One Health approaches to AMR

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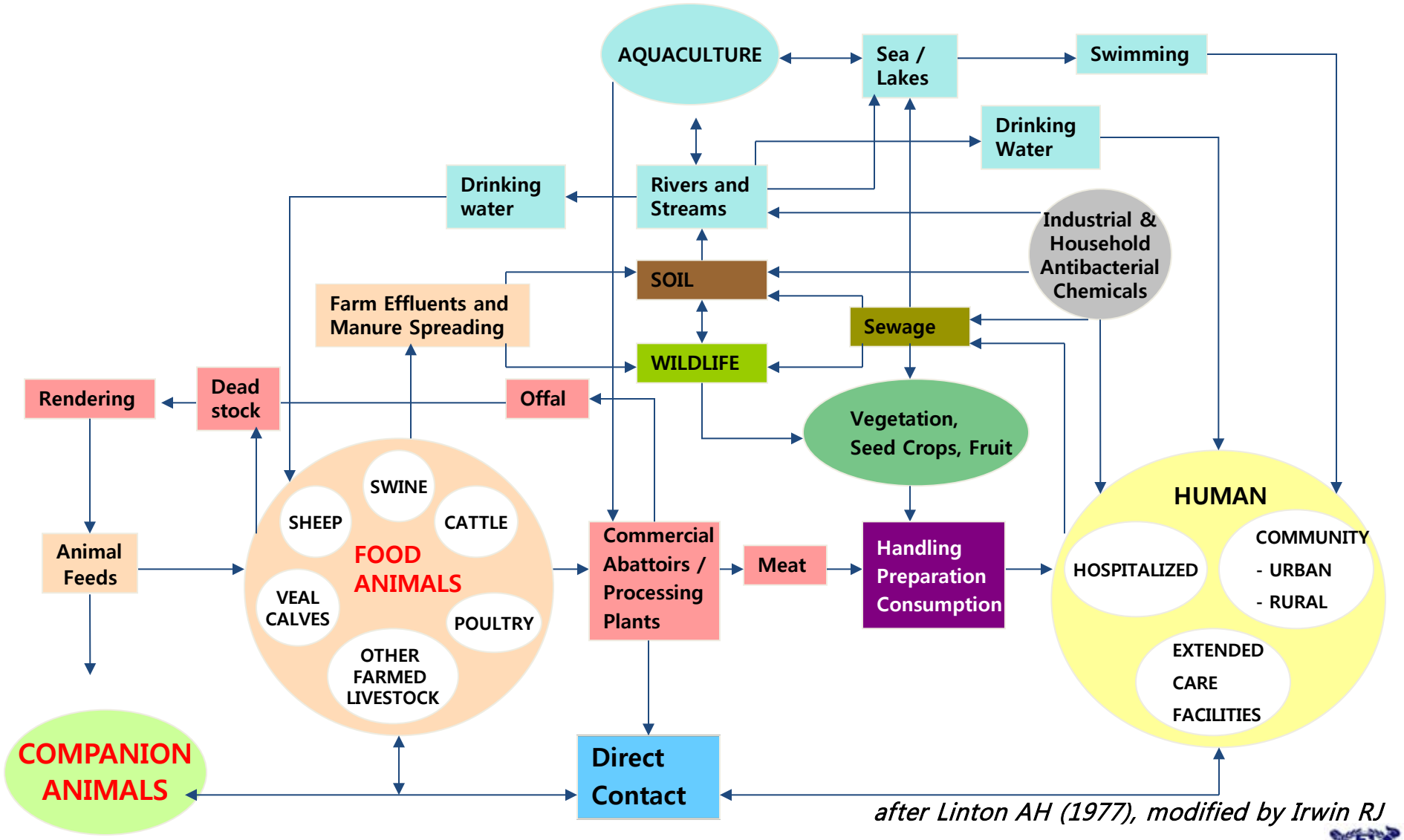
Epidemiology of antimicrobial resistance



after Linton AH (1977), modified by Irwin RJ

One health=One medicine

- Healthy animal
- Safe and healthy food
- Happy people

OIE approach to ´One Health´

"Protecting animals, preserving our future"

Zoonotic potential of animal pathogens*

- 60% of human pathogens are zoonotic
- 80% of animal pathogens are multi-host
- 75% of emerging diseases are zoonotic

http://www.cdc.gov/ncezid/

Antimicrobial Resistance (AMR)

Why is it of global concern?

•There is a lack of coherent global approaches to prevention and containment

The human, animal and plant sectors have **a shared responsibility** to prevent or minimize the development of antimicrobial resistance by both human and non-human pathogens

- **Harmonization of national antimicrobial resistance surveillance and monitoring programs**, and implementation of **international coordination programs**

- Implementation of **risk assessment**

Researchers amplify antibiotic of last resort hoping to halt superbugs

By Elizabeth Roberts, CNN

Updated 1454 GMT (2254 HKT) May 30, 2017

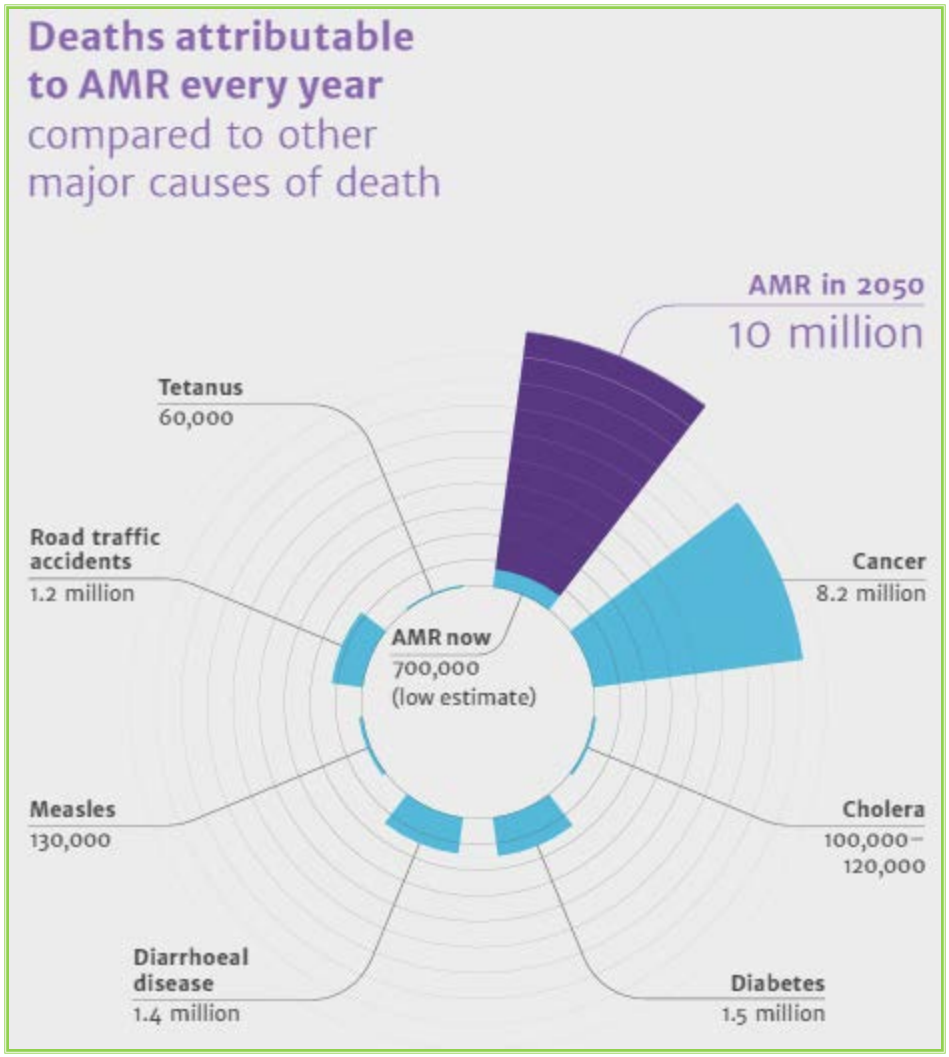
Source: CNN

New "superbug" no antibiotic can combat arrives in U.S. 03:23

News & buzz


Donald Trump likes to 'joke' about a lot of things that aren't...


Hot car deaths reach record numbers in July


Deaths attributable to AMR every year
compared to other major causes of death
AMR in 2050
10 million
Tetanus
60,000
Road traffic accidents
1.2 million
AMR now
700,000
(low estimate)
Cancer
8.2 million
Measles
130,000
Cholera
100,000–120,000
Diarrhoeal disease
1.4 million
Diabetes
1.5 million

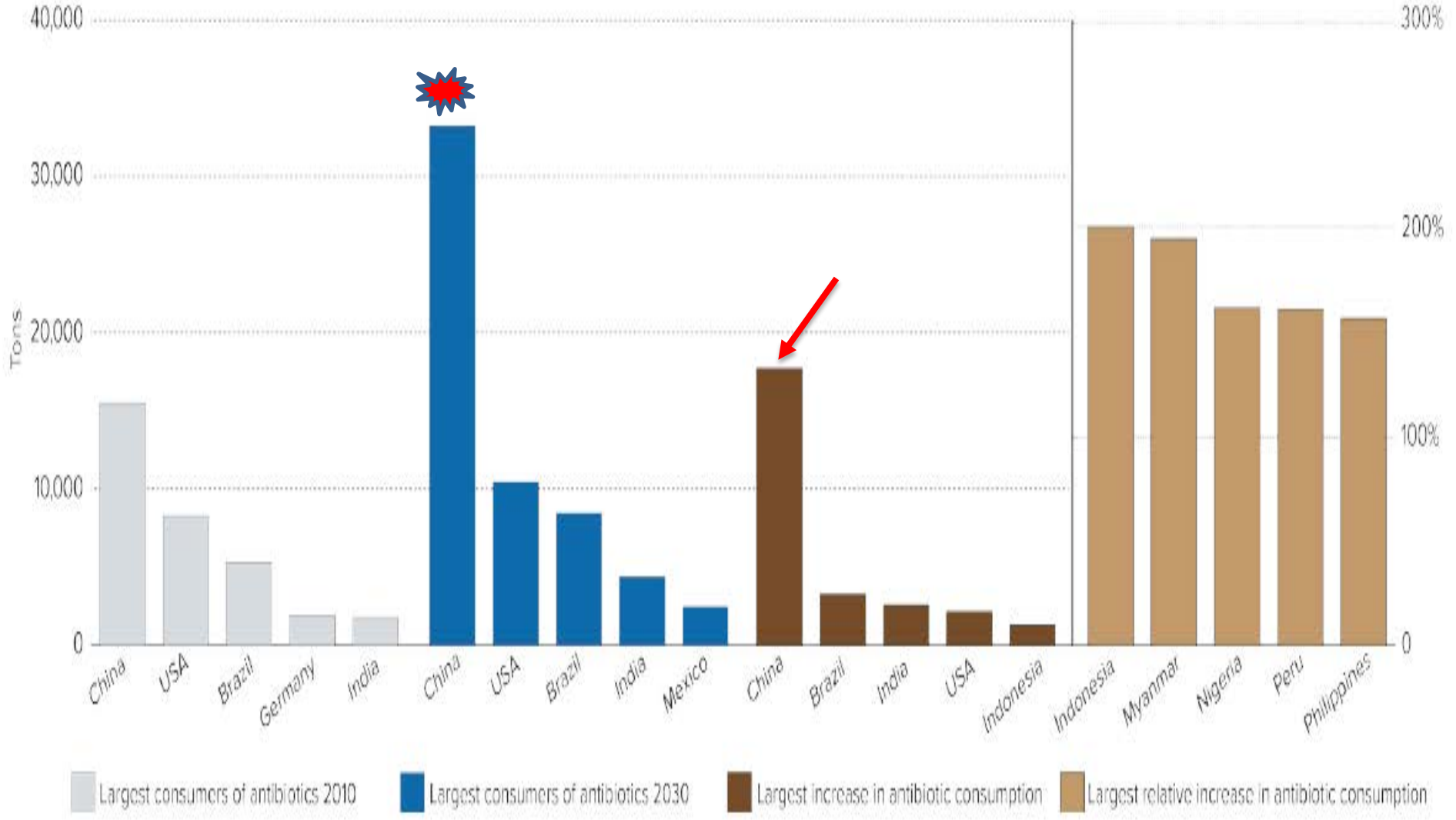


Fig. 1. Antibiotic consumption in livestock in high-consuming countries, 2010–2030 (projected for 2030). Adapted from Van Boeckel et al. 2015

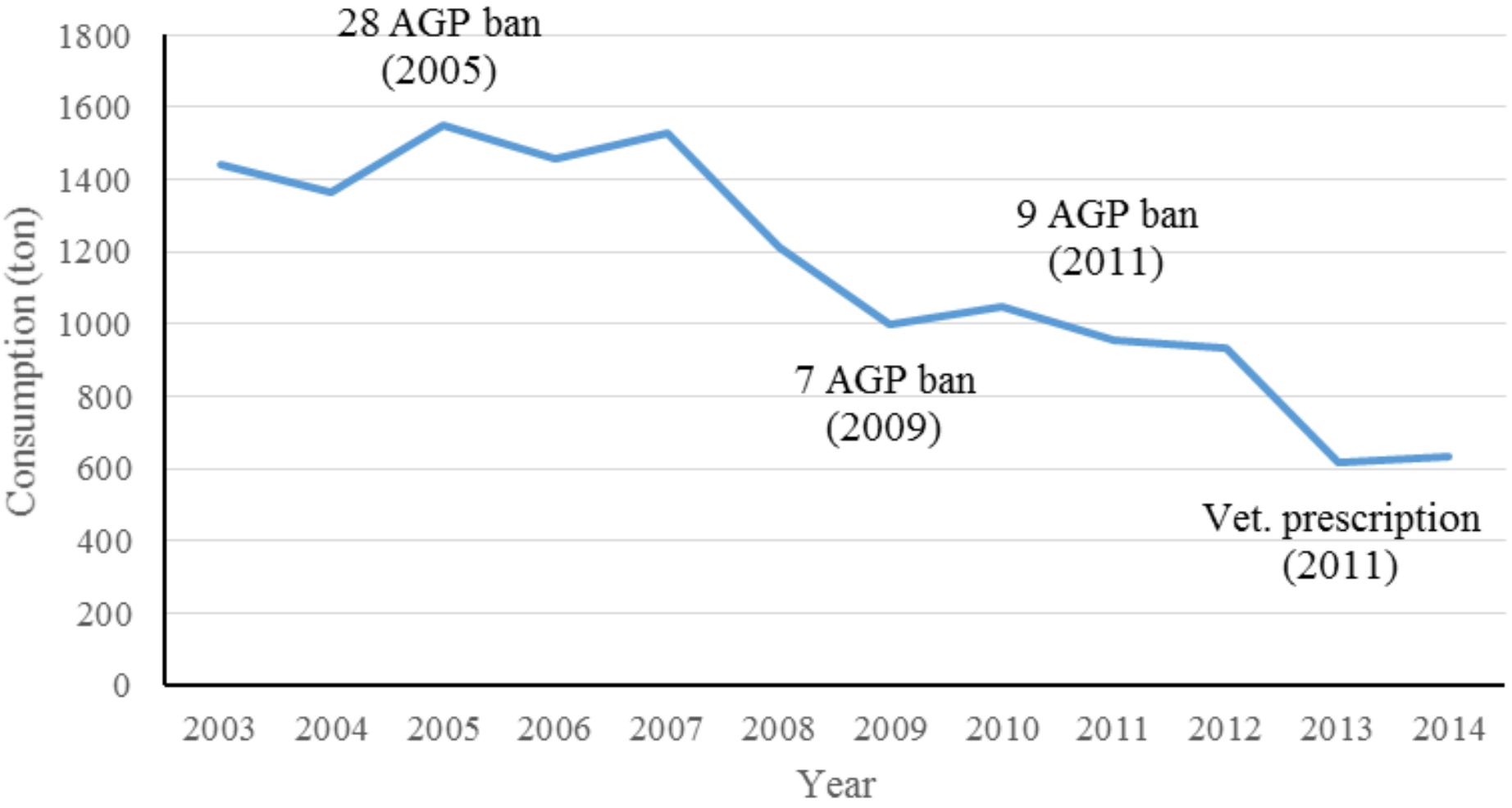
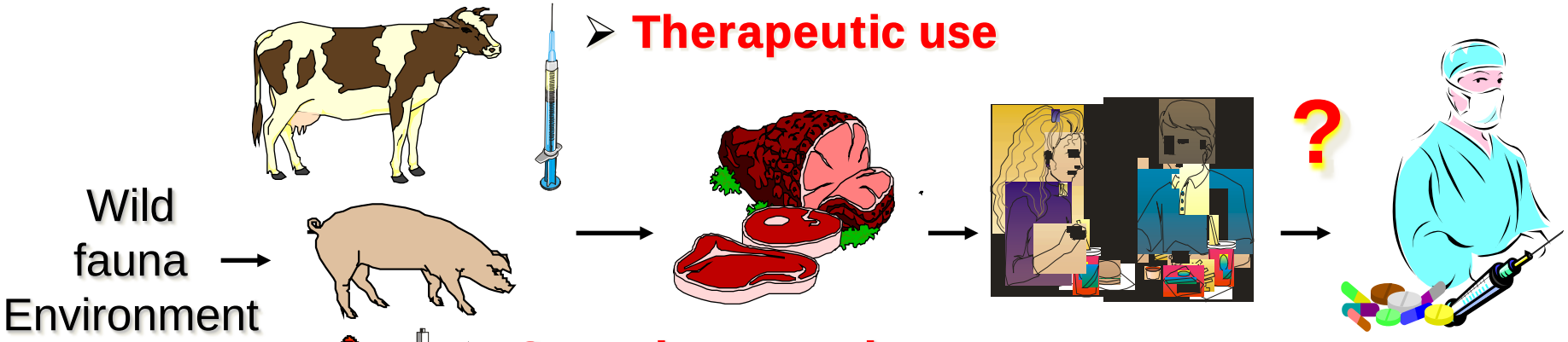


Fig. 2. Continuative trend of sales of antimicrobial drugs for food-producing animals in South Korea. Adapted from QIA, 2015

Antimicrobial use in animals

Antimicrobial Resistance may spread to human through the food supply

Total contribution of animals to human resistance < 4%



➢ **Therapeutic use**

➢ **Growth promotion**

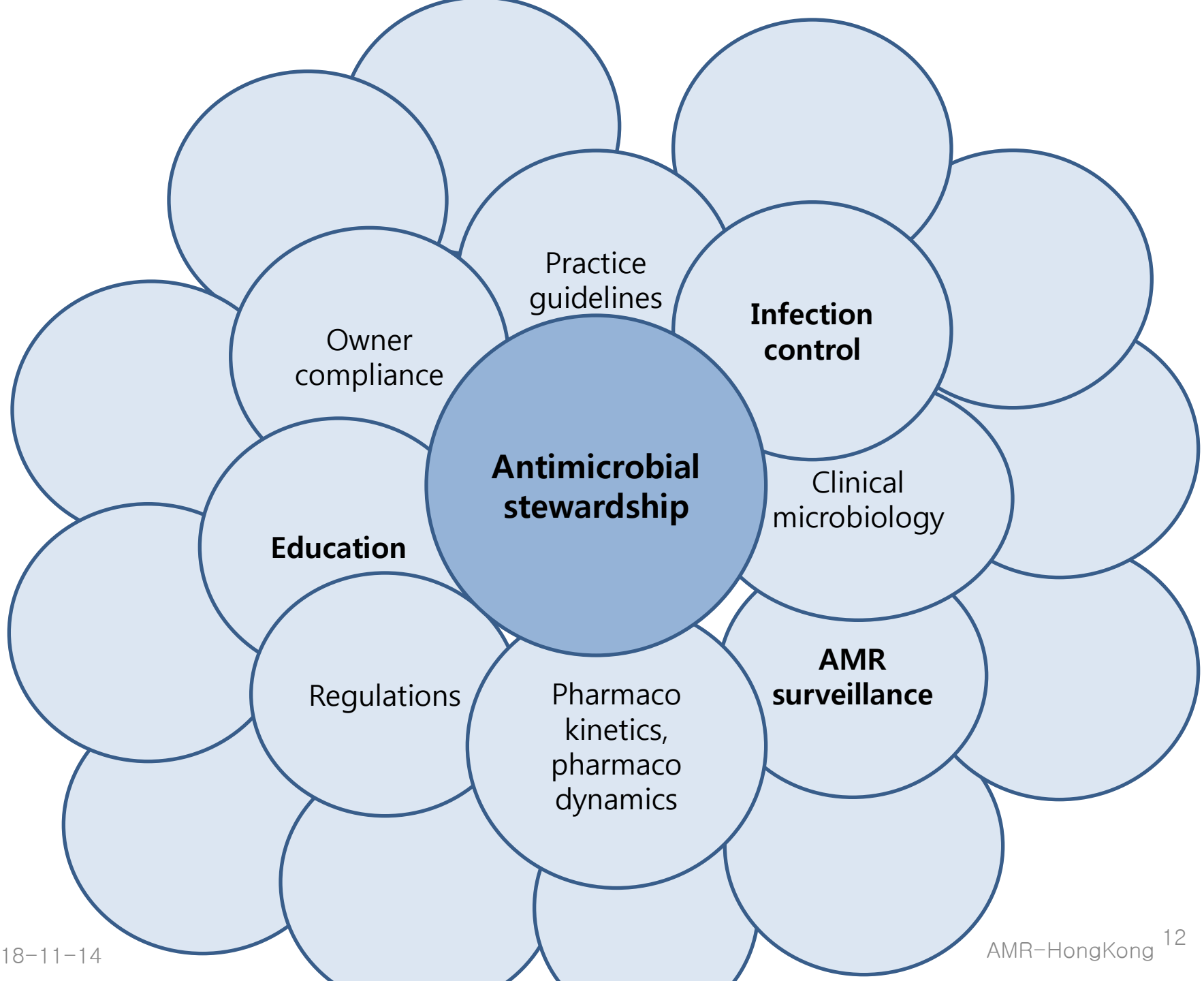
feed additives to increase feed efficiency or growth rate

➢ **Pro / Metaphylactic use**

prior to unexpected exposure to an infectious agent,
or prior to onset of clinical disease (Bywater *et al.*, JAC, 2004)

Benefits of antimicrobial use in food animal production

- **Higher survival, less illness , animal welfare**
  - Healthy animals enter the food chain
- **Increased growth rate and/or feed efficiency**
  - Feed cost savings
- **Decreased animal waste**
  - Lowered environmental impact
- **Reduced food borne pathogen carriage**
  - Potentially less human disease


Practice guidelines
Infection control
Owner compliance
Antimicrobial stewardship
Clinical microbiology
Education
AMR surveillance
Regulations
Pharmaco kinetics, pharmaco dynamics

Strategies to **control AMR in food chain**

- *Strengthening the monitoring systems on antimicrobial usage and resistance* :

  Harmonization and standardization **are needed to compare situations at the national and international levels.**

  *** Critically Important AMR factors may be developed**

  (according to Dr. Page, Australia)

- *Regulatory decisions based on risk assessment*

  Based on **Codex and OIE** frameworks of risk assessment

- **Not an anecdotal evidence but science-based and transparent decision-making** **in public health, much works including development of further methodology and training of risk analysts are needed.**

Recommendations

- *The animal resistant profile should be screened not only to food animals but also to companion animals at science-based approaches*

- "**One health**" approach to antimicrobial use and resistance is essential to minimize the antimicrobial resistance in humans and animals, because these are *the responsibility of all three health communities: human health, animal health, and environmental health-communities.*

Contents lists available at SciVerse ScienceDirect

Diagnostic Microbiology and Infectious Disease

journal homepage: www.elsevier.com/locate/diagmicrobio

Notes

Dissemination of multidrug-resistant *Escherichia coli* in Korean veterinary hospitals☆

Jeong Hwa So [a], Juwon Kim [b], Il Kwon Bae [b], Seok Hoon Jeong [b,*], So Hyun Kim [c], Suk-kyung Lim [a], Yong Ho Park [d], Kyungwon Lee [b]

Occurrence of antimicrobial resistance and virulence genes, and distribution of enterococcal clonal complex 17 from animals and human beings in Korea

Ka Hee Kwon, Sun Young Hwang, Bo Youn Moon, Young Kyung Park, Sook Shin, Cheol-Yong Hwang, Yong Ho Park[1]

Journal of Veterinary
24(5) 924–931
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sagepub.com/journal
DOI: 10.1177/10406
http://jvdi.sagepub.cc

SHORT COMMUNICATION

Detection of CC17 *Enterococcus faecium* in Dogs and a Comparison with Human Isolates

K. H. Kwon, B. Y. Moon, S. Y. Hwang and Y. H. Park

Department of Microbiology and Brain Korea 21 Program for Veterinary Science, College of Veterinary Medicine, Seoul National University, Seoul, Korea

Impacts

- This is the first report of *Enterococcus faecium* CC17 isolated from dogs with enterococcal infections in Korea.
- This is the first genetic comparison of *E. faecium* isolated from canine and human patients based on results from pulsed field gel electrophoresis (PFGE) and multilocus sequence typing (MLST).
- The results suggest that the CC17 lineage is more able to infect dogs as well as humans than other lineages.

Genetic and phenotypic characterization of methicillin-resistant staphylococci isolated from veterinary hospitals in South Korea

Bo Youn Moon, Jung-Ho Youn, Sook Shin, Sun Young Hwang,[1] Yong Ho Park[1]

Journal of Veterinary Diagnostic Investigation
24(3) 489–498
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DOI: 10.1177/1040638712440985
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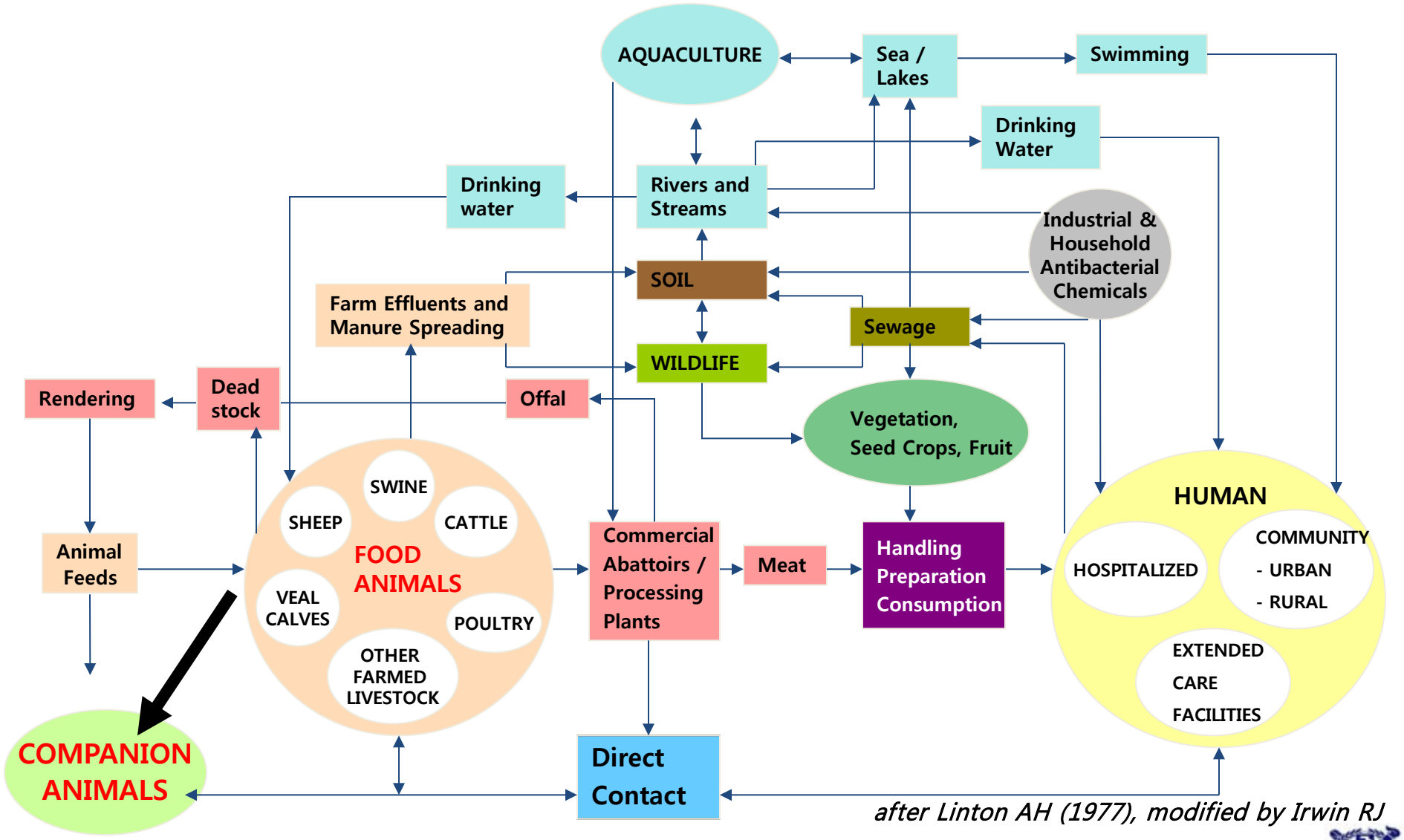
Epidemiology of antimicrobial resistance



after Linton AH (1977), modified by Irwin RJ

AAC
Journals.ASM.org

Molecular Characterization of Extended-Spectrum-β-Lactamase-Producing and Plasmid-Mediated AmpC β-Lactamase-Producing *Escherichia coli* Isolated from Stray Dogs in South Korea

Migma Dorji Tamang, Hyang-Mi Nam, Geum-Chan Jang, Su-Ran Kim, Myung Hwa Chae, Suk-Chan Jung, Jae-Won Byun, Yong Ho Park, and Suk-Kyung Lim

Bacterial Disease Division, Animal, Plant, and Fisheries Quarantine and Inspection Agency, Anyang, Gyeonggi-do, Republic of Korea

J. Microbiol. Biotechnol. (2014), 24(3), 386–393
http://dx.doi.org/10.4014/jmb.1310.10088

jmb

blaDHA-1/ CMY-2 b-lactamase-producing E. coli detected in dogs

Characterization of Veterinary Hospital-Associated Isolates of *Enterococcus* Species in Korea

Yeon Soo Chung[1†], Ka Hee Kwon[1†], Sook Shin[1], Jae Hong Kim[1], Yong Ho Park[1], and Jang Won Yoon[1,2*]

[1]*Department of Veterinary Microbiology, College of Veterinary Medicine, Seoul National University, Seoul 151-742, Republic of Korea*
[2]*College of Veterinary Medicine, Kangwon National University, Chuncheon 200-701, Republic of Korea*

Similar PFGE pattern of AR Enterococci have been found in companion animal, their owners and vet doctors

Original Article

J Vet Sci 2016, 17(2), 199-206 · http://dx.doi.org/10.4142/jvs.2016.17.2.199

JVS

Isolation and characterization of antimicrobial-resistant *Escherichia coli* from national horse racetracks and private horse-riding courses in Korea

Yeon Soo Chung[1], Jae Won Song[1], Dae Ho Kim[1], Sook Shin[1], Young Kyung Park[1], Soo Jin Yang[2], Suk Kyung Lim[3], Kun Taek Park[1,*], Yong Ho Park[1,*]

[1]*Department of Veterinary Microbiology, BK21 PLUS Program for Creative Veterinary Science Research, and Research Institute for Veterinary Science, College of Veterinary Medicine, Seoul National University, Seoul 08826, Korea*

[2]*Department of Animal Science and Technology, College of Biotechnology and Natural Resource, Chung-Ang University 2nd Campus, Anseong 17546, Korea*

[3]*Animal and Plant Quarantine Agency, Anyang 14086, Korea*

Limited information is available regarding horse-associated antimicrobial resistant (AR) *Escherichia* (*E.*) *coli*. This study was designed to evaluate the frequency and characterize the pattern of AR *E. coli* from healthy horse-associated samples. A total of 143 *E. coli* (4.6%) were isolated from 3,078 samples collected from three national racetracks and 14 private horse-riding courses in Korea. Thirty of the *E. coli* isolates (21%) showed antimicrobial resistance to at least one antimicrobial agent, and four of the AR *E. coli* (13.3%) were defined as multi-drug resistance. Most of the AR *E. coli* harbored AR genes corresponding to their antimicrobial resistance phenotypes. Four of the AR *E. coli* carried class 1 integrase gene (*intI1*), a gene associated with multi-drug resistance. Pulsed-field gel electrophoretic analysis showed no genetic relatedness among AR *E. coli* isolated from different facilities; however, cross-transmissions between horses or horses and environments were detected in two facilities. Although cross-transmission of AR *E. coli* in horses and their environments was generally low, our study suggests a risk of transmission of AR bacteria between horses and humans. Further studies are needed to evaluate the risk of possible transmission of horse-associated AR bacteria to human communities through horse riders and horse-care workers.

Keywords: *Escherichia coli*, antimicrobial resistance, class 1 integron, cross-transmission, horse

AR-ESBL-*E.coli* have been found in either horses, environment and human-in-contact

Contents lists available at ScienceDirect

Comparative Immunology, Microbiology and Infectious Diseases

journal homepage: www.elsevier.com/locate/cimid

Prevalence and characterization of *Staphylococcus aureus* and *Staphylococcus pseudintermedius* isolated from companion animals and environment in the veterinary teaching hospital in Zambia, Africa

Jung-Ho Youn[a], Yong Ho Park[b], Bernard Hang'ombe[c], Chihiro Sugimoto[a,*]

[a] Division of Collaboration and Education, Research Center for Zoonosis Control, Hokkaido University, Kita-20, Nishi-10, Kita-ku, Sapporo, Hokkaido 001-0020, Japan
[b] Department of Microbiology, College of Veterinary Medicine, Seoul National University, Seoul 151-742, Republic of Korea
[c] Department of Paraclinical Studies, School of Veterinary Medicine, University of Zambia, P.O. Box 32379, Lusaka, Zambia

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Keywords:
Staphylococcus aureus
Staphylococcus pseudintermedius
Veterinary hospital
Africa
Antimicrobial resistance

ABSTRACT

The Republic of Zambia consists of only one veterinary teaching school at the University of Zambia (UNZA) where students and veterinarians are exposed to many bacterial pathogens including *Staphylococcus aureus* (SA) and *Staphylococcus pseudintermedius* (SP). The aim of this study was the characterization and antimicrobial susceptibility profile of eleven SA and 48 SP isolates from the veterinary hospitals' in- and outpatients and the environment. No isolate was resistant to cefoxitin by disk diffusion test and the corresponding resistance gene *mecA* was not found. In contrast, the resistance rates of SA to penicillin (63.6%) and trimethoprim-sulfamethoxazole (36.4%) and SP to penicillin (52.1%) and tetracycline (25.0%) were the highest. A variety of sequence types (STs) without a predominant type including numerous novel types were determined, especially for SP (39.6%). The *spa* typing provided a clonal assignment for all SAs (100%) and 24 SPs (50%) with three and two novel types, respectively. This study has provided an overview of SA and SP in the veterinary teaching hospital at UNZA. However, for a better understanding of these species regarding pathogenesis and transmission, further studies on the prevalence and characterization of SA and SP from veterinary staff, pet owners, and farm animals in Zambia is needed.

AR *S.aureus* and *S. pseudintermedius* have been detected in companion animal and their owners.

Human-to-Dog Transmission of Methicillin-Resistant *Staphylococcus aureus*

Engeline van Duijkeren,*
Maurice J.H.M. Wolfhagen,† Adrienne T.A. Box,‡
Max E.O.C. Heck,§ Wim J.B. Wannet,§
and Ad C. Fluit‡

Methicillin-resistant *Staphylococcus aureus* (MRSA) was cultured from the nose of a healthy dog whose owner was colonized with MRSA while she worked in a Dutch nursing home. Pulsed-field gel electrophoresis and typing of the staphylococcal chromosome cassette *mec* (SCC*mec*) region showed that both MRSA strains were identical.

Emerging Infectious Diseases
Vol. 10, No. 12, December 2004

ELSEVIER

BRAZILIAN JOURNAL OF MICROBIOLOGY

http://www.bjmicrobiol.com.br/

Medical Microbiology

Resistance patterns, ESBL genes, and genetic relatedness of *Escherichia coli* from dogs and owners

A.C. Carvalho[a,b,*], A.V. Barbosa[b], L.R. Arais[b], P.F. Ribeiro[b], V.C. Carneiro[b], A.M.F. Cerqueira[b]

International collaboration

- **OIE** have emphasized the importance of prudential and rational use of antimicrobials in animals in order **to minimize the possible impact of animal antimicrobial usage on public and animal health**.
- A guiding principle with respect to antimicrobial usage should be **"as little as possible, as much as necessary"**. *It is essential that all parties work together to ensure safe use and to minimize the development of resistance.*
- It has been suggested that an ***intergovernmental panel on AR***, akin to the **Intergovernmental Panel on Climate Change** (Woolhouse et.al, 2015)

S. Korea Elected Chair of CODEX Ad Hoc Task Force

- Korea has been elected to head an ad hoc T/F of CODEX (July 3th, 2016)

- Korea will lead efforts in producing global guidelines regarding ***the reduction and prevention of the use of antimicrobial resistant microorganisms in environment, farm and fishery products, and food from 2017-2020 (4yrs)***
- Create global guidelines to monitor the use of **antimicrobial resistant materials** by 2020.

국제식품규격위원회 항생제 내성 특별위원회 (CODEX TFAMR)

CODEX ALIMENTARIUS
International Food Standards
World Health Organization
Food and Agriculture Organization of the United Nations

Ad hoc Codex Intergovernmental Task Force on Antimicrobial Resistance (TFAMR)

FAO/WHO ID No:	CX-804
Reference:	CX/AMR
Terms of Reference:	**2017** **Objectives** To develop science-based guidance on the management of foodborne antimicrobial resistance, taking full account of the WHO Global Action Plan on Antimicrobial Resistance, in particular objectives 3 and 4, the work and standards of relevant international organizations, such as FAO, WHO and OIE, and the One-Health approach, to ensure that Members have the necessary guidance to enable coherent management of antimicrobial resistance along the food chain. **Terms of reference** (i) To review and revise as appropriate the Code of Practice to Minimise and Contain Antimicrobial Resistance (CAC/RCP 61-2005) to address the entire food chain, in line with the mandate of Codex. (ii) To consider the development of Guidance on Integrated Surveillance of Antimicrobial Resistance, taking into account the guidance developed by the WHO Advisory Group on Integrated Surveillance of Antimicrobial Resistance (AGISAR) and relevant OIE documents. **NOTE:** The Task Force shall complete its work within three (max four sessions), starting in 2017.
Status:	Active
Host:	Republic of Korea

보 도 자 료

CODEX 항생제 내성 특별위원회 의장 위촉식 및 제1차 전문가 자문회의 개최

□ 식품의약품안전처(처장 손문기)는 국제식품규격위원회(CODEX) '항생제 내성 특별위원회' 의장으로 박용호 교수(서울대 수의학과)를 위촉하고, 3월 10일 특별위원회 운영을 위한 제1차 전문가 자문회의를 개최한다고 밝혔다.

○ 의장으로 위촉된 박용호 교수는 오는 '18년까지 2년 간 항생제 내성 특별위원회 의장으로서 국제회의를 주재하고 항생제 내성 저감화 등을 위한 논의를 주도하는 역할을 맡게 된다.

Daily VET

박용호 서울대 교수, CODEX 항생제 내성 특별위원장 선임

한국, CODEX 항생제 내성 특별위원회 의장국..내성 저감 국제논의 이끈다

등록 : 2017.03.10 12:54:53 수정 : 2017.03.10 12:54:53 윤상준 기자 ysj@dailyvet.co.kr

식품의약품안전처가 국제식품규격위원회(CODEX) 항생제 내성 특별위원장으로 서울대학교 수의과대학 박용호 교수를 위촉했다고 10일 밝혔다.

RECENT DISCUSSIONS IN CODEX

on AMR

2018-11-14

AMR-HongKong

DISCUSSIONS at CCEXEC70 (2015)

FAO and WHO drew the attention of CCEXEC70 to relevant decision of FAO and WHO on AMR including the ***Global Action Plan*** **of AMR** and take urgent action **to mitigate risks of inappropriate antimicrobial use and AMR**

REPLIES TO 'CIRCULA LETTER' (Codex Work)

Codex members **noted**:

- Many countries and **members need more time and experience to identify gaps/need for revision**
- CAC/RCP 61-2005 is in use since a longer time. Gaps to be addressed include:
- 1. Reference to CIA list;
- 2. The use of antimicrobials as **growth promoter**;
- 3. Use of **alternatives** to AM;
- ***4. Guidance for monitoring*** the use of AM;
- 5. Highlight the **One Health approach**;
- 6. Broaden the scope to consider all uses of AM in agriculture

ESTABLISHMENT of TFAMR

Ad hoc Intergovernmental Task Force on Antimicrobial Resistance (TFAMR) **, established at CAC39 in 2016, hosted by the Republic of Korea to:**

- Review and revise the ***Code of Practice to Minimize and Contain Antimicrobial Resistance*** to address the **entire food chain**
- Consider the development of Guidance on ***Integrated Surveillance of Antimicrobial Resistance***, taking into account the guidance developed by the **WHO Advisory Group on Integrated Surveillance of Antimicrobial Resistance (AGISAR) and relevant OIE documents**

The TFAMR will complete its work within three (max four) sessions, starting from 2017 to 2020

- **CAC40** approved the project documents of the TFAMR and establishment of **Electronic Working Group** in 2017

- TFAMR's ***5th Session was held in Jeju, Nov. 27 ~ Dec.1, 2017***

- ***6th session will be held in Busan, Dec. 10~14, 2018***

6th session will be held in Busan, Dec. 10~14, 2018

Issues expected :

- Use of AM for growth promotion to be allowed if there is risk analysis?
- Does feed contribute to AMR development?
- Efficacy and safety of AM alternatives
- Definition of terms: crop health professional, agriculture (vegetable + animal?), CIA, antimicrobial agents, therapeutic use, crop
- Approach to AMU monitoring and surveillance: stepwise, gradual, phased, needs-based

2nd OIE Global Conference on AMR

Marrakesh, Morocco, 29-31 October 2018

Speakers agree that…

- AMR tacking is one of the global key issues closely related to UN's **SDG 1**(No Poverty) and **2**(Zero Hunger).
- We all have **shared responsibility.**
- Global efforts are required along with regional efforts as in climate change issue.

2nd OIE Global Conference on AMR
Marrakesh, Morocco, 29-31 October 2018

What international organizations highlight

- International organizations emphasize enhanced cooperation between **OIE, FAO, WHO +** UNEP + Industries + National Governments + Private Sector + Media + Patent Holder + Civil Societies + Consumers **based on One Health approach**.

- From economic perspective, **World Bank and Fleming Fund** stress the importance of investment in agriculture, infrastructure, public health, vaccine, hygiene and feed.

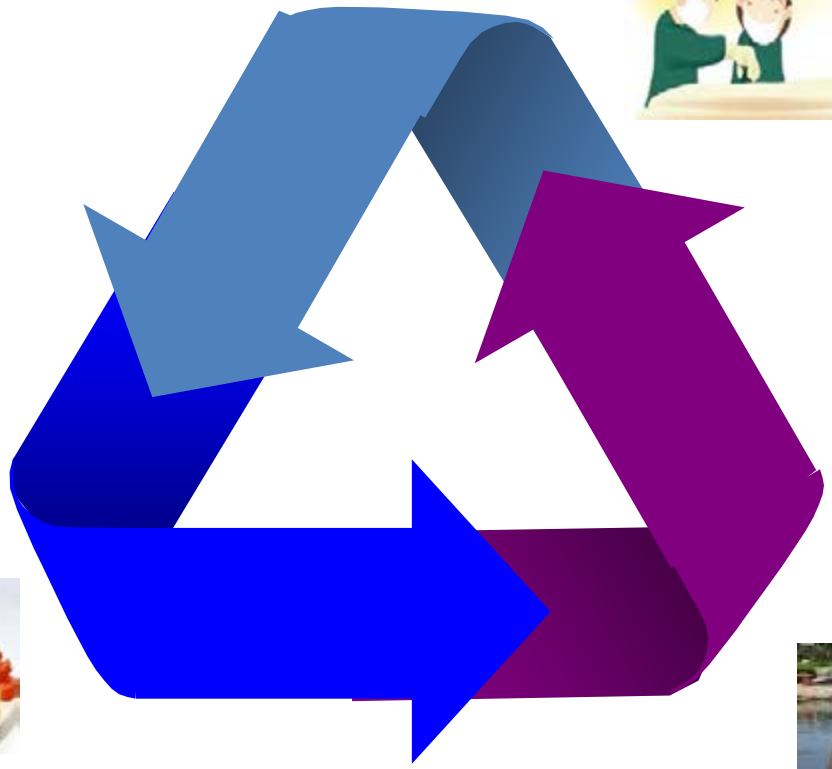
International collaboration

- **OIE** have emphasized the importance of prudential and rational use of antimicrobials in animals in order **to minimize the possible impact of animal antimicrobial usage on public and animal health**.
- A guiding principle with respect to antimicrobial usage should be **"as little as possible, as much as necessary".** ***It is essential that all parties work together to ensure safe use and to minimize the development of resistance.***

- It has been suggested that an *intergovernmental panel on AR*, akin to the **Intergovernmental Panel on Climate Change** (Woolhouse et.al, 2015)

“One Health” approach

Human health communities



Animal health communities

Environmental communities