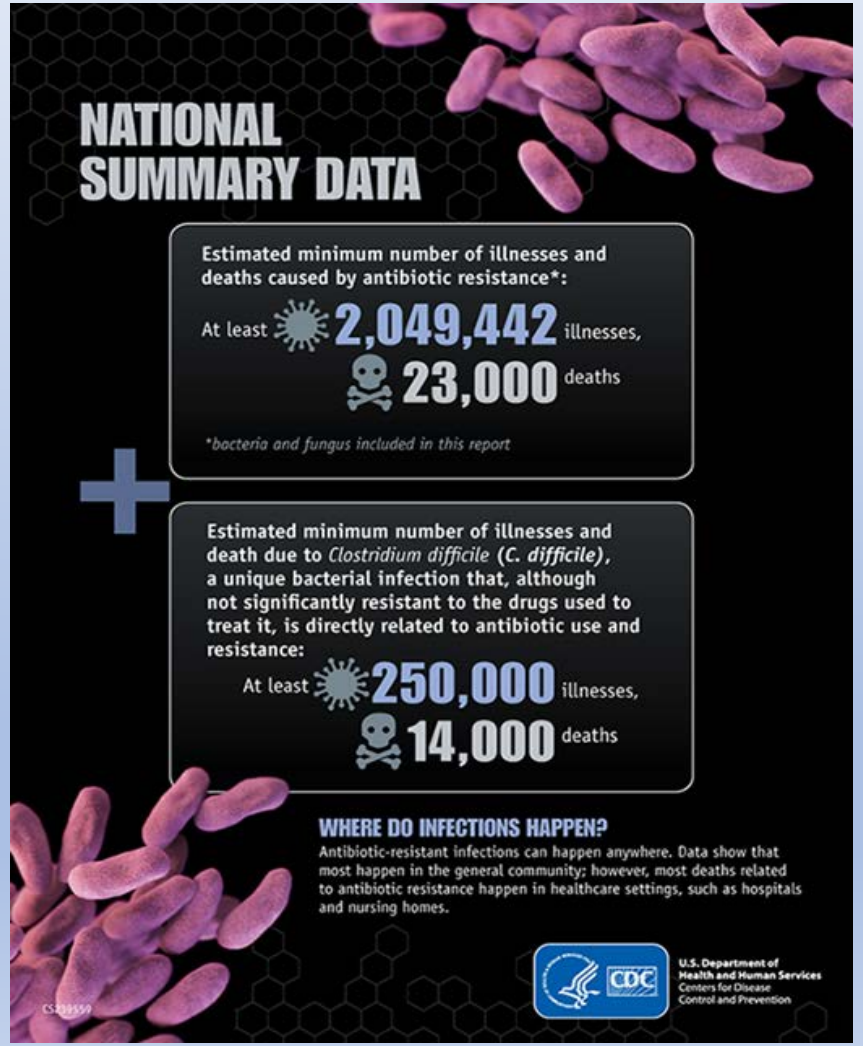
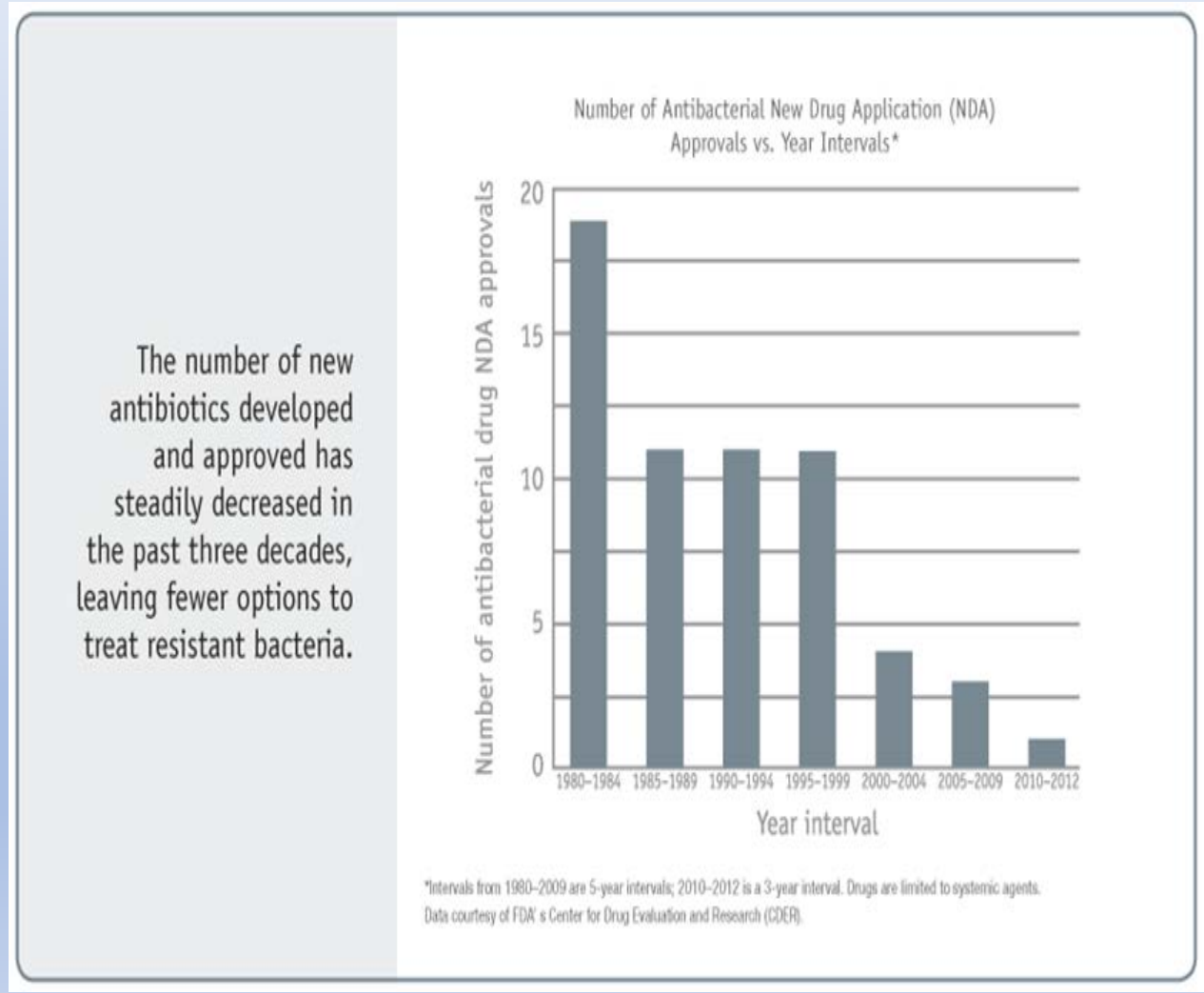
GLOBAL HEALTH CONFERENCE

PROGRESS AND CHALLENGE OF THE VETERINARY PROFESSION FOR THE AMR CONTAINMENT

Dra. Macarena Vidal Ogueta
DEAN OF VETERINARY SCHOOL
UNIVERSIDAD MAYOR
PANVET PRESIDENT

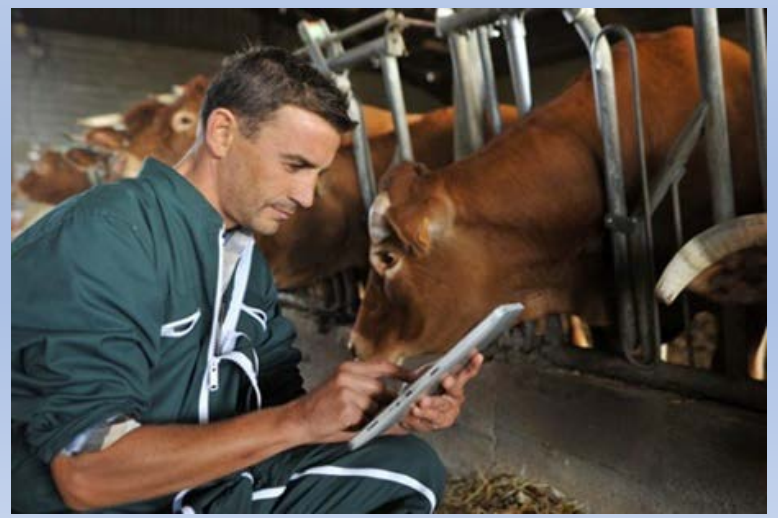
AMR


NATIONAL SUMMARY DATA
Estimated minimum number of illnesses and deaths caused by antibiotic resistance*:
At least 2,049,442 illnesses,
23,000 deaths
*bacteria and fungus included in this report
Estimated minimum number of illnesses and death due to Clostridium difficile (C. difficile), a unique bacterial infection that, although not significantly resistant to the drugs used to treat it, is directly related to antibiotic use and resistance:
At least 250,000 illnesses,
14,000 deaths
WHERE DO INFECTIONS HAPPEN?
Antibiotic-resistant infections can happen anywhere. Data show that most happen in the general community; however, most deaths related to antibiotic resistance happen in healthcare settings, such as hospitals and nursing homes.
CDC
U.S. Department of Health and Human Services
Centers for Disease Control and Prevention


The number of new antibiotics developed and approved has steadily decreased in the past three decades, leaving fewer options to treat resistant bacteria.
Number of Antibacterial New Drug Application (NDA) Approvals vs. Year Intervals*
Number of antibacterial drug NDA approvals
0
5
10
15
20
1980–1984
1985–1989
1990–1994
1995–1999
2000–2004
2005–2009
2010–2012
Year interval
*Intervals from 1980–2009 are 5-year intervals; 2010–2012 is a 3-year interval. Drugs are limited to systemic agents.
Data courtesy of FDA's Center for Drug Evaluation and Research (CDER).

MISSION

Serve the continent's veterinary medical profession by promoting their rights and pointing out their obligations and quality standards by strengthening the development of veterinary sciences in the areas of animal and human health, animal welfare, animal production and productivity, contributing to the protection and sustainability of the environment for the benefit of society.



VIEW

Represent the veterinary medical profession and the veterinary sciences in all aspects, in the American continent.

Strengthen its recognition as the leading association of the continent in: Education, organization and defense of professional interests, veterinary regulation, scientific research and dissemination of veterinary sciences.

Maintain its leadership as a reference body for its members.

Consolidate its position as a promoter of innovations in professional evaluation and certification processes, institutional accreditation that makes it possible to guarantee the quality of the professional practice of the veterinarian

PAN AMERICAN ASSOCIATION OF VETERINARY SCIENCES

www.panvet.vet

LA GLOBALIZACIÓN

La globalización ha sido acelerada en nuestro tiempo por una revolución científica y tecnológica. Y tiene repercusiones políticas, sociales y culturales de largo alcance que es importante visualizar.

POLÍTICA

SOCIAL

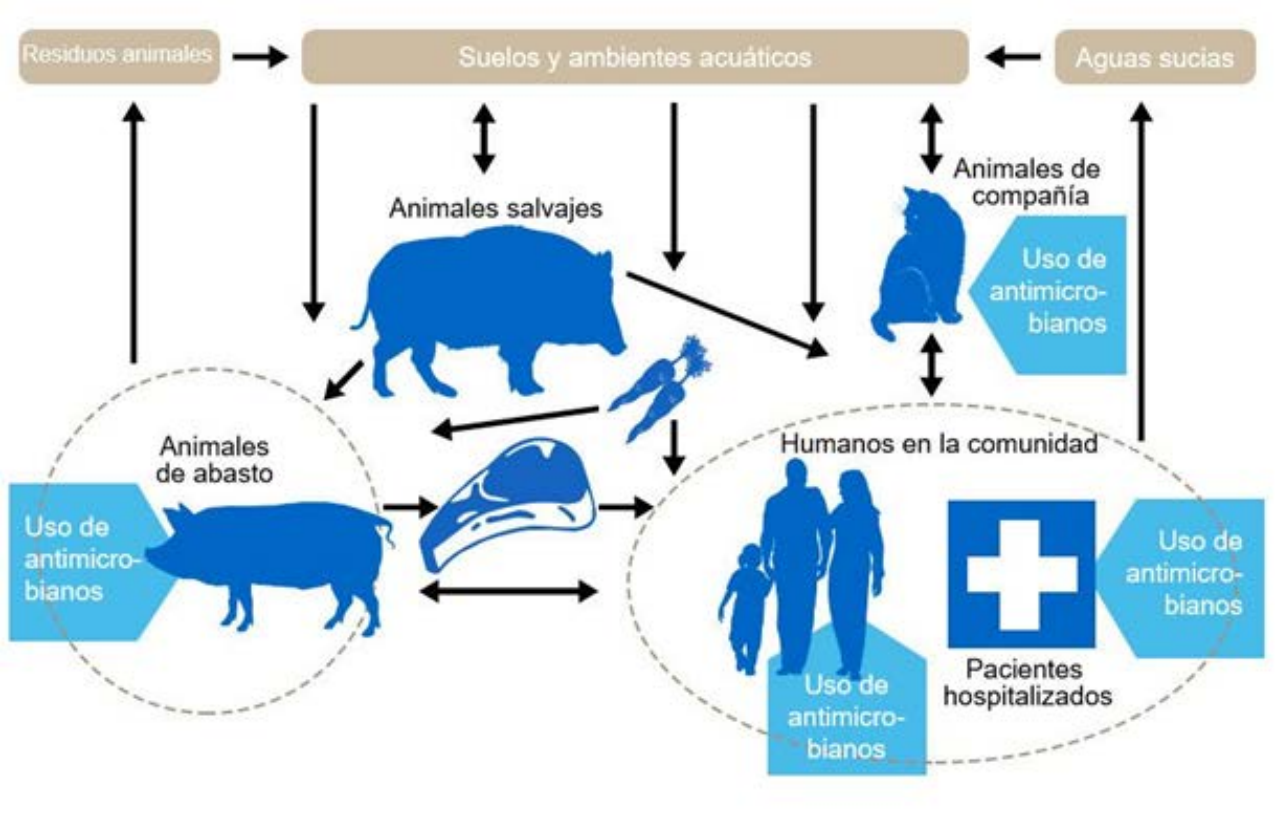
CULTURAL

THE HEALTH OF MAN, ANIMALS AND THE ENVIRONMENT ARE INTERCONNECTED FOCUS ON HEALTH

A multidisciplinary collaborative effort that focuses on the interconnection of a large ecosystem to achieve the optimal health of humans, animals and environments around the world.

AMR IS A PROBLEM

Determinants of antimicrobials resistance



✓ The RAM is consubstantial to the use of antimicrobials

Resistance factors:

✓ Amount use

✓ use time

ANTIBIOTICS USED IN ANIMALS ARE CONNECTED WITH HUMAN HEALTH

- ✓ The use of antibiotics in food-producing animals can select bacteria that are resistant to antibiotics (including those that are pathogenic to humans).
- ✓ Resistant bacteria can be transmitted from food-producing animals to humans through the food supply
- ✓ Resistant bacterial pathogens cause diseases in humans.
- ✓ Infections caused by resistant bacteria cause adverse effects on human health.

CRYTICALLY IMPORTANT VETERINARY ANTIMICROBIAL AGENTS

- HIGHLY IMPORTANT:

✓ Rifampicin, Rifaximin, Fosfomycin, Ionophores, Lincosamides, Bacitracin, Colistin, Polymyxin, Quinolones, Fluoroquinolones, Sulfonamides, Sulfonamides-Trimethoprim, Tetracyclines, Tiamulin,

- IMPORTANT:

✓ Bicozamycin, Novobiocin, Avilamycin, Virginiamicin

CRITICALLY IMPORTANT VETERINARY ANTIMICROBIAL AGENTS

- CRITICALLY IMPORTANT

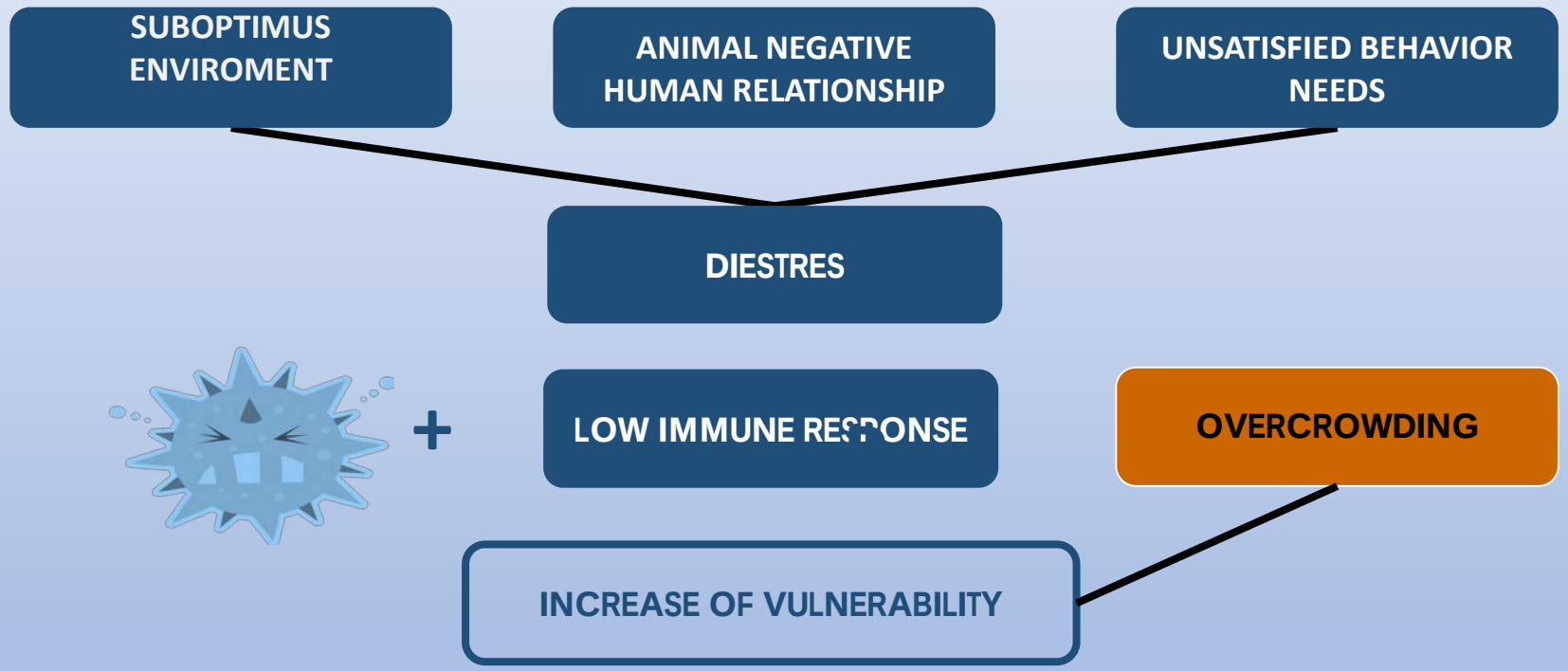
✓ Aminoglycosides: Spectinomycin, Streptomycin, Kanamycin, Neomycin, Gentamicin, Tobramycin, Amikacin, ...

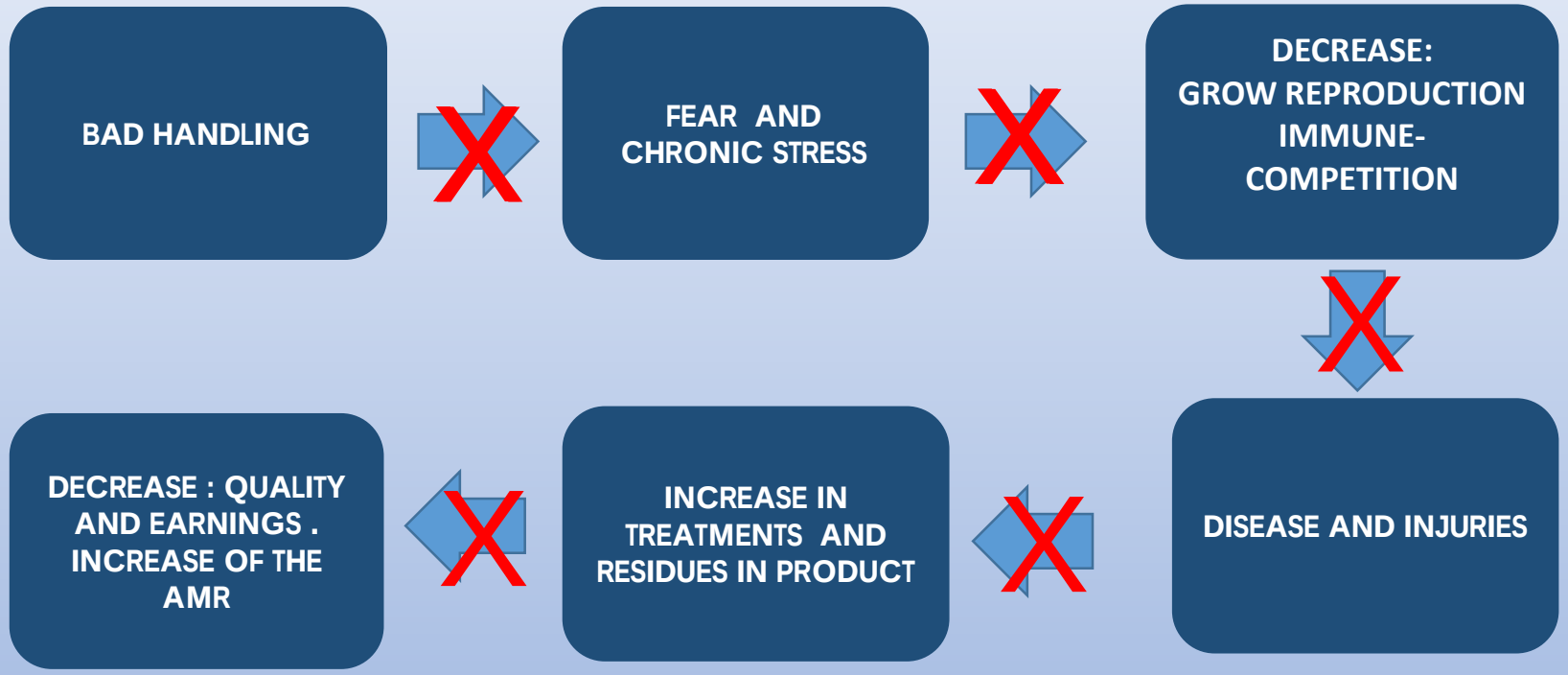
✓ Cephalosporins: 1st, 2nd, 3rd (Cefoperazone, Ceftiofur, Ceftriazone) and 4th generation (Cefquinoma)

✓ Macrolides: Tulatromycin, Erythromycin, Spiromycin, Tylosin
✓ Beta lactams: Benzylpenicillin, Procaine penicillin, Amoxicillin, Ampicillin, Amoxicillin-Aclavlavoline, Cloxacillin, Oxacillin, ...

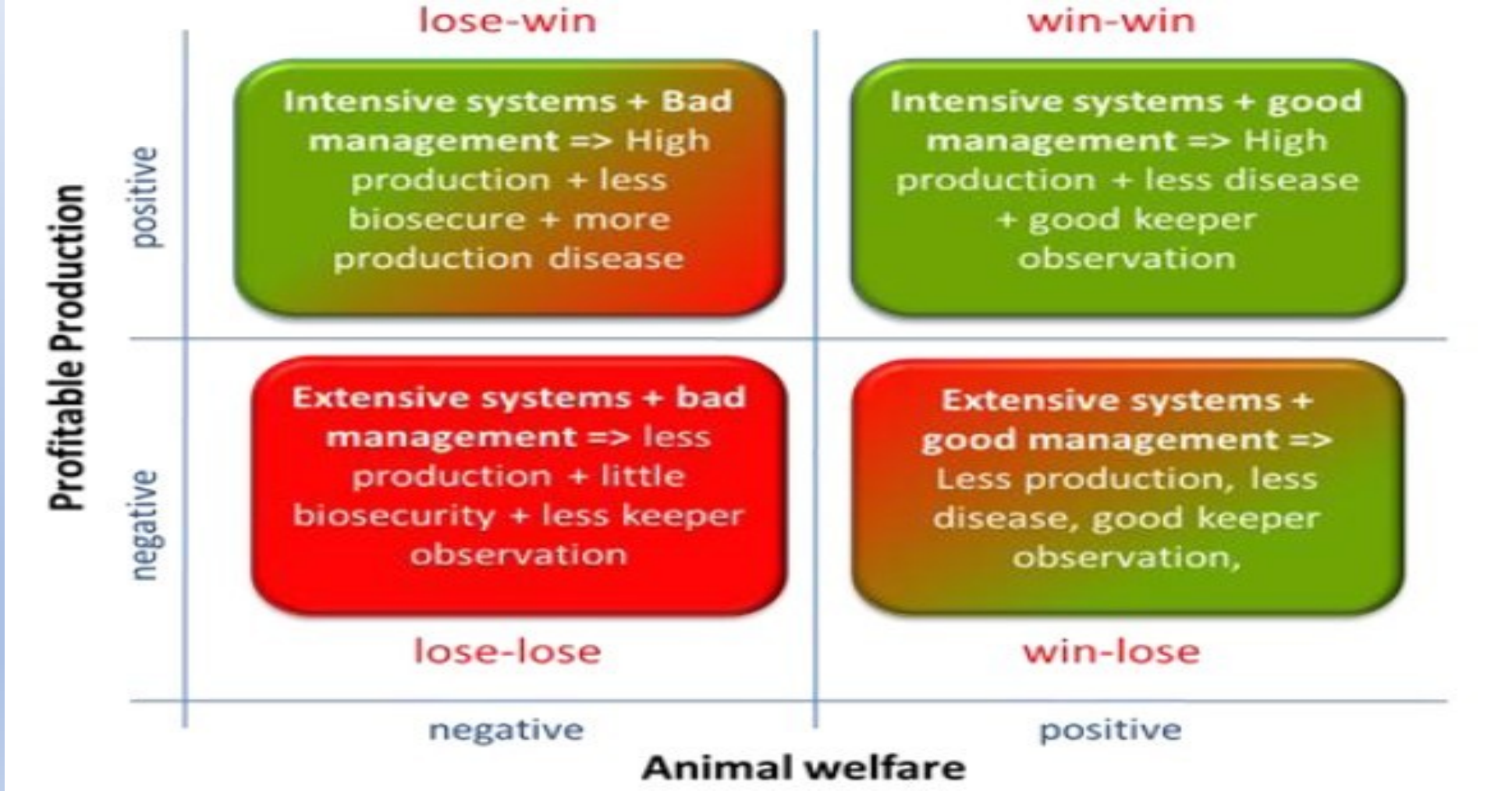
✓ Phenicols: Florfenicol

Intensification of Production



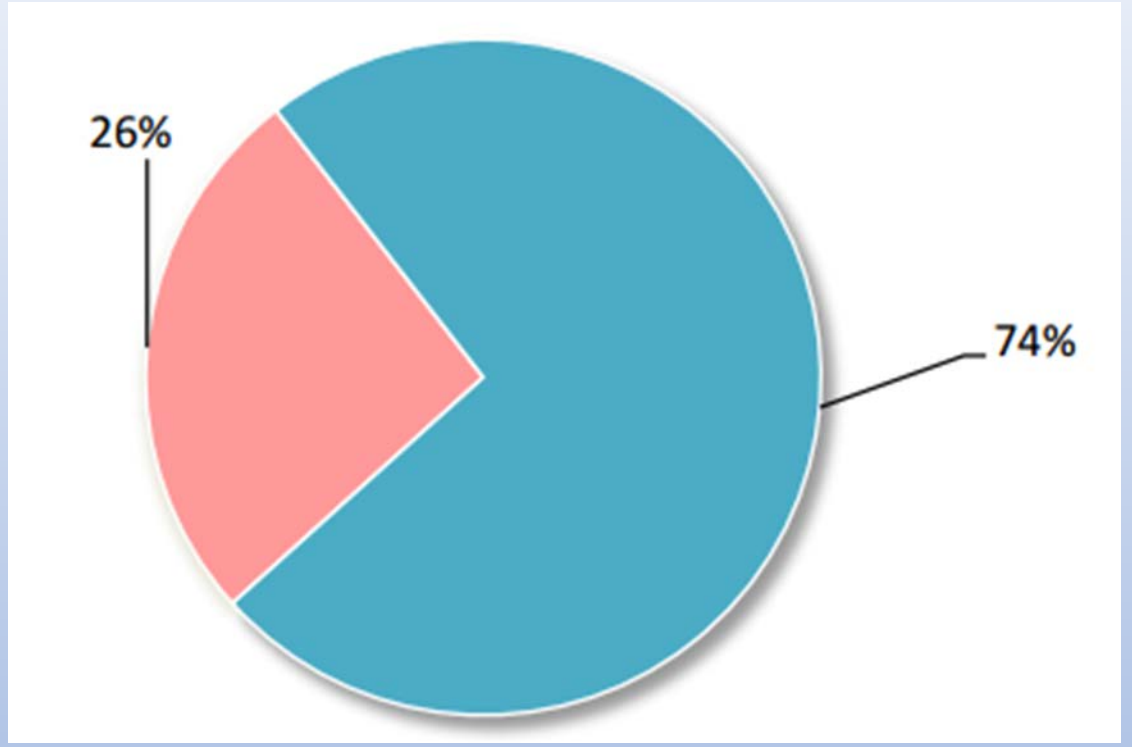

BAD HANDLING
FEAR AND CHRONIC STRESS
DECREASE: GROW REPRODUCTION IMMUNE- COMPETITION
DISEASE AND INJURIES
INCREASE IN TREATMENTS AND RESIDUES IN PRODUCT
DECREASE : QUALITY AND EARNINGS . INCREASE OF THE AMR

ANIMAL PRODUCTION



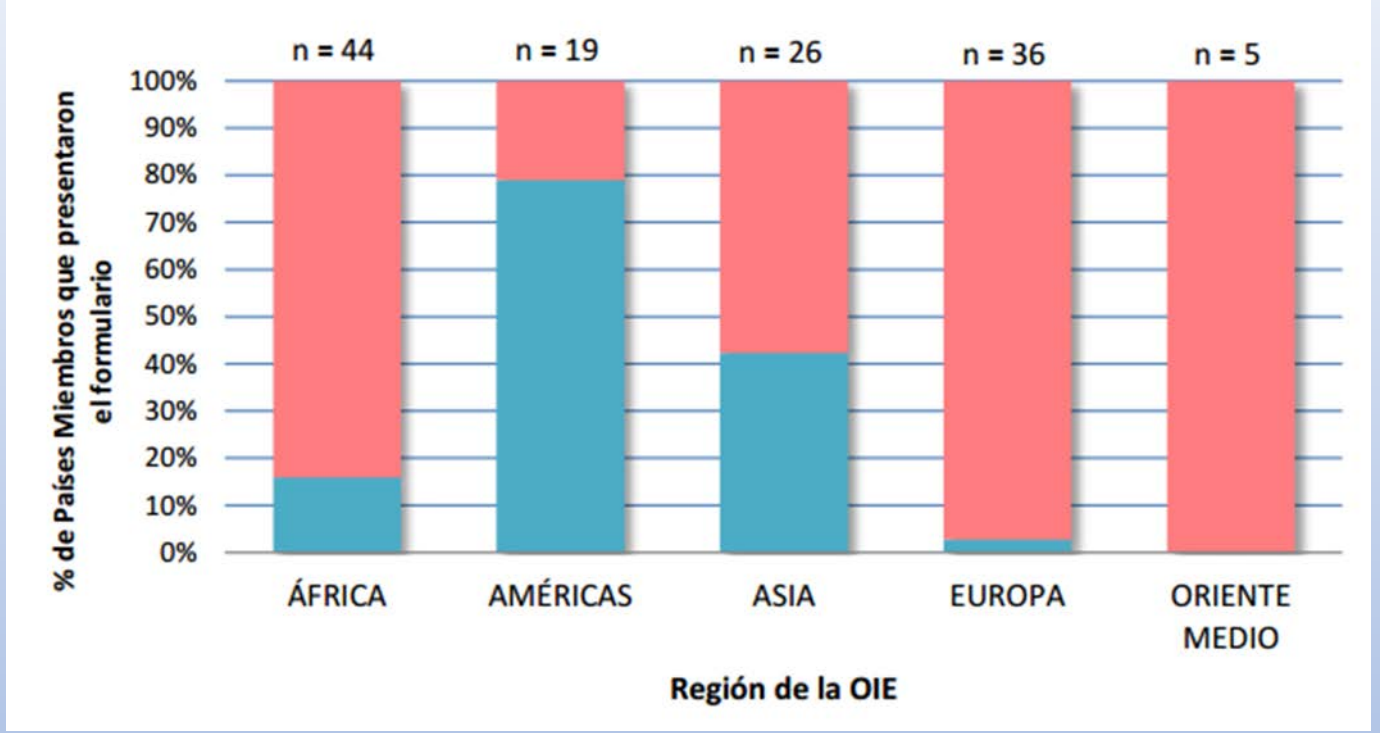
Growth Promoters

Antimicrobial agents authorized as growth promoters, OIE 2015.



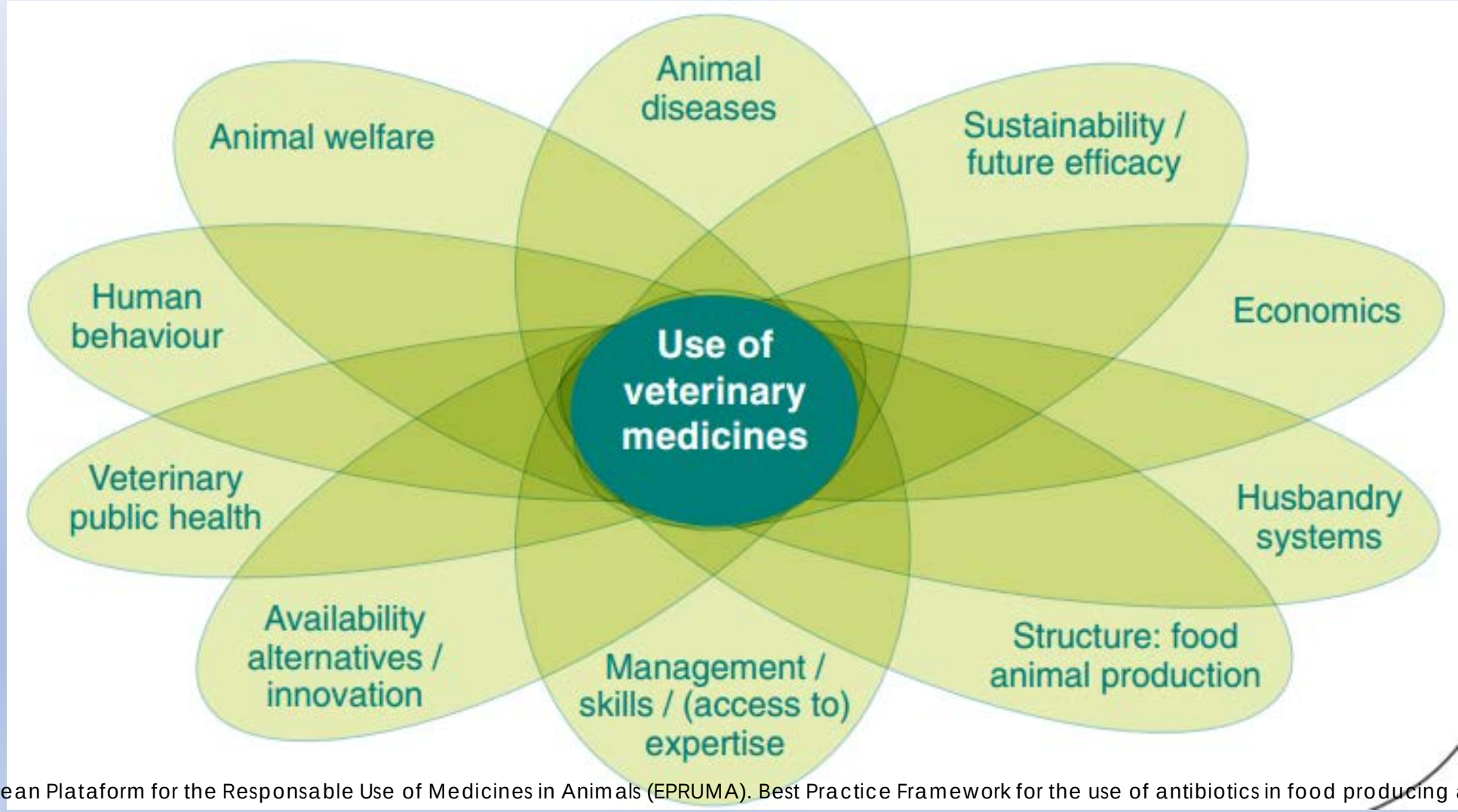
Growth Promoters

Antimicrobial agents authorized as growth promoters, OIE 2015.



- antimicrobial agents as authorized growth promoters
- antimicrobial agents as growth promoters not authorized

DIFFERENT FACTORS



Fuente: European Plataform for the Responsable Use of Medicines in Animals (EPRUMA). Best Practice Framework for the use of antibiotics in food producing animals

GLOBAL ACTION PLANS WHO

Antimicrobial resistance

GLOBAL ACTION PLAN ON ANTIMICROBIAL RESISTANCE

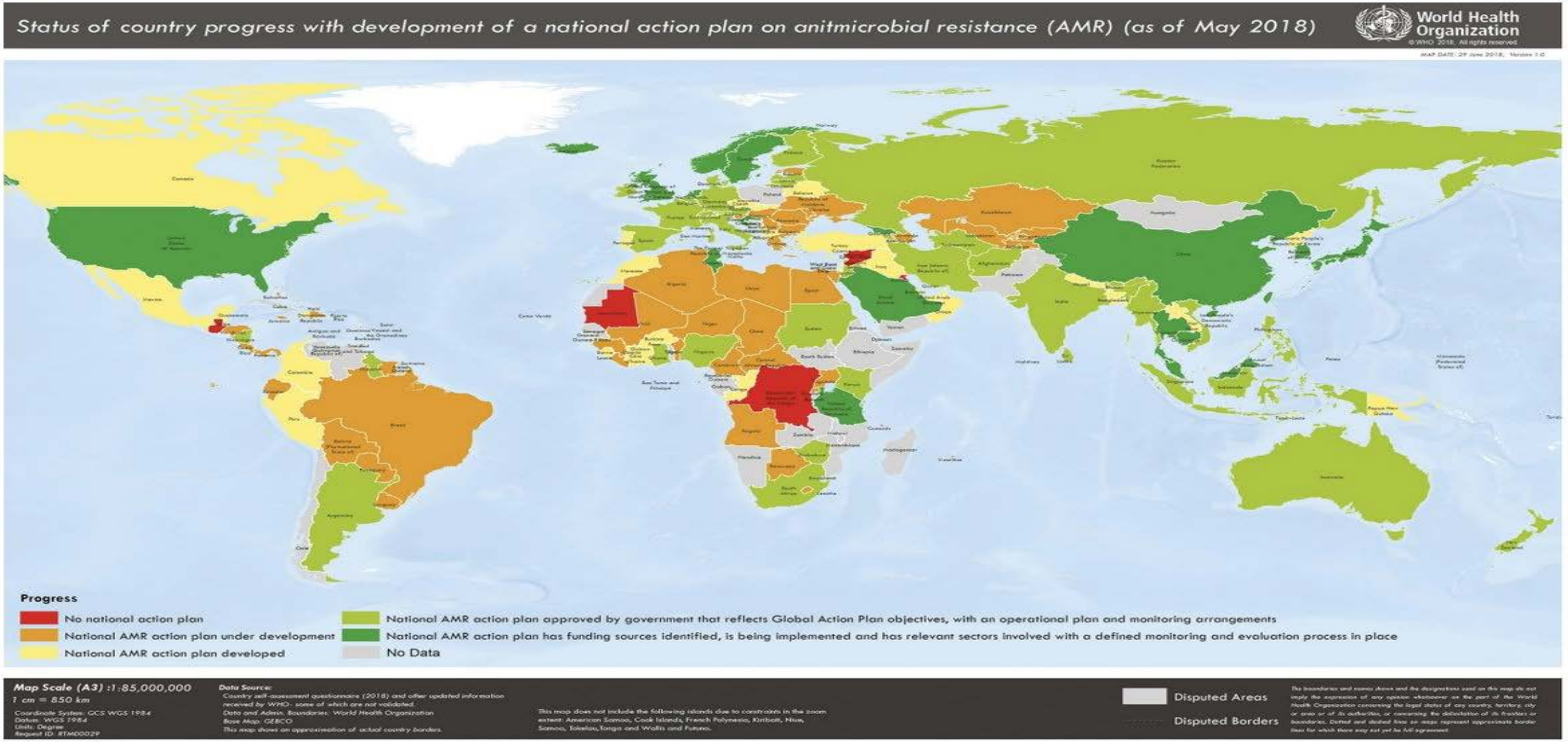
Monitoring of PANVET Countries Progress on Antimicrobial Resistance (AMR): Country self-assessment questionnaire (version two)

All Questions

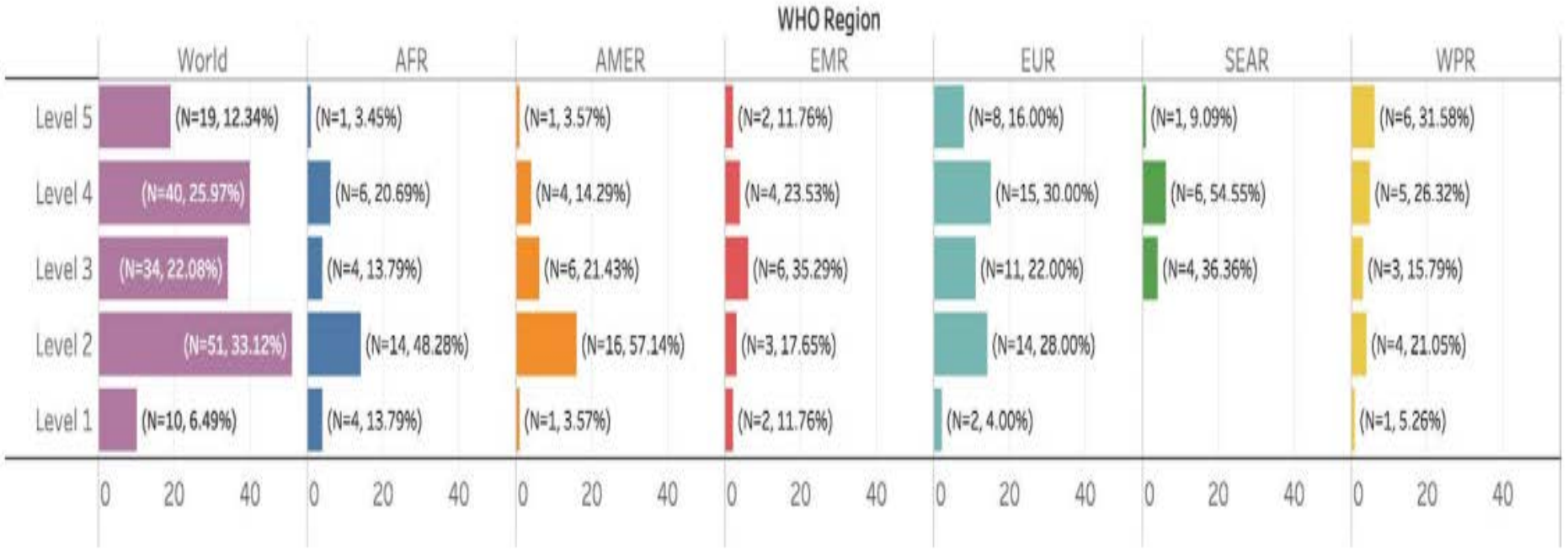
- 4.1 Multi-sector and One Health collaboration/coordination
- 4.2 Which sectors are actively involved in developing and implementing the AMR National Action Plan?
- 5.1 Country progress with development of a national action plan on AMR
- 5.2 Is your country's national action plan on AMR linked to any other existing action plans, strategies or targets related to HIV, tuberculosis, malaria or neglected tropical diseases?
- 6.1 Raising awareness and understanding of antibiotic resistance risks and response in human health
- 6.2 Raising awareness and understanding of AMR risks and response in animal health, plant health, food production, food safety, and environment sectors
- 6.3 Training and professional education on AMR in the human health sector
- 6.4 Training and professional education on AMR in the veterinary sector
- 6.5 Training and professional education on AMR in farming sector (animal and plant), food production, food safety and the environment
- 6.6 Progress with strengthening veterinary services
- 7.1 National monitoring system for consumption and rational use of antimicrobials in human health
- 7.2 National monitoring system for antimicrobials intended to be used in animals (sales/use)
- 7.3 National monitoring system for antimicrobial use in plant production
- 7.4 National surveillance system for antimicrobial resistance (AMR) in humans
- 7.5 National surveillance system for antimicrobial resistance (AMR) in animals, plants, foods and environment
- 8.1 Infection Prevention and Control (IPC) in human health care
- 8.2 Good health, management and hygiene practices to reduce the use of antimicrobials in animal and plant production and AMR transmission in food production
- 9.1 Optimizing antimicrobial use in human health
- 9.2 Optimizing antimicrobial use in animal and plant health
- 9.3 Legislation and/or regulations to prevent contamination of the environment with antimicrobials*
- 9.4 Country use policy and regulatory status

Status of PANVET countries progress with developed of a national action plan of AMR

Figure 1.



Global and regional progress in the development of national action plans.



Level 5: National AMR action plan has funding sources identified, is being implemented and has relevant sectors involved with a defined monitoring and evaluation process in place.

Level 4: National AMR action plan approved by government that reflects Global Action Plan objectives, with an operational plan and monitoring arrangements.

Level 3: National AMR action plan developed.

Level 2: National AMR action plan under development.

Level 1: No national AMR action plan.

Canada	4.1	B	Multi-sectoral working group(s) or coordination committee on AMR established with Government leadership.	AMER	North America	Americas	HIC
	4.2	Y	Yes				
	5.1	C	National AMR action plan developed.				
	5.2	N	No				
	6.1	C	Limited or small-scale antibiotic resistance awareness campaign targeting some, but not all, relevant stakeholders (e.g. general public, doctors, pharmacists, nurses, medicine sellers).				
	6.2		No data received				
	6.2.1	C	C - Limited or small-scale antimicrobial resistance awareness campaign targeting some but not all relevant stakeholders within sector.				
	6.2.2	C	C - Limited or small-scale antimicrobial resistance awareness campaign targeting some but not all relevant stakeholders within sector.				
	6.2.3	B	B - Some activities in parts of the country to raise awareness about risks of antimicrobial resistance and actions that can be taken to address it.				
	6.2.4	B	B - Some activities in parts of the country to raise awareness about risks of antimicrobial resistance and actions that can be taken to address it.				
	6.2.5	B	B - Some activities in parts of the country to raise awareness about risks of antimicrobial resistance and actions that can be taken to address it.				
	6.3	C	AMR is covered in 1) some pre-service training and in 2) some in-service training or other continuing professional development (CPD) for human health workers.				
	6.4	B	Ad hoc AMR training courses available for veterinary related professionals.				
	6.5	A	No training provision on AMR for key stakeholders, e.g. farmers and farm workers, extension workers, food and feed processors and retailers,				

UNIVERSIDAD MAYOR

7.1	C	Total sales of antimicrobials are monitored at national level and/or some monitoring of antibiotic use at sub-national level.
7.2	C	Data collected and reported on total quantity of AMs sold for/used in animals and their intended type of use (therapeutic or growth promotion).
7.3	D	Data collected and reported on total quantity of AM used nationally in plant production.
7.4	C	National AMR surveillance activities are in place for common bacterial pathogens that link patient information with susceptibility testing, with a national reference laboratory that participates in external quality assurance.
7.5		No data received
7.5.1	E	E - National system of surveillance of AMR established for priority pathogens and for relevant commensal bacteria which follows quality assurance processes in line with intergovernmental standards. Laboratories that report for AMR surveillance follow quality assurance processes.
7.5.2	A	A - No national plan for a system of monitoring of AMR is available.
7.5.3	E	E - National system of surveillance of AMR established for priority pathogens and for relevant commensal bacteria which follows quality assurance processes in line with intergovernmental standards. Laboratories that report for AMR surveillance follow quality assurance processes.
7.5.4	A	A - No national plan for a system of monitoring of AMR is available.
8.1	C	A national IPC programme and operational plan are available and national guidelines for health care IPC are available and disseminated. Selected health facilities are implementing the guidelines, with monitoring and feedback in place.
8.2		No data received
8.2.1	C	C - National plan agreed to ensure good production practices in line with international standards (e.g. OIE Terrestrial and Aquatic Codes, Codex Alimentarius). Nationally agreed guidance for good production practices developed, adapted for implementation at local farm and food production level.
8.2.2	B	B - Some activities in place to develop and promote good production practices.
8.2.3	C	C - National plan agreed to ensure good production practices in line with international standards (e.g. OIE Terrestrial and Aquatic Codes, Codex Alimentarius). Nationally agreed guidance for good production practices developed, adapted for implementation at local farm and food production level.
8.2.4	C	C - National plan agreed to ensure good production practices in line with international standards (e.g. OIE Terrestrial and Aquatic Codes, Codex Alimentarius). Nationally agreed guidance for good production practices developed, adapted for implementation at local farm and food production level.
8.2.5	A	A - No systematic efforts to improve good production practices to reduce the need to use antimicrobials.
9.1	C	Practices to assure appropriate antimicrobial use being implemented in some healthcare facilities and guidelines for appropriate use of antimicrobials available.
9.2		No data received
9.3	B	Legislation and/or regulations are in place to control at least the release of human sewage into the environment.
9.4	Y	Yes

Country	Question	2017	Answer	WHO Region	FAO Region	OIE Region	WB income group
United States of America	4.1	E	Integrated approaches used to implement the national AMR action plan.	AMER	North America	Americas	HIC
	4.2	N	No				
	5.1	E	National AMR action plan has funding sources identified, is being implemented and has relevant sectors involved with a defined monitoring and evaluation process in place.				
	5.2	Y	Yes				
	6.1	E	Focused, national scale government-supported activities implemented to change behaviour regarding antibiotic resistance in target groups in human health, both public and private sectors, with monitoring undertaken of their awareness and behaviour change over last 5 years.				

6.2	D	Nationwide, government-supported antimicrobial resistance awareness campaign targeting all or the majority of relevant stakeholders within sector.
6.2.1	E	E - Focused, national scale government supported activities implemented to change behavior of relevant stakeholders within sector, with monitoring undertaken of their awareness and behaviour change over last 2-5 years.
6.2.2	C	C - Limited or small-scale antimicrobial resistance awareness campaign targeting some but not all relevant stakeholders within sector.
6.2.3	E	E - Focused, national scale government supported activities implemented to change behavior of relevant stakeholders within sector, with monitoring undertaken of their awareness and behaviour change over last 2-5 years.
6.2.4	E	E - Focused, national scale government supported activities implemented to change behavior of relevant stakeholders within sector, with monitoring undertaken of their awareness and behaviour change over last 2-5 years.
6.2.5	C	C - Limited or small-scale antimicrobial resistance awareness campaign targeting some but not all relevant stakeholders within sector.
6.3	E	AMR is systematically and formally incorporated in pre-service training curricula for all relevant human health cadres. In-service training or other CPD on AMR is taken up by relevant groups for human health nationwide, in public and private sectors.
6.4	E	AMR is systematically and formally incorporated in curricula for graduating veterinarians and veterinary paraprofessionals when relevant and continuing professional training is a formal requirement.
6.5	B	Tailored ad hoc AMR training courses available for at least two groups of key stakeholders.
6.6	E	Documented evidence of strong capacity in compliance with OIE standards on the quality of Veterinary Services*.
7.1	E	On a regular basis (every year/two years) data is collected and reported on:Antimicrobial sales or consumption at national level for human use; andAntibiotic prescribing and appropriate/rational use, in a representative

7.1	E	On a regular basis (every year/two years) data is collected and reported on:Antimicrobial sales or consumption at national level for human use; andAntibiotic prescribing and appropriate/rational use, in a representative sample of health facilities, public and private.
7.2	C	Data collected and reported on total quantity of AMs sold for/used in animals and their intended type of use (therapeutic or growth promotion).
7.3	C	Data collected and reported on quantity of AM used in some subsectors of plant production.
7.4	C	National AMR surveillance activities are in place for common bacterial pathogens that link patient information with susceptibility testing, with a national reference laboratory that participates in external quality assurance.
7.5	E	National system of surveillance of AMR established for priority pathogens and for relevant commensal bacteria which follows quality assurance processes in line with intergovernmental standards. Laboratories that report for AMR surveillance follow quality assurance processes.
7.5.1	C	C - Some AMR data is collected locally but may not use a standardised approach and lacks national coordination and/or quality management.
7.5.2	A	A - No national plan for a system of monitoring of AMR is available.
7.5.3	E	E - National system of surveillance of AMR established for priority pathogens and for relevant commensal bacteria which follows quality assurance processes in line with
7.5.4	A	A - No national plan for a system of monitoring of AMR is available.
8.1	D	National IPC programme available according to the WHO IPC core components guidelines* and IPC plans and guidelines implemented nationwide. All health care facilities have a functional built environment (including water and sanitation), and necessary materials and equipment to perform IPC, per national standards.
8.2	D	Nationwide implementation of plan to ensure good production practices and national guidance published and disseminated.
8.2.1	C	C - National plan agreed to ensure good production practices in line with international standards (e.g. OIE Terrestrial and Aquatic Codes, Codex Alimentarius). Nationally agreed guidance for good production practices developed, adapted for implementation at local farm and food production level.
8.2.2	C	C - National plan agreed to ensure good production practices in line with international standards (e.g. OIE Terrestrial and Aquatic Codes, Codex Alimentarius). Nationally agreed guidance for good production practices developed, adapted for implementation at local farm and food production level.
8.2.3	C	C - National plan agreed to ensure good production practices in line with international standards (e.g. OIE Terrestrial and Aquatic Codes, Codex Alimentarius). Nationally agreed guidance for good production practices developed, adapted for implementation at local farm and food production level.

8.2.4	C	C - National plan agreed to ensure good production practices in line with international standards (e.g. OIE Terrestrial and Aquatic Codes, Codex Alimentarius). Nationally agreed guidance for good production practices developed, adapted for implementation at local farm and food production level.
8.2.5	B	B - Some activities in place to develop and promote good production practices.
9.1	D	Guidelines and other practices to enable appropriate use are implemented in most health facilities nationwide. Monitoring and surveillance results are used to inform action and to update treatment guidelines and essential medicines lists.
9.2	E	Guidelines for responsible and prudent use of antimicrobials based on international standards (e.g. OIE Terrestrial and Aquatic Codes, Codex Alimentarius) are available according to animal species and/or production sector and include restriction of specific antimicrobial classes listed as Critically Important for humans and animals.
9.3	E	There is a functioning system for monitoring regulatory compliance of all waste discharge to the environment (sewage, health facilities, agriculture, manure and industrial effluent). Regulations are in place that limit discharge of all antimicrobial residues into the environment, including in municipal and pharmaceutical industry waste and wastewater.
9.4	Y	Yes

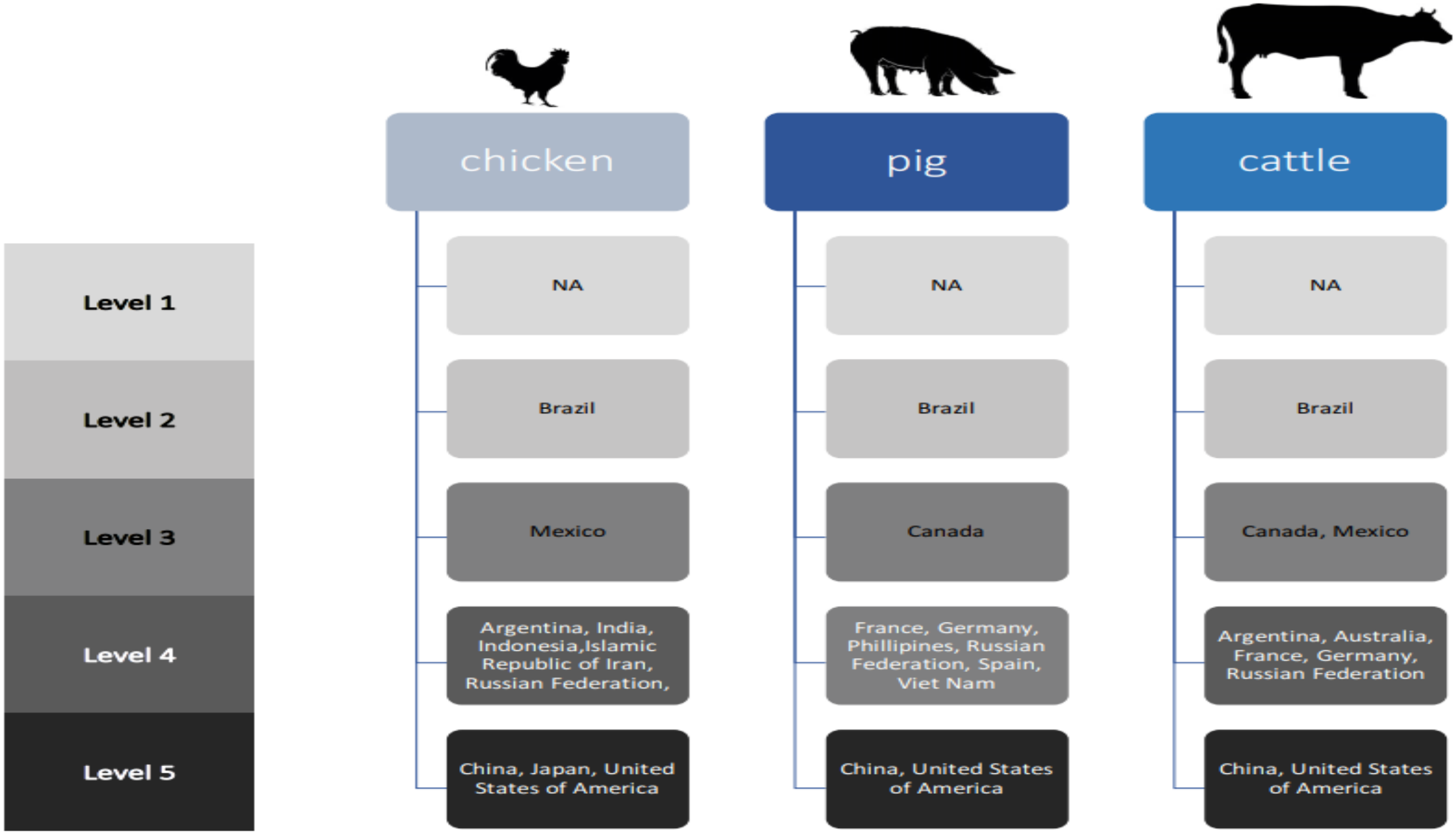
Venezuela (Bolivarian Republic of)	4.1		No data received	AMER	Latin America and Carribean (RLC)	Americas	MIC (upper)
	4.2	N	No				
	5.1		No data received				
	5.2						
	6.1		No data received				
	6.2		No data received				
	6.2.1		No data received				
	6.2.2		No data received				

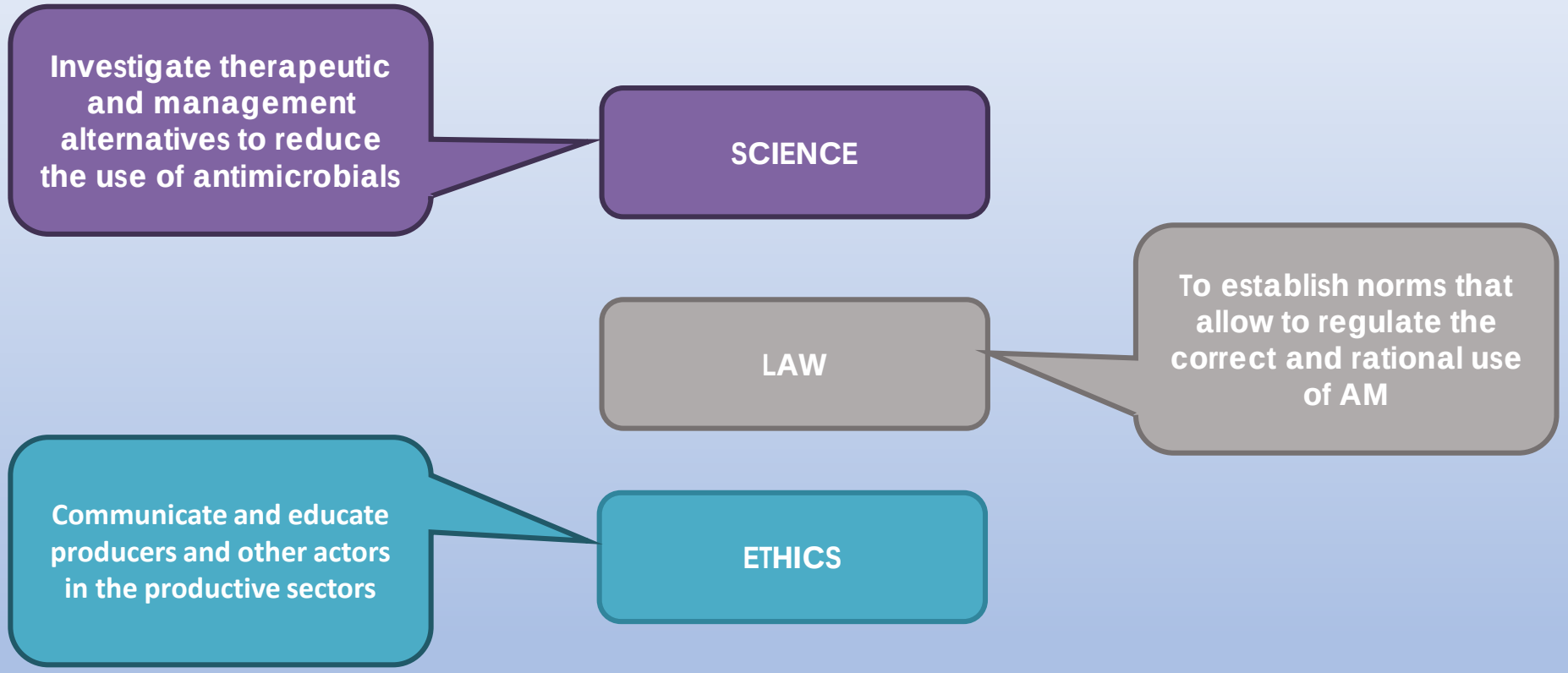
6.2.3		No data received
6.2.4		No data received
6.2.5		No data received
6.3		No data received
6.4		No data received
6.5		No data received
6.6		No data received
7.1		No data received

7.2		No data received
7.3		No data received
7.4		No data received
7.5		No data received
7.5.1		No data received
7.5.2		No data received
7.5.3		No data received
7.5.4		No data received

8.1		No data received
8.2		No data received
8.2.1		No data received
8.2.2		No data received
8.2.3		No data received
8.2.4		No data received
8.2.5		No data received
9.1		No data received
9.2		No data received
9.3		No data received
9.4	N	N/A

Figure 4. National action plan progress among the top 10 meat-producing countries (Chicken-Pig-Cattle) that responded to the survey.




Investigate therapeutic and management alternatives to reduce the use of antimicrobials
SCIENCE
LAW
To establish norms that allow to regulate the correct and rational use of AM
Communicate and educate producers and other actors in the productive sectors
ETHICS

INTENSIVE SYSTEMS OF ANIMAL PRODUCTION

AMR: Challenges for animal production

- Normative
- Training
- Surveillance
- Responsible use
- Prevention

Regulatory framework

Competent Authority

To align the different actors in order to reduce and contain AMR.

Manufacturing, quality and marketing

The Authority must establish the conditions for manufacturing, quality control as well as commercialization of antimicrobials

Use of medications

Prescription MV, records in farms, use according to label as also extra-label and its use as promoters of growth

Surveillance

(Public Health)

Integrated

Feed, animals, food, environment, humans

Pathogens and indicators

Salmonella, Campylobacter, E. Coli, Enterococci, others

Constant

The analysis should consider monitoring the resistance of bacteria over time

Surveillance

(Antibiotic use)

OIE

Has established guidelines for monitoring the use of antimicrobials in animals

Various sources

- Manufacturing
- Sales and purchases
- Prescriptions
- Food factories
- Registration in farms

Required information

- Kilograms of active ingredient
- Number of animals per species
- Weight of animals
- Dosage (dose, interval, treatment duration)

Responsible use of antimicrobials

Only when it is necessary

After a clinical examination and diagnosis of bacterial disease

Selection

Of the most appropriate antimicrobial based on clinical experience, laboratory information, pharmacodynamics and pharmacokinetics, as well as the list of OIE-relevant antimicrobials

Prescription

The MV must provide a detailed treatment protocol

Records

Inventory of antimicrobial products, treatment schedule, identification of animals, periods of deficiency, bacterial susceptibility

Control and Prevention

Accommodation conditions

Management of densities, temperatures, ventilation

Rustic animals

Selection of breeds / crosses of more resistant animals

Animal welfare

Animals with high levels of well-being have a more competent immune system to fight the entry of pathogens

Control and Prevention

Nutrition

Food is essential for an optimal health response

Vaccination

Immunization is one of the most effective protective measures

Protective products

Oriented to improve intestinal health and prevent entry and establishment of pathogens

Control and Prevention

Health Plan

What detail preventive and control measures for infectious diseases of greater risk and importance

Biosecurity

Central pillar for the prevention of the entrance of infectious agents

Hygiene and disinfection

Maintenance of a clean environment with a controlled load of microorganisms

WHAT HAVE WE DONE?

- Raising awareness about livestock: biosecurity, prevention, management welfare...
- More transparency and responsibility
- Collaboration between different professional and agents: breeders, veterinarians, animal health industry, stakes holders, Administrations, research centers ...)
- Development of guides to good practices in the responsible use of antimicrobials. Ej. EPRUMA European platform for the responsible use of veterinary medicines, promotion of best practices and guarantee of animal health, animal welfare and public health that encompasses all sectors that unites the best production practices with animal health and public health.

CONCLUSIONS “CHALLENGE OF THE VETERINARY PROFESSION FOR THE AMR CONTAINMENT

- ✓ Development and investigation (D + I)
- ✓ Impulse for the development of new molecules.
- ✓ Development of rapid diagnostic tools (for the realization of oriented treatments).
- ✓ Diagnosis of the pathogen Antibiogram
- ✓ Development of vaccines for the prevention of diseases
- ✓ Application Good Production Practices

RAM IS A SERIOUS PROBLEM IN VETERINARY.

- As producers and veterinarians we must ensure that antibiotics are used correctly
- Ensure that both human infections and animals are going to be treated in the future.
- Prevent the transmission of infectious agents to the food chain and the environment.
- Risk must be reduced without reducing the availability of antibiotics needed for livestock production

- The integration between the agricultural, the academy and the authorities is fundamental to combat AMR.
- These actors must be able to work together to develop integrated national work plans.

Awareness AMR

Producers, technicians and farm workers

Veterinary

Consumers

BVA
British Veterinary Association

Responsible use of antimicrobials in veterinary practice:
THE 7-POINT PLAN

1 Work with clients to avoid need for antimicrobials

- Inform owners about the benefits of regular pet health checks
- Use symptomatic relief or topical preparations where appropriate
- Integrated disease control programmes
- Animal Health and Welfare Planning
- Isolate infected animals wherever possible

2 Avoid inappropriate use

- For example, for uncomplicated viral infections
- Restrict use to ill or at-risk animals
- Advise clients on correct administration and storage of products and completion of course
- Avoid underdosing

3 Choose the right drug for the right bug

- Identify likely target organisms and predict their susceptibility
- Create practice-based protocols for common infections based on clinical judgement and up to date knowledge
- Know how antimicrobials work and their pharmacodynamic properties
- Use narrow spectrum antimicrobials where possible

4 Monitor antimicrobial sensitivity

- While clinical diagnosis is often the initial basis for treatment, bacterial culture and sensitivity must be determined whenever possible so that a change of treatment can be implemented if necessary
- Monitor bacterial culture and sensitivity trends

5 Minimise use

- Use only when necessary and evidence that usage reduces morbidity and/or mortality
- Regularly assess antimicrobial use and develop written protocols for appropriate use
- Use alongside strict aseptic techniques and written practice guidelines

6 Record and justify deviations from protocols

- Be able to justify your choice of antimicrobial and dose
- Keep accurate records of treatment and outcome to help evaluate therapeutic regimens

7 Report suspected treatment failure to the VMD

- This may be the first indication of resistance
- Report through the Suspected Adverse Reaction Surveillance Scheme (SARSS)

- Antimicrobials are essential for the treatment and prevention of the spread of infectious and zoonotic bacterial diseases in both animals and humans
- Every use increases the risk of selection for resistant bacteria
- Responsible use optimises therapeutic effects while minimising the risk of selection for resistant bacteria
- Responsible use — correct antimicrobial: as little as possible, as much as necessary

HIGHER RISK ANTIMICROBIALS

Fluoroquinolones, 3rd/4th generation cephalosporins and macrolides:

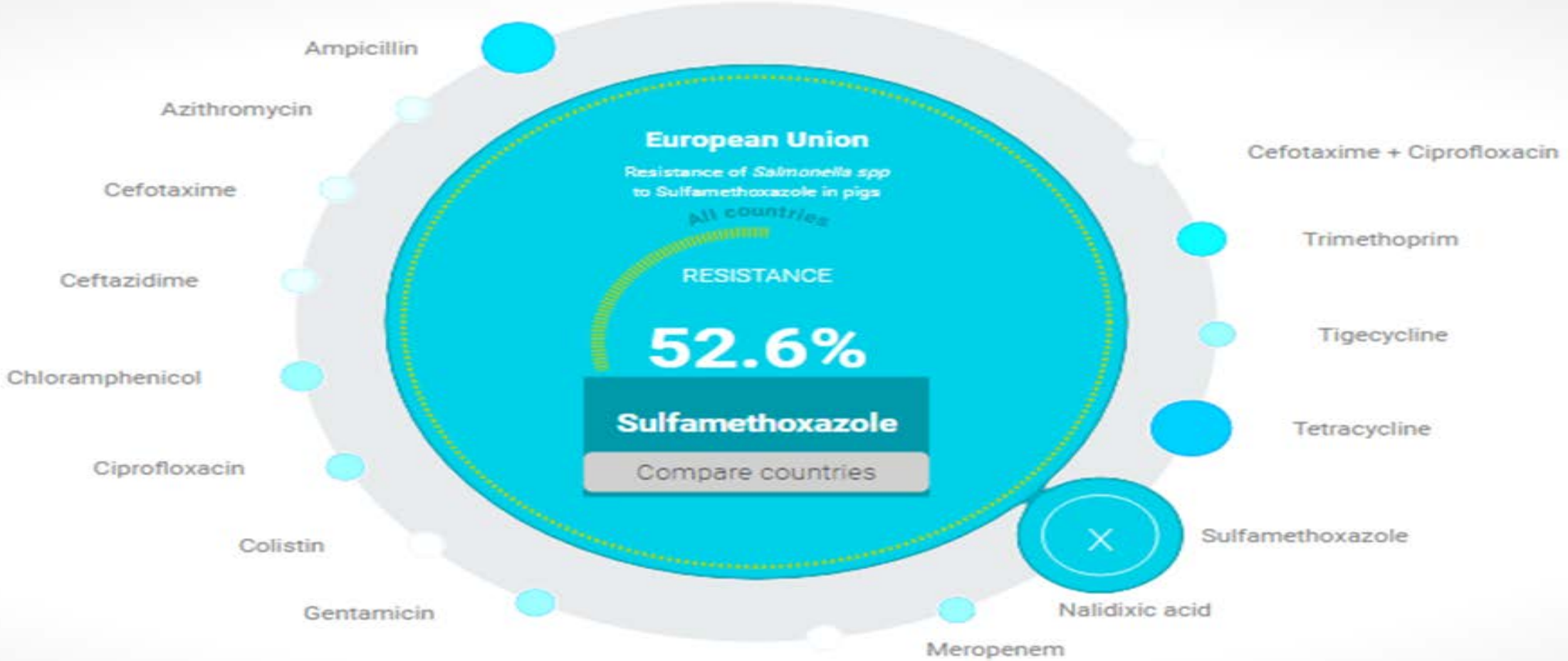
- Reserve these antimicrobials for clinical conditions that respond poorly to other classes of antimicrobials and where bacterial culture and sensitivity has been carried out.
- Do not administer systemically to groups or flocks of animals except in very specific situations and special attention should be given to the risk of antimicrobial resistance as part of the benefit/risk assessment.
- Avoid off label use whenever possible

For the latest detailed guidance visit

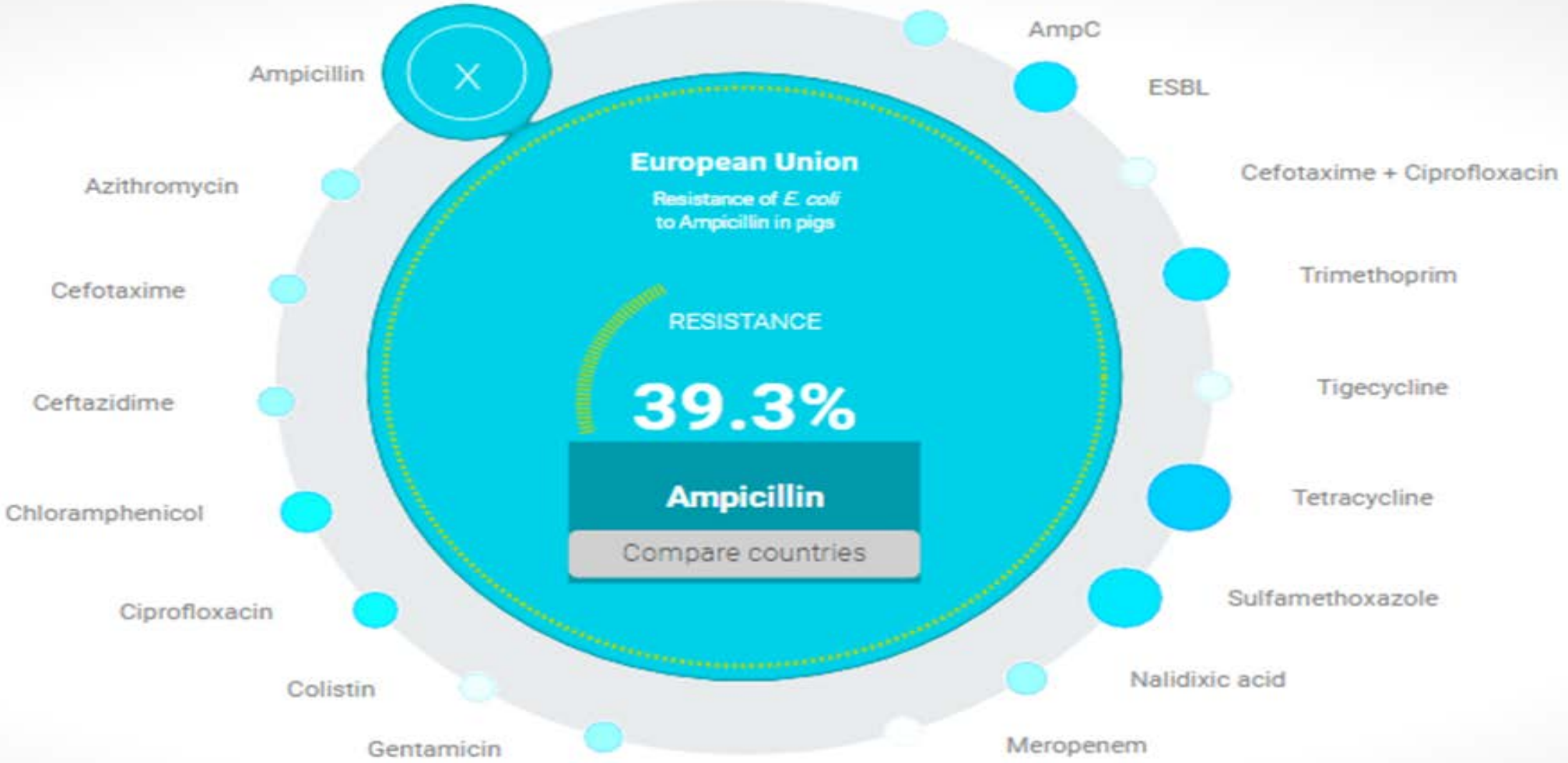
www.bva.co.uk

ANTIBIOTIC GUARDIAN

Salmonella spp | Pigs



Rare <0.1% | Very low 0.1% to 1% | Low >1% to 10% | Moderate >10% to 20% | High >20% to 50% | Very high >50% to 70% | Extremely high >70%



Rare · Very low · Low · Moderate · High · Very high · Extremely high

INTEGRAL APPROACH IN COUNTRIES WITH WHO / FAO / OIE/ SUPPORT

OMS

FAO FIAT PANIS

OIE
WORLD ORGANISATION FOR ANIMAL HEALTH
Protecting animals, preserving our future