Challenges and Successes in AMR Global Action Plan Implementation

Dr. Marc Sprenger, director AMR

14 September 2017
Canadian Academy of Health Sciences

World Health Organization

Overview

1. Global Impact of AMR
2. Use of Antibiotics
3. WHO and the Global Action Plan
4. National Action Plans
5. One Health
6. Moving Forward

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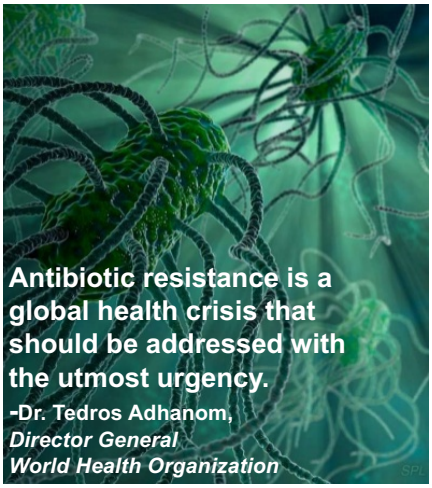
AMR is the Greatest Threat to Modern Medicine



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AMR is the Greatest Threat to Modern Medicine

Profound health consequences
- Individuals, health systems, food systems, and practice of medicine

Economic and other intersectoral implications
- Development, agriculture, food, business, etc.

Long-term threat with no end in sight unless fundamental changes are made

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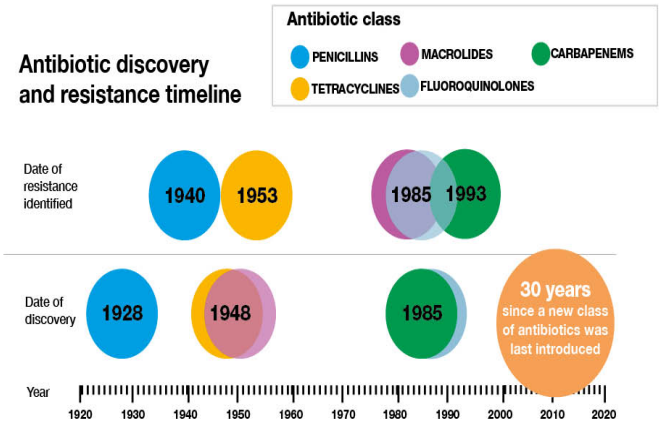
AMR Over Time



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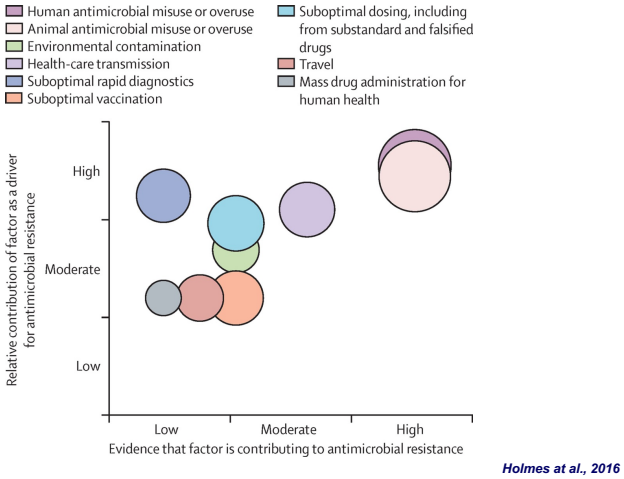
Factors Contributing to AMR



Holmes at al., 2016

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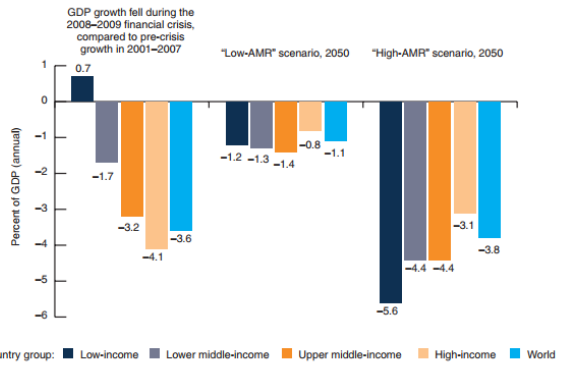
WB Projects the Global Implications of AMR

FIGURE ES2. Economic Costs of AMR May Be as Severe as During the Financial Crisis

AMR could reduce GDP substantially—but unlike in the recent financial crisis, the damage could last longer and affect low-income countries the most
(annual costs as % of GDP)



World Bank Group Report on Drug-Resistant Infections (March 2017)

World Health Organization

Focusing In: AMR in Thailand

Box 1: Burden and prevalence of antimicrobial resistance in Thailand[2]

AMR burden*

- About 88 000 infections were attributed to antimicrobial resistance (AMR), resulting in at least 3.24 million additional days in hospital and 38 000 deaths
- Direct costs of antibiotics to treat AMR infection were about $70-$170m (£54-£132m; €62-€150m; 2400-5800m baht)
- Indirect costs of morbidity and premature deaths related to AMR were at least $1100m

AMR prevalence†

- Important resistant pathogens include imipenem resistant *Acinetobacter* spp, imipenem resistant *Pseudomonas aeruginosa*, vancomycin resistant enterococci, carbapenem resistant Enterobacteriaceae, extended spectrum β-lactamase producing Enterobacteriaceae, and multidrug resistant and extensive drug resistant tuberculosis
- Between 2000 and 2014, the prevalence of imipenem resistant *P aeruginosa* and *Acinetobacter* spp increased from 10% to 22% and from 14% to 65%, respectively

Antimicrobial consumption‡

- More than 5200 antimicrobial products are registered with the Thai Food and Drug Administration, of which two thirds are for humans and the remainder for animals
- Antimicrobials account for 15-20% of the total human drug costs, and 50% of antimicrobial consumption is antibiotics; the other 50% are antiviral, antifungal, and other drugs
- $315m was spent on antibiotics in 2009, which is higher than on medicines for cardiovascular diseases ($260m) and cancer ($225m)
- Penicillins, cephalosporins and carbapenems are the top three antibiotics consumed.

*Based on data from 2010 for five bacteria: *Escherichia coli*, *Klebsiella pneumoniae*, *A. baumannii*, *P aeruginosa* and meticillin resistant *Staphylococcus aureus*.

†AMR prevalence is based on data from the National Antimicrobial Resistance Surveillance Center, Ministry of Public Health

‡Antimicrobial consumption is estimated from the consumption value as a proxy measure. The drug consumption value is the sum of the drug production and importation values reported by drug companies to the FDA annually. The Thai Surveillance of Antimicrobial Consumption System (Thai SAC), which is under development, will monitor antimicrobial consumption for humans as the defined daily dose per 1000 inhabitants per day, guided by WHO methods,[3] and for animals as the mg per population correction unit, as used by the European Surveillance of Veterinary Antimicrobial Consumption project.[4]

Sumpradit et all, 2017

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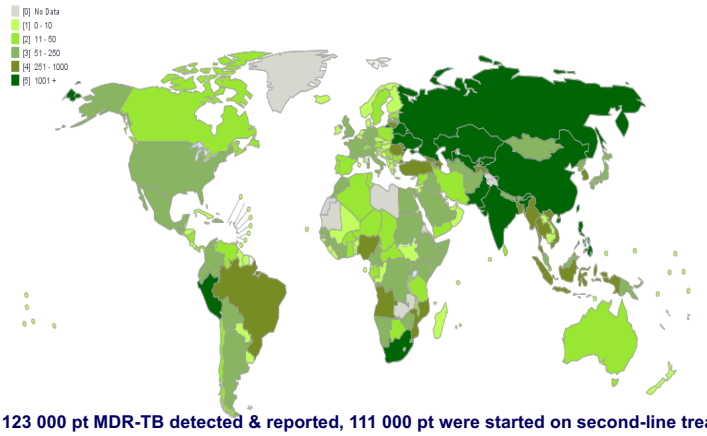
Notified MDR-TB cases, 2014



123 000 pt MDR-TB detected & reported, 111 000 pt were started on second-line treatment
480 000 cases of MDR-TB estimated among TB patients

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AMR and SDGs

AMR strikes hardest on the poor
→ Rate of resistance is high
→ Lack of affordable treatment
→ Poor infection prevention

Antibiotic residues from hospitals, pharmaceutical companies and agriculture contaminate the water

Untreatable infections in animals threaten sustainable food production for our population

*Cumulative costs of AMR is predicted to be US $120 trillion by 2050

Antimicrobials are fundamental components of all health systems

It is crucial to balance access, innovation and conservation of antimicrobials to contain AMR

All of which require multi-stakeholder partnerships

*World Bank Group Report on Drug-Resistant Infections (March 2017)

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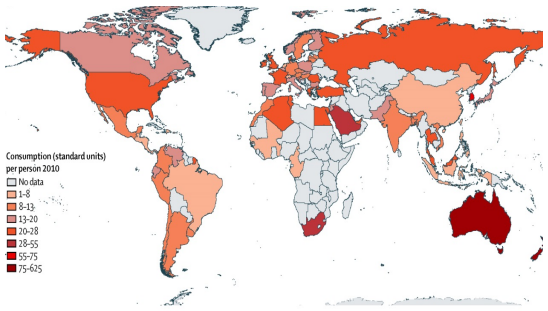
Use of Antibiotics Is On The Rise

Total global antibiotics consumption increased 30%



Van Boeckel et al. The Lancet Infectious Diseases 2014 14, 742-750DOI: (10.1016/S1473-3099(14)70780-7)

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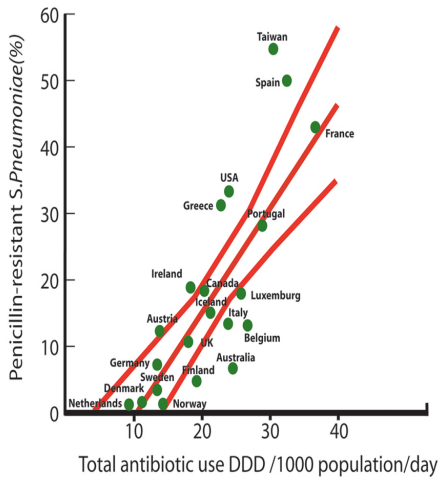
The More We Use Antibiotics, The More We Lose



From Albrich et al EID 2004

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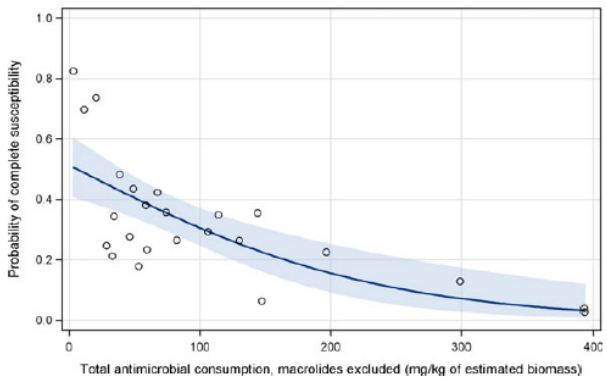
The More We Use Antibiotics, The More We Lose

2) Probability of complete susceptibility – 2014–2015



JIACRA 2017 ECDC/EFSA/EMA

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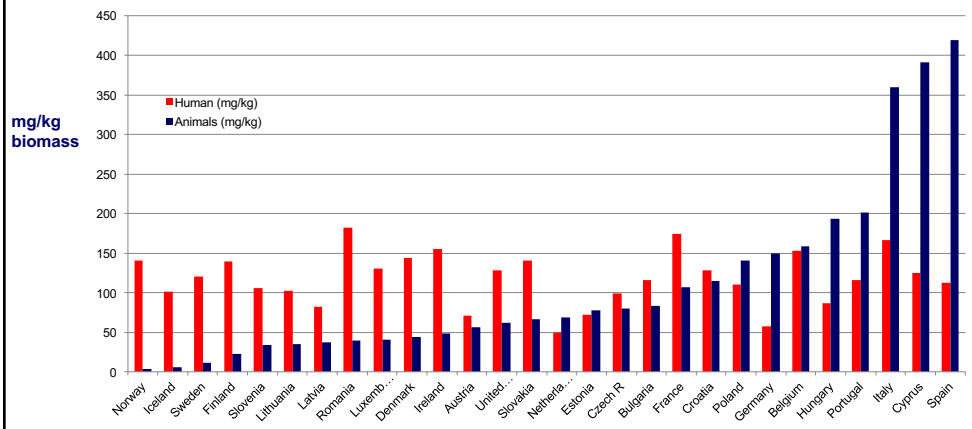
Antibiotic Consumption in Animals/Humans



(JIACRA ECDC/EFSA/EMA, 2017)

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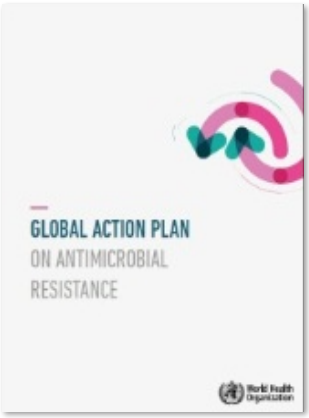
Global Action Plan Antimicrobial Resistance

Adopted by World Health Assembly in 2015

Recognized & supported by FAO (Resolution 4/2015) and OIE (Resolution 26) governing bodies in 2015

Bring AMR to UNGA!



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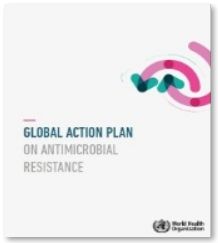
Global Action Plan's 5 Strategic Objectives

1. Improve awareness and understanding (WAAW & behaviour change)
2. Strengthen knowledge through surveillance & research (GLASS)
3. Reduce the incidence of infection (IPC)
4. Optimize the use of antimicrobial medicines (stewardship)
5. Ensure sustainable investment (R&D)



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GAP Implementation

Objective 1: *"Improve awareness and understanding of AMR through effective communication, education and training."*

A) World Antibiotic Awareness Week

B) Behaviour Change Group

C) Health Workforce Education

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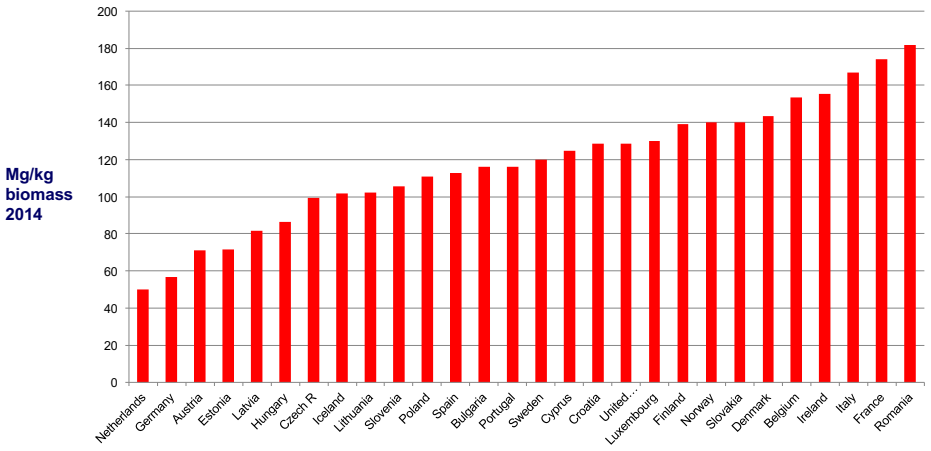
Antibiotics Consumption in Humans



(JIACRA ECDC/EFSA/EMA, 2017)

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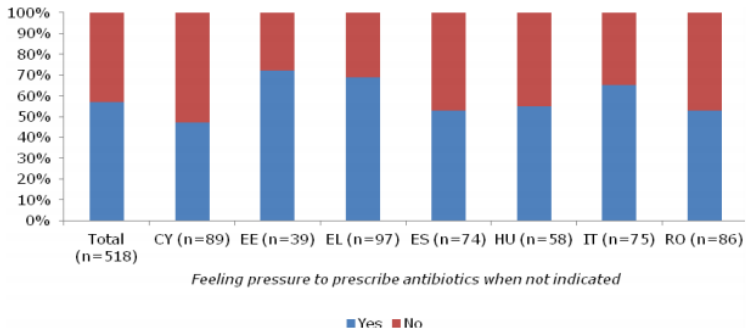
Patient Pressure to Prescribe Antibiotics

Figure 4.15. The percentage of GPs who feel under pressure to prescribe antibiotics when not indicated, total and by Member State (as a percentage of all GPs; n = 518 GPs). (*Source:* ARNA GP survey.)



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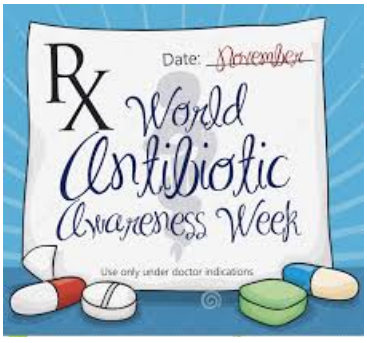
World Antibiotic Awareness Week



Annual campaign to educate the public and health professionals on AMR

13-19 November 2017

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Behaviour Change Expert Group

Will provide guidance to WHO on best practices within behavior change

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Health Workforce Education & AMR

Consultation on health workforce education in March 2017

Defined tools/resources needed to ensure health workers are educated and trained on AMR

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Strengthening Educational Materials on AMR

New Materials Include

- Courses and educational materials in ALL regions
- In-service and pre-service training
- Focus on physicians and pharmacists

WHO is Leading

- Competency framework
- Curricula development
- Survey of health workers' knowledge and attitudes

Academia are crucial

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GAP Implementation

Objective 2: Strengthen the knowledge and evidence base through surveillance & research

GLASS
Global AMR Surveillance System

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Resistant Pathogens in SE Asia

Table 1 | Overview of resistance in selected pathogens in South East Asia

Organism	Resistant to	National resistance data (%)*	Published resistance data (%)*
Escherichia coli	3rd generation cephalosporins	16-68	19-95
	fluoroquinolones	32-64	4-89
Klebsiella pneumoniae	3rd generation cephalosporins	34-81	5-100
	Carbapenam	0-8	0-55
Meticillin resistant *Staphylococcus aureus* (MRSA)	β lactams	10-26	2-81
Streptococcus pneumoniae	Penicillin	47-8	0-6
Non-typhoidal *Salmonella*	Fluoroquinolones	0.2-4	1.4
Shigella sp	Fluoroquinolones	–	0-82
Neisseria gonorrhoeae	3rd generation cephalosporinst	0-5	5-15

Source: WHO. Antimicrobial resistance: global report on surveillance.[9]
*Percentage of resistant isolates out of total isolates of bacteria that were analysed for antimicrobial susceptibility testing.
†Decreased susceptibility to 3rd generation cephalosporins.

Shah et all, 2017

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Surveillance of Human Pathogens

Global Antimicrobial Surveillance System (GLASS) - 43 countries

- IT platform: aggregated & individual data
- WHONET adapted for GLASS

Implementation package developed (with focus on LMICs)

Rapid alert portal being developed

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GLASS Priorities

Table 2. Priority specimens and pathogens for surveillance of AMR

Specimen	Laboratory case definition	Surveillance type and sampling setting	Priority pathogens for surveillance
Blood	Isolation of pathogen from blood[a]	Selected sites or national coverage Continuous Patients in hospital and in the community	*E. coli* *K. pneumoniae* *A. baumannii* *S. aureus* *S. pneumoniae* *Salmonella* spp.
Urine	Significant growth in urine specimen[b]	Selected sites or national coverage Continuous Patients in hospital and in the community	*E. coli* *K. pneumoniae*
Faeces	Isolation of *Salmonella* spp.[c] or *Shigella* spp. from stools	Selected sites or national coverage Continuous Patients in hospital and in the community	*Salmonella* spp. *Shigella* spp.
Urethral and cervical swabs	Isolation of *N. gonorrhoeae*	Selected sites or national coverage Continuous Patients in hospital and in the community	*N. gonorrhoeae*

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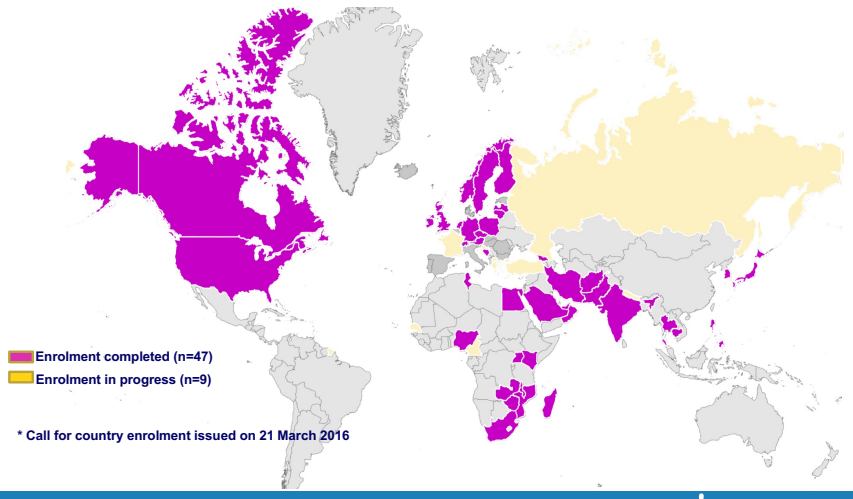
Status of countries enrolled in GLASS

As of 21 July 2017*



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GLASS Future Directions

Integrated foodborne AMR surveillance
- Food-animals
- Food
- Humans

Monitoring of antimicrobial use or consumption

Surveillance of bacterial resistance in humans

Environmental AMR surveillance

… other types of AMR surveillance

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GAP Implementation

Objective 3: Reduce incidence of infection through effective sanitation, hygiene and infection prevention measures

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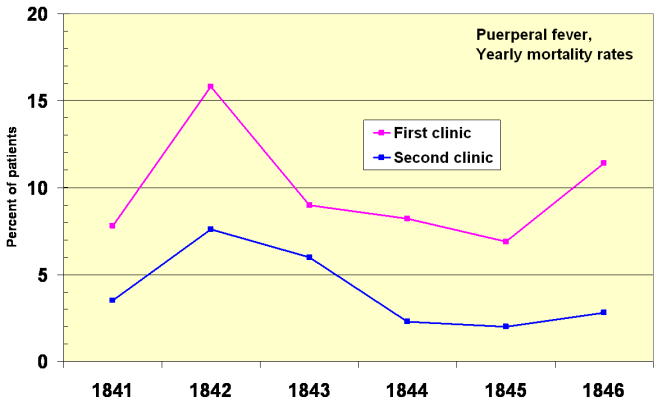
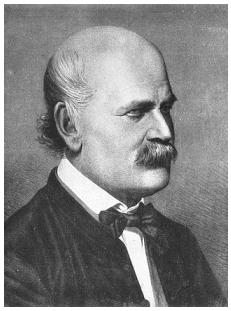
Preventing Infections: Semmelweis pioneer!





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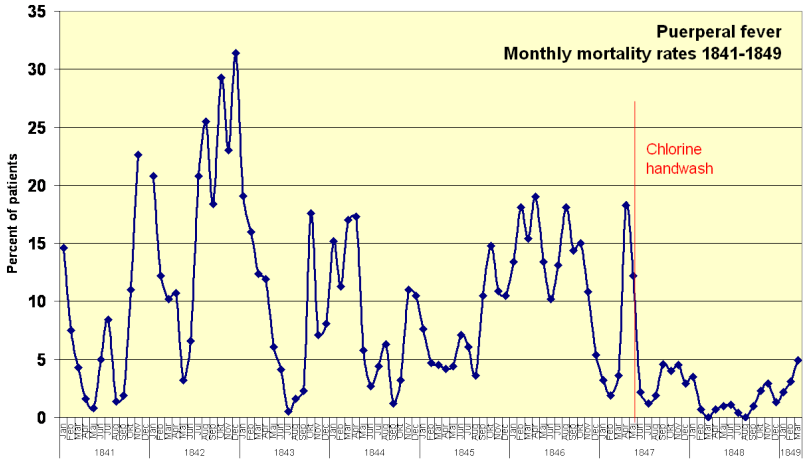
Preventing Infections



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Hand Hygiene Day- 5 May 2017

"Fight antibiotic resistance: it's in your hands"

- The "5 Moments for Hand Hygiene" guidelines

1 BEFORE PATIENT CONTACT	WHEN? Clean your hands before touching a patient when approaching him or her WHY? To protect the patient against harmful germs carried on your hands
2 BEFORE AN ASEPTIC TASK	WHEN? Clean your hands immediately before any aseptic task WHY? To protect the patient against harmful germs, including the patient's own germs, entering his or her body
3 AFTER BODY FLUID EXPOSURE RISK	WHEN? Clean your hands immediately after an exposure risk to body fluids (and after glove removal) WHY? To protect yourself and the health-care environment from harmful patient germs
4 AFTER PATIENT CONTACT	WHEN? Clean your hands after touching a patient and his or her immediate surroundings when leaving WHY? To protect yourself and the health-care environment from harmful patient germs
5 AFTER CONTACT WITH PATIENT SURROUNDINGS	WHEN? Clean your hands after touching any object or furniture in the patient's immediate surroundings, when leaving - even without touching the patient WHY? To protect yourself and the health-care environment from harmful patient germs

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Preventing Infections

Infection Prevention and Control

- Core Components implementation manuals and assessment framework
- Hand Hygiene Day
- Guidelines

Vaccines

- AMR in new vaccine development

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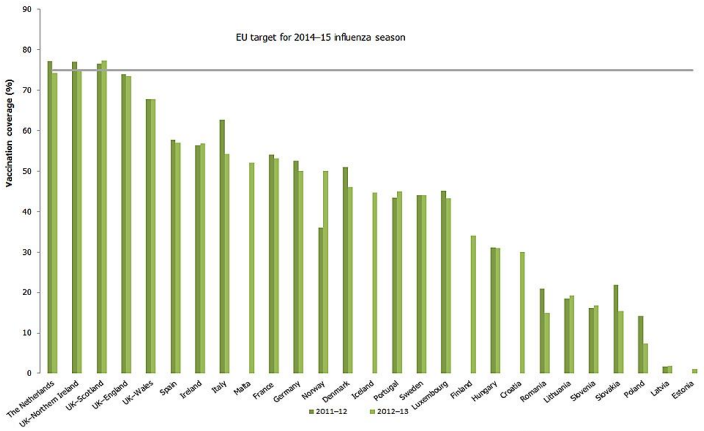
Vaccine Uptake Is Important for AMR



Seasonal influenza vaccination coverage rates in older age groups in EU/EEA Member States, 2011–12 and 2012–13 influenza seasons (n=24 Member States)

Vaccine uptake reduces the number of unnecessary antibiotic prescriptions

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GAP Implementation

Objective 4: Optimize the use of antimicrobials in human and animal health

Photo Courtesy of: FAO, HJ Ormel DVM

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WHO Guidelines and Resources

WHO Model List of Essential Medicines

- Updated in 2017
- Added 30 medicines for adult and 25 for children
- Antibiotics are now grouped to 3 categories:
  - **ACCESS** Antibiotics that should be available at all times (29 AB)
  - **WATCH** Antibiotics recommended as first- or second-choice (7 AB) treatments for a small number of infections
  - **RESERVE** Antibiotics that are last-resort options (8 AB)

WHO is creating an analysis of the antibiotic pipeline

- Will be released September 2017

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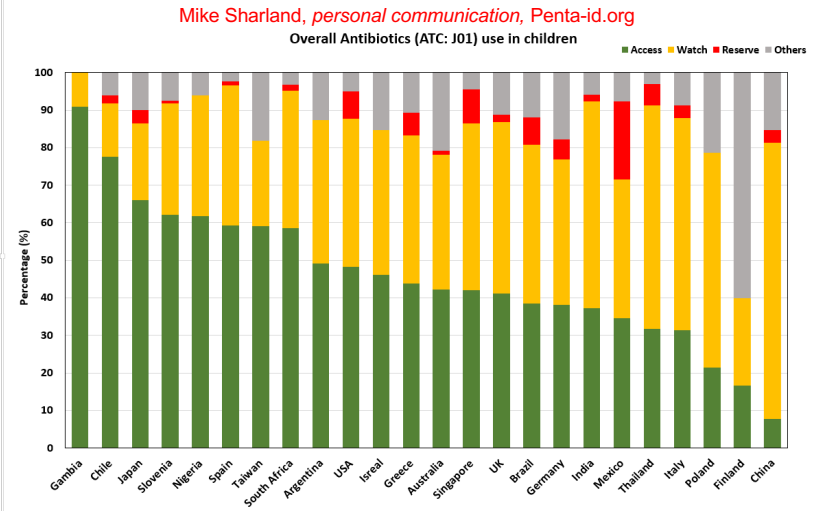
EML A-WA-RE index uses in DU

PPS in >20.000 patients

Mike Sharland, *personal communication,* Penta-id.org



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Antibiotic Use in Primary Care Facilities

Table 2 | Antibiotic use in public sector primary care facilities and policy changes in eight countries for which a situational analysis was done twice during 2010-15[19]

	No of public facilities, patient encounters (No with URTI data)		Average % (range) of outpatients given antibiotics across facility type		Average % (range) of patients with URTI given antibiotics across facility type		
Country	2010-12	2014-15	2010-12†	2014-15†	2010-12†	2014-15†	New policies implemented between 2010-12 and 2014-15
Bangladesh	4, 120 (0)	10, 300 (6, 183)	48 (34-74)	31 (19-54)	—	59 (59-60)	None. Variable drug availability in terms of supply and type
Bhutan	8, 240 (0)	13, 390 (12, 360)	33 (31-34)	41 (33-49)	—	34 (26-42)	Some monitoring and continuing medical education, updated essential medicines list and standard treatment guidelines, and good drug availability
Maldives	5, 150 (0)	8, 240 (8, 215)	38 (35-43)	24 (15-34)	—	43 (34-48)	None. Decreased drug availability
Myanmar	10, 300 (8, 90)	14, 420 (11, 360)	38 (27-56)	47 (34-54)	83 (72-100)	87 (73-96)	None. Increased drug availability
Nepal	13, 390 (9, 110)	10, 300 (7, 350)	47 (21-54)	44* (39-46)	73 (72-74)	66 (63-71)	Non-governmental organisation rational use of medicine project in a few districts. Variable drug availability
Sri Lanka	6, 180 (0)	10,300 (8, 271)	49 (22-66)	56 (45-67)	—	70 (47-85)	Drug and therapeutic committees started in 2015. Variable drug availability
Thailand	9, 270 (6, 73)	14, 420 (13, 485)	30 (23-45)	12 (11-14)	57 (54-62)	43 (20-52)	Monitoring use, updated essential medicines list, drug and therapeutic committees, and antibiotic smart use and PLEASE projects¶
East Timor	10, 300 (8, 153)	16, 480 (15, 334)	50 (42-75)	43 (39-50)	77 (69-88)	55 (47-66)	None. Decreased drug availability

URTI=upper respiratory tract infection.
*Includes one medical college in Nepal offering some public services.
†Antibiotic smart use project, started in 2007, consists of multifaceted interventions at the individual, organisational, network, and policy levels aimed at changing behaviour, maintaining the changes, and scaling up the project. Activities vary across institutions. ¶PLEASE project, started in 2014 in 71 hospitals. It consists of: pharmacy and therapeutics committee (P), labelling and leaflet (L), essential tools for rational use of medicines (E), awareness of rational use among prescribers and patients (A), special population care (S), and ethics in promotion (E).

Holloway et all, 2017

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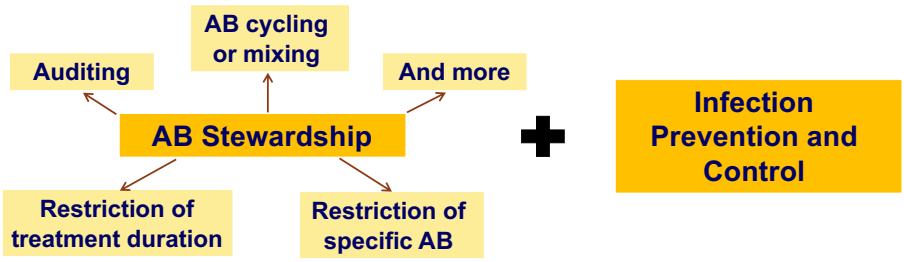
Antibiotic Stewardship (Baur et al)

Antibiotic stewardship programs reduce incidence of infections in hospitals, especially for MDR gram-negative bacteria



Baur, David, Beryl Primrose Gladstone, Francesco Burkert, Elena Carrara, Federico Foschi, Stefanie Döbele, and Evelina Tacconelli. "Effect of Antibiotic Stewardship on the Incidence of Infection and Colonisation with Antibiotic-resistant Bacteria and Clostridium Difficile Infection: A Systematic Review and Meta-analysis." *The Lancet Infectious Diseases* (2017): n. pag. Web.

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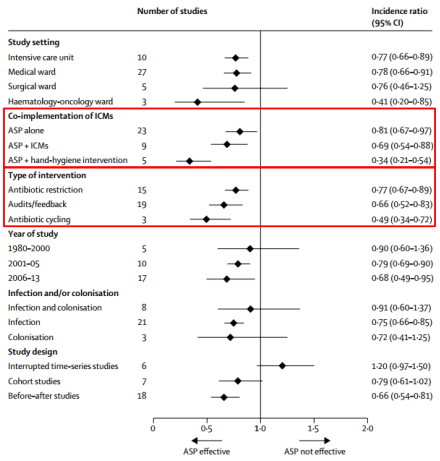
Forest Plot of Study Results

- When paired with IPC methods, AB stewardship is highly effective, and the combination reduces AMR more than just AB stewardship alone
- Magnitude of effect depends on the type of AB stewardship programme implemented



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Implementing Antibiotic Stewardship with IPC

- AB stewardship and IPC should be integrated in national action plans
- Financial restrictions pose as a challenge for some countries
  - Important to consider non-traditional stewards (e.g. community health workers) in resource-limited settings
- Collaboration among countries and taking a multidisciplinary approach to AB stewardship is crucial

Goff, Debra A., and Marc Mendelson. "Antibiotic Stewardship Hits a Home Run for Patients." *The Lancet Infectious Diseases* (2017): n. pag. Web.

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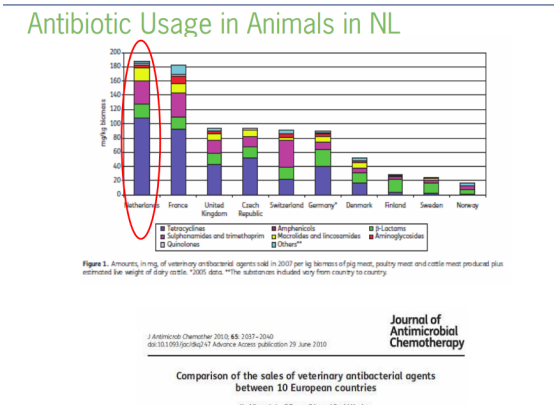
NL: high AB use in Agriculture



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Netherlands: political commitment

- Minister of Public Health
  - Ban Critically Important Antimicrobials for human use
  - Redefine 1st, 2nd, 3rd choice antimicrobials (selection for ESBLs)
- Minister of Agriculture
  take your own measures, or I have to make new laws!

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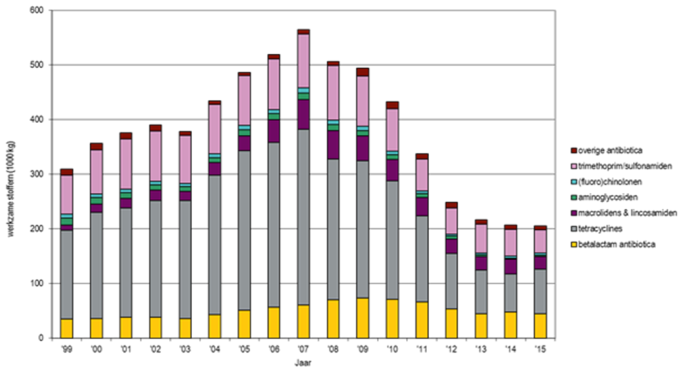
Netherlands: results so far



- Developments in sales of antimicrobial agents between 1999 and 2015, in number of kilograms of active substances sold (x1000) (source: FIDIN), by main pharmacotherapeutic group in 2015.

Benchmarking of broiler farms

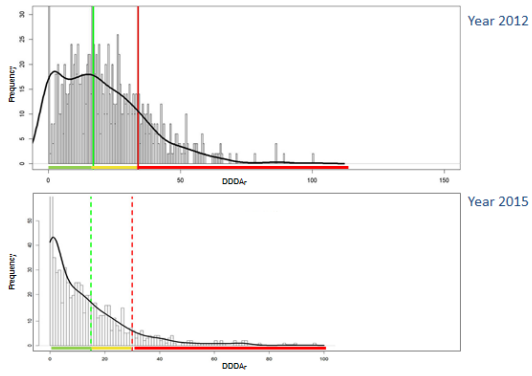
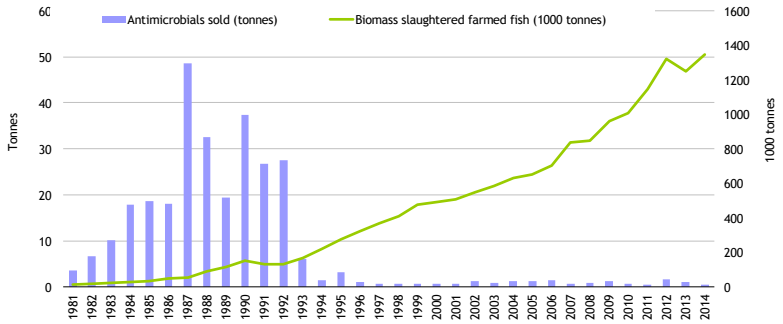


Figure 1: Benchmarking broiler farms 2012 (upper figure) and 2015 (lower figure) with target (—), signaling (—) and action (—) tresholds; number of farms (Y-axis) and Defined Daily Dose Animal/year (X-axis). Shows change in distribution of farms over the years.

Removing ABX From Food Producing Animals

Total sales, in kilograms of active substance, of antimicrobials for therapeutic use in farmed fish in Norway



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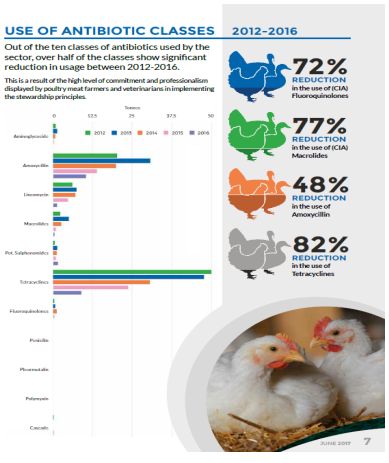
British Poultry Council

BPC reduced antibiotic use by weight by 71%

Poultry meat production increased by 11%



World Health Organization

GAP Implementation

Objective 5: Develop the economic case for sustainable investment that takes account of the needs of all countries, and increase investment in new medicines, diagnostic tools, vaccines, and other interventions

World Health Organization

'Magical' antibiotic brings fresh hope to battle against drug resistance

It has taken 60 years for bacteria to become resistant to vancomycin; modified drug now works in three ways, making it harder for bugs to develop resistance

The WHO has warned that antibiotic resistance is one of the biggest threats to global health, food security and development. Photograph: David Goldman/AP

World Health Organization

WHO Priority Pathogens List for R&D

Priority 1: CRITICAL	Priority 2: HIGH	Priority 3: MEDIUM
• *Acinetobacter baumannii* carbapenem-resistant	• *Enterococcus faecium* vancomycin-resistant	• *Streptococcus pneumoniae* penicillin-non-susceptible
• *Pseudomonas aeruginosa* carbapenem-resistant	• *Staphylococcus aureus* methicillin-resistant, vancomycin-intermediate and resistant	• *Haemophilus influenzae* ampicillin-resistant
• *Enterobacteriaceae* carbapenem-resistant, ESBL-producing	• *Helicobacter pylori* clarithromycin-resistant	• *Shigella spp.* fluoroquinolone-resistant
	• *Campylobacter spp.* fluoroquinolone-resistant	
	• *Salmonellae* fluoroquinolone-resistant	
	• *Neisseria gonorrhoeae* cephalosporin-resistant, fluoroquinolone-resistant	

Source: WHO
ebolaalert.org

GARD-P

Partnership to Develop New Antibiotics

- WHO and DNDi collaboration; May 2016
- Assist with drug approval process , manufacturing, and stewardship

Programme Areas:

1. Sexually Transmitted Infection
2. Antimicrobial Memory Recovery and Exploratory Programme
3. Neonatal Sepsis
4. Paediatric Antibiotic Platform

GARD-P Update

GARD-P

Partnership to Develop New Antibiotics

- WHO and DNDi collaboration
- Assist with drug approval process , manufacturing, and stewardship

In Action: Gonorrhoea pipeline (Zoliflodacin, Phase 3)

- GARDP is helping Entasis Therapeutics with nonclinical activities

When the medication reaches the market

- Entasis will sell to 44 countries (high income countries + China)
- **GARDP will manufacture and sell to the rest of the world (mostly LMICs)**

World Health Organization

Point of Care Diagnostics

Point-of-care diagnostics are essential for appropriate treatment and surveillance

WHO is working on target product profiles for diagnostics and developing guidelines

World Health Organization

Overview

1. Global Impact of AMR
2. Use of Antibiotics
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4. National Action Plans
5. One Health
6. Moving Forward

World Health Organization

Global Action Plan is the Model for NAPs

Countries committed to developing National Action Plans

Currently 82 countries have NAP

52 countries are developing their NAP

GLOBAL ACTION PLAN
ON ANTIMICROBIAL
RESISTANCE

World Health Organization

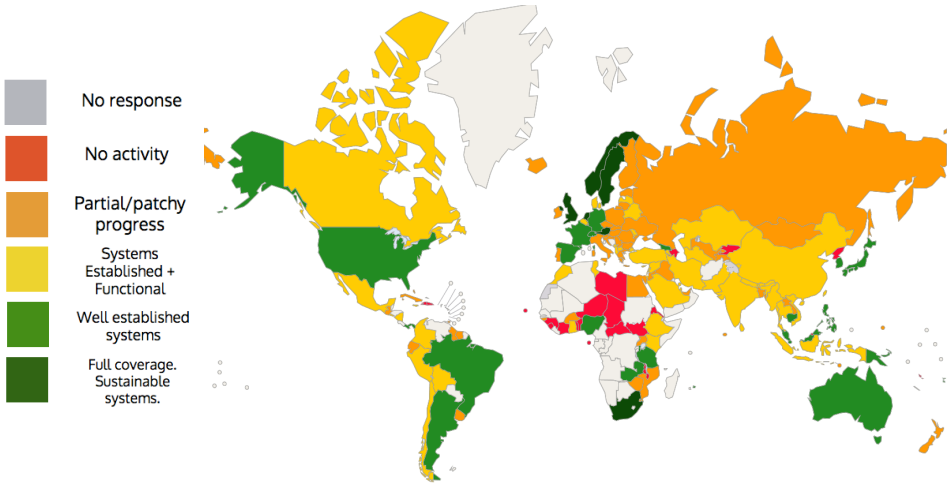
National multisectoral workshop 5d

World Health Organization

Integrated approach

World Health Organization

Country Progress with NAP Development



World Health Organization

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"One Health" Approach

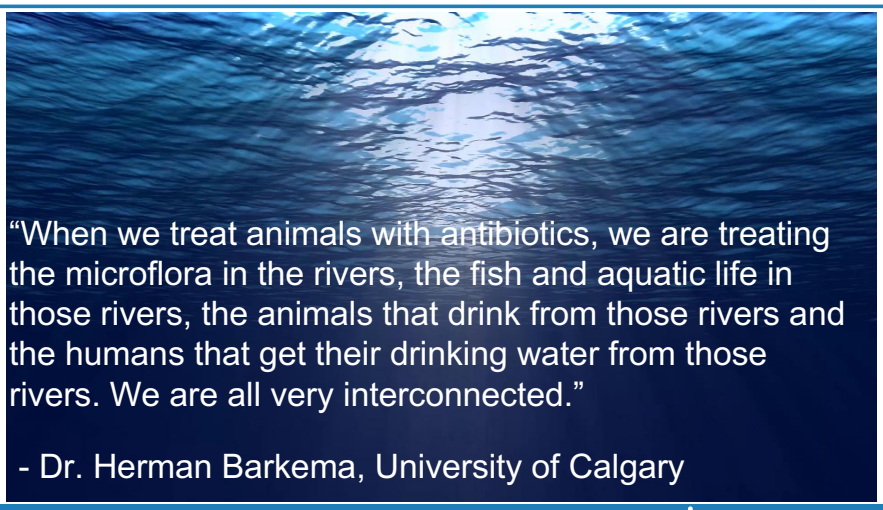
AMR affects humans, animals, and the environment

Partnering with FAO and OIE on a comprehensive approach

WHO is collaborating with UNEP to develop evidence base on AMR's impact on the environment

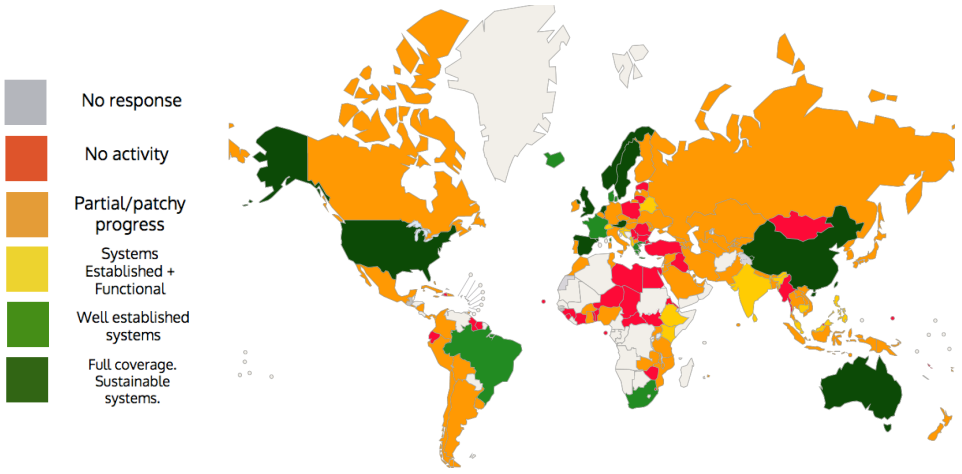
World Health Organization

AMR and One Health



World Health Organization

Countries with One Health Programs



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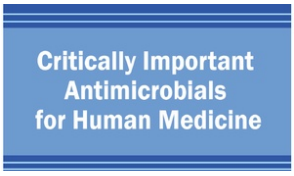
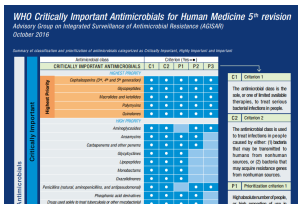
WHO Critically Important Antimicrobials List

Food and Safety Department developed guidelines for antimicrobials important for human medicine in food animals



5th Critically Important Antimicrobials for Human Medicine List was published in April



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WHO Guideline for Use of Medically Important Antimicrobials in Food-Producing Animals

Goals:

Help preserve the effectiveness of medically important antimicrobials, particularly those antimicrobials judged to be critically important to human medicine.

- **Provide formal recommendations for limitations of specific uses of medically important antimicrobials in food-producing animals, particularly antimicrobials judged to be critically important for humans**

- **Supports the Global Action Plan on Antimicrobial Resistance**

World Health Organization

UNIVERSITY OF CALGARY

Restriction in the use of antibiotics in food animals and antibiotic resistance in food animals and humans: A Systematic Review and Meta-Analysis

Dr. Karen Tang and Dr. Paul Ronksley
On Behalf of the Systematic Review Team
University of Calgary

March 27th, 2017
2nd WHO Guideline Development Meeting

World Health Organization

Increasing Consumer Demand…

Antibiotics Policies and Sourcing Practices*

Restaurant	Good Policy (10)	Policy Applies to All Types of Meat (6)	Availability of Meat Produced without Routine Antibiotics** (8)	Third Party Audits (4)	Policy Online (3)	Responded to Survey (3)	Total Points	Total Possible Points	Percentage Total	Grade
	10	6	8	3	3	3	33	34	97%	A
	10	7	8	4	3	3	35	36	97%	A
	10	2	3	4	3	3	25	32	78%	B
DUNKIN' DONUTS	10	8	0	0	3	3	24	36	67%	C
	10	2	1	4	3	0	20	34	59%	C
	5	2	1	1	2	0	11	36	31%	F
Wendy's	0	0	0	3	3	3	9	36	25%	F
BURGER KING	0	0	0	0	3	0	3	34	9%	F
Denny's	0	0	0	0	0	3	3	36	8%	F
	0	0	0	0	0	3	3	34	9%	F
	0	0	0	0	1	0	1	36	3%	F
							0	36	0%	F

Public Interest Research Group, 2015

Detailed Scorecard of Antibiotics Policies and Sourcing Practices*

Company	Good Policy Across All Meats (7, 21, or 28*)	Timebound Commitment (3, 9 or 12*)	Availability of Meat Produced w/o Routine Antibiotics (8, 24, or 32) + 1*	Transparency (7, 21 or 28)*	Total Points	Total Possible Points	%-age Total	Grade
	26	12	32	28	98	100	98%	A
	21	9	24	17.6	71.6	75	96%	A
	28	12	6	28	74	100	74%	B
	7	3	1	7	18	25	72%	B
	7	3	9	21	40	75	53%	C+
Wendy's	7	3	4	21	35	75	47%	C
	7	3	0	21	31	75	41%	C-
	3.5	1.5	0	21	26	75	35%	D+
	3.5	1.5	0	14.3	19.3	75	26%	D
	0	0	0	8	8	100	8%	F
Denny's	0	0	0	6	6	75	8%	F
DUNKIN' DONUTS	0	0	0	8	8	100	8%	F
	0	0	0	8	8	100	8%	F
	0	0	0	2	2	25	8%	F
	3.5	0	0	0	3.5	100	4%	F
	0	0	0	6	6	75	4%	F
	0	0	0	3	3	75	4%	F
	0	0	0	4	4	100	4%	F
					0	100	0	F

*A comprehensive description of scoring methodology is provided in Appendix 2.

Public Interest Research Group, 2016

World Health Organization

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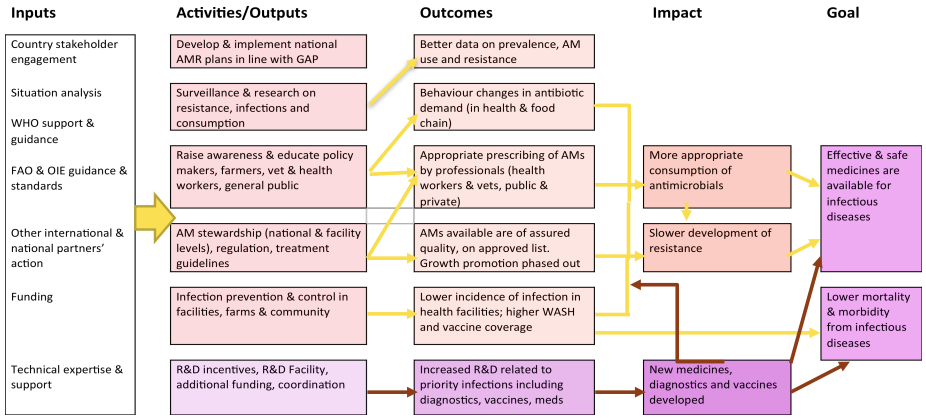
Framework for Monitoring GAP



World Health Organization

UNGA High-Level Meeting 21 Sept 2016

World Health Organization

AMR Inter-Agency Coordination Group

Chaired by UN Deputy Secretary-General and WHO DG

- Secretariat housed at WHO

Composed of individual experts/representatives of agencies

- Responsible for global coordination of AMR activities; determining commitments and gaps of activity

Upcoming: Teleconference in Sep; Meeting in Oct in Paris

FAO FIAT PANIS

OIE WORLD ORGANISATION FOR ANIMAL HEALTH

World Health Organization

After 20h flight: reality check

World Health Organization

No prescription needed, just take 2

World Health Organization

Limited staff, 10 fte 3000 beds

World Health Organization

No prescription needed, just take 2

World Health Organization

Home made disks

World Health Organization

Pleased to see a dispenser…

World Health Organization

Moving Forward

Scientific Academies do play a crucial role in AMR research

This research is the foundation of future policies for AMR stewardship

We appreciate Canada's engagement and look forward to its continued leadership in this space

World Health Organization

My dream: Preserve AB 4 future generations!

World Health Organization

For More Information

Please visit: http://www.who.int/antimicrobial-resistance/en/

On Twitter: @Marcsprenger4PH

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