ReAct

Action on Antibiotic Resistance

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Antibiotic Use in Food Animals: Indonesia Overview

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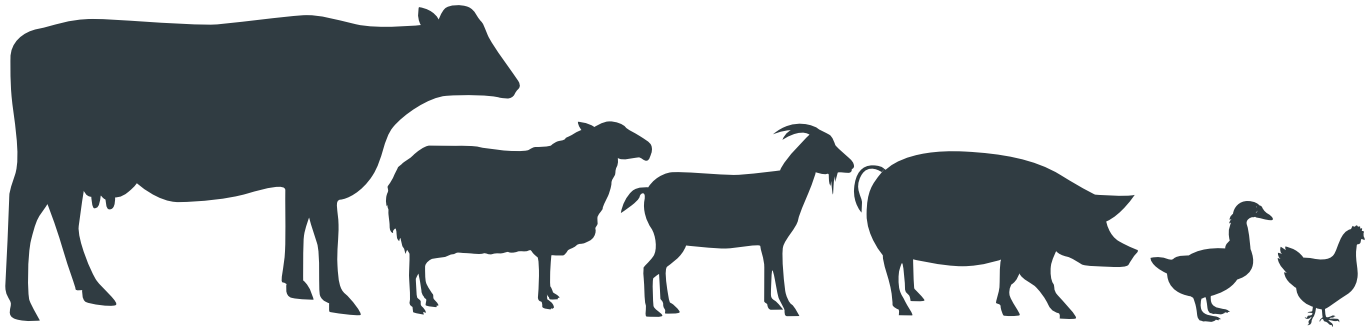

Antibiotic Use in Food Animals: Indonesia Overview

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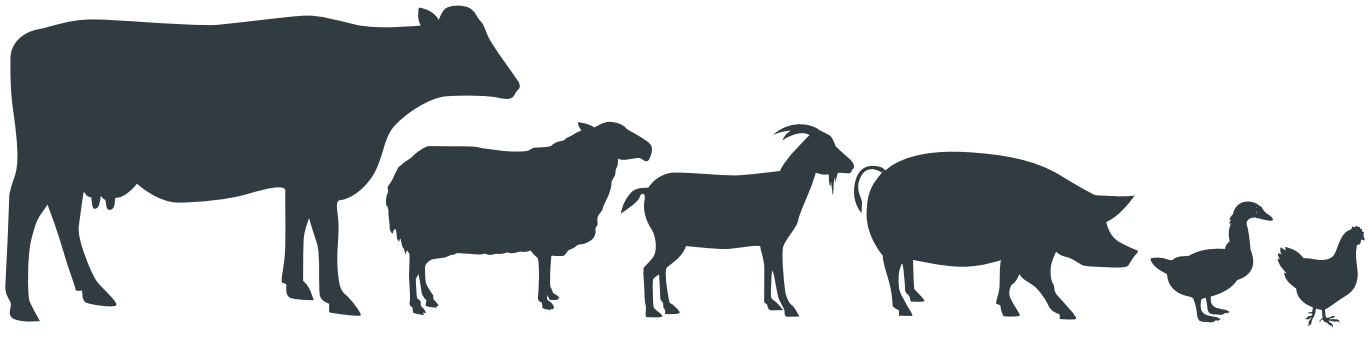


Preface

The challenges of antimicrobial resistance (AMR) that Indonesia faces are similar as those of many other low and middle income countries in the region and beyond. Misuse and overuse of antibiotics in humans and in livestock and aquaculture are the key drivers of resistance in the country. With the economy prospering for the past decade and a growing demand for poultry products and the development of aquaculture exports, agricultural use pf antibiotics probably exceeds medical use in Indonesia. Data on AMR in Indonesia however has been patchy, generated by a few laboratories from large universities, not connected to a national network.

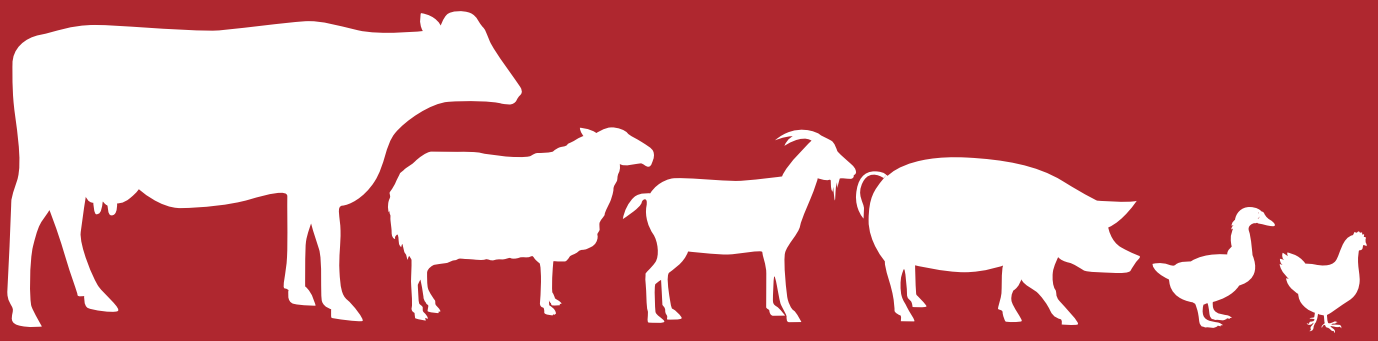
Responding to the growing AMR threat the Indonesian Ministry of Health prepared the Strategic Plan of AMR Control in Indonesia 2015 – 2019, whose focus includes:

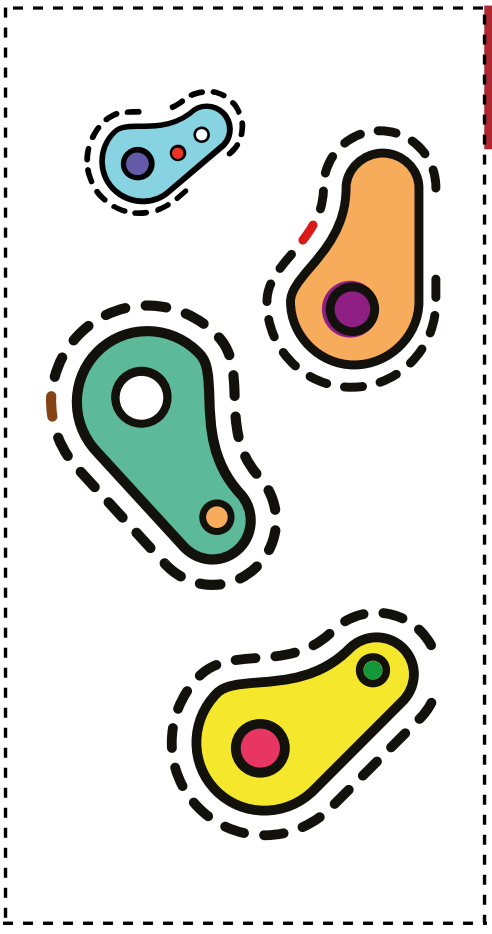
- Training for health workers on rational use of medicine;
- Developing community awareness campaign tools;
- Putting in place guidelines for antibiotic use;
- Putting in place drug audits to keep a record of use antibiotics;

This booklet provides a brief round-up of the problems and suggested steps needed to reduce antibiotic use in food-animal production in Indonesia. It is meant as a very basic introduction to this vast subject and aimed at policymakers, media, health professionals and concerned citizen groups.

Section A

Understanding antibiotics and its use in food animals





What are bacteria?

Bacteria are tiny single-celled organisms that can be found all over the planet, including soil, water, plants, animals, humans - except places which have been sterilised.

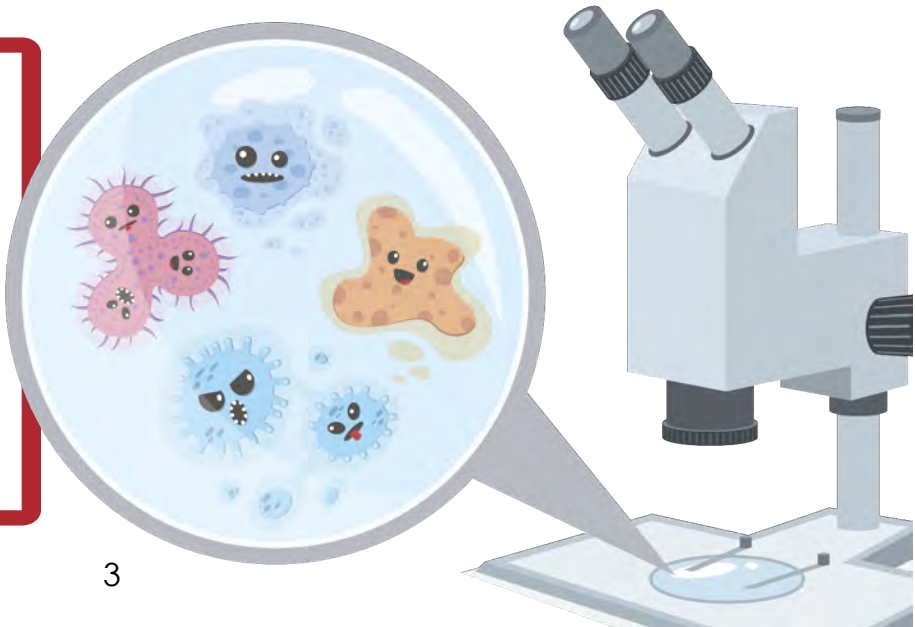
Bacteria are among the most abundant organisms on Earth. The majority of the bacteria play a positive role in nature. They help sustain the existence and continuity of all life forms on our planet.

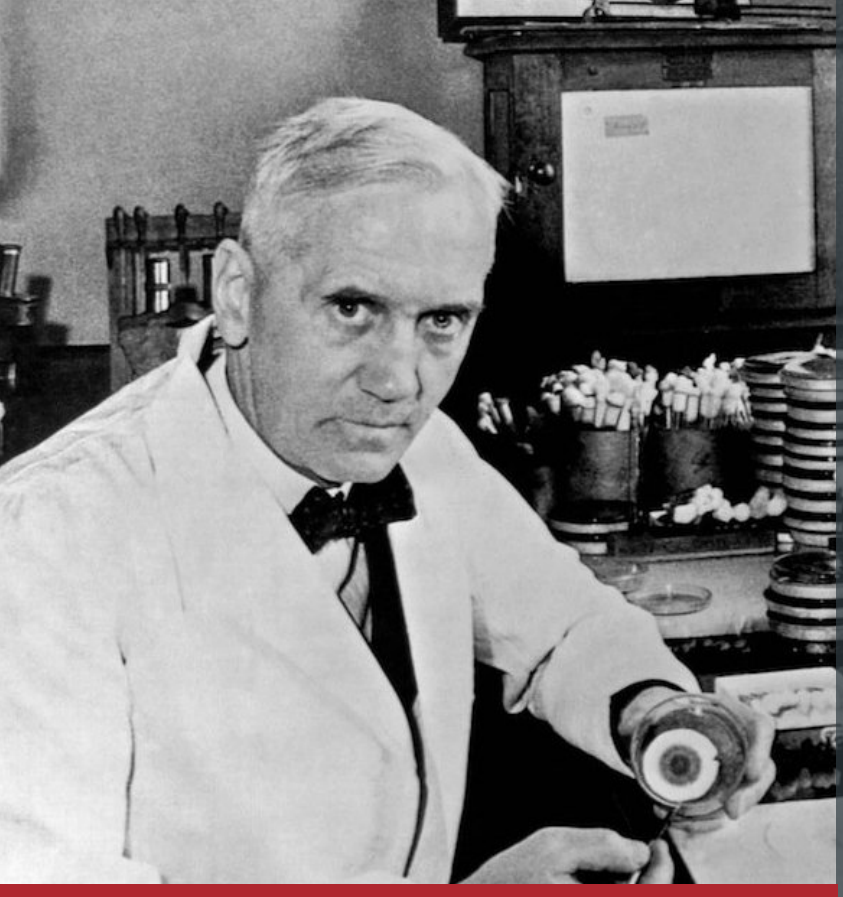
Bacteria decompose and recycle dead animals and plants; digest sewage into simple chemicals; extract nitrogen from the air for plants; and play an essential role in production of food. Scientists and industries also utilise bacteria to produce a lot of useful products.

What if bacteria enter our bodies...

Nevertheless, not all bacteria are friendly. Pathogenic bacteria cause harm to our bodies. When bacteria manage to get through our first line of defence which is our body's skin and mucous membranes and enter our bodies, they make us sick. For healthy people, the immune system will detect the presence of foreign organisms and activate different types of white blood cells in the bloodstream. Neutrophils engulf and kill the bacteria; Eosinophils and monocytes swallow up the foreign organisms and particles; Basophils help to intensify inflammation to facilitate specialised white blood cells to reach the site of the injury, protecting against a bacterial infection from worsening.

Bacteria are believed to be the first life forms on Earth, which appeared about 4 billion years ago.





"When I woke up just after dawn on September 28, 1928, I certainly didn't plan to revolutionize all medicine by discovering the world's first antibiotic, or bacteria killer. But I guess that was exactly what I did."

Accidental Discovery of First Antibiotic - Penicillin

In 1928, Sir Alexander Fleming was investigating staphylococcus, a type of bacteria that causes boils (infection of hair follicle causing an inflamed pus-filled swelling on the skin). Before he left for vacation, he forgot to place the petri dishes containing staphylococcus culture into incubator. When he was back to his lab, Fleming noted that a mold called Penicillium notatum had contaminated his Petri dishes. After inspecting, he was amazed to find that the mold inhibited the normal growth of the staphylococci. He named this active antimicrobial substance "penicillin."

Discovery of Antibiotics?

Antibiotics are agents with biological activities to kill or inhibit the growth of bacteria. Ever since antibiotics were discovered eight decades ago, they have been used widely in modern medicine and are extremely effective against bacterial infections, which once used to be major cause to morbidity and mortality.

Antibiotics are not only used to treat bacterial infections in humans, but also used to protect the health and welfare of animals.

Type of Antibiotics

Bacteriocidal Antibiotics

Antibiotics that kill bacteria include aminoglycosides, beta lactams, fluoroquinolones, glycopeptides, lipopeptides, nitroimidazoles and nitrofurans.

Bacteriostatic Antibiotics

Antibiotics that inhibit bacterial growth include glycylcyclines, lincosamides, macrolides, oxazolidinones, streptogramins and sulphonamides.

Antibiotics use in food-animal production

What are food animals?

Animals that are raised and bred to produce food for human consumption such as eggs, meat and milk.

Example: Beef cattle, dairy cattle, goat, sheep, deer, pigs, broiler chicken, layer chicken and ducks

Why antibiotics are used in animals?

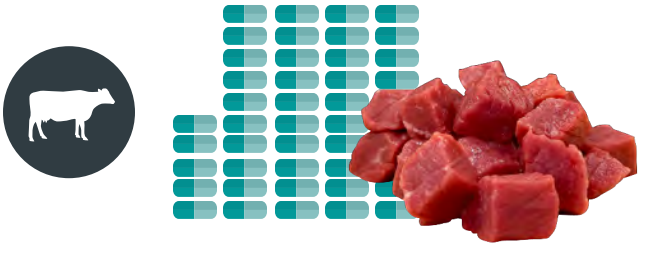
There are three main reasons why antibiotics are used by farmers:

- As treatment for animals that show clinical signs of an infectious disease
- As metaphylaxis to treat a group of clinically healthy animals and minimise an expected outbreak of a disease or as prophylaxis to prevent those at risk from being infected
- As growth promoter to boost the weight of the animals.

Reference:
1. National Pharmaceutical Regulatory Agency (NPRA). Registration and Regulatory Control of Veterinary Products in Malaysia. ppt. Available at http://vam.org. my/home/wp-content/uploads/2017/11/Pn Asnida_V MP-Registration-and-Control.pdf. (accessed on 28 December 2017)

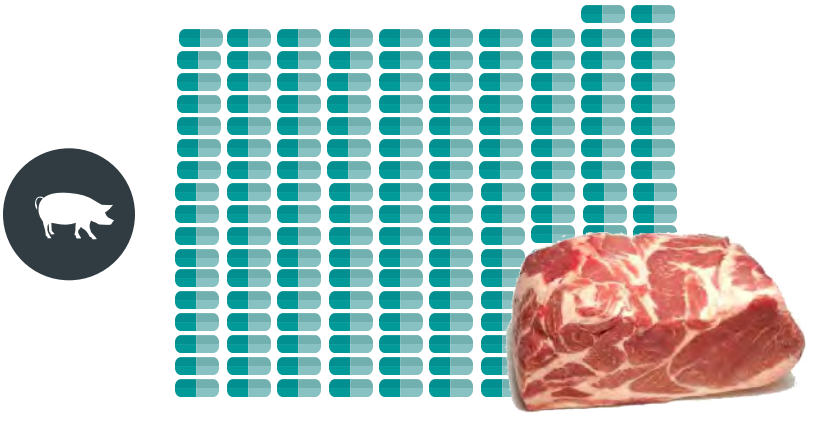
Global trends in antimicrobial use in food animals

Organisation for Economic Cooperation and Deveopment (OECD) estimates that the amount of antimicrobials used in food animals will escalate globally from 63,151 tons in 2010 to 105,596 tons by 2030 - an increase of 67%. The followings are the estimated global average annual consumption of antimicrobials to produce one kilogram of meat:



45mg of antimicrobials are used to produce 1kg of beef

148mg of antimicrobials are used to produce 1kg of chicken



172mg of antimicrobials are used to produce 1kg of pork

The term "antimicrobial" refers to any agent that kills microorganisms and inhibits their growth. An antimicrobial agent can be further categorised into groups according to the microorganisms it acts against. For example, antibiotics are used against bacteria whereas antifungals are against fungi.

Reference:
1. Laximinarayan, R., Van Boeckel, T., Teillant, A. 2015. Global Antimicrobial Use in the Livestock Sector. Organisation for Economic Co-operation and Development. TAD/CA/APM/WP(2014)34/FINAL.
2. Van Boeckel T.P. et. al. Global trends in antimicrobial use in food animals. PNAS. 2015: 112 (18); 5649 - 5654.

Top 5 countries with the largest shares of global antimicrobial consumption in food-animal production

1. China (23%)
2. The United States (13%)
3. Brazil (9%)
4. India (3%)
5. Germany (3%)

In the United States, 80% of annual antimicrobial consumption is used in food animals.

Reference:
1. Van Boeckel T.P. et. al. Global trends in antimicrobial use in food animals. PNAS. 2015: 112 (18); 5649 - 5654.

Livestock in Indonesia

Agriculture is vital to the Indonesian economy, accounting for 42% of total employment and contributing 13.5% to the GDP in 2015. In particular, the livestock and poultry populations in Indonesia have risen substantially since 2000 in response to Indonesia's growing food demand. There are three distinct modes of livestock production of all species in Indonesia:

a. Corporate vertically integrated production system: By making use of their own production facilities or contracting and controlling third party production facilities, these units produce, process and market the produce, often through modern retail outlets such as supermarkets and through the fast food and restaurant industry . Currently some 80% of urban poultry consumption is now derived from corporate farming.

b. Commercial production systems: Largely making use of similar genetic resources, feed and methods as the first group, some working as outsourcers for the first group, others remaining independent in their marketing, usually preferring to work through middlemen and wet markets.

c. Family farming/traditional production systems: In this mode livestock production is in symbiosis with the family's overall crop production and serves the family's needs followed by sale of surplus on local markets or to middlemen.

Chicken

YEAR 2009

1.4 million tonnes

28.5%

YEAR 2013

1.8 million tonnes

-9.3%

Goat

73,864 tonnes (2009)

66,990 tonnes(2013)

85.3%

Cattle

233,055 tonnes (2009)

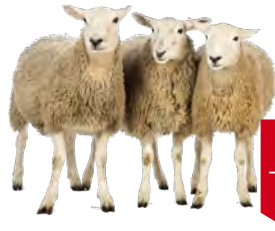
431,747 tonnes (2013)

15.2%

Swine

666,410 tonnes (2009)

767,714 tonnes(2013)



-18.1 %

Sheep

54,205 tonnes (2009)

44,365 tonnes (2013)

Reference:
1. FAOSTAT Agricultural Production, April 2016 and Livestock and Animal Health Statistics 2017, Directorate General of Livestock and Animal Health Service
http://ditjenpkh.pertanian.go.id/userfiles/File/Buku_Statistik_2017_(ebook).pdf?time=1505127443012)

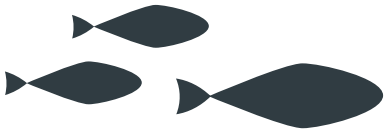
Fisheries in Indonesia

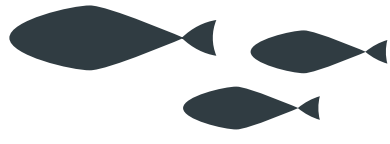
After rice, fish is an essential source of protein in the Indonesian diet and fish production is thus an important aspect of food security. Exploitation of 5.8 million square kilometers of Indonesia's territorial waters, 5.4 million hectares of inland waters and 1.1 million hectares of ponds contributed about 3.34% to Gross National Product (GNP—without oil and gas) in 2017 or almost 20% of agricultural GNP. In constant prices, the fisheries sector growth since 2004 has been consistently 2% higher than that of the agricultural sector.

Approximately 54% of animal protein consumed by Indonesians comes from fish and seafood. In small, remote islands fish contribute up to 90% of the protein requirements of local populations. At 32 kilograms per person per year, fish consumption is almost double the global average of 19 kilograms per person per year. The national average protein consumption from fish well exceeded the combined protein consumption from beef, chicken and eggs in 2011. Since 2002 (16.3 kg) fish consumption increased by 3%/year.

Future domestic demand for fish is expected to almost double by 2040. As marine fish production has mostly reached sustainability limits, local aquaculture production growth of food-fish is projected as the key source of future incremental supply to satisfy demand. Aquaculture food fish production (about 1.7 million tons in 2013) would need to more than triple by 2040 to satisfy projected domestic demand.

Aquaculture has also been rapidly expanding at a 10 percent rate in the last two decades, driving growth in the fishing sector. However, most of the country's aquaculture is not mechanized and largely produced by small farms using traditional methods.





Reference:
1. Agricultural Transformation & Food Security 2040. Indonesia Country Report. Japan International Cooperation Agency. 2013
2. http://www.fao.org/fishery/facp/IDN/en
3. https://phys.org/news/2016-02-fishing-food.html
4. http://www.insideindonesia.org/catch-of-the-day
5. Country fact sheet on food and agriculture policy trends, Indonesia, 2017. FAO

Antibiotic use in Indonesia

While there are no formal estimates nationally, antimicrobial resistance (AMR) is thought to be high and on the rise in the country. Indonesia is among the five countries with the greatest projected percentage increases in antimicrobial consumption by 2030. The five, selected from 50 countries with the largest amounts of antimicrobials used in livestock in 2010, include Myanmar (205%), Indonesia (202%), Nigeria (163%), Peru (160%), and Vietnam (157%).

Fortunately, in Indonesia, AMR has been on the agenda of Indonesian health policy makers since early 2000. Results of the Antimicrobial Resistance in Indonesia: Prevalence and Prevention (AAMRIN) study in 2001 for example showed 50 - 76% inappropriate antibiotic use, and low compliance of hand washing among health care staff (46%) in the hospitals.

In 2005 a survey in a hospital in Surabaya, Indonesia, found prevalence of extended spectrum β lactamases, including CTX-M, of 20% and 28% among clinical E. coli and Klebsiella pneumoniae, respectively. In 2009 the gene for New Delhi metallo-β-lactamase (bla_{NDM-1}) was found in a sample of K. pneumoniae in Indonesia.

In 2011, a population-based study showed that self-medication with antibiotics exists in Indonesian population (7.3%) for treatment of minor symptoms such as common-cold, headache etc. The most widely used antibiotics include amoxicillin, ampicillin, fradiomycin-gramicidin, tetracycline, and ciprofloxacin.

Another study found that generally, antibiotics were available over the counter in all visited pharmacies and sold in the streets and contained an active inaredient.

Reference:
1.Parathon H, Kuntaman K, Widiastoety TH, et al. Progress towards antimicrobial resin stance containment and control in Indonesia. The BMJ. 2017;358:j3808. doi:10.1136/bmj.j3808
2.Global trends in antimicrobial use in food animals. Van Boeckel et al. Proc Natl Acad Sci U S A. 2015 May 5;112(18):5649-54. doi: 10.1073/pnas.1503141112. Epub 2015 Mar 19.
3.State of Play of Antimicrobial Resistance Research and Surveillance in South East Asia. K. Cheng Liew Karuniawati A, Saharman YR, Lestari DC. Detection of carbapenemase encoding genes in Enterobacteriace, Pseudomonas aeruginosa, and Acinetobacter baumanii isolated from patients at Intensive Care Unit Cipto Mangunkusumo Hospital in 2011. Acta Med Indones 2013;45:101-6.
4.Self medication with antibiotics in Yogyakarta City Indonesia: a cross sectional population-based survey, Widayati et al., 2011, BMC Research Notes https://bmcresnotes.biomedcentral.com/articles/10.1186/1756-0500-4-491 (accessed on 22 July 2018)
5.Cross-sectional study of availability and pharmaceutical quality of antibiotics requested with or without prescription (Over The Counter) in Surabaya, Indonesia, Hadi et al, 2010, BMC Infectious Diseases,

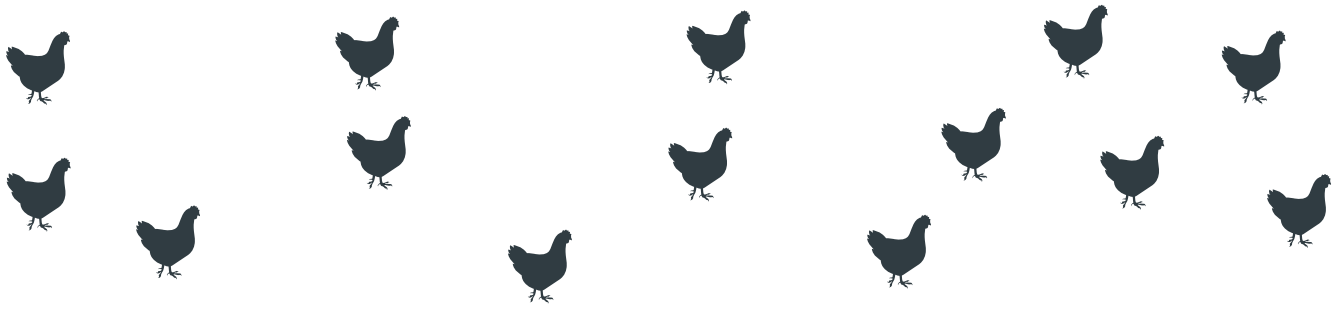
ABR in Poultry

The share of antimicrobials used in livestock production in Indonesia is dominantly in poultry farms rather than other livestock sectors.

A study of antibiotic use in 360 small and medium scale commercial broiler farms in three provinces: West Java, East Java, South Sulawesi by the Ministry of Agriculture revealed the following results:

- Most of the farms (86%) operated under a supply contract with a major integrated poultry company.
- The decision on which antibiotics to use is influenced by technical staff of the poultry farm supply contract company, who also provide the antibiotics for farmers (75%), followed by farmers' previous experiences (9%), and sales staff of drug/feed/day-old-chick suppliers (7%).
- Most farm supply contract company technical staff (86%) and drug/feed/day-old-chick suppliers' staff (50%) do not have a veterinary background.
- Most commonly used antibiotics were:Enrofloxacin (49.4%), amoxicillin/colistin (35.3%), trimethoprim/sulfadiazine (14.1%), and doxycycline (13.3%).
- 81.4% of farmers routinely give antibiotics as a prophylactic. Most farmers (61%) believe that antibiotic usage on their farms is necessary to raise broilers successfully. Only 2% of farmers performed antibiotic susceptibility tests to select antibiotics for flock treatment purposes.
- Failures of antibiotic therapeutic treatment in broilers were experienced by 57% of farmers surveyed; when failures occurred at marketable age, 80% of farmers would sell the broilers to the market.

The survey found an average antibiotic withdrawal time of 10 days before broiler harvesting, but 19% of farmers reported a withdrawal time of less than 5 days.



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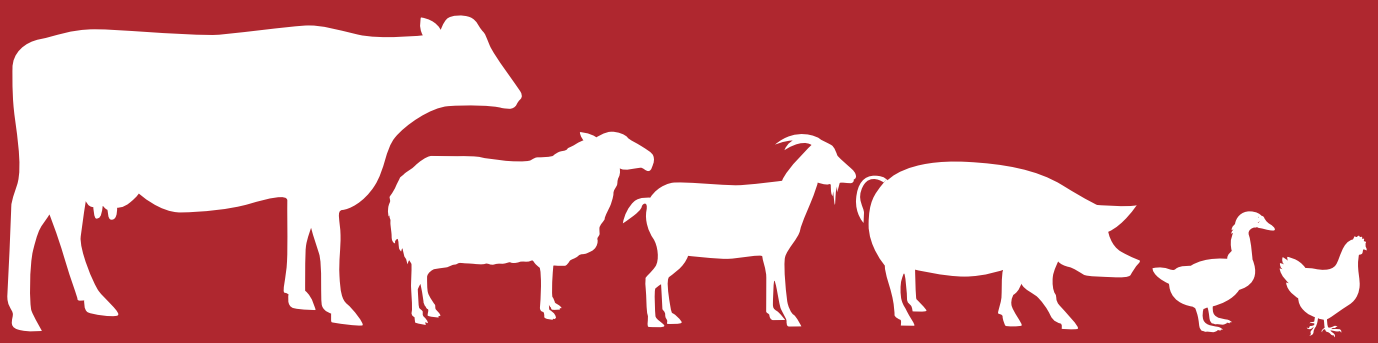
1. Country Report - Indonesia. Imron Suandy and X Suparno. Quality Control for Livestock Services, Directorate of Veterinary Public Health and Post – Harvest, Ministry of Agriculture, Republic of Indonesia. http://cdn.dairyasia.org/APHCA/dmdocuments/Events/36th_APHCA_Session/Papers/Country%20Report_Indonesia%20F.pdf (accessed on 10 March 2018)
2. Antibiotics Use on Small and Medium Scale Broiler Farms in West Java, East Java and South Sulawesi Provinces, Indonesia. Isriyanti et al, 2017. Directorate General of Livestock and Animal Health Services, Ministry of Agriculture, Indonesia.

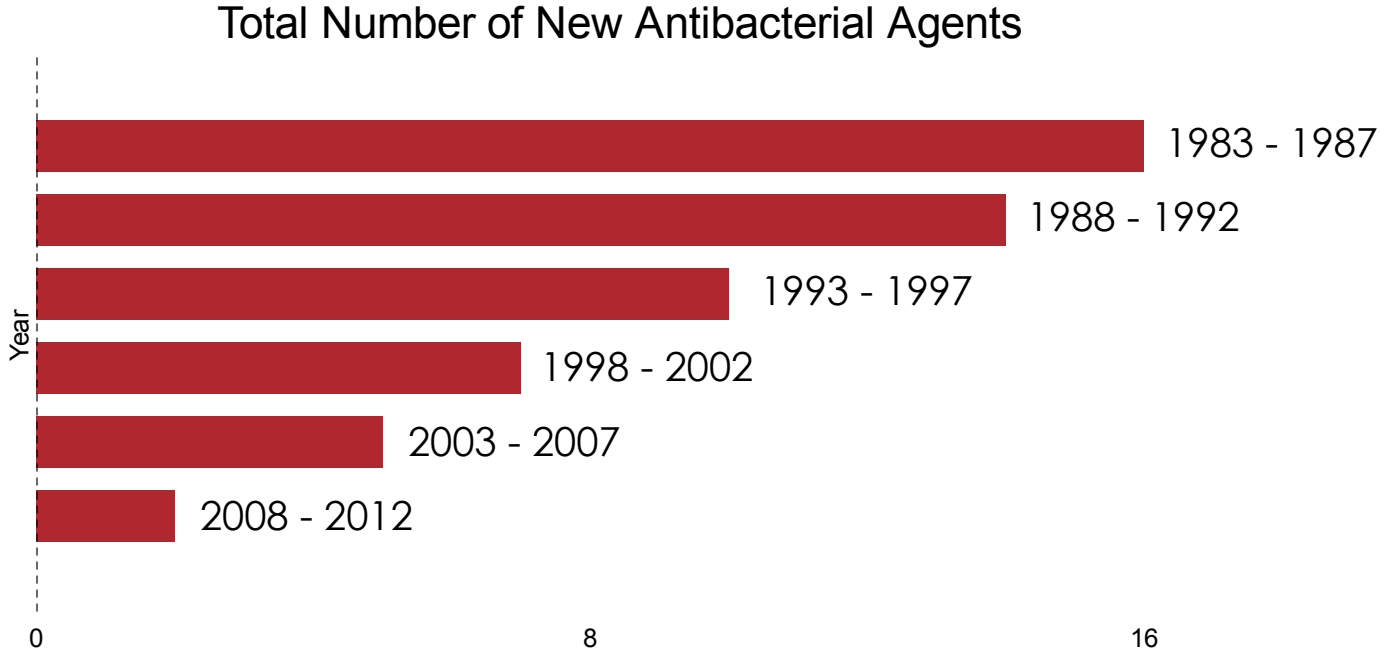
Section B

The emergence of antibiotic resistance



Antibiotics Begin to Fail

The post-World War II period witnessed a 'golden era' of antibiotic discovery. New antimicrobial agents were discovered, developed and marketed from the late 1940s to the early of 1970s. Nevertheless the discovery rate started dwindling 1980s onwards, leaving a discovery void. This is because of an increasingly arduous discovery process and declining interest by companies and government in the research and development of antibiotics due to less promising returns on investment (ROI). Around the same time, antibiotic resistance began to emerge due to primarily rampant misuse of antibiotics. Today antibiotic resistance could be detected nearly as quickly as newer antibiotics were developed.



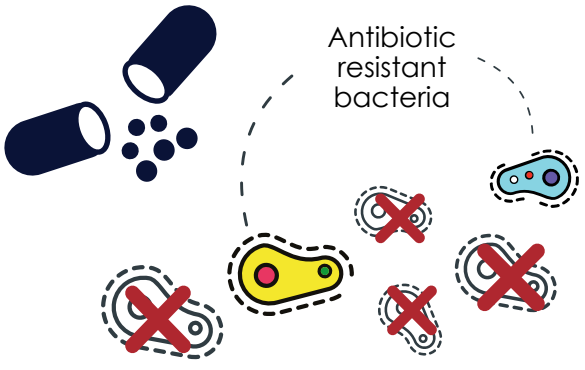
Similarly, overuse and inappropriate use of antibiotics in the food-producing animals have also given rise to antibiotic resistance in animal pathogens. Antibiotic regimes no longer work on sick animals. Worse still, the resistant bacteria can spread from animals to humans through the food chain.

The emergence of antibiotic resistance progressively undermines the viability of many antibiotics. Resistant bacteria cause thousands of deaths every year. If there is no immediate and radical actions taken collectively against this trend, soon humans will be running out of options to save lives and the world will go backward to a pre-antibiotic era.

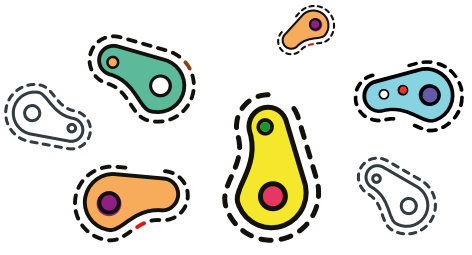
Reference:
1. The Epidemic of Antibiotic-Resistance Infections, CID 2008: 46 (15 January) Clin Infect Dis. (2011) May 52 (suppl 5): S397-S428.
2. WHO. Tackling antibiotic resistance from a food safety perspective in Europe, World Health Organisation, Geneva, 2011. 2011.

What is antibiotic resistance?

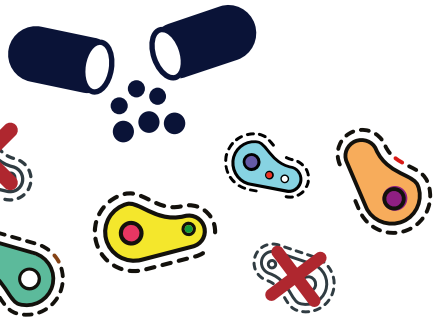
Antibiotic resistance (ABR) is the ability of some bacteria to protect themselves against the effects of an antibiotics. Clinical resistance means that a bacterium can grow in the antibiotic concentrations reached in the body during therapy resulting in treatment failure.



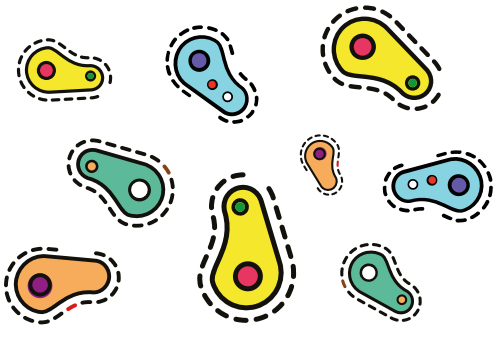
When an antibiotic is used it disables or kills only the susceptible bacteria but not the ones that have become resistant due to genetic mutations or variation.



Resistant bacteria now grow and multiply. Some bacteria even transfer their "drug-resistance" to other bacteria.



When antibiotics are used again they confront larger numbers of resistant bacteria.



Eventually antibiotic resistance results in treatment failure.

Reference:
1. ReAct. Antibiotic resistance. Available at https://www.reactgroup.org/toolbox/understand/antibiotic-resistance/ (accessed on 31 January 2018)

Spread of antibiotic resistance through food animals

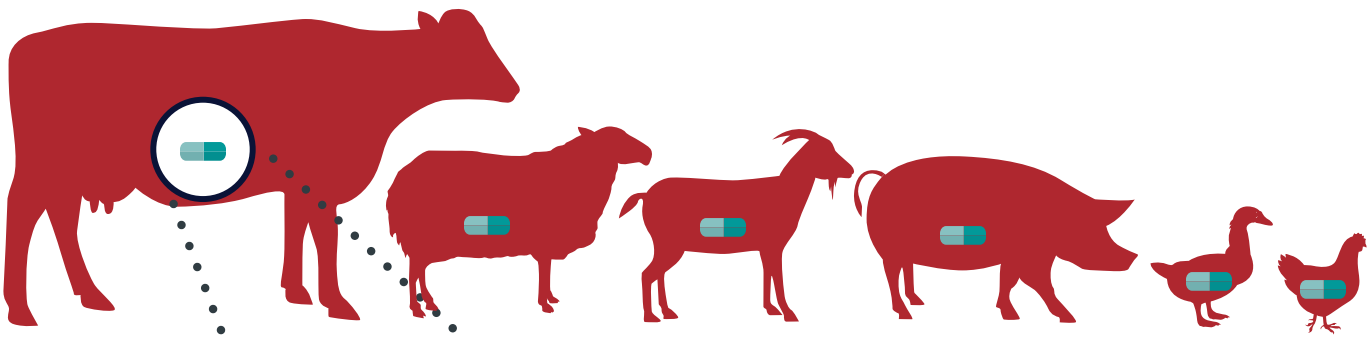
Many classes of antimicrobials that are used for humans are also being used in food animals. Apart from the use of these medicines for treatment of sick animas many food-animal producers also use them to promote growth or for routine disease prevention in crowded and unsanitary industrial conditions.

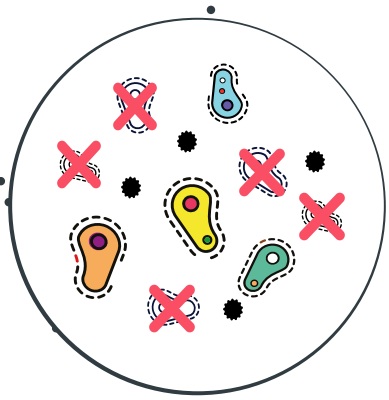
Such indiscriminate use of antibiotics accelerates the development of antibiotic resistant bacteria, which then escape and spread into communities. Farm and slaughterhouse workers, and veterinarians, who come in close contact with colonised or infected animals, are also at risk of carrying such resistant bacteria and passing them on to others.

Bacteria as well as antibiotic residues from food-animal production are also spread widely in the environment, mainly through manure, where it affects bacteria in the environment as well as in wild fauna.

When people are exposed to these resistant bacteria from animals, this leads to resistant infections in humans. Multiple studies show an association between the use of antibiotics in animals and the spread of antibiotic resistance-related bacteria in humans.

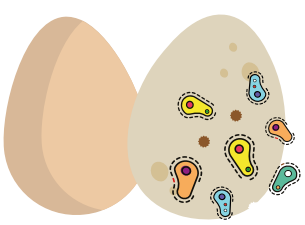
Antibiotic resistance: from animals to humans



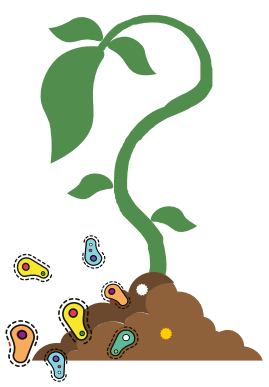


Antibiotics kill susceptible bacteria but resistant bacteria are left to grow and multiply

Resistant bacteria spread to animal meat



Resistant bacteria contaminate the eggs via animal faeces



Resistant bacteria contaminate environment e.g. soil and plants

Resistant bacteria can spread to humans from raw or inadequately cooked food when the raw materials are contaminated or cross-contaminated with other food and environment during preparation

Veterinary Capacity in Indonesia

As in many developing countries, most veterinary services in Indonesia are provided by the government. Veterinary Public Health Inspectors are placed at provincial and district livestock service offices to carry out the control and inspection related to the quality of livestock products.

The Livestock Products Sampling Officers are trained and appointed to carry out the sampling operations of livestock products for laboratory examinations. The National Veterinary Research Laboratory conducts research and development of methods of analysis for residue of veterinary drugs.

In early 2017 Indonesia passed legislation titled 'Government Regulation No. 3/2017 on Veterinary Authority', to quickly respond to priority infectious animal diseases. The new law integrates veterinary services with other services, such as agriculture, food security and fisheries throughout the country.

Apart from obligating the appointment of the so-called Authorized Veterinarians at national, provincial and district/city levels, the new regulation also calls for a National Animal Health System that fosters the implementation of veterinary practices throughout Indonesia, where animal health officers must be involved.

Over the decades, the effective delivery of veterinary services by the state in Indonesia has been heavily constrained by lack of sufficient veterinarians, poor infrastructure, inadequate budgets and a heavily centralized planning system which offers little flexibility for local managers to respond to local needs.

In the last decade however, there has been a concerted effort to improve veterinary services by both domestic and global agencies, owing to the fact that Indonesia was the global epicentre for the human H5N1 avian influenza pandemic with more human cases and fatalities than any other country.

Reference:
1.Delivery of animal health services using a participatory, community based approach in south and north Sulawesi, Indonesia. Hutabarat TSPN, Gonzalez-Levassor D and Young J, Directorate of Veterinary Services, Directorate General of Livestock Services, Department of Agriculture. Proceedings of the 9th International Symposium on Veterinary Epidemiology and Economics, 2000.

Participatory Disease Surveillance and Response

One of the novel initiatives developed in response to the avian flu pandemic, through collaboration between national and international agencies, was the Participatory Disease Surveillance and Response (PDSR) programme, which targeted the backyard poultry sector and engaged thousands of families, which breed chicken for commercial or subsistence purposes, across Indonesia's many islands.

Starting off in early 2006 as a pilot programme in four Local Disease Control Centres (LDCCs) of Java, the project rapidly expanded throughout much of Indonesia. At its peak in mid-2008, there were 2123 PDSR officers in 31 LDCCs situated in Java, Bali, Kalimantan, Sulawesi and Sumatra. PDSR officers were either civil servants or people recruited on fixed-term contracts by local government, under the authority of the state agency in charge of livestock services.

Focusing on the village as its epidemiological unit, the PDSR program used its large cadre across the country to build its own surveillance system for data collection, analysis and synthesis. The participatory disease searching and disease reporting ensured that the surveillance system was sensitive and timely, yielding valuable information for both local action as well as policy-making purposes.

Apart from helping deal with the ongoing avian influenza outbreak the PDSR project has been praised for helping build capacity at the level of local communities to deal effectively with epidemics in the future too. According to one independent evaluation, the PDSR approach has "injected a new lease of life into the understanding of, and responsiveness to, the animal health constraints of many rural and urban communities" and "strengthened the capacity of local animal health services in Indonesia".

The Indonesian Ministry of Health also set up the integrated surveillance for Avian Influenza (IS-AI) project to make detection and reporting of human cases in the community more efficient and improve information sharing and coordination between human and animal health sectors. The system incorporated immediate reporting of outbreaks to human health authorities, documentation of best practices in descriptive epidemiology and case management, contact tracing and intensive case finding, sample collection and rapid transport to laboratory.

Reference:
1.Independent Evaluation of FAO's Participatory Disease Surveillance and Response Programme in Indonesia Prepared by: Prof. Brian Perry, Dr. Kamarudin Md. Isa, Mr. Carlos Tarazona for the FAO Evaluation Service. July 2009.

Surveillance of AMR in Indonesia

The Quality Control Laboratory for Livestock Products (QCLLP) was established in 1994 and is designed to carry out laboratory analysis and confirmation of residues and microbial contaminants in livestock products. This laboratory has also been designated as a National Reference Laboratory for quality control of livestock products.

Apart from the QCLLP, there are 8 Laboratories of Animal Diseases Investigation Centers covering 8 regions of Indonesia, which have been promoted as Veterinary Assay Laboratories with additional competency on analysis of residues and microbial contaminants. The Veterinary Public Health Laboratory located in districts and provincial areas are equipped to carry out simple tests of livestock products.

ATLASS for AMR Surveillance

The FAO Assessment Tool for Laboratory and Antimicrobial Resistance (ATLASS) was launched in Indonesia in 2017, reinforcing the country's planned implementation of the national AMR surveillance system. ATLASS will foster a standardized AMR surveillance system, enabling comparable and validated data on AMR to be collected and analysed regionally and globally.

ATLASS is structured in two modules: surveillance and laboratory modules, the latter of which comprises an activity form and a laboratory mapping tool form. Data compiled during the assessment will be used to build a final report that will be submitted to national vet authorities. At the global level, the ATLASS data will be submitted to FAO global portal for data integration, compilation and analysis.

In piloting the new tool to assess national AMR surveillance in livestock, a joint team of FAO and the Chulalongkorn University, with support from the Directorate General of Livestock and Animal Health Services, Ministry of Agriculture, assessed three laboratories in Indonesia for their capacities and preparedness. The three laboratories are the National Veterinary Product Assay Laboratory (BPMSPH) in Bogor, the National Veterinary Drug Assay Laboratory (BBPMSOH) in Bogor, and Subang Disease Investigation Centre in Subang. All are located in West Java.

Antimicrobial Resistance in food products

Milk

ESBL-producing K. pneumoniae was identified at high frequency in bulk tank milk being supplied by dairy farms. Most of these isolates harboured bla_{SHV} and some also had bla_{TEM-1} and $bla_{CTX-M-15}$ encoding for the resistance.

Poultry

In 2011 the Quality Control Laboratory for Livestock Products (QCLLP) conducted a study to monitor the antimicrobial resistance in sentinel bacteria isolated from poultry meat from one of poultry pocket areas in West Java. In 2012, the program was extended throughout Java.

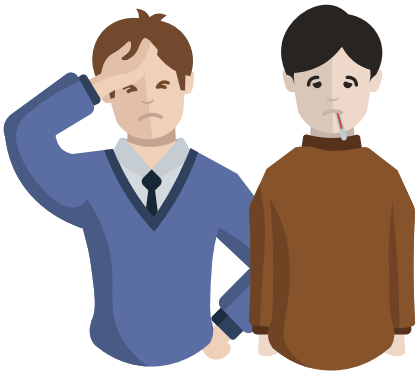
The results of AMR pattern monitoring in E. coli bacteria show an increased pattern in all types of antimicrobials, while in Salmonella Spp bacteria resistance was found in a few types of antimicrobials (mainly erythromycin).

Another study of fresh chicken carcasses sold in traditional markets found Listeria monocytogenes in 16% of the samples and most of them were MDR, especially to penicillin, ampicillin, and erythromycin. A study in 2014 of commensal E. coli, E. faecalis and E. faecium isolated from poultry chickens were found to be resistant for oxytetracycline and fluoroquinolones.

Reference:
1.Sudarwanto M, Akineden Ö, Odenthal S, Gross M, Usleber E. Extended-Spectrum β lactamase (ESBL)-producing Klebsiella pneumoniae in bulk tank milk from dairy farms in Indonesia. Foodborne Pathog Dis. 2015;12:585–90.
2.Sugiri YD, Gölz G, Meeyam T, Baumann MP, Kleer J, Chaisowwong W et al. Prevalence and antimicrobial susceptibility of Listeria monocytogenes on chicken carcasses in Bandung, Indonesia. J Food Prot. 2014;77(8):1407–10.
3. Usui M, Ozawa S, Onozato H, Kuge R, Obata Y, Uemae T et al. Antimicrobial susceptibility of indicator bacteria isolated from chickens in Southeast Asian countries (Vietnam, Indonesia and Thailand). J Vet Med Sci. 2014;76:685–92.

Consequences of antibiotic resistance

Antibiotic resistance poses great threat to food safety and public health when the resistant bacteria spread from food animals to humans through the food chain. Antibiotics used in the first line treatment are no longer effective to eradicate common food-borne disease-causing bacteria such as Salmonella and Campylobacter.



Infections which used to be common become more difficult to treat

The length of hospital stay increases to, on average, more than 25 days

Treatment cost is higher

Risk of bloodstream infections and death is higher

Who are at risk?

In general, certain groups of people whose immune systems are week and who have an increased risk for getting infections are at a higher risk of being infected by antibiotic resistant bacteria.

Infants, especially premature babies

Seniors, particularly those living in long term care facilities

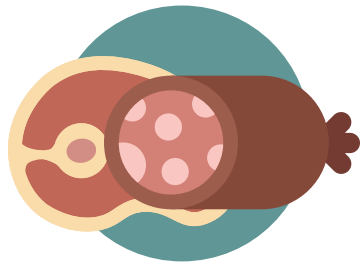
People with weakened immune systems due to illnesses or injury

Farmers who may have direct contact with sick animals

People who are living in a crowded and unhygienic place

People who do not practice good hygiene habits like hand hygiene

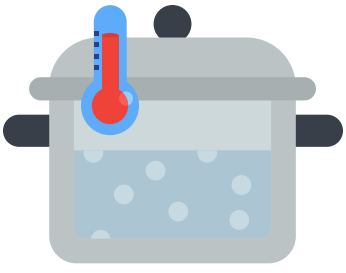
Personnel who work in healthcare facilities and day care centres such as doctors, nurses etc.



Slaughter house and meat processing plant workers or butchers

Reduce the chances of infection

Follow simple food safety tips: COOK, CLEAN, CHILL, SEPARATE [1]



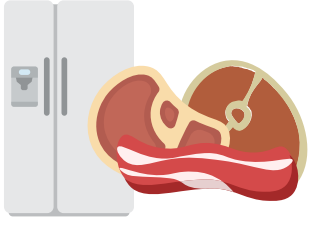
COOK

Food should be cooked to a safe internal temperature.

- 68°C for whole beef, pork, lamb, and veal (allowing the meat to rest for 3 minutes before carving or consuming) or 72°C for ground meats
- 74°C for for all poultry, including ground chicken and ground

CLEAN

- Wash hands before handling raw foods to avoid contamination especially after contact with animals or animal environment.
- Wash hands after touching raw meat, poultry or seafood.
- Wash the work surfaces, cutting boards, utensils and grill before and after cooking.



CHILL

Keep the temperature of the refrigerator below 4°C and refrigerate foods within 2 hours of cooking.

SEPARATE

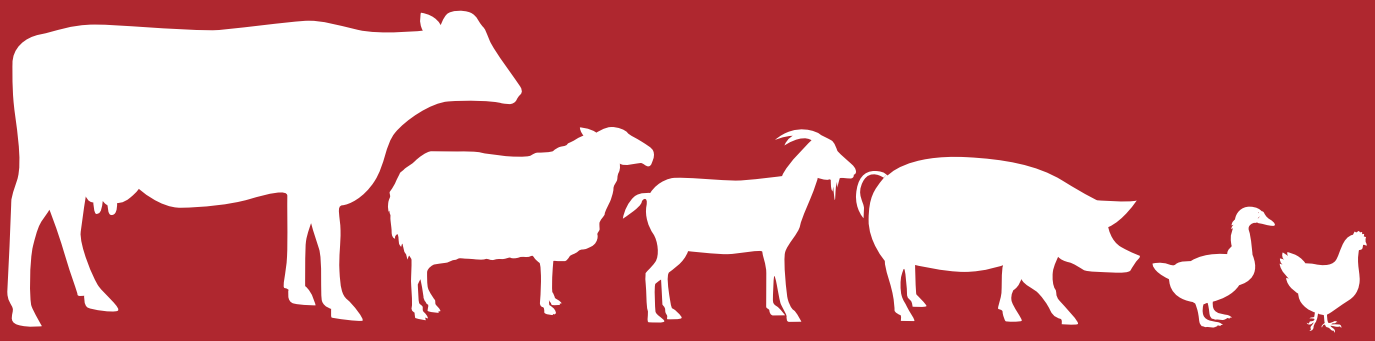
Bacteria from raw meat, poultry, seafood, and eggs may spread to ready-to-eat foods.

- Do not store raw and cooked food in the same space.
- Handle raw meats and ready-to-eat foods separately Use different cutting boards to prepare raw meats and any food that will be eaten without cooking.

Reference:
1. Centers for Disease Control and Prevention. Antibiotic Resistance, Food and Food-producing Animals. Available at https://www.cdc.gov /features/ antibiotic-resistance-food/index.html (accessed on 10 January 2018)

Section C

Responding to antibiotic resistance



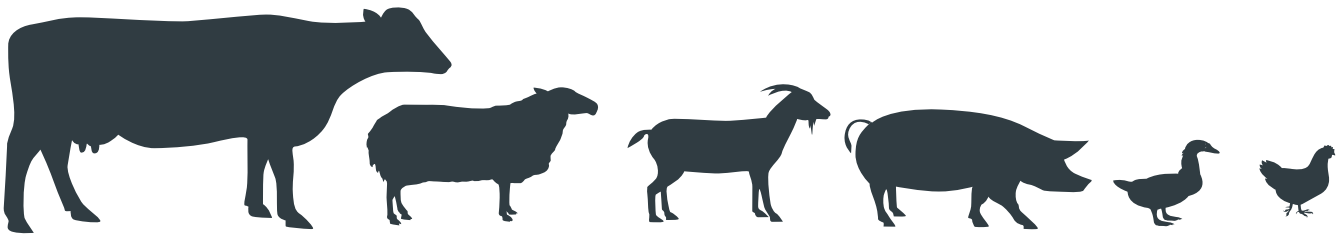
One Health Approach

Indonesia confirmed its commitment to advance One Health collaboration in early 2017 with five ministries issuing a joint communique stating that "problems impacting the health of humans, animals, and the environment can only be solved by working together across sectors".

The communique was issued at a seminar on "One Health Stakeholders Collaboration – Action on Antimicrobial Resistance" held by FAO Indonesia in Jakarta and endorsed by the Ministry of Agriculture (MOA), the Ministry of Health (MOH), the Ministry of Environment and Forestry (MOEF), the Ministry of Marine Affairs and Fisheries (MMAF), and the Coordinating Ministry of Human Development and Culture (Kemenko PMK).

The joint communique highlights the five ministries' commitment to work together to:

1. Undertake One Health-driven risk mapping to help inform programme direction and synergies within and across ministries;
2. Address the major threat of AMR in Indonesia and urgent problem of inappropriate antimicrobial usage in people and food production through strengthened regulatory frameworks, and commitment of adequate financing and human resources to national AMR control programmes;
3. Raise awareness and improve communication about the importance and relevance of Zoonoses and One Health to the public and to policy and decision-makers;
4. Clarify, foster and integrate One Health linkages across the International Health Regulations (IHR), Joint External Evaluation (JEE) and other health assessment tools, and build any recommendations into Government of Indonesia strategic national action plans;
5. Support and advance One Health coordination among ministries, agencies with specific focus on animal-human sector coordination in the areas of zoonotic and pandemic diseases;
6. Support and advance One Health coordination with other countries and international agencies and partners under the Global Health Security Agenda;
7. Improve the sharing of information across technical areas at all levels to promote transparent reporting and inter-sectoral data sharing for the prevention of public health events of international concern.



Regulatory Institutions

Animal Health

The Ministry of Agriculture (MOA) through the Directorate General of Livestock and Animal Health Services (DGLS) are responsible for controlling livestock production including animal health and quality of livestock products. The regulations are based on Animal Health and Animal Husbandry Law No.18, 2009 which stipulates the authority to control animal health and livestock production, including veterinary public health.

Veterinary Drugs

The control and administration of veterinary drugs are conducted by the Sub-directorate of Veterinary Drugs Control, which belongs to Directorate of Animal Health of the Directorate General of Livestock and Animal Health Services.

The Veterinary Drugs Commission was established to give advice on the policy related to veterinary drugs, and the Veterinary Drugs Assessment Committee to conduct technical assessment of administration of veterinary drugs.

The quality control and assay of veterinary drugs are carried out at the Veterinary Drugs Assay Laboratory. The laboratory is designed to conduct the test and to issue the quality certificate for the products to prove that they meet the requirements.

The Veterinary Drugs Inspectors are placed at provincial and district livestock service offices to carry out the control and inspections related to veterinary drugs in their work area.

The Indonesian Ministry of Fisheries oversees the use of veterinary drugs in aquaculture.

Regulatory Institutions

Food Quality

The quality control of food products is managed under the authority of the Ministry of Agriculture for livestock products, the Ministry of Oceanic and Fisheries for marine and fish products and the Food and Drugs Control Agency for most processed foods. Some other institutions such as Ministry of Health and Ministry of Trade are also involved.

Sub-Directorate of Residues

Under the Ministry of Agriculture, there is a Sub-Directorate of Residues which belongs to the Directorate of Veterinary Public Health of the Directorate-General of Livestock Services. The Sub-Directorate of Residues oversees control of residues of veterinary drugs in livestock products.

Regulatory Framework

- Veterinary drugs have been regulated in Indonesia since 1912
- The Veterinary Drugs Inspector and the operation procedure for controlling of veterinary drugs were established with the decree of the Ministry of Agriculture No. 15, 1994.
- Regulation of veterinary drugs used in aquaculture were cited in the decree of the Minister of Oceanic and Fisheries No.26, 2002 and No.4158, 2003.
- The Animal Health and Animal Husbandry Law No. 18, 2009 on Farming and Animal Health requires:
  - Restriction of antibiotic use as growth promoter
  - Registration and certification of animal medicines
  - Mandatory prescription by a veterinarian for the use of veterinary drugs; National and local government must supervise the making, preparing, and distributing of veterinary drugs;
  - Supervision by veterinary authority in the making, preparing, distributing, and testing of veterinary drugs;
  - Restriction of the use of certain medicines to farm animals for human consumption.

- Article No.49 - 54 chapters, 2nd of Law No. 18, 2009 states that the control of manufacturing, storage, distribution and used of veterinary drugs are under sole authority of the government.

- The government has also banned the use of antibiotics as growth promoter since 1 January 2018 (based on the Law No. 41/2014, which is a revision of Law No. 18/2009 regarding Farming and Health).

Antibiotic Residues

- To improve the quality of livestock products the government launched the quality assurance program called "ASUH" meaning Aman (safe), Sehat (healthy), Utuh (wholesomeness) and Halal (edible under religious rules).

- The animals should be slaughtered at the slaughter houses or other places designed specifically to meet the criteria for slaughter house under the inspection of the authorized officers.

- The animals are subjected to examination by the drug administration and their health conditions certified by veterinarians before their slaughter.

- Veterinary Control Numbers are issued in order to improve the quality assurance of food safety by implementing the minimum requirements for sanitation and hygiene. The numbers are issued to the institutions such as slaughtered house, processing plant and private such as importer, cold storage and processing plant.

- HACCP principles were introduced and popularised since 1998; however the implementation of the principles is still not satisfactory. Some companies exporting food products however have implemented the principles already.

- Monitoring and surveillance of residue and microbial contaminants, a program called "PMSR" has been established since 1998. The samples are collected and tested by the institutions and laboratories involved in the control of livestock products. The results of monitoring are evaluated at the annual meeting of PMSR, and the data used for strategic planning of the program.

- Laboratory accreditation programs based on ISO-17025 was one of the efforts which has been implemented to provide testing laboratories with a recognized Good Laboratory Practice status.

- SNI-BMR is a national standard for maximum residue limit (MRL) of veterinary drugs which was adopted from Codex MRL, so that the risk analysis procedures match those at the international level.

The Healthy Farm Trial

Although a majority of poultry products are still being sold through traditional markets, an increasing proportion of chicken meat and eggs is being sold through a growing supermarket system. The government of Indonesia and the Australian government developed a clean market chain (CMC) system to help smallholder poultry producers, a majority in the Indonesian poultry sector, provide products from bio-secure farms through supermarket networks.

The Healthy Farm Trial project was undertaken in three provinces in Indonesia including Bali, West Java and South Sulawesi, from 2011 to 2012 with the aim of increasing confidence in the quality of products marketed by smallholder farmers. The CMC was designed to minimize the spread of poultry-related diseases and required farms to implement approved biosecurity measures and pass through audited slaughterhouses. The products were then sold in supermarkets that are able to charge a premium price for the product.

Among the biosecurity practices suggested to farmers included using padlocks at the farm gate and at the shed, foot bath at the shed door, 'no entrance' signs at the shed door and preventing other birds and animals from entering the farms.

An evaluation of the CMC project four years after it was completed found that farmers received the same price from selling a bio-secure product to CMC as they would have in a traditional market . However many of the farmers involved in the trial continued to use the biosecurity measures they had been prescribed, because they were felt these biosecurity measures increased productivity and reduced their personal and commercial risk. Thus the Healthy Farm Trial, according to evaluators, demonstrated the viability of CMCs driven solely by market factors, and resulting in benefits to all stakeholders involved in the chain.

Reference:
1.Developing a clean market chain for poultry products in Indonesia. 2014. ACIAR Technical Reports 82. Australian Center for International Agricultural Research. www.aciar.gov.au

Recommendations

These recommendations are targeted at the ministries and agencies of the Government of Indonesia responsible for public health, animal health, agriculture and fisheries sectors.

- Improve control of antibiotics import, production and distribution
- Improve routine monitoring and surveillance program for AMR in the food-animal production sector
- Implement AMR surveillance in primary healthcare facilities
- Increase community awareness and engagement in tackling AMR
- Improve both quality and quantity of human resources needed to tackle AMR in the food-animal production sector.
- Document and disseminate best practices in farm biosecurity, lowering use of antibiotics in food-animal production and implementation of the Indonesia's NAP on AMR.
- Help farmers do a planned transition to lower use of antibiotics in food production.
- Finance the Indonesian National Action Plan adequately and organize timebound implementation.

Antibiotic Use in Food Animals: Indonesia Overview