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CONTROLLING ANTIBIOTIC RESISTANCE

through the One Health Approach

BACKGROUND

Antibiotic resistance is a threat to the efficacy of medical and veterinary care, especially in view of the declining flow of new antibiotics. There is widespread evidence of the overuse and inappropriate use of antibiotics in both human and veterinary medicine. There is debate over the use of antibiotics for non-clinical purposes in agriculture.

The rational and prudent use of antibiotics in medicine and agriculture is a 'global public good' in the sense that the implications of irrational and imprudent use extend beyond national boundaries and effective strategies for controlling antibiotic use require international coherence.

The stakeholders who have interests in antibiotic use and antibiotic resistance include powerful corporations, the medical and veterinary professions, farmers and communities.

We propose to examine the role of civil society and the private sector in responding to the One Health Challenge through a case study of the governance of antibiotic use in medicine and agriculture.

MODERATOR

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OBJECTIVES

We propose to explore the need and strategies for a more rational and prudent governance regime regarding antibiotic use in medicine and agriculture and to explore the role of civil society and the private sector in related disciplines, based on One Health concept, in working together towards such a regime.

SPEAKERS

- **Li Yang Hsu**, Assistant Professor,
  National University Health System, Singapore
- **David Wallinga**, Senior Advisor in Science,
  Food and Health, Institute for Agriculture and Trade Policy, USA
- **Maria Virginia Ala**, Director IV,
  National Center for Pharmaceutical Access to Medicine, Philippines
- **Andri Jatikusumah**, Executive Director,
  Center for Indonesian Veterinary Analytical Studies (CIVAS), Indonesia

PANELISTS

- **Mira Shiva**, Steering Commitee Member,
  People's Health Movement, India
- **Carmem Pessoa-Silva**, Team Lead,
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Director IV
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Director IV
Health Policy Development and Planning Bureau
October 22, 2008 to present

Officer-in-Charge
Bureau of International Health Cooperation
January 18, 2005 to October 21, 2008

Medical Officer VII
Bureau of International Health Cooperation
Department of Health, Manila
January 2001 to present

Project Manager IV
Women's Health and Safe Motherhood Project
Department of Health
November 1995 to December 2000

- Reviews detailed implementation plan and updates this annually.
- Coordinates with and integrates all project participants – DOH program managers, consultants, suppliers/contractors into a smooth working group.
- Coordinates the establishment of management structures consistent with donor and government executives of participating LGU's to ensure effective project implementation.
- Provides periodic updates to the Project Director on policy and project implementation and provide briefing/updates to other officials and participating agencies.
- Act as resource person, facilitator and trainer during consultation meetings, workshops and training/seminars.
- Assist DOH and LGUs in developing performance monitoring systems and other management information system.
- Established reporting procedures and coordinates submission and review of progress reports to DOH and donor agencies.
- Coordinates WHSMP activities with other DOH initiatives which promotes interests of the local government and promote local management and expansion of health programs/projects.
- Supervises the performance of the technical and administrative staff of the PMO.
- Act as Secretary to the PSC and implements commendations/ decisions of PSC.
- Performs other functions assigned by the Project Director.

Medical Specialist III
Office for Special Concerns/Office for Public Health Services
Department of Health
November 1992 to October 1995

Designated Acting Project Manager
Women's Health and Safe Motherhood Project
August 1994 to October 1995

- Pre-implementation activities of the Women's Health and Safe Motherhood Project

Dr Li Yang Hsu, MBBS (Singapore), MPH (Harvard), is an infectious diseases physician who is currently working as a clinician-scientist in the Department of Medicine, Yong Loo Lin School of Medicine, National University Health System, Singapore. He has concurrent appointments as the director of the Centre for Infectious Disease Epidemiology & Research (CIDER) at the Saw Swee Hock School of Public Health, and adjunct clinician-scientist at the Institute of Bioengineering & Nanotechnology. His areas of research include the epidemiology of methicillin-resistant Staphylococcus aureus as well as the clinical and socioeconomic impact of antimicrobial resistance.

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Andri Jatikusumah earned bachelor degree from Faculty of Veterinary Medicine, Bogor Agricultural University and her Master degree in Veterinary Epidemiology and Economics from Utrecht University, The Netherlands.

He started his career in pharmaceutical company and decided to work with NGO because of his passion in action research and community engagement for animal disease or zoonotic disease, animal welfare and food safety and apply it for the society since 2006. He has been involved in many research and community engagements program during his career in NGO. In his professional career he has being involved in veterinary organization such as Indonesian Veterinary Medical Association (IVMA), Indonesian Veterinary Epidemiology Association (IVEA)

Currently, He assign as an Executive Director in Centre for Indonesian Veterinary Analytical Studies (CIVAS) since 2011, Non-Government Organization that focused in animal welfare, animal health and food safety.

ANDRI JATIKUSUMAH

Executive Director

Center for Indonesian Veterinary Analytical Studies (CIVAS) Indonesia

David Legge started his career as a physician but early on moved into health services research, health policy and planning and public health. He has been based in the La Trobe School of Public Health since 1995 from whence he has developed his research interests and teaching in the political economy of health, comparative health systems, primary health care and international health policy. Since 1996 David has been teaching health policy and management in China and researching the health challenges associated with China's economic and political transition. From 1998 to 2006 David was academic coordinator for the Victorian Public Health Training Scheme, a broadly based in service training program for public health practice. David has been active in the global People's Health Movement since 2000 when it was formed and since 2005 has been academic coordinator of the International People's Health University which is a short course program in the political economy of health for health activists, offered through the People's Health Movement.

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Dr Carmem L. PESSOA-SILVA is Brazilian, joined the World Health Organization (WHO) in 2005. From January 2005 to November 2011 Dr Pessoa-Silva was the team leader for the WHO programme "Infection Prevention and Control in Health Care". In the context of renewed efforts to combat antimicrobial drug resistance, WHO established the programme "Antimicrobial Drug Resistance" in December 2011 and appointed Dr Pessoa-Silva to lead the new programme.

Prior to WHO, Dr Pessoa-Silva was an Associate Professor of Infectious Diseases for 12 years at the Federal University of Rio de Janeiro, Rio de Janeiro, Brazil.

She is also the main author to several abstracts and publications including:

- Reduction of health care associated infection risk in neonates by successful hand hygiene promotion. Pediatrics, 2007.
- Behavioural considerations for hand hygiene practices: the basic building blocks. J Hosp Infection, 2007.
- The WHO policy package to combat antimicrobial resistance. Bull World Health Organ 2011;89:390–392.
- Control of community-associated methicillin-resistant Staphylococcus aureus in neonatology. J Hosp Infect. 2006;63:93-100.
- Epidemiology of endemic extended-Spectrum beta-lactamase producing Klebsiella pneumoniae at an intensive care unit in Rio de Janeiro. Microb Drug Resist. 2006;12:50-8.
- Genetic relatedness among extended-spectrum β-lactamase producing Klebsiella pneumoniae outbreak isolates associated with colonization and invasive disease in a neonatal intensive care unit. Microb Drug Resist. 2005;11:21-5.
- Extended-spectrum beta-lactamase-producing Klebsiella pneumoniae in a Neonatal Intensive Care Unit: Outbreak Description and Risk Factors for Infection and Colonization. J Hosp Infection. 2003;53:198-206.

MIRA SHIVA

Steering Commitee Member
People's Health Movement India

Dr Mira Shiva did her Post graduation in Medicine from Christian Medical College Ludhiana , Punjab in 1978 , the year of the Alma Ata, then a Community Health & Development Residency. For over 3 decades she has been engaged with Comprehensive Primary Health Care, issues of Gender justice , social & health equity . she was involved in relief work & health impact studies after Bhopal Gas Tragedy .

She has been involved with issues of Rational Drug Policy & Rational use of Drugs , Women & Child health , Food & Nutrition security , Food Safety & Biosafety , Environment & Health, Using law for Public Health .

She is a Founder Member of Peoples Health Movement , & its Steering Committee Member .

She is Founder Member & former Chairperson of Health Action International (Asia Pacific)

She is Coordinator Initiative for Health & Equity in Society , Founder Coordinator &CoConvenor All India Drug Action Network.. She was member Central Council for Health ,Chairperson Consumer Education Task Force on Safety of Food & Medicine , Health Committee of National Human Rights Commission ,

She was Head of Public Policy & Director Women Health & Development & Rational Drug Policy on Voluntary Health Association of India . She is steering Committee Member Right to Food Campaign , Diverse Women for Diversity , Indian Alliance for Child Rights , National Alliance for Maternal Health &Human Rights

She was member Working Group on Regulations for Food & Drugs, Founding member Doctors for Food Safety & Biosafety , Founder Member &Co coordinator Indian Initiative for Management of Antibiotic Resistance .

She was the National Focal Point for National Profile for Women Health & Development 2001 & Coeditor Of the Publication by same name by WHO & VHAI .

She has Coauthored & Co edited Banned & Bannable Drugs , Essential Drugs & Rational Use of Drugs , Comprehensive Policies & Programs for Women's Health , Darkness at noon , Poison in our Foods .

She is recipient of the first Dr Olle Hansson award for showing Moral Courage & for contribution Nationally &Globally for Rational Use of . She is also recipient of the Women Scientists Award in 2006 by Science & Society , Dept of Science & Technology for "prevention of misuse of Medicines & Medical Technologies "

David Wallinga, M.D., M.P.A., is Senior Advisor in Science, Food and Health at the Institute for Agriculture and Trade Policy, Minneapolis, MN. Dr. Wallinga applies medical science and a systems lens to analyze the risk and health impacts of our industrialized meat production and other food systems. IATP advocates for public policies to help build food systems that are healthier, less obesogenic, less polluting and less wasteful of antibiotics, while supporting farmers and rural communities. IATP is a founder and steering committee member of Keep Antibiotics Working: the Campaign to End Antibiotic Overuse in Animal Agriculture.

From 2009 through 2010, Dr. Wallinga was a William T. Grant Foundation Distinguished Fellow in Food Systems and Public Health at University of Minnesota, School of Public Health. He received a medical degree from the University of Minnesota Medical School, a master's degree from Princeton University and a bachelor's from Dartmouth College.

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CONTROLLING ANTIBIOTIC RESISTANCE THROUGH THE ONE HEALTH APPROACH

Antimicrobial Resistance: Fundamental Basis and Issues with Control

Li Yang HSU (for ReACT)

Antimicrobial resistance is the most evident manifestation of bacterial evolution. The mechanisms of resistance are ancient and many were probably selected out millions of years ago – bacteria from the Lechuguilla cave being the case in point, with resistance to multiple different modern antibiotics despite the bacteria being isolated for almost 4 million years [1]. Soon after the development of penicillin, Alexander Fleming noted that formerly susceptible bacteria could develop resistance to the compound in the petri dish, and gave one of the earliest warnings of its implications during his Nobel lecture [2]. However, the development and proliferation of multiple classes of antibiotics in the subsequent 3 decades, coupled with the excellent safety profiles of most antibiotics, resulted in lax human antibiotic prescribing standards and significant inappropriate antibiotic prescription in many parts of the world [3]. In the 1950s, the use of sub-therapeutic quantities of antibiotics was found to enhance the feed-to-weight ratio of food animals, and the practice of using antibiotics as growth promoters quickly escalated globally [4]. In the past two decades, there is accumulating evidence linking levels of human antibiotic prescription to resistance [5,6], and also nontherapeutic use in animals to antimicrobial resistance in pathogenic human bacteria [4]. Coupled with a dramatic decline in the development of novel antibiotics [7], a paradigm shift framing antibiotics as precious and potentially finite rather than limitless resources was inevitable.

The negative impact of antimicrobial resistance in humans is enormous, resulting in increased healthcare costs, higher mortality and morbidity, and productivity losses [3,4,8]. Multiple professional and civic organizations, including the World Health Organization, have put forward position papers and recommendations on how to preserve the beneficial impact of antibiotics [8]. Superficially, the way forward is clear – the recommendations are largely similar and can be broadly classified as follows:

1. More transparent, better and global surveillance of antimicrobial usage and resistance.
2. Improving the “antibiotic pipeline” – facilitating and increasing the development of novel classes of antibiotics.
3. Improving the appropriate prescription of antibiotics in both humans and animals – including reducing the use of antibiotics as growth promoters in animal husbandry and aquaculture.

4. Better infection control practices and regulation to limit the spread of antimicrobial-resistant pathogens within institutions and cross-borders, and also in animal husbandry.
5. Better education at all levels on the issues of antimicrobial resistance.

Nonetheless, progress on the control of antimicrobial resistance has been slow, and it is perhaps apt that the issue of antimicrobial resistance in recent times is increasingly being re-framed as a wicked problem. The term 'wicked problem' was originally used to describe social issues that are complex, ill defined and subject to multiple interpretations, and are virtually impossible to completely solve – "solutions" often result in making things better (or worse), the implementation of which frequently results in trade-offs and unanticipated complications [9]. Antimicrobial resistance – embedded within the complexity and scale of human and animal medicine and interactions – can no longer be viewed as a purely scientific puzzle to be overcome, but involves sociopolitical and cultural initiatives in order for progress to be made. And given the evolutionary capability of bacteria, the issue can perhaps never be completely resolved.

In the hospital setting, particularly public hospitals in less developed countries and Asia, the high patient-to-healthcare staff ratio and high hospital occupancy results in difficulties in improving compliance to infection control practices, including basic hand hygiene and isolation/cohorting of patients infected or colonized by antimicrobial-resistant bacteria. The drive for medical tourism dollars has as an indirect consequence enhanced the spread of multidrug-resistant bacteria such as the carbapenem-resistant Enterobacteriaceae [10]. Advances in medical care especially in the areas of transplantation and cancer chemotherapy have resulted in a steadily growing cohort of severely immunocompromised patients where broad-spectrum antibiotics are routinely prescribed at the first sign of infection – practices that are endorsed by professional guidelines [11]. Attempts at antimicrobial stewardship in the hospital setting not infrequently result in conflict with physicians whose perspective is in providing 'best' care for their patients, and who view antimicrobial stewardship as an encroachment on their right to prescribe [2]. In each of the abovementioned examples, competing priorities render it difficult to implement practices that can effectively bring down antimicrobial resistance rates in many institutions worldwide.

Similarly, in the case of animal husbandry and aquaculture, competing priorities and razor-thin profit margins in some cases are deterrents against stopping the practice of antibiotics as growth promoters or even withholding mass antibiotic treatment at the appearance of the first ill animal or fish [4,8]. The significance of antimicrobial resistance in animal bacteria with respect to human health is also repeatedly challenged despite the accumulated evidence [4]. The World Health Organization had comprehensively highlighted major gaps and challenges in the control of antimicrobial resistance globally, including the lack of comprehensive multidisciplinary strategies, lack of adequate regulatory frameworks, insufficient awareness and education at all levels, and the presence of incentives that encourage abuse of antibiotics [8].

Seen in the perspective of a wicked problem, how and whether antimicrobial resistance can eventually be brought under control appears unclear. Nonetheless, it is important to note the major advancements and improvements made (and that continue to be made) with other issues listed as wicked problems, including gender inequality, poverty, ethnic inequality, etc. From this perspective, any improvement is good, and continued progress better. Taking a 'One Health' approach to antimicrobial resistance in order to try to align all concerns and interests, gaining political will and commitment for the right regulatory and cross-border cooperative frameworks, education at all levels – including framing the issue in ways that people will care about, are all logical and necessary steps. Encouragement of action at all levels along with greater collection and transparency of data – while messy – is an approach that has also worked well with other issues of similar or greater complexity.

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PRESERVING EFFECTIVE ANTIBIOTICS:
Strong Public Health Action Needed to Avoid the 'Tragedy of the Commons'

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Abstract: In 1968, ecologist Garrett Hardin described "The Tragedy of the Commons"[1] , the notion that individuals will deplete a shared resource by acting short-term out of self-interest, despite everyone's understanding that to do so runs contrary to their long-term best interests. So it is with effective antibiotics.

The overall usage of antibiotics is perhaps the major factor in driving bacteria to become resistant to them. That is fundamental to microbiology. Yet in much of the world today, there is routine and enormous use of antibacterials in animal agriculture. This usageensures farm environmentsare replete with both the residues of antibiotics and the genetic determinants of antibiotic resistance. These conditions have helped to create what some call a "perfect storm", i.e. conditions ripe for the formation and spread of resistance that is then transmitted via various routes to the human population. In short, the overuse of animal antibiotics by some few parties, acting out of their own self-interest, is undercutting the effectiveness of antibiotics for the rest of us.

This talk employs the very active debate about the scale and impact of this antibiotic usage in U.S. animal agriculture to illuminate possible better policies and practices that can support public health as well as better animal health.In the United States, it was only when Congress passed the 2008 amendments to the Animal Drug User Fee Act that data on sales of antimicrobials were first collected and publicly reported by the U.S. Food and Drug Administration. Today, these data indicate over 80% of all U.S. antimicrobials are sold for use in animal agriculture – more than 29 million pounds each year (Tables 1&2) – most of them from medically important antibiotic classes, including penicillins, tetracyclines, macrolides, cephalosporins, etc. Ninety percent of animal antimicrobials are added to animal feed or drinking water, for what are often non-therapeutic, economic purposes such as growth promotion and feed efficiency.[2]

Aside from the recent collection of data on antibiotic sales, federal agencies regulating animal antibiotics in the United States have demonstrated little action to date to restrict or reduce such use. In

Table 1. Antimicrobial Drugs FDA-Approved for Use in Food-Producing Animals 2010 Sales and Distribution Data Reported by Drug Class

	Antimicrobial Class	Annual Totals[1]	
		Kilograms	pounds
Domestic	Aminoglycosides	200,794	441,747
	Cephalosporins[2]	24,588	54,094
	Ionophores	3,821,138	8,406,504
	Lincosamides[2]	154,653	340,237
	Macrolides[2]	553,229	1,217,104
	Penicillins[2]	870,948	1,916,086
	Sulfas[2]	506,218	1,113,680
	Tetracyclines[2]	5,592,123	12,302,671
	NIR[2,3]	1,517,447	3,338,383
Export[4]	Tetracyclines[2]	9,968	21,930
	NIRE[2,5]	206,566	454,445
	Total	**13,457,672**	**29,606,878**

Source: U.S. Food and Drug Administration, ADUFA Reports: 2010 Summary Report on Antimicrobials Sold or Distributed for Use in Food-Producing Animals. Accessed December 28, 2012 at www.fda.gov.

[1] kilograms or pounds of active ingredient.
[2] Includes products labeled for use in multiple species, including both food- and nonfood-producing animals.
[3] NIR = Not Independently Reported. Antimicrobial classes for which there were less than three distinct sponsors (companies) actively marketing products were not independently reported, including: Aminocoumarins, Amphenicols, Diaminopyrimidines, Fluoroquinolones, Glycolipids, Pleu romutilins, Polypeptides, Quinoxalines, Streptogramins.
[4] Only includes exports of FDA-approved, US-labeled antimicrobial drugs approved for use in food-producing animals. Export totals from 2009 summary report inadvertently included some non-FDA-approved antimicrobial drug products, which resulted in an incorrect, larger number.
[5] NIRE = Not Independently Reported Export. Antimicrobial Classes for which there were less than three distinct sponsors exporting products were not independently reported. These classes include: Aminocoumarins, Aminoglycosides, Amphenicols, Cephalosporins, Diaminopyrimidines, luoroquinolones, Glycolipids, Ionophores, Lincosamides, Macrolides, Penicillins, Pleuromutilins, olypeptides, Sulfas, Quinoxalines, Streptogramins.

2012, there was limited action to end the off-label injection of cephalosporins into hatchery eggs, for example[3] ; and, in 2005 the FDA successfully removed fluoroquinolones from therapeutic use in poultry flocks (albeit not from swine production). However, despite the bulk of antibiotics being used in animal feed, no FDA-approved feed antibiotics has ever been removed from the market. In mid-2012, the FDA announced a framework for pharmaceutical companies to voluntarily withdraw their non-therapeutic feed antibiotic products from the market, reducing sales and profits, while putting remaining products solely under veterinary control; it remains unclear what motivation the pharmaceutical industry has for doing so. Even the changes to antibiotics

Table 2. Marketed Antimicrobial Drugs and Drug Classes FDA-Approved for Use in Food-Producing Animals in the United States

Aminocoumarins	**Fluoroquinolones**	**Macrolides**	**Quinoxalines**
Novobiocin	Danofloxacin	Carbomycin	Carbadox
	Enrofloxacin	Erythromycin	
Aminoglycosides		Oleandomycin	**Streptogramins**
Apramycin	**Glycolipids**	Tilmicosin	Virginiamycin
Gentamicin	Bambermycins	Tulathromycin	
Neomycin		Tylosin	**Sulfas**
Spectinomycin	**Ionophores**		Sulfachlorpyridazine
	Laidlomycin	**Penicillins**	Sulfadiazine
Amphenicols	Lasalocid	Amoxicillin	Sulfadimethoxine
Florfenicol	Monensin	Ampicillin	Sulfamerazine
	Narasin	Cloxacillin	Sulfamethazine
Cephalosporins	Salinomycin	Penicillin	Sulfaquinoxaline
Ceftiofur	Semduramicin		
Cephapirin		**Pleuromutilins**	**Tetracyclines**
	Lincosamides	Tiamulin	Chlortetracycline
Diaminopyrimidines	Lincomycin		Oxytetracycline
Ormetoprim	Pirlimycin	**Polypeptides**	Tetracycline
		Bacitracin	
		Polymixin B	

Source: U.S. Food and Drug Administration, ADUFA Reports: 2010 Summary Report on Antimicrobials Sold or Distributed for Use in Food-Producing Animals. Accessed December 28, 2012 at www.fda.gov.

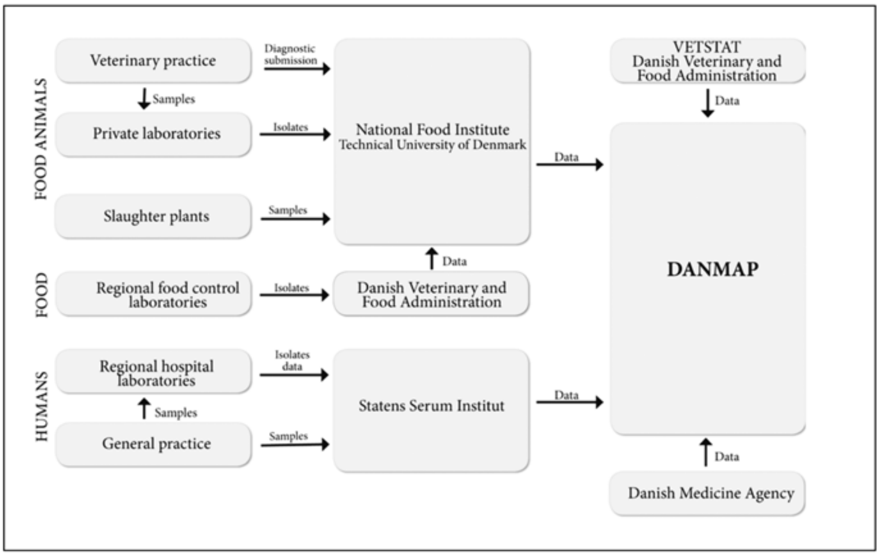
sales and usage optimistically envisioned by the FDA would only take place several years in the future.

Denmark offers a contrasting example – one where public policy has better reflected effective antibiotics as a part of the public commons. In Denmark, a major meat producer and the world's largest exporter of pork, there has been nearly 15 years of deliberate public policy focused on reducing the overall usage of antibiotics, in both human and animal settings. An announced phase-out of antibiotic growth promoters, first in poultry and then in swine was accompanied by government monitoring, research and assistance to farmers to help accomplish the phase-out.

In 1995, the Danish Ministry of Food, Agriculture and Fisheries and the Danish Ministry of Health jointly began DANMAP, the Danish Integrated Antimicrobial Resistance Monitoring and Research Programme. The timing, three years before the poultry phase out had even begun, was so that a programme would be in place to follow the eventual impact of the growth promotion phase out. As its name suggests, DANMAP integrates information about the consumption of antimicrobials in human, veterinary and food production settings, as well as the occurrence of antimicrobial resistance in humans, in animals and on food.

Dr. Frank Aarestrup, head of the EU Reference Laboratory for Antimicrobial Resistance and the WHO Collaborating Centre for Antimicrobial Resistance in Foodborne Pathogens at the National Food Institute, Technical University of Denmark, states that Denmark's subsequent use of antimicrobials dropped by 60 percent, measured by the amount of antimicrobials used per unit of meat produced[4]. According to a 2002 expert panel convened by the World Health Organization, the Danish antimicrobial growth promoter phase-out accomplished a reduction in public health risk due to resistance but no or minimal consequence to animal health, to farm

Source: DANMAP Organization and workflow www DANMAP.org



productivity or earnings, or to consumer prices. Today, the United States uses what is estimated as about five times more antimicrobials per pound of meat produced than does Denmark, and ten times more than Norway or Sweden[5].

Another key early change in Denmark was the restriction on veterinary profits from the sales of antibiotics beginning in 1995; it was a change supported by the Danish Veterinary Association, possibly in part because larger hog and cattle producers were then required to receive monthly veterinary visits. In effect, the veterinary profession adopted a changed role as advisors rather than as drug providers. To our knowledge, the FDA is not considering any restrictions on veterinarian sales or profits from drug sales at this time.

More broadly, the global epidemic of antibiotic resistance is an ecological problem. And the microbial ecosystem respects neither the borders of the United States nor of Denmark. Because trade in pharmaceuticals, in animal feeds, in meat products and, to a lesser extent, in food animals, has become increasingly global, the risk is the Tragedy of the Commons with respect to effective antibiotics will increasingly be a supranational rather than a national problem. Much of this trade is conducted by global corporations with a fiduciary duty to their shareholders to maximize profit without regard for the public health consequences. In addition, the impact of bilateral and multilateral trade agreements over the last three decades has been to decrease the ability of national entities to impose public health-based restrictions on corporate activities. The lack of any supranational public health authority with any regulatory powers lends further pessimism to the prospect of preserving a global commons of available antibiotics effective for sick animals and people who need them.

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PHILIPPINE COUNTRY SITUATION
On Antimicrobial Resistance

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The problem of antimicrobial resistance (AMR) has been recognized worldwide. Multidrug resistant pathogens such as MRSA, MDR -TB, XDR-TB and the third generation cephalosporin-resistant extended-spectrum beta-lactamases have been noted. Currently, new pathogens such as Klebsiella pneumoniae, Pseudomonas aeruginosa, and Vibrio clorerae 01 which possess the ability to resist almost all available antibiotics are emerging.

WHO has been spearheading the global containment initiatives on AMR in humans since 2001, with its publication of the WHO Global Strategy outlining the six-point policy package that sets the framework for critical actions to be undertaken by the government to stimulate change by stakeholders. (1) The Food and Agriculture Organization of the United Nations (FAO) and the World Organization for Animal Health (OIE), on the other hand, have been cooperating with each other to address the AMR issues in the animal sector. As early as 2004, in recognition of the multifactorial problem of antimicrobial usage and resistance in the agriculture and veterinary field including aquaculture, OIE has convened an ad hoc committee on Antimicrobial Resistance responsible for the development of specific chapters tackling this problem in the Terrestial Code and Terrestial Manual. (2)

In the Philippines, although many in the health sector are aware of the existence of antimicrobial resistance, the current efforts have not been enough to directly address the situation and consider that the problem is like a time bomb ready to explode.

The presence of antimicrobial resistant strains in the country has been monitored by the Research Institute for Tropical Medicine (RITM), the Department of Health (DOH) designated reference laboratory responsible for the Antimicrobial Resistance Surveillance Program or ARSP (DO No. 339J), since 1988. RITM, together with the 21 bacteriology laboratory (sentinel sites) in tertiary care hospitals which are mostly government owned, located in the 14 regions nationwide conduct the laboratory-based AMR surveillance of the pathogens from clinical cases.

Most of the bacterial pathogens which are in the surveillance list are those which are causing infections in the ten leading causes of morbidity, namely acute lower respiratory tract infection and pneumonia, bronchitis/bronchiolitis ,and acute watery diarrhea. The surveillance also take account of organisms which are commonly associated with HAIs, and the sexually transmitted infection, i.e. N. gonorrhea, and Escherichia coli, an enteric pathogen, as well as a common cause of urinary tract infections. (3) The ARSP does not include though all diseases of interest like tuberculosis and HIV. For tuberculosis, the surveillance of the MDR-TB and XDR-TB is done by the National Tuberculosis Research Laboratory which is also in RITM, and some private laboratories while resistance in HIV is detected by the STD AIDS Cooperative Central Laboratory or SACCL of DOH.

Unfortunately, ARSP does not have a counterpart in the animal sector. The laboratory surveillance of antimicrobial resistance in animal husbandry and aquaculture is not in place. The only activity that may indirectly relate to AMR in the animal sector is the drug residue monitoring as required under AO No. 24 s. 2009 otherwise known as the National Veterinary Drug Residues Control Program in food. This policy likewise provides the implementing guidelines on the manufacture, importation, exportation, distribution, administration, regulation, control and rational use of veterinary drugs in food producing animals. Currently pending in the Senate is the Food Safety Act bill which will ensure the quality of food throughout the food chain for human consumption.

Majority of the information on AMR in animals can be gathered from researches that have been conducted by undergraduate and graduate students. The most common isolates in these studies were Escherichia coli and the non-typhoidal salmonella. Most of these studies found 100% of the isolates exhibiting AMR to one antimicrobial and most of them showed it to be tetracycline. It was also shown that in a lot of these cases more than 90% exhibited multiple drug resistance. Other antimicrobials to which high resistance were registered are trimethoprim- sulfamethoxazole, penicillin ,ampicillin and chloramphenicol . The isolates which was found to have high resistance to antimicrobials was Escherichia coli. In other researches, they have provided evidences regarding conjugative transferability of drug resistance (4, 5, 7) and have attributed the development of AMR to the use of antibiotics in feeds in the farm where the samples were taken. (4) Similarly, in a study conducted Morales in 2000, it was shown that antibiotic residues increased AMR and allergic reactions to antibiotics in humans. (6)

Based on the country situation analysis that was recently conducted, it shows that the critical role of the laboratory in the surveillance of AMR has not been fully recognized. This is evident by the limited number of participating laboratories to the program since its inception, inadequate manpower and funding support to expand the scope of the testing, absence of information on correlation between laboratory-based data with clinical data or antibiotic use surveillance and the lack of integration of all AMR data. (8)

There have been several factors identified as contributory to the emergence of antimictobial resistance and problems in access to essential medicines and use of poor quality drugs are some of them. The Philippines has established early a regulatory body to monitor drugs and medicines from procurement to ensuring their quality through the creation of the Food and Drug Administration (RA 3720 or the Food, Drug, Devices and Cosmetics Act). As an additional mechanism to safeguard the drug supply in the country, the Philippine Medicines Policy was created in 2010 (formerly the Philippine National Drug Policy) in order to ensure equitable availability and affordability of safe, efficacious and quality (Phil Medicines Policy 2010) under the guidance of the DOH- National Center for Pharmaceutical Access and Management (NCPAM) established by AO 2010-0005. A key strategy in implementing this policy is the development of the Philippine National Drug Formulary (PNDF) which contains the essential drugs list or drugs that are essential for diseases and conditions of the majority in the Philippines.

There is, however, a gap in completely looking at the AMR picture on these areas as there is still inadequate system in the veterinary field to complement efforts in human health. Both animal husbandry and aquaculture have no essential medicines list to guide stakeholders on the acceptable drugs/medicines. Furthermore, presence of two regulatory bodies for drug regulation, feed additives and water soluble drugs under Bureau of Animal Industry (BAI) while pharmaceutical preparation with FDA, creates some confusion to manufacturers which affects the supply of these medicines in the market. (8)

The gap further expands to the concern in monitoring the rational drug use or medicines in the veterinary sector and in patient care. For both human and animal sectors, implementation of the monitoring system on drug prescription, dispensing and use is insufficient, if not totally missing. Information on antibiotic use on a national level has always been found to be scanty, and hospital consumption contributes little in total drug use information. At best, conclusions can be inferred only from data/ trends noted in tertiary training hospitals in Metro Manila. Much is desired when it comes to monitoring in the veterinary field.

Moreover, there are no standard treatment guidelines (STGs) for animals and some drugs needed to treat a specific disease are not registered in the Philippines. Veterinarians are left without a choice but to find a substitute for those antibiotics and antimicrobials for humans are normally selected even if available packaging is not appropriate for veterinary use. Another issue is the non-compliance of farm owners to the withdrawal period recommended in administering drugs to food animals. If this withdrawal period is not followed, there will be drug residues in foods sold in the market. One major challenge to the Department of Agriculture is the practice of drug companies to go directly to farm owners and sell drugs which is difficult to monitor. (8)

On a positive note, policies exist that provide rules and regulations in the implementation of prescribing and dispensing requirements in both humans (AO No. 62 s. 1989 and AO No. 63 s. 1989) and animals (AO No. 111b s. 1991 and AO No. 40). It is noteworthy to mention that the animal sector has demonstrated a strong will when they banned the use of chloramphenicol, beta antagonist drugs and nitrofurans in food producing animals. But this same resolve is now being challenged in the light of uncontrolled practice of using antibiotics as growth promoters in animals.

In view of the magnitude of the problem of AMR, the government needs to make AMR control a national priority by creating a national plan that shall integrate, coordinate, strengthen and develop sustainable, well financed, collaborative systems and mechanisms to combat AMR in the Philippines.

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8. Country Situation Analysis on Antimicrobial (CSA-AMR) Study

A COLLABORATIVE PROJECT ON DEVELOPING A STRATEGY

for the Prudent Use of Antimicrobial Agents to Control Antimicrobial Resistance in Humans, Animals and the Environment in Selected Asian Countries

Dr. Visanu THAMLIKITKUL & Andri JATIKUSUMAH

The burden of Antimicrobial resistance (AMR) in many Asian countries is enormous since the assessment and use of antibiotics are not well controlled due to a lack of national policies and enforcement of regulations on AMR containment in this region. AMR is a complex, multi-dimensional and multi-factorial problem which involves various stakeholders at local, regional, national and international levels. Therefore, a trans-disciplinary approach and a wide range of stakeholders must be involved to solve this problem. The integration of veterinary science and human public health, epidemiology and socioeconomics are important elements for AMR containment. Therefore, it is essential to develop an appropriate AMR containment strategy that is acceptable to multiple stakeholders, simple and practical, and adaptable to each country's situation.

The project entitled "An Ecohealth Approach to Develop a Strategy for the Prudent Use of Antimicrobials to Control Antimicrobial Resistance in Human, Animal, and Environmental Health in Selected Asian Countries" is a collaborative project among 5 Asian countries: China, Indonesia, Lao PDR, Thailand and Vietnam. These participating countries are members of the Asia Partnership on Emerging Infectious Diseases Research (APEIR). The proposal has been developed by the investigators of the participating countries and submitted to the International Development Research Centre (IDRC), Canada for funding consideration.

This project will be conducted using an ecohealth approach that perceives the social, political, economic, human health and environmental components as an integrated system instead of separate systems. The project will be carried out through three interlinked sequential phases. (1) AMR Containment Strategy Formulation Phase – Baseline data on antimicrobial accessibility and usage, AMR situation and AMR burden, and relevant laws and regulations related to veterinary and human medicine in each participating country will be collected and analyzed. The potentially effective and appropriate AMR containment strategy will be formulated according to each participating country's situation based on the observed baseline data and applicable local and global relevant evidence. (2) AMR Containment Strategy Implementation Phase – The formulated AMR containment strategy will be implemented

in selected animal farms and healthcare facilities as the prototypes in each participating country. The data on antimicrobial usage and AMR of the selected study sites in each participating country after implementation of the AMR containment strategy will be collected, analyzed and compared with the baseline data. Measures of the effectiveness of the AMR containment strategy will then be available.
(3) AMR Containment Strategy Dissemination and Advocacy Phase – The AMR containment strategy will be reviewed and revised according to the results from the AMR containment strategy implementation. Recommendations on policies and practices pertaining to AMR containment will be shared with relevant key stakeholders and policy makers who can influence policy decisions to endorse, disseminate and advocate for such policies and practices on AMR containment to the target sectors in each participating country.

The outputs of the project are expected to result in smarter use of antimicrobials in farm animals and in humans and, therefore, reduce the risk of AMR development without adversely affecting profitability from livestock or animal and human health. The experiences from the study sites will be used to influence and change policies and practices on antimicrobial use and AMR containment in selected Asian countries.