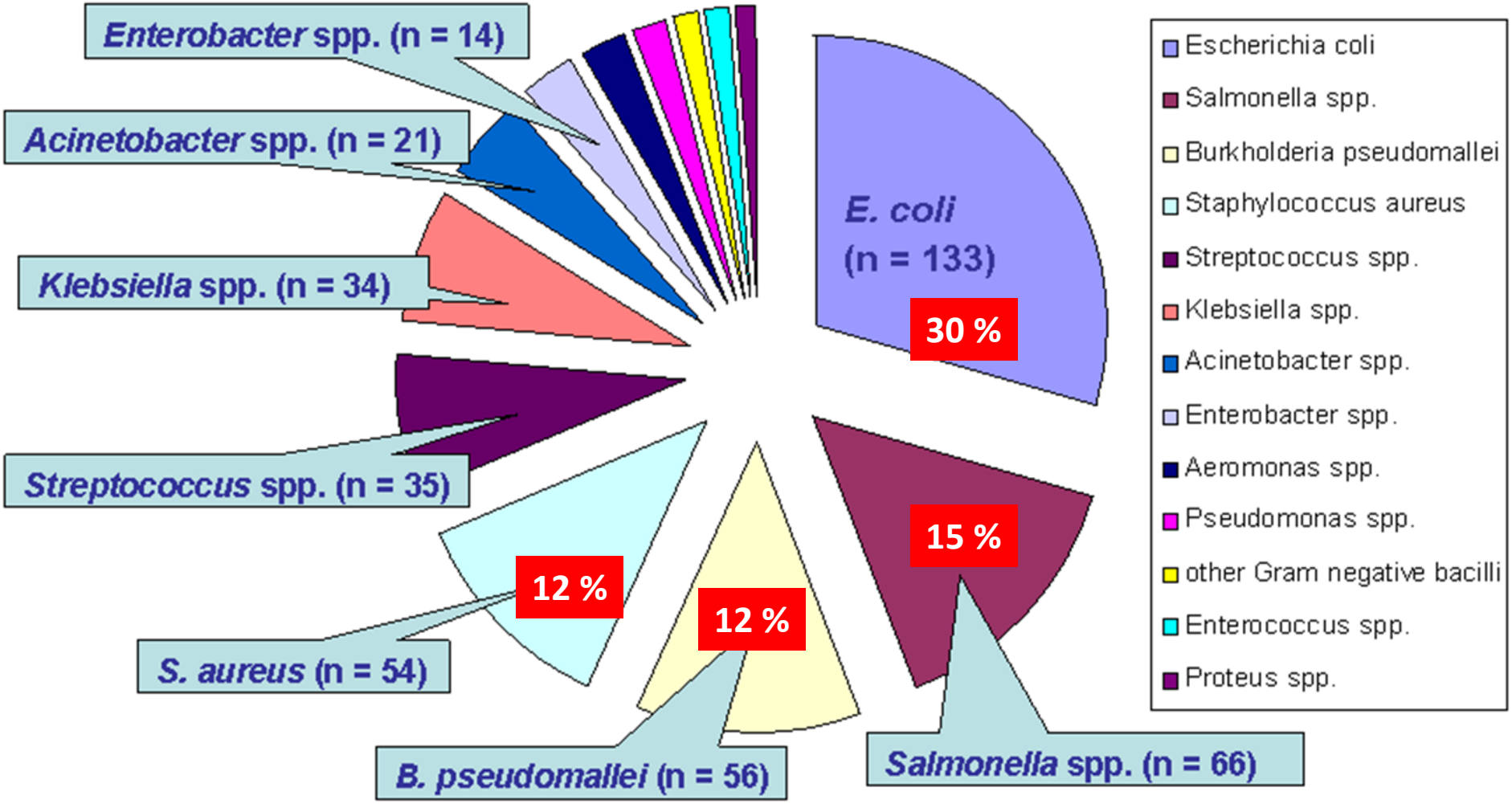
2. early and correct antibiotic therapy

Antibiotic resistance world wide

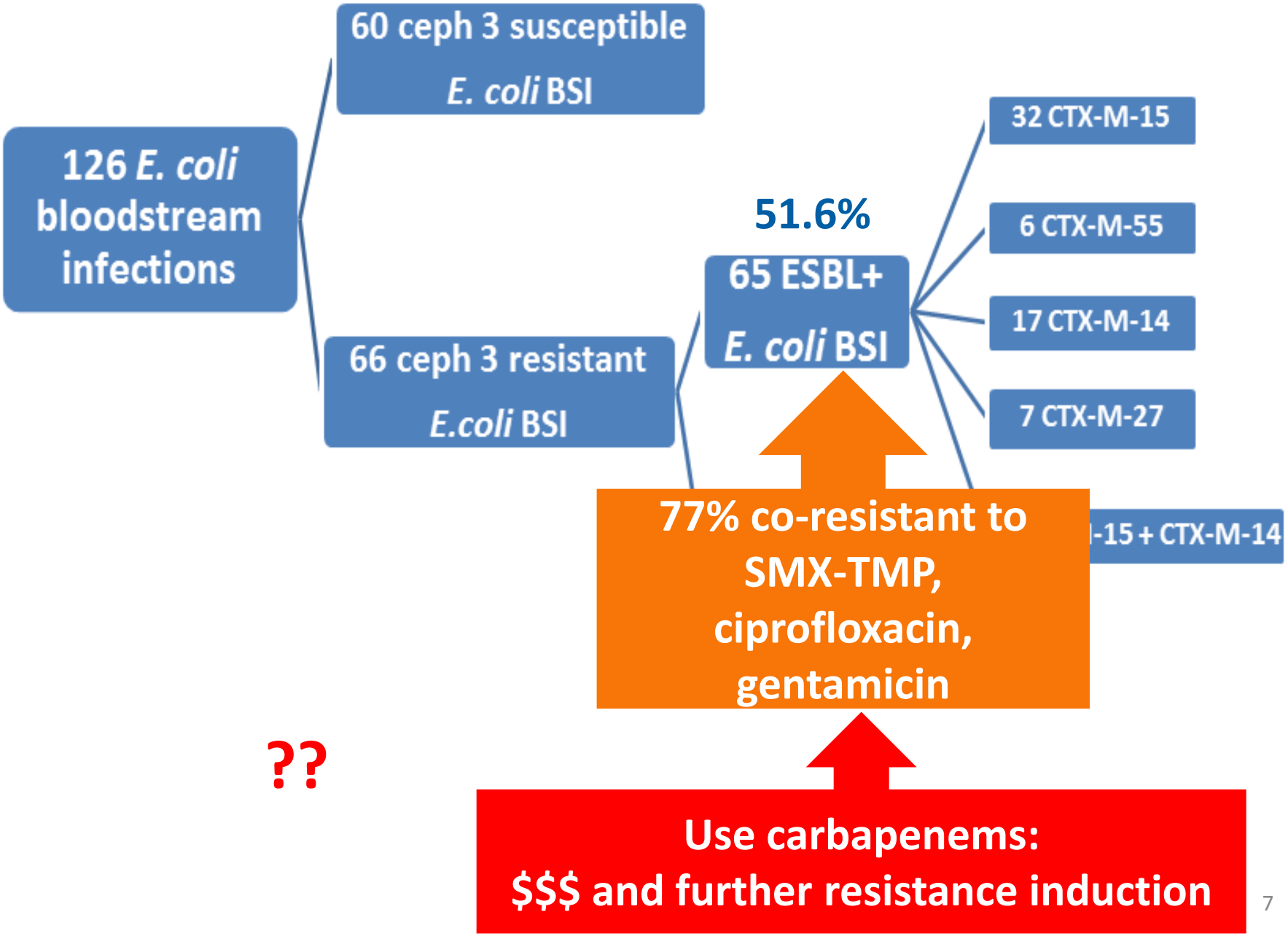


Molton, Clin Infect Dis 2013

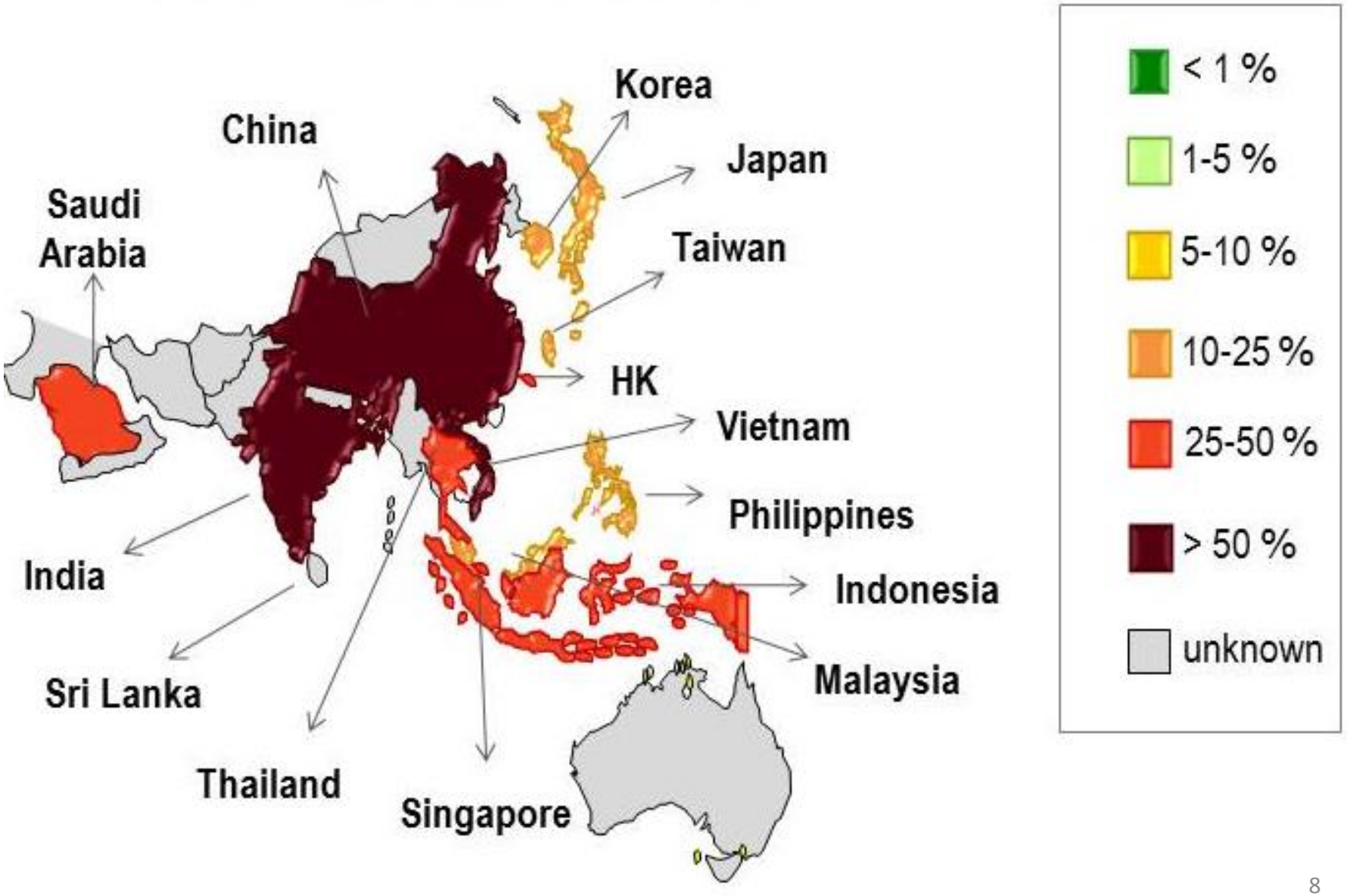
Distribution of 450 key pathogens from BSI (SHCH 2007-2010)



Vlieghe et al, Plos One 2013


126 E. coli bloodstream infections
60 ceph 3 susceptible E. coli BSI
66 ceph 3 resistant E.coli BSI
51.6%
65 ESBL+ E. coli BSI
32 CTX-M-15
6 CTX-M-55
17 CTX-M-14
7 CTX-M-27
-15 + CTX-M-14
77% co-resistant to SMX-TMP, ciprofloxacin, gentamicin
??
Use carbapenems:
$$$ and further resistance induction

ESBL-positive *E. coli* in Asia



Hsueh P-R, first APEC Expert Forum, 2011

Impact in low-resources settings?

Cohort study
1828 Tanzanian children with fever
13.9% BSI

40% Enterobacteriaceae
➔ ESBL 18%

Risk factors for mortality

- **Gram- sepsis**
- **HIV+**
- **Malnutrition**
- **Inappropriate AB**

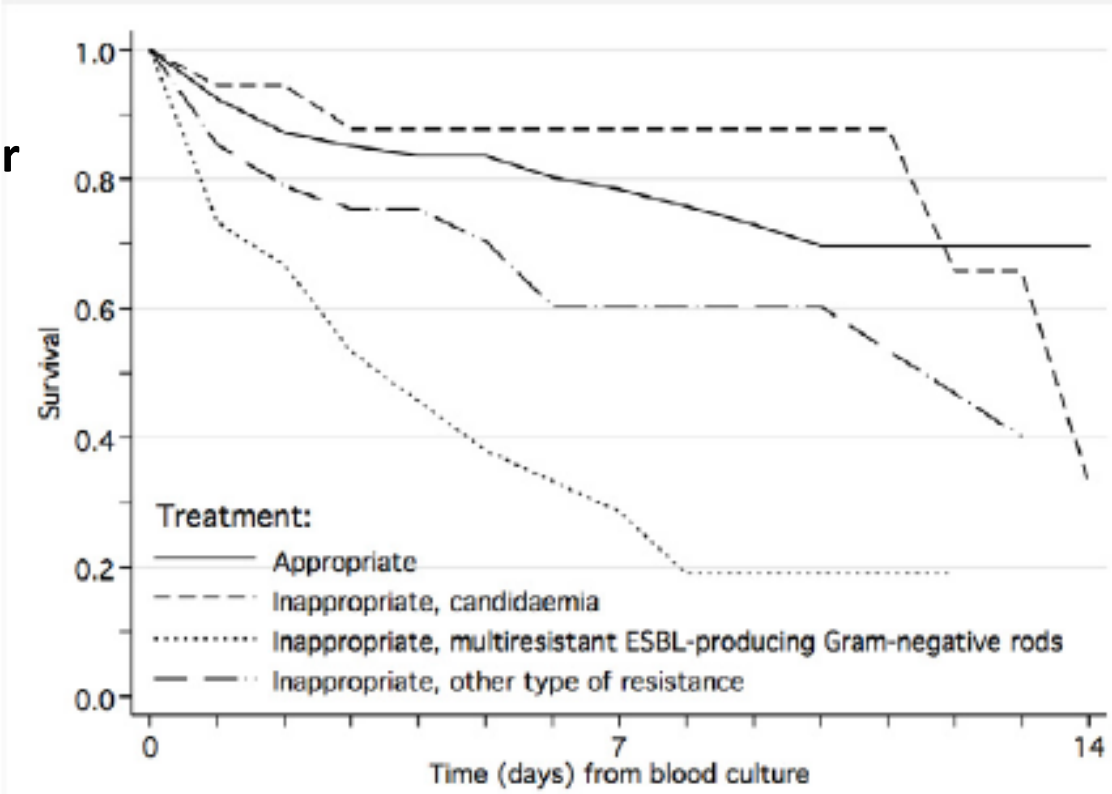
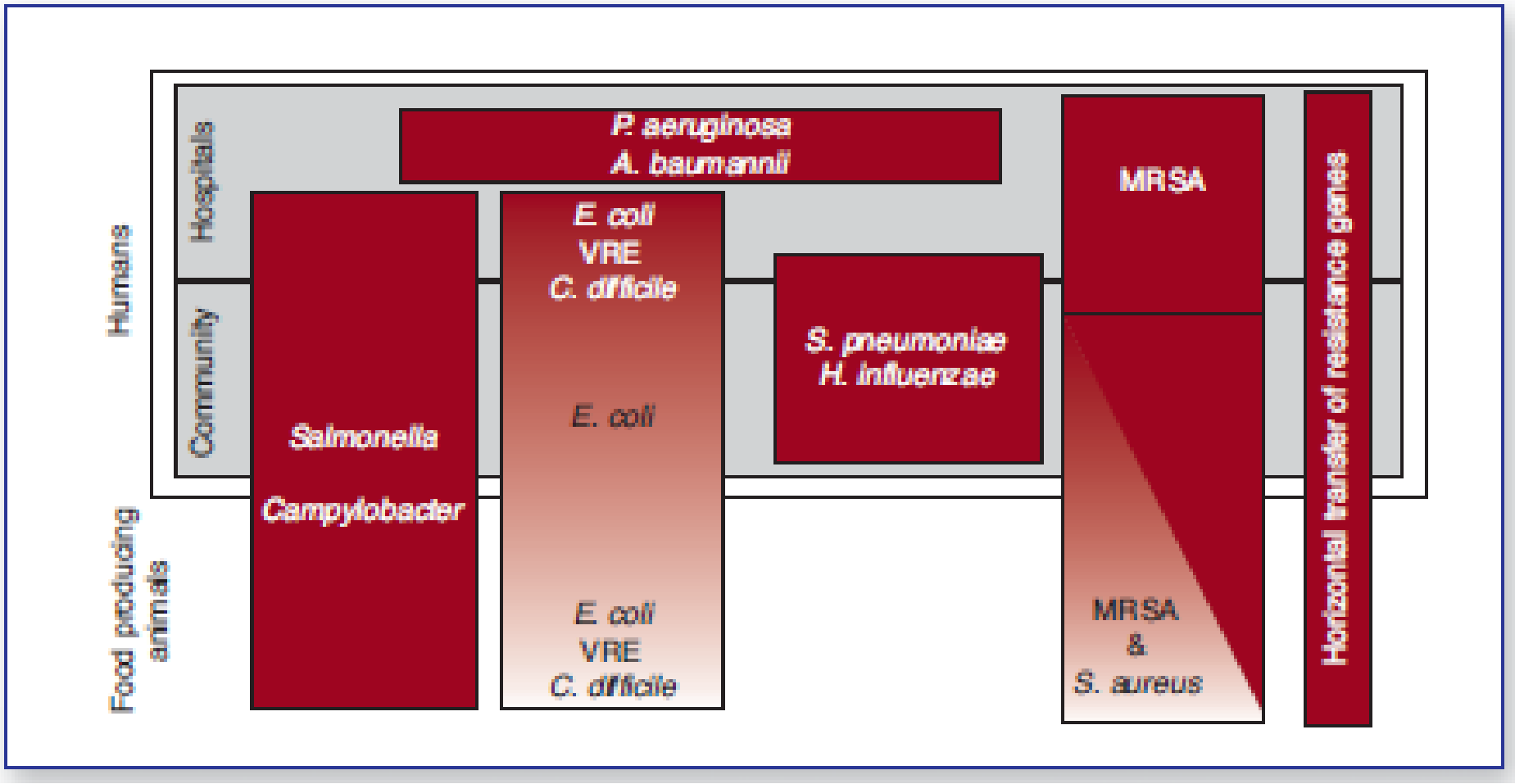


Figure 3
Impact of antimicrobial resistance on survival from laboratory-confirmed bloodstream infection.

Blomberg, BMC Infect Dis 2007

Human-animal overlapping resistance

Figure 4.2 Reservoirs of AMR bacteria causing human infections



Source: WHO 2005

OPEN ACCESS Freely available online

PLOS ONE

Frequency of Severe Malaria and Invasive Bacterial Infections among Children Admitted to a Rural Hospital in Burkina Faso

Jessica Maltha[1,2*], Issa Guiraud[3], Bérenger Kaboré[3], Palpouguini Lompo[3], Benedikt Ley[1], Emmanuel Bottieau[1], Chris Van Geet[2,4], Halidou Tinto[3], Jan Jacobs[1]

- 2012-2013
- All children temp ≥ 39°C +/- severe illness' signs

- n = 711 ➔ 63 bacteremia + 6 meningitis

- Top 4 pathogens (> 80%)
  - Non-typhoid *Salmonella*
  - *Salmonella* Typhi
  - *Streptococcus pneumoniae*
  - *Escherichia coli*

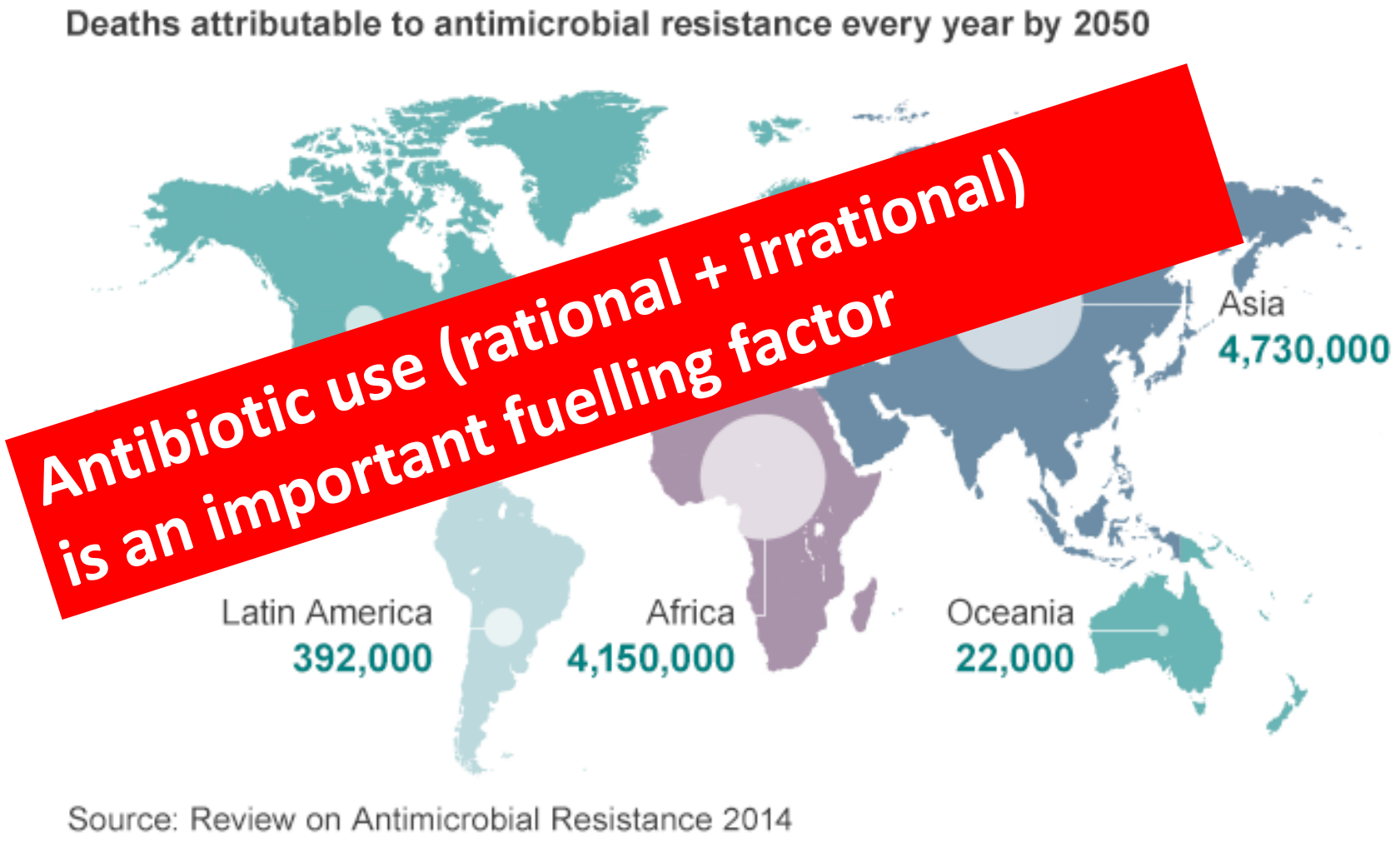
- 28% had recently used AB (cotrim, amoxy)

Maltha, Plos One 2014

Salmonella susceptibility

	Non-typhoid *Salmonella*	*Salmonella* Typhi
	n = 21	n = 12
Antibiotic	**n (%) resistant isolates**	
Ampicillin	19 (90.5)	0
Chloramphenicol	19 (90.5)	10 (83.3)
TMP-SMX	19 (90.5)	10 (83.3)
MDR	19 (90.5)	0
Nalidixic acid	1 (4.8)	0
Ciprofloxacin	NA	NA
DCS	1 (4.8)	0
ESBL confirmed	1 (4.8)	0
Azithromycin	0	0
Gentamicin	NA	NA
Meropenem/Ertapenem	NA	NA

Maltha, Plos One 2014


Deaths attributable to antimicrobial resistance every year by 2050
Antibiotic use (rational + irrational) is an important fuelling factor
Asia
4,730,000
Latin America
392,000
Africa
4,150,000
Oceania
22,000
Source: Review on Antimicrobial Resistance 2014

Antibiotics to compensate for lack of diagnostic means

Antibiotics to compensate for lack of hygiene/infection control

'Only 1 dose of surgical prophylaxis? Nooo…!
Our patients and hospitals are too dirty.
In this place, we need to give more and longer antibiotics…
This is not Europe…!'

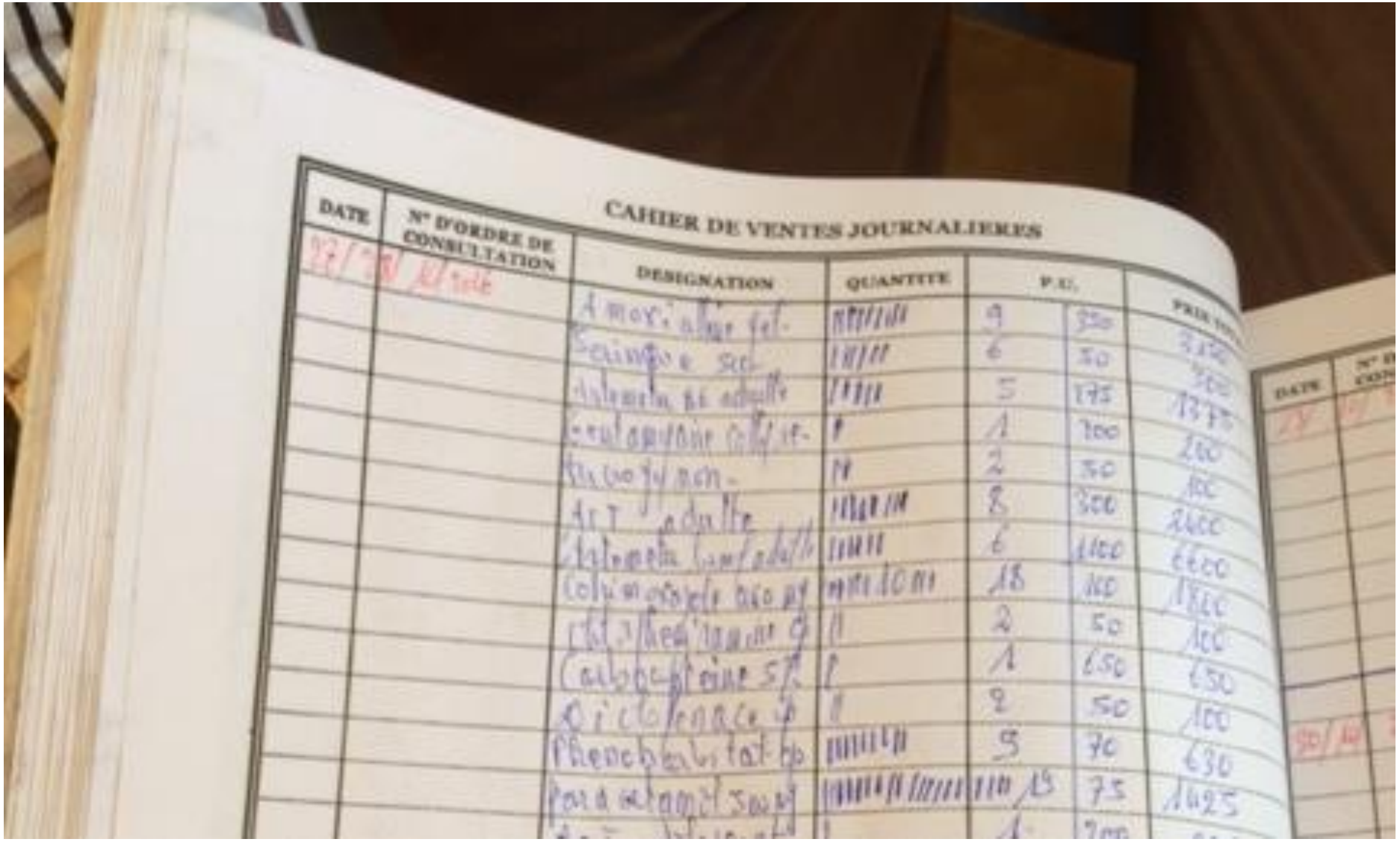
Antibiotics
as the cheapest solution

Invasive pneumococcal or staphylococcal infections:

IV penicillin or cloxacillin is most rational choice (q4-q6)

Ceftriaxone 1-2 g q24 is cheaper and easier to access…

Selling AB per tablet



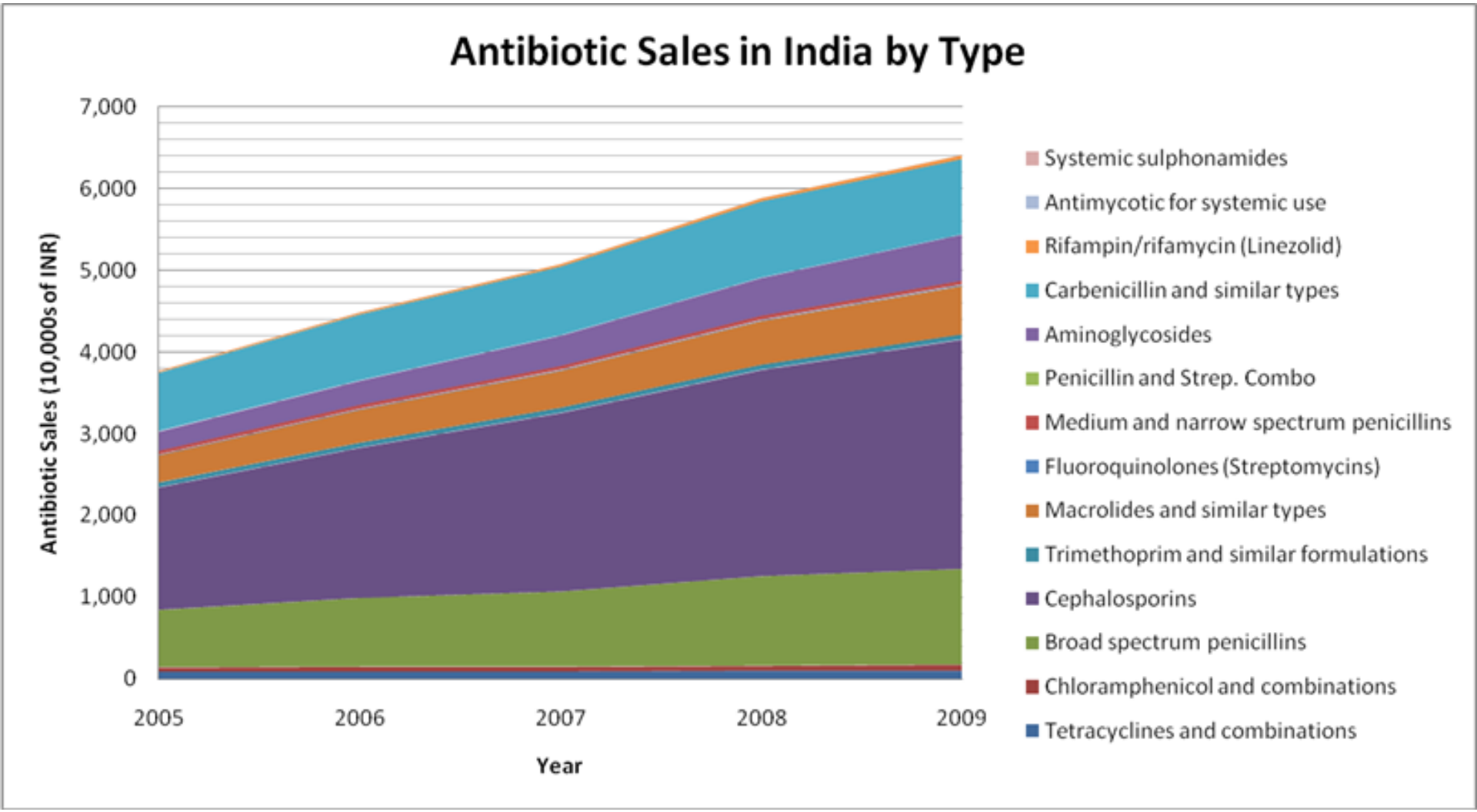
… also for animals

Photo : Y. Froehlich

Antibiotics to compensate (need for) training

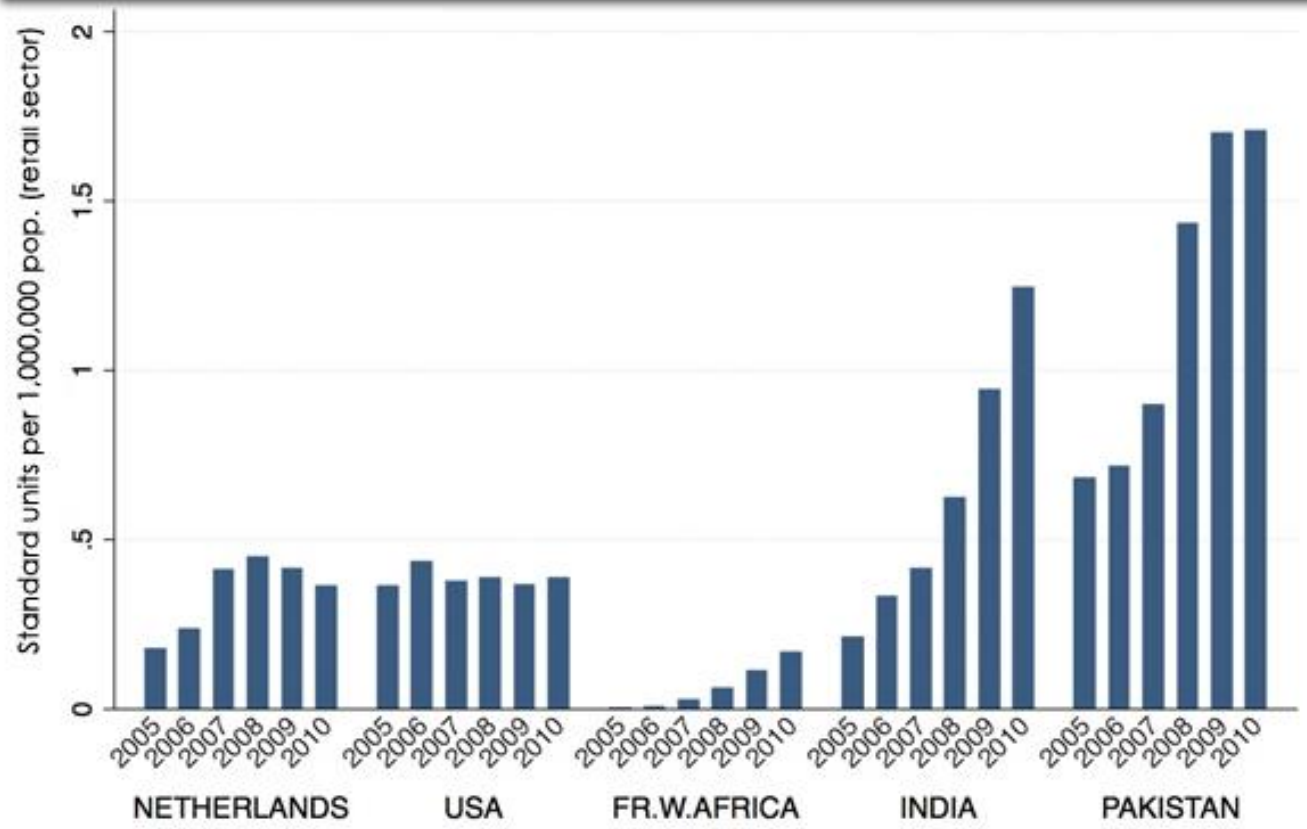
Good training, (too) many students

Antibiotics as a status symbol



Source: GARP

Retail sales of carbapenem antibiotics to treat Gram-negative bacteria are increasing rapidly in India and Pakistan



CDDEP
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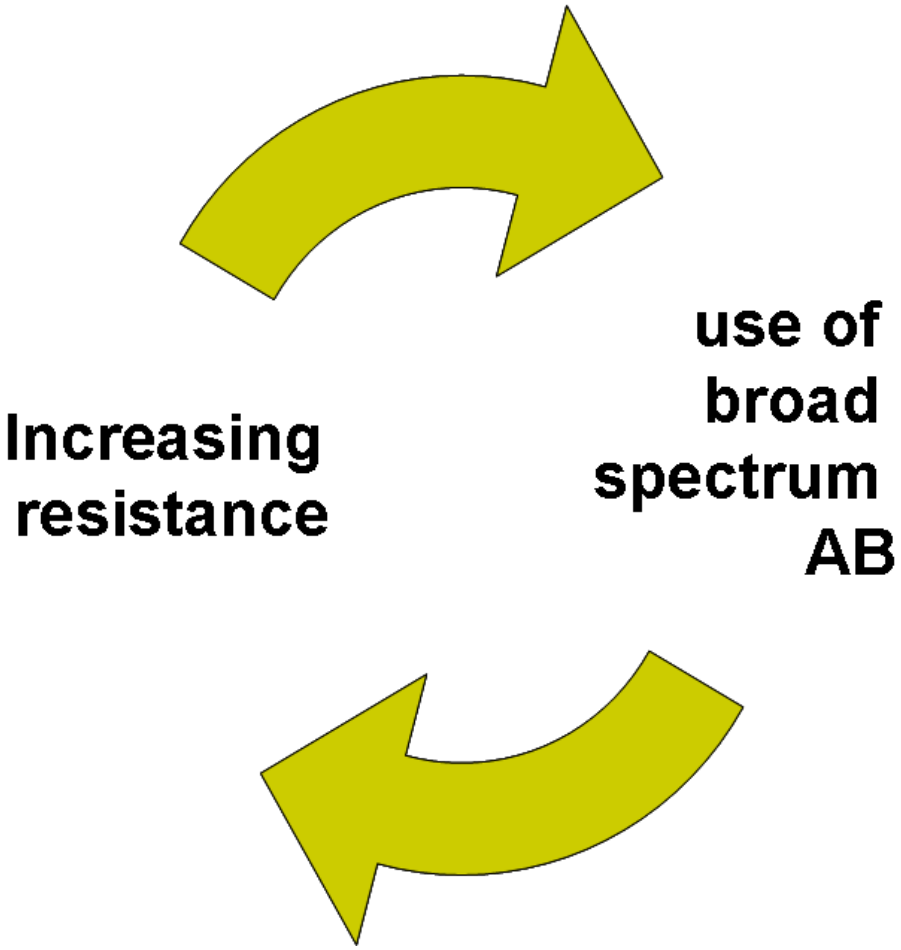
WASHINGTON DC • NEW DELHI

The vicious circle of resistance



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

Lancet Infect Dis 2011; 11: 355–62

RAPID COMMUNICATIONS

Detection of mcr-1 encoding plasmid-mediated colistin-resistant *Escherichia coli* isolates from human bloodstream infection and imported chicken meat, Denmark 2015

H Hasman [1], AM Hammerum [1], F Hansen [1], RS Hendriksen [2], B Olesen [3], Y Agersø [2], E Zankari [2], P Leekitcharoenphon [2], M Stegger [1,4], RS Kaas [2], LM Cavaco [2], DS Hansen [3], FM Aarestrup [2], RL Skov [1]

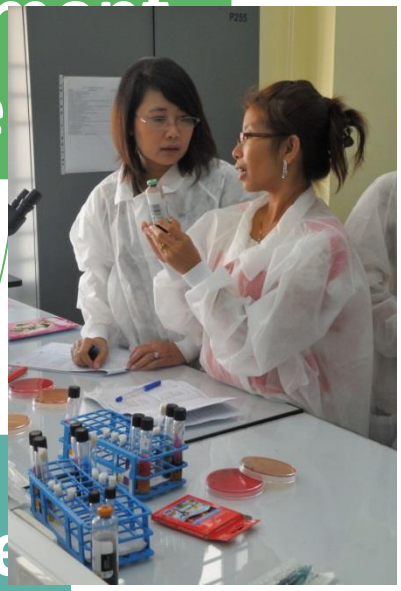
https://amr-review.org/

Work to do…

Access to/restrict drugs

Revise treatment guide

Education



Infection control

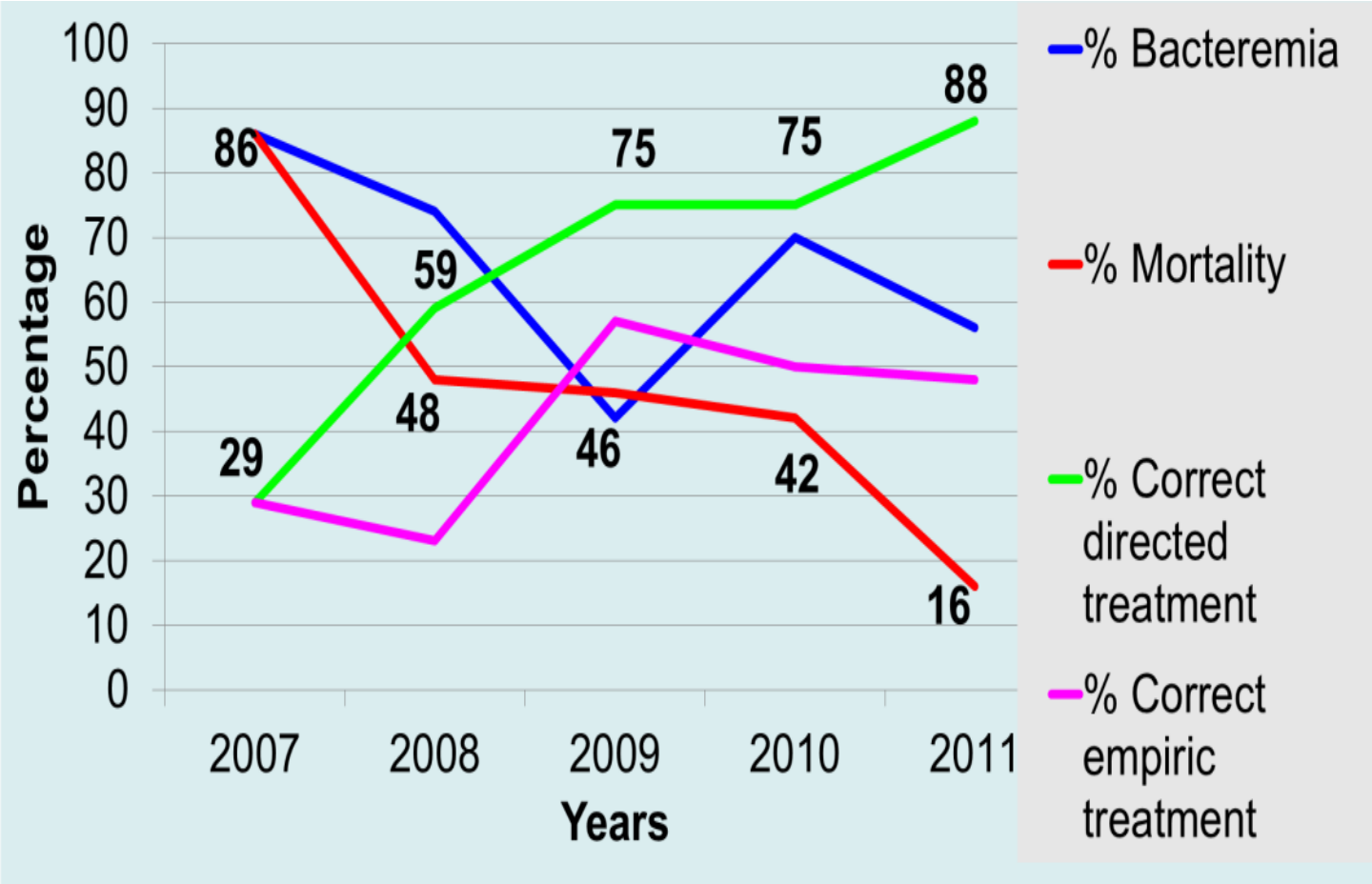
Surveillance

Blood culture-based surveillance

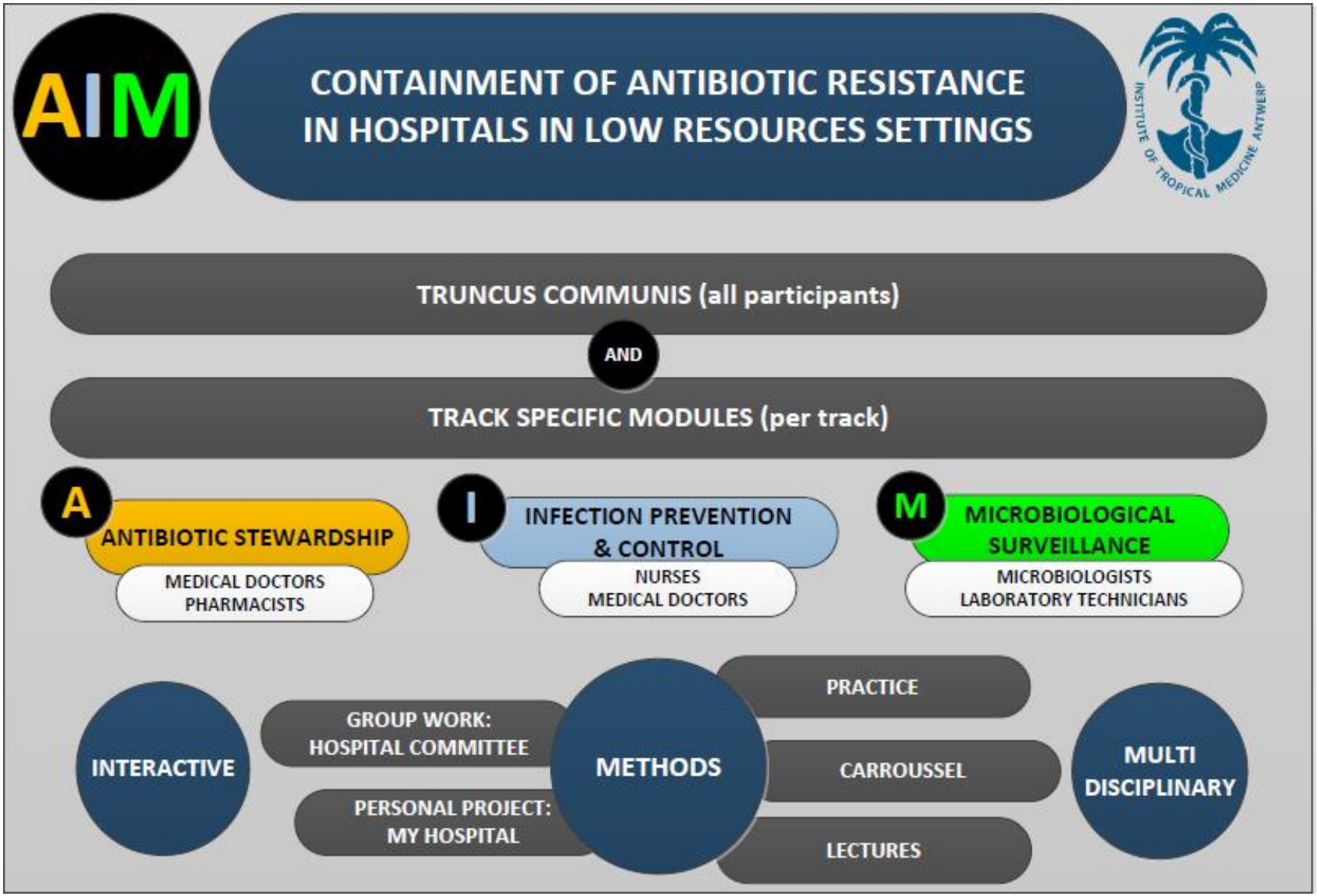
Individual patient management

Standard treatment guidelines writing

Clinician's learning curve on melioidosis management, SHCH



March 6-24 2017



https://edu.itg.be/Course/Component/16?typeId=3