



Republic of Ghana

# Policy on Antimicrobial Use and Resistance

Inflection prevention and control  
Antimicrobials Antibiotic Consumption  
Policy Health Data Misuse Sensitization  
Antibiotics Abuse Use Farmers Surveillance  
Fungi Food Farms Drug Resistance Laboratories Hygiene  
Bacteria National Action Virus Access  
Testing Health professionals Training  
Infectious diseases Veterinarian Agriculture  
Investments Environment



1<sup>st</sup> Edition, 2017



Republic of Ghana  
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Ministry of Health  
Ministry of Food and Agriculture  
Ministry of Environment, Science, Technology and Innovation  
Ministry of Fisheries and Aquaculture Development

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Ministry of Health,  
Ministry of Food and Agriculture,  
Ministry of Environment, Science, Technology and Innovation,  
Ministry of Fisheries and Aquaculture Development Ghana

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## 1.1 Preface

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This document is the first edition of the National Policy on Antimicrobial Use and Resistance developed by the Ministry of Health of Ghana.

The policy has been informed by the need to contain the phenomenon of antimicrobial resistance, which is considered as a threat to public health in the world. It is also guided by the need for sustainable measures towards universal health coverage, the World Health Organization's global action plan on antimicrobial resistance, the sustainable development goals, the Health Sector Medium Term Strategy as well as World Health Organization's guidelines for medicines policy development.

The policy is to provide direction and guidance for all stakeholders who are affected by or use antimicrobial agents. Thus, all actions in the relevant sectors would take alignment from this policy to ensure convergence of action and purpose, and to maximize our efforts in preserving this important group of medicines to protect the health of all.

The various elements of the policy include interventions to improve awareness and understanding of AMR, strengthen knowledge and evidence base for AMR policy and related actions, reduce incidence of infection, optimize use of antimicrobials as well as develop economic case for sustainable investments in antimicrobials.

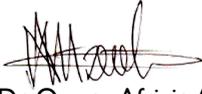
In emphasizing these areas and the policy actions recommended, attention has been given to the best available evidence, stakeholder concerns and inputs, the life-saving value of antimicrobial medicines in disease management, global action on AMR and the socio-economic environment.

This policy would be implemented through a National Action Plan defining the role of all implementing stakeholders and shall be the official policy to guide the use of antimicrobial agents in Ghana.

We wish to express our sincere appreciation to all stakeholders, the Technical Working Group of Experts, AMR platform, the Swedish International Development Agency, ReAct Uppsala, UK Department for International Development, the World Health Organization, the ADMER Project, Ghana, Food and Agriculture Organisation (FAO) Ghana office, and all contributors whose immense inputs and support has made the development of this policy a success.



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## 1.2 List of Abbreviations

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ADMER	Antibiotic Drug Use, Monitoring and Evaluation of Resistance
AMR	Antimicrobial resistance
AMU	Antimicrobial use
APD	Animal Production Directorate of MOFA
API	Active Pharmaceutical Ingredient
APMLGh	Association of Private Medical Laboratories Ghana
BE/BP	Bioequivalence
CHAG	Christian Health Association of Ghana
CMS	Central Medical Stores
CRIG	Cocoa Research Institute of Ghana
CSD	Crop Services Directorate of MOFA
CSO	Civil Society Organization
DQCL	District Quality Control Laboratory
DTC	Drug and Therapeutics Committees
ECOWAS	Economic Community of West African States
EML	Essential Medicines List
FAO	Food and Agriculture Organisation
FDA	Food and Drugs Authority
G-DRG	Ghana Diagnostic Related Groups
GABS	Ghana Association of Biomedical laboratory scientist
GHS	Ghana Health Service
GMA	Ghana Medical Association
GNDP	Ghana National Drugs Programme
GRNA	Ghana Registered Nurses Association
GSA	Ghana Standards Authority
HAI	Healthcare Associated Infections
HIV	Human immuno-deficiency virus
HRC	Health Research Centre
ICD	Institutional Care Division
INRUD	International Network for Rational Use of Drugs
IPC	Infection Prevention and Control
IPM	Integrated Pest Management
KCCR	Kumasi Centre for Collaborative Research in Tropical Medicine
MDR-TB	Multidrug-resistant tuberculosis

MeTA	Medicines Transparency Alliance
MOH	Ministry of Health
MOFA	Ministry of Food and Agriculture
MRSA	Methicillin-resistant <i>Staphylococcus aureus</i>
NDIRC	National Drug Information Resource Centre
NHIA	National Health Insurance Authority
NHIL	National Health Insurance List
NHIS	National Health Insurance Scheme
NMIMR	Noguchi Memorial Institute of Medical Research
NNRTI	Non-Nucleoside reverse transcriptase inhibitors
NQCL	National Quality Control Laboratory
NRTI	Nucleoside reverse transcriptase inhibitors
OIE	World Organisation for Animal Health
OPD	Out-patient department
OTC	Over-the-Counter
PMAG	Pharmaceutical Manufacturers Association of Ghana
POM	Prescription only Medicines
PPME	Policy Planning Monitoring and Evaluation
PPP	Public Private Partnerships
PPRSD	Plant Protection and Regulatory Services Directorate
PSGH	Pharmaceutical Society of Ghana
RMS	Regional Medical Stores
RUM	Rational Use of Medicines
SEA	South East Asia
SSFFCs	Spurious, Substandard, Falsified, Fake and Counterfeit medicines
STG	Standard Treatment Guidelines
TB	Tuberculosis
TH	Teaching Hospital
TTH	Tamale Teaching Hospital
WHO	World Health Organization
XDR-TB	Extensively drug-resistant tuberculosis

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## 2. Introduction

The discovery of antimicrobials has played an important role in decreasing morbidity and mortality due to infectious diseases. The success of infectious disease treatment has been one of modern medicine's greatest achievements. Expansion and improvement in health systems and resources, coupled with production technologies across the world has also led to increase in availability and access to antimicrobials. Over the years, improved access to antimicrobials has been accompanied by poor practices that have contributed to microbes developing resistance to these life-saving medicines.

The emergence and spread of antimicrobial resistance has been recognized as one of the major health problems globally and it is compounded in low-resource countries (WHO, 2014).

Antimicrobial resistance (AMR) is resistance of a microorganism to an antimicrobial drug that was originally effective for treatment of infections caused by it (WHO, 2014). Resistant microorganisms (including bacteria, fungi, viruses and other parasites) are able to withstand attack by antimicrobial drugs, such as antibacterial drugs, antifungals, antivirals, and antimalarials, so that standard treatments become ineffective. Antimicrobial resistance results in prolonged illness, as well as increased burden on health systems and insurance schemes. It also hampers the control of infectious diseases, increases the cost of healthcare, affects health security, damages trade and economies and threatens a return to the pre-antibiotic era (WHO, 2014). Prolonged ill-health may result in loss of man-hours and productivity and hence loss of income to the family and the nation at large.

The threat of AMR and its impact now and the future across all sectors including animal, agriculture, the environment etc. is real, as it affects commonly used and affordable antimicrobials. The need to address this precarious situation now is critical to preserving the effectiveness of antimicrobials.

There are several factors that contribute to the development of AMR. These include:

- Irresponsible and/or inappropriate use of antimicrobials
- Lack of information on the proper use of antimicrobials
- Absence of policy on antimicrobial access and use
- Spurious, Substandard, Falsified, Fake and Counterfeit antimicrobials
- Unregulated access to antimicrobials
- Use of antimicrobials in agriculture as growth promoters
- Poor infection prevention and control in health facilities

- Poor environmental sanitation
- Poor or absence of surveillance on antimicrobial use
- Poor knowledge on antimicrobial resistance
- Bad agricultural or animal husbandry practice

The multiple interrelated factors contributing to resistance across all sectors, require multi-stakeholder involvement in a concerted effort at tackling resistance in the one health approach.

This policy was prepared with broad consultation with multi-stakeholders involving public and private sector agencies, academia, research institutions and civil society organizations. There are some policies and guidelines that define approaches to the use of antimicrobials mainly in human health but are largely absent for other sectors such as food, agriculture, fisheries, the environment, etc. The policy therefore seeks to develop strategies that will assure responsible use of antimicrobials and help control the development and spread of antimicrobial resistance across all sectors of Ghana.

In this policy, interventions in areas such as responsible use of antimicrobials, infection prevention and control, waste management, strengthening disease control programmes, laboratory diagnostics and protocols, national surveillance for antimicrobials, regulation and enforcement, antimicrobial manufacturing, distribution and use, and legislative and legal framework among others will be defined across all sectors i.e. human, animal, agriculture, and environment.

## 1.5 Trends in antimicrobial resistance

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### 1.5.1 Global trends

WHO reports that, about 440 000 new cases of multidrug-resistant tuberculosis (MDR-TB) emerge annually, causing at least 150 000 deaths. Extensively drug-resistant tuberculosis (XDR-TB) has been reported in 64 countries (WHO, 2014). It is also reported that, a high percentage of hospital-acquired infections are caused by highly resistant bacteria such as methicillin-resistant *Staphylococcus aureus* (MRSA).

AMR has become a serious problem for treatment of gonorrhoea (caused by *Neisseria gonorrhoeae*), involving “last-line” oral cephalosporins. This phenomenon is increasing in prevalence worldwide. Untreatable gonococcal infections would result in increased rates of illness and death, thus reversing the gains made in the control of this sexually transmitted infection (WHO, 2014).

AMR is also an emerging concern for treatment of HIV infection, after the rapid expansion in access to antiretroviral drugs in recent years.

At the end of 2011, more than 8 million people were receiving antiretroviral therapy in low- and middle-income countries to treat HIV. Although analysis of data from WHO surveys that target people who have been recently infected with HIV indicates increasing levels of resistance to the non-nucleoside reverse transcriptase (NNRTI) class of drug used to treat HIV. This increase is particularly noticeable in Africa, where the prevalence of resistance to NNRTI reached 3.4% (95% CI, 1.8-5.2%) in 2009 (WHO, 2014).

Over the past 10 years, antiviral drugs have become important tools for treatment of epidemic and pandemic influenza. It was estimated that, by 2012, virtually all influenza A viruses circulating in humans would be resistant to drugs frequently used for the prevention of influenza (amantadine and rimantadine). Antiviral susceptibility is constantly monitored through the WHO Global Surveillance and Response System.

There is evidence to show that aquaculture has been contributing to the global development and spread of AMR. Isolates of bacteria from tilapia and other fish species in Tanzania and other countries were found to be resistant to the antimicrobials commonly used in human medicine, even in some farms where these antimicrobials had not been used (Shah, 2012). Pseudomonas and Staphylococcal isolates from fish have been found to exhibit resistance to nine antimicrobials, with the highest rate of 77% to tetracycline (Miller-Morgan, 2014). Samples of seafood (shrimp and salmon) collected from 11 countries across the world showed detectable levels of antimicrobials, with that of oxytetracycline being the highest. This trend is expected to increase, with serious public health implications if drastic steps are not taken to arrest the situation (Done et al 2015). Consumption of food with significant levels of residual antimicrobials over time could lead to the development of antimicrobial resistance.

### **1.5.2 Trends in African countries**

In Africa, antibiotics are among the commonest prescribed medicines. A survey on predictors of antibiotic use in five countries in Africa showed that 90% of individuals with acute illness sought care outside the home with 95% receiving medicines and 36% received antibiotics. Of the antibiotics received, cotrimoxazole, amoxicillin and metronidazole represented 75% of received antibiotics. Over 30% of individuals accessed antibiotics without prescription and one in four individuals obtained antibiotics from an informal dispenser. This survey also reported various levels of resistance to antibiotics in the sampled countries. (Newman, Frimpong, Donkor, & Opintan, 2011), (WHO, 2014)

Many African countries reported the presence of resistant strains of bacteria. For instance, in Nigeria, there is high resistance to vancomycin, gentamycin, chloramphenicol and cloxacillin. (Umolu, et al 2002)

### 1.5.3 Trends in Ghana

The overall primary drug resistance rate of 23.5% in Ghanaian TB patients ranks Ghana among those African countries with a high prevalence of drug-resistant TB. (Owusu-Dabo & Ohene, 2006)

Various studies carried out proved the existence of antibiotic resistance in Ghana. A study in two teaching, seven regional and two district hospitals in Ghana showed that, very common microbes such as *Streptococci*, *Salmonella*, and *E. coli* showed very high levels of multiple drug resistance; some as high as 78.7%. In the various hospitals sampled, the prevalence of resistance to common and affordable antimicrobials such as tetracycline, co-trimoxazole, ampicillin and nalidixic acid are significantly high (largely above 70%) (Newman, Frimpong, Donkor, & Opintan, 2011), (Nweneka, 2009).

Another study carried out in 2007 in some key health facilities among inpatients and out patients, specimens taken from various sources including wounds, urine, sputum and blood, showed high prevalence of MRSA (Newman, Frimpong, Donkor, & Opintan, 2011). Resistance to common antibiotics has been identified in other studies, based on isolates of *Staphylococcus aureus* from inpatients and hospital staff at Korle-Bu Teaching Hospital. See table below:

Table 1 Antibiotic resistance of *Staphylococcus aureus* isolates from inpatients (IP) and hospital staff (HS) at the Korle-Bu Teaching Hospital, Ghana, 2011-2012

Antibiotic	n (%)		
	IP (N=63)	HS (N=42)	Total (N=105)
Penicillin	62(98)	36(86)	98(93)
Tetracycline	21(33)	8(19)	29(28)
Fusidic acid	11(17)	2(5)	13(12)
Cefoxitin	6(10)	0(0)	6(6)
SXT*	3(5)	0(0)	3(3)
Erythromycin	4(6)	1(2)	5(5)
Clindamycin	3(5)	0(0)	3(3)
Norfloxacin	2(3)	0(0)	2(2)
Gentamicin	1(2)	1(2)	2(2)
Rifampicin	1(2)	0(0)	1(1)
Mupirocin	0(0)	1(2)	1(1)
Linezolid	0(0)	0(0)	0(0)

\*SXT, trimethoprim/sulfamethoxazole

Furthermore, other evidence in Ghana suggests that, many infectious pathogens are failing to respond to common, potent and easily accessible antibiotics in the health system and thus resulting in increased morbidity and mortality from infections (Nweneka, 2009).

The absence of national antibiotic use policy that guides the use and control of resistance is also contributing immensely to the upsurge in abuse of antibiotics at the community and the institutional level across the country (Gyansa-Lutterodt M, 2013).

## 2 Situational Analysis

### 2.1 Use of antimicrobials in veterinary, food, fisheries and aquaculture

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**In the food, agriculture and fisheries sectors**, the ever-increasing exchange of fresh and processed products has contributed to the development and spread of resistance. Bacteria isolated over the years from livestock, poultry and their products and from surfaces of tables and knives at slaughter houses, included resistant strains of *Campylobacter jejuni*, *E coli* (12 serovars) and *Salmonella spp.* These microbes were resistant to the commonly used antimicrobials such as ampicillin, tetracycline, cefadroxil, erythromycin, cefotiam, penicillin (Sackey et al 2001, quoted by Turkson, 2014). The percentage of resistance to these antimicrobial drugs ranged from 61% to 97% (see Table 3 in annex).

The preponderance of multivalent antimicrobial medicines over monovalent ones for use in veterinary practice during the past two decades, points to the decline or total loss in the efficacy of the monovalent preparations in treating the same infections for which they were very successfully used in the past. This phenomenon was confirmed by most of the animal health care personnel, farmers and veterinary drug distributors interviewed in a recent survey carried out in the Greater Accra, Ashanti and the Brong Ahafo Regions (Hanson, 2016).

In crop production, fungicides are the most common antimicrobials used against diseases and pests. The replacement of existing fungicides with new ones at regular intervals may be an indication of development of resistance by pests and diseases to the former. It may be inferred that waste water from livestock and poultry establishments and other rubbish dumps serve as sources of spread of resistant pathogens. Untreated manure may also contribute to the spread of resistant microbes in the soil and the environment. This has its serious implications and consequences for food and nutrition security.

In aquaculture, interviews with farmers have indicated that antimicrobials are added to feeds for growth promotion. Antimicrobials are also directly added to the ponds or cages for disease prevention and control. The indication for the use of the agents and the choice of the particular ones used are most often done without the involvement of animal health professionals. About 80% of the antimicrobials used in aquaculture enter the environment with their activity intact, where they select for bacteria whose resistance arises from mutations, or more importantly, from mobile genetic elements containing multiple resistance determinants transmissible to other bacteria (Cabello, F.C. et al, 2013). Consumption of farmed fish, especially in situations

where withdrawal periods are not adhered to results in the spread of antimicrobial resistance.

The antimicrobial agents used in aquaculture belong to the same classes as those used in livestock and in humans and these are; the macrolides, cephalosporins, beta-lactams, sulphonamides and quinolones. Fish farming also contributes to contamination of the environment with resistant bacteria when untreated manure from livestock establishments, which may contain such organisms, is used as feed fish and the effluent discharged without being processed. Although a fish health unit exist in the Fisheries Commission, the unit is not adequately resourced to monitor antimicrobial use in aquaculture.

The use of antimicrobials for disease prevention and growth promotion in animal husbandry, and the existence of antibiotic residues in the food chain are also likely to compound the problem of antibiotic resistance (Schmidt, 2009), (Xuan Le T, et al 2005),. (Donkor, Tetteh-Quarcoo, Nartey, & Agyeman, 2012).

A case study from Ghana on the presence of beta-lactamase producing *Escherichia coli* and *Klebsiella pneumoniae* isolates as well as tetracycline residues in chicken meat established the occurrence of drug resistance among *E. coli* and *K. pneumoniae* strains isolated from chicken meat bought in Ghana. In addition, high incidence of tetracycline residues was found in the chicken meat samples (Rasmussen, 2014).

Another study on the presence of antimicrobials and resistance in healthy subjects from Greater Accra concluded that 74.2% of study subjects showed the presence of at least one antimicrobials in their urine, though all (100%) of the study participants had not knowingly consumed antimicrobials. This calls for further investigation as it may be possible that people are consuming antibiotics from alternate sources such as food and water (Hane-Weijman & Trads, 2014).

The Veterinary Public Health and Food Safety Unit together with the Laboratory and Epidemiology Units of the Veterinary Services Division (VSD) are responsible for monitoring the use of antibiotics and surveillance of resistance in animals. The overall goal of the Veterinary Public Health and Food Safety Unit is to prevent zoonotic diseases in humans and assure food safety. Collaboration with MOH is mainly in the area of zoonotic diseases and not on antimicrobial resistance.

In the past, antimicrobial resistance has not been a priority for the veterinary services in Ghana. There are no acceptable national standards for; antibiotic residue in veterinary and aquaculture produce; no testing for antibiotic residue is done, and no minimum allowable weaning period before slaughter and processing.

The FDA regulates importation and is also responsible for the registration; post market surveillance and quality assurance of all medicines including antimicrobials used in veterinary services (Ghana Public Health Act, 851, 2012).

## 2.2 Responsible use of Medicines

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At the health facility level, there are inappropriate prescriptions of antibiotics. The levels of prescribing are not adhered to; dangerous drug books are not kept and managed.

Due to inadequate logistics and laboratory setup, culture and sensitivity testing is not done. Where they exist, the sensitivity patterns are not reviewed at the facility levels. There are instances especially at the OPDs where laboratory results show resistance to a particular antibiotic but patients are still treated with these antibiotics. There appears to be lack of adequate dissemination of laboratory findings to prescribers who continue to use the particular antibiotics. Health professionals sometimes also prescribe antibiotics when not needed.

At the community level, antimicrobials are widely and freely available in the market places, lorry stations, buses, as well as 'freelance medicines vendors' in the villages, and chemical sellers (Ghana Health Summit, 2014). The sources of these antimicrobials are unknown and quality cannot be guaranteed. Prevalence of self-medication with antibiotics amongst tertiary students was as high as 75% (Donkor et al, 2012). The most common antibiotic used was amoxicillin.

Traditional medicine practice is another area where antimicrobials are abused. Anecdotal reports suggest that antibiotics have been used to adulterate some herbal products.

The Responsible Use of Medicines (RUM) is one of the key ingredients in any plan to control the development and spread of AMR. This demand having a good Antimicrobial Stewardship Plan over the use of antimicrobials for all relevant sectors and a composite one for the country.

The Ghana National Medicines Policy recommends routine monitoring of responsible use of medicines. Since 1998, Ghana has been implementing the rational use of medicines programme, with the aim of improving medicine use. The rational use of medicines concept demands that patients receive medicines appropriate to their clinical needs in doses that meet individual requirements and for the right duration. Since the implementation of the programme, percentage of encounters with an antibiotic prescribed at the out-patient department (OPD) level has reduced from 56.3% in 1999 to 41.4% in 2015 as indicated in Figure 1.

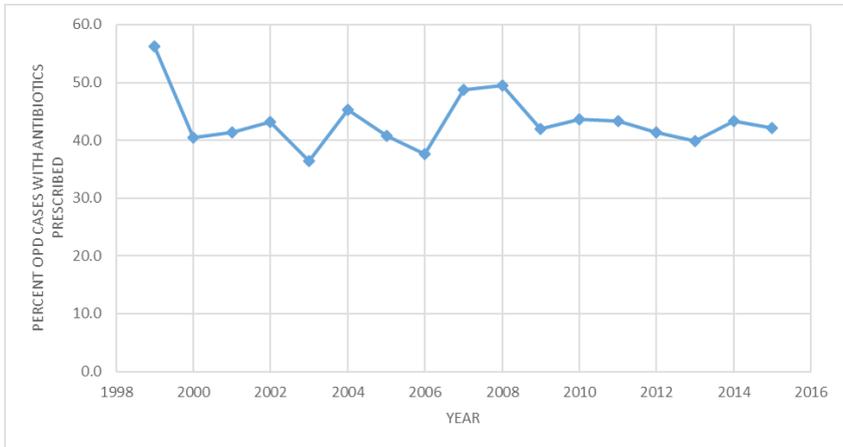


Figure 1: Percentage of encounters with an antibiotic prescribed from 1999 to 2015 in Ghana. (Ghana Health Service (Office of the Chief Pharmacist), 2017)

Drugs and Therapeutic Committees (DTCs) were formed and trained in medicines management to monitor the use of antibiotics in health facilities. Such data has been used for advocacy on AMR and related issues.

There is little collaboration among stakeholders in the food, agriculture and fisheries sectors, hence there is no antimicrobial stewardship plans for these sectors. Standard reporting format for antimicrobials used or prescription restrictions are not available or enforced. The sector is also poorly regulated and hence laden with un-professional practitioners. There is little or no training/continuous training for practitioners in food, crop, veterinary and fisheries in the use of antimicrobials. There is no standardized or approved list of antimicrobials for use in these sectors.

## 2.3 Infection prevention and control (IPC)

Infection prevention and control are measures put in place in a health care facility or a farm establishment (animal, fish or plant) in order to prevent the introduction of infection and also to curtail its spread within and without.

### 2.3.1 Public, Home, Community and Farms

Infection prevention and control policies are poorly implemented in the community, homes, farms and public places. The goal of infection prevention and control is to identify and address all the factors which may introduce infection and spread it

within the farm. Absence of infection makes a farming enterprise more productive, since less money is spent on treatments. This will also lead to a potential decrease in the use of antimicrobials and therefore contribute to slowing down the development and spread of resistant pathogens.

There is evidence to show that prevention is cheaper than cure and that most of the losses suffered in production in these sectors are due to the incidence of preventable diseases. It is therefore vital that infection prevention is given high priority in the food, agriculture and fisheries sectors.

In food, agriculture and fisheries sectors, pathogens can be introduced and spread through the air, water, feed or equipment and tools being used, and in some instances by personnel. Visitors may also introduce infection through contaminated items such as used egg crates, sacks, other containers, clothing and means of transport. Wild animals, birds, insects etc. may also be implicated.

However, over the years, not much attention has been placed on infection prevention and control activities due to numerous factors, such as:

- Absence of policy on infection control
- Inadequate logistics
- Lack of appreciation of the importance of infection prevention and control activities

It is only after major disease outbreaks that some ad-hoc measures are put in place for infection prevention. These measures are however, not sustained for long. Importance is not placed on vector control, nor mass spraying of farms (except cocoa) nor to the mass vaccination campaigns against endemic animal diseases.

Plants, plantlets, seeds, livestock and their products are brought into the country without the necessary checks being carried out on them or being quarantined. There is over-reliance on health and phytosanitary certificates from importing countries without the necessary tests being carried out on them for microbial contamination locally. Simple equipment for personal hygiene and facility hygiene are mostly not available.

The institution of bio-security measures which should prevent farms from being infected are not often carried out. Waste from farms, plants, livestock and fisheries are often not well managed and so serve as sources of infections. The soil as a reservoir of pathogens for animals should not be overlooked (the spores of *Bacillus anthracis* are still viable after more than 50 years in the soil). Livestock moved from one district to another is covered by movement permit.

### 2.3.2 Hospitals

Good infection prevention and control programmes in health facilities reduce the frequency of healthcare associated infections. There has been slow progress in improving hand hygiene practices across patient care points within healthcare facilities. An Emergency, Obstetrics and Neonatal care study in 2011 showed 8% of facilities out of 1268 had no water source. In one region, 25% of health facilities out of a total of 96 had no water source. These have great implications for hand hygiene practices. (Ghana Health Service, 2011)

In the absence of hand washing sinks and running water, “Veronica buckets” are commonly used in most health facilities. However recent studies have shown contamination of water in these containers with microbes due to inadequate cleaning. There are very few hand washing and toilet facilities for patients in the healthcare setting.

In a study done by Asare et al; compliance to hand hygiene recommendations before and after patient contact was 15.4% and 38.5% for physicians, 4.1% and 9.9% for nurses. Gloves were used for 60.8% of patient contacts (85.7% high-risk, 35.4% low-risk); however, compliance to recommended procedure occurred in only 12.2% of high risk contacts and none of the low risk contacts. Gloves were not changed between patients in 43.7% of high-risk contacts and 88.2% of low-risk contacts. (Ghana Health Service (ICD, 2011))

Another study in a hospital on the prevalence of wound infection by Apanga et al, (2013) showed that the prevalence of wound infection was relatively high with nosocomial wound infection accounting for approximately 40% of the total wound infections.

In 2012, there was an outbreak of Methicillin Resistant *Staphylococcus aureus* (MRSA) in Neonatal Intensive Care Unit of the Child Health Department of the Korle-Bu Teaching Hospital (Newman M., 2014).

In 2003, the first national policy on infection prevention and control was developed with engagement of staff in the teaching hospitals and limited training of other health workers. In 2009, a first revision was conducted introducing infection prevention and control considerations for antibiotic use. With further stakeholder involvement, extensive dissemination and training of health workers was undertaken. With the emergence of newer pandemic diseases, a new revision was undertaken in 2015. Extensive dissemination to health workers has been done from national through regional to district levels to undertake infection prevention and control activities (Ghana Health Service (ICD), 2016).

### 2.3.3 Waste Management

Waste management comprises all the activities required to deal with waste from an establishment or place from its inception to its final disposal. It includes collection, treatment, transportation, disposal and monitoring. Waste management should start from the point of generation. Ideally there should be segregation of waste before collection, transportation, treatment and disposal. The goal of waste management is to prevent the adverse effect of waste on health and the environment.

Waste can be a major source of spreading pathogenic and resistant microorganism, which will not only result in health problems but also lead to increased cost of production and productivity losses in the food, agriculture and fisheries sectors.

The provision of health care such as any other human activity generates wastes, which have to be managed or disposed off in a safe manner in order to minimize risk to the health-worker, clients and community at large. About 10-25% of waste generated in health facilities are hazardous, and require special arrangement for management. Examples of hazardous health care wastes are pathological waste such as tissues and body fluids, pharmaceuticals (expired and unused drugs), sharps (syringes, disposables, and scalpels) and radio-active waste. There is slow progress in improving healthcare waste management. Waste is often not segregated, where sharps are collected in separate containers, the containers are often left to overflow. Color coding practices are not often adhered to. Open dumping is a common practice, however, where incinerators are provided their maintenance and use is hampered by lack of resources.

There is an MOH waste management policy developed in 2006 that seeks to ensure that, health care waste is managed effectively in compliance with existing laws and regulations and others to be passed in future in order to protect health care workers, their clients (patients, caregivers and visitors) and the environment from potential disease-causing waste materials. The Guidelines provide standards, procedures and processes for handling health care waste in health sector institutions and mechanisms for performance monitoring.

Waste management in the food, agriculture and fisheries sectors, has not received the attention it deserves. This may be due to the lack of appreciation of its role in infection prevention and control. Currently, there are no policies for managing wastes from the sectors' production activities. There are however guidelines for a few specific cases in the formal sector, especially during major disease outbreaks, (Highly Pathogenic Avian Influenza outbreaks) but the resources to implement these are not available.

At the farm level, no monitoring is done to ensure compliance, unless during disease outbreaks. Effluents from fish farms and solid wastes from farms, of all types

and sizes are discarded anyhow and anywhere. No standardized procedures for disposal of wastes from veterinary laboratories etc. have been established. Other wastes are dumped among domestic waste without initial processing to render them harmless.

Improper waste management could lead to the introduction and spread of resistant pathogens as well as the introduction of sub-lethal quantities of antimicrobials into the environment that could promote resistance.

## 2.4 Strengthening Disease Control Programs

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New diseases and epidemics may emerge at any time while existing diseases may pose new challenges to health. Some of these diseases can easily be transferred between human, animal and the environment and present public health challenges. Timely response to control disease outbreaks in all sectors (human, animals and plants), not only prevents or reduces the spread of these diseases, the harm it poses and the associated economic loss, but also reduces the cost of the control exercises. It is therefore important to have in place for all the sectors, standard operational principles or general guidelines for the control of disease outbreaks and specific strategies for very important ones (those of great socio-economic importance).

Most disease control programmes in Ghana have structures and standard operating procedures for implementation when disease outbreaks occur. However, inadequate funding of programme activities has been the main challenge. Regular support for activities at the community level is low, hence, adherence to positive lifestyle activities and prevention is often adhoc. Surveillance and routine monitoring of antimicrobials used in some programmes is lacking. There is little or no private-public partnership in disease control programmes. Though there is an established system to deal with disease outbreaks, its implementation is often adhoc.

Disease control programs for the Food, Agriculture and Fisheries sectors are weak. Though there are some general guidelines to control disease outbreaks, these guidelines are not enforced due to the frequent non-availability of equipment and logistics needed to respond to them. Quarantine facilities are few and often not in good state. Movement restrictions for animals and plants are difficult to enforce for these sectors. Often diseased animals, plants, fish and their products are transported to clean areas with ease.

Poor record keeping and weak enforcement of regulation presents challenges in tracing sources of disease outbreaks. Difficulties are experienced in accurately diagnosing disease due to the weak laboratory presence in most of the areas where the farms are located. Added to these factors is the problem of trained human resource inadequacies.

## 2.5 Laboratory diagnostics and protocol requirements

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There are some policies and regulatory structures in place to support the provision of laboratory services for health care, for example the national laboratories policy for human health. The goal is to ensure optimal delivery of laboratory services for the various levels of healthcare delivery for both public and private sectors. This service is to ensure that the antimicrobials introduced are specific for the disease-causing microbes and contribute to the containment of antimicrobial resistance.

A large majority of primary care laboratories do not have the capacity to do microbiology tests due to inadequate capacity, inadequate human resource, equipment and reagents.

Culture and sensitivity is not done in most cases for the following reasons:

- Most clinicians do not request for sensitivity test for diagnosis and treatment
- Weak capacity of some labs to do sensitivity testing
- Antimicrobial discs used for sensitivity testing are based on what the agents provide

Within the food, agriculture and fisheries sectors, there are not enough infrastructures to provide laboratory services. Apart from the zonal veterinary laboratories in Accra, Tamale, Takoradi, Kumasi and to some extent in Techiman, the other regional veterinary laboratories offer rudimentary laboratory services.

Most of the districts do not have veterinary laboratories. Only the four zonal laboratories can do some work on antimicrobial usage and resistance. There are also not enough personnel to run the few ones. The Fisheries Commission is now putting up a fish pathology laboratory in Accra.

The Plant Protection and Regulatory Services Directorate (PPRSD) has only one plant pathology laboratory in the country, located in Accra. It can diagnose fungal and bacterial diseases, but not viral diseases. It lacks the ability to carry out sensitivity tests and thus the ability to detect AMR. The Research Institutes however have similar laboratories with greater capabilities. The Seed Inspectorate Division of PPRSD has one national seed laboratory in Accra and six (6) satellite laboratories at Winneba, Kumasi, Tamale, Wa, Bolgatanga and Ho. Those in Accra, Wa, Bolgatanga and Tamale test for fungal contamination whilst the other only carries out germination tests. All seeds and plantlets imported into the country must undergo microbial assessment (usually fungal contamination tests).

## 2.6 National surveillance system for antibiotics

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Surveillance of antimicrobial resistance is done to track changes in microbial populations, detect early resistant strains of public health importance, support the prompt notification and investigation of outbreaks and deploy more effective antibiotic treatment in clinical cases. There is a general disease surveillance mechanism in Ghana as well as for specific programmes. This is however not the case for aquaculture and crop production, except cocoa sector.

Surveillance findings are required to inform clinical therapy decisions, to guide policy recommendations and to assess the impact of resistance containment interventions. National surveillance systems for antibiotics exist for a few programme drugs e.g. TB and HIV. An assessment of the TB surveillance system in Ghana revealed some favorable findings. The surveillance system is paper-based, based on the WHO-recommended structure of quarterly reporting of aggregated data. It covers health facilities in 216 districts in 10 regions. (Bonsu et al. 2014). An electronic recording and reporting case-based surveillance system is not in place (Bonsu and Boakye 2013).

Some of the markers of data quality in the surveillance system include:

- Standardization and consistency with international standard (i.e. WHO)
- Surveillance system designed to capture a minimum set of variables for relevant cases
- Scheduled and adequate periodic data submissions (reporting) received and processed at the national level
- Accuracy, completeness, internal and external consistency in data
- Surveillance data provide a direct measure of drug resistant TB in new cases (Bonsu & Boateng, 2013)

The fight against AMR threats in the food, agriculture and fisheries sectors can only be successful if there is enough evidence to guide it. No such permanent surveillance systems have ever been put in place for the crop, fisheries and livestock sectors, except that carried out by the Cocoa Research Institute of Ghana for the cocoa sector.

## 2.7 Regulation and enforcement

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The mandate for FDA for regulation comes from the Public Health Act 2012 (Act 851) and has developed guidelines and SOPs for their operations. Their activities include monitoring of safety profiles of antimicrobials used in Ghana, providing technical support to local manufacturing industries, conducting post market surveillance of products and also responsible for evaluation and registration of antimicrobials in general. The Health professionals practice is regulated by the Health Professionals Regula-

tory Act 2013 (Act 857). This Act regulates the services provided by health professionals in the country. The overall legal framework for medicines including antimicrobials is set out in the Public Health Act 2012 (Act 851) and enforced by the FDA. There are no specific provisions on antimicrobials in these Acts.

The policy framework for the regulation of antimicrobials is weak or non-existent. The existing policies of essential medicines in general do apply to antimicrobials. There is however, a specific policy intervention for infectious diseases such as malaria, TB and HIV, which has been under global fund support over the years.

Regulations and their enforcement are very important if any headway is to be made in the fight to control the AMR threats. The FDA and Pharmacy council are responsible for medicine regulation and enforcement. FDA regulates the manufacture of local antibiotics as well as the importation; however, there are concerns that there may be high levels of substandard, spurious, fake, falsified, counterfeits (SSFSCs) antimicrobials on the market. Study by Bekoe and Ahiabu., showed that antibiotic supplies from the informal sector were of lower quality than those from the formal sector (Bekoe and Ahiabu, 2014). The importation through unapproved routes makes regulation difficult. The sale of antimicrobials on the open markets, vehicles and unapproved locations is also a source of concern.

Ghana has a large number of regulations covering the operations of the food, agriculture and fisheries sectors on the use of pharmaceuticals, pesticides, waste management, etc. The challenge however, is the enforcement of these laws. The FDA and EPA are responsible for the registration of drugs, feeds and other chemicals used in the food and agricultural sectors. Monitoring on the field is done by these agencies in collaboration with VSD, APD, FC and PPRSD. Most of the antimicrobial agents used in food, agriculture and fisheries are not manufactured in Ghana but imported from outside the country, by big companies. These companies have warehouses where the drugs are stored for distribution. Even though imports of drugs should be only through the Kotoka International Airport and the Tema Harbour, many come through unapproved routes. It is therefore difficult to keep track of all the antimicrobials being used in Ghana, and their efficacy.

## 2.8 Antibiotic Manufacturing, Distribution and Use

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The Private sector is the main actor when it comes to the manufacturing of medicines including antibiotics. The Government however provide tax incentives for the private sector. The local industry has the technology for manufacturing both active pharmaceutical ingredients, packaging and finished dosage forms. The industry produces medicines for a wide variety of therapeutic uses, including antimicrobials.

About 30% of the essential medicine needs of Ghana are met through local

manufacturing with the rest mainly by import. This huge import unfortunately leaves room for illegal activities such as importation of fake, counterfeit and sub-standard medicines including antibiotics.

There are plans to establish a bioequivalent centre that will help assure quality of antibiotics produced or procured into the country.

There are about 38 pharmaceutical manufacturing companies in Ghana, however none of them produce antimicrobials from Active Pharmaceutical Ingredient (API) to the finished product. (Seiter and Gyansa-Lutterodt, 2009) Most of the pharmaceutical companies do not produce antimicrobials but are involved in contract manufacturing and importation from companies outside Ghana.

Medicines including antimicrobials are procured through the public procurement arrangements, which are regulated by various Acts and Legislations. These essential medicines are received by the publicly owned Central Medical Stores (CMS) for warehousing and distribution to the various Regional Medical Stores and health facilities in the public and private sectors. Due to the decentralized procurement arrangement system in the health sector, health facilities are also allowed to procure outside the Central Medical Stores within an agreed and regulated threshold value. Some private groups such as Christian Health Association of Ghana (CHAG) procure and distribute medicines including antibiotics to its members. Medicines including antimicrobials are also imported and distributed by licensed private wholesalers across the country. Seiter and Gyansa-Lutterodt, 2009, indicate that about 150 companies are licensed or registered national or regional wholesalers of pharmaceutical products

Distribution of medicines is characterized by complex interaction between the public, self-financed and faith-based sectors. Antimicrobials distribution does not follow a specified system or pattern. The distribution is as occurs with other essential medicines. Ghana operates a pull system for essential drugs where facilities decide periodically what they require and purchase either from the next level or from the private sector.

Most of the major manufacturers have an integrated distribution business with fixed distribution points in several regions and mobile vans that make scheduled tours to deliver medicines to more remote locations.

Due to the free market and poor enforcement of regulations, antimicrobial distribution cannot be tracked easily. Unrestricted access makes it possible for untrained persons to access and distribute antimicrobials. Limited number of health cadres and their poor distribution to the rural areas have created a delicate balance between access and proper antimicrobial therapy.

There is no written strategy to monitor the use of antimicrobials in the health

facilities. There is however an International Network for Rational Use of Drugs (INRUD) indicator which monitors the proportion of antibiotics prescribed and is currently about 43%. (Medicines Transparency Alliance Ghana, 2010) Prescribing by national guidelines is poorly adhered to. Non-pneumonia acute ARI of any age treated with antibiotics stood at 100%.

Almost all the antimicrobials used in food, agriculture and fisheries sectors are imported into the country. Apart from the cocoa sector where COCOBOD does the importation, all the antimicrobial agents are imported, stored and distributed by the private sector.

The same problems encountered by the human health sector in the manufacture, distribution and use of antimicrobials are the same encountered in the food, agriculture and fisheries sectors.

## 2.9 Legislative and legal framework/policies

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There is a national medicines policy for the health sector which does not specifically mention antimicrobial resistance. Standard guidelines exist for the use of antimicrobials in the treatment of infectious diseases. This serves as a guidance document only and there are no legal provisions to enforce adherence to the STG. The Ghana EML, which is extracted from the STG, serves only as basis for public procurement and also in defining the NHIA medicines list (Seiter & Gyansa-Lutterodt, 2009).

For a summary of key findings from situational analysis informing the policy on antimicrobial use and resistance in Ghana, see Table 4 in the annex.

## 3 Policy Goals, Objectives and Strategies

### 3.1 Preamble

The AMR policy has been developed to improve awareness and understanding of AMR through effective communication, education and training. It seeks to strengthen knowledge and evidence base through national surveillance and research and improvement of laboratory services for culture and sensitivity. It also seeks to reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures.

It is expected that the use of antimicrobial agents in humans, plants and animal health would be optimized in the ‘one health’ approach through specific interventions in Responsible Use of Antimicrobials in humans, veterinary and aquaculture as well as in the environment and industry. The policy also recommends specific regulatory interventions to deal with manufacturing, supply chain, and to also increase investment in new medicines, diagnostic tools and vaccines.

It is emphasized that a strong multi-stakeholder collaboration, which has made the development of this policy a success, would also strengthen the implementation of this policy under existing governance structures. The policy seeks a systemic balance between access and excess to preserve antimicrobials for current and future generations.

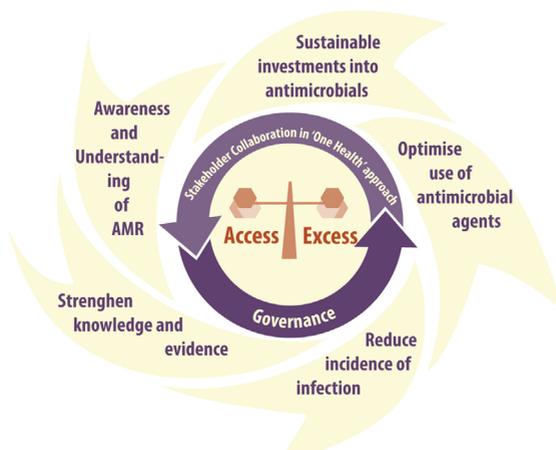


Figure 2: Conceptual framework for AMR interventions in Ghana

## 3.2 Goal

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The overall goal of this policy is to improve and sustain the health of the population (human, animal and plants) in their environment and enhancing food security by ensuring the responsible use and access to safe, effective and affordable antimicrobials of good quality as well as slow the emergence of resistant microbes and prevent the spread of resistant infections in “one-health” approach.

## 3.3 Policy Objectives

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The objectives are to:

- Improve awareness and understanding of AMR through effective communication, education and training
- Strengthen knowledge and evidence base through surveillance and research
- Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures and good agricultural and biosecurity practices
- Optimize the use of antimicrobial agents in human and animal health, aquaculture and crop production
- Develop the economic case and create an enabling environment for sustainable investment that takes account of the needs of Ghana, and increase investment in new medicines, diagnostic tools, vaccines and other interventions

## Policy Statements

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### 4 To improve awareness and understanding of AMR through effective communication, education and training

Government will enhance the knowledge and understanding of the general Ghanaian public about the risks associated with antimicrobial resistance in the public health, livestock, aquaculture and crop production.

#### 4.1 Communication and education

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- 4.1.3.1 There shall be collaboration with all stakeholders (including the Media and Civil Society Organizations) for continuous education to promote the responsible use of antimicrobials in the general public in the spirit of the 'one-health' approach.
- 4.1.3.2 There shall be continuous education to promote the responsible use of antimicrobials in animal husbandry, aquaculture and crop production with emphasis on the dangers of antimicrobial misuse.
- 4.1.3.3 The Ministries of Health; Food and Agriculture, Fisheries and Aquaculture Development and; Environment, Science, Technology & Innovation in collaboration with the educational institutions should incorporate information on antimicrobials into their curricula (the concept of AMU and AMR).

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### 5 To strengthen knowledge and evidence base through surveillance and research

Government will create an effective institutional framework for surveillance of Antimicrobial Resistance and use in the health and food production sectors.

#### 5.1 National surveillance

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- 5.1.3.1 There shall be established national monitoring systems for antimicrobial use and surveillance of antimicrobial resistance to inform policy.
- 5.1.3.2 Laboratories for animal, fish, plant and human shall be strengthened to

monitor resistance to antimicrobials.

- 5.1.3.3 There shall be a data management system to yield quality surveillance data that can be shared regionally and globally to drive future actions in managing AMR.

## 5.2 Laboratory services

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- 5.2.3.1 Government and other stakeholders shall provide resources to improve on the quality of laboratory diagnostic services to inform the selection and prescribing of antimicrobials
- 5.2.3.2 The National laboratory policy shall be implemented in all healthcare facilities. District hospital laboratories shall be strengthened to provide culture and sensitivity testing services.
- 5.2.3.3 Government through the Ministries of Food and Agriculture and Fisheries and Aquaculture Development and Environment, Science, Technology and Innovation as part of environment sectors shall develop National laboratory policies for the food, agriculture, fisheries and environment sectors. All the laboratories in these sectors shall be strengthened to enable them work on AMU and AMR

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## 6 To reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures and good agricultural and biosecurity practices

Government will promote effective infection prevention measures in the public health, livestock, aquaculture and crop production sectors.

### 6.1 Infection prevention and control

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- 6.1.3.1 The Ministry of Health Infection prevention and control policies and guidelines shall be implemented in all health facilities.
- 6.1.3.2 The Ministries of Food and Agriculture, Fisheries and Aquaculture Development; and Environment, Science, Technology & Innovation shall develop for agencies in these sectors guidelines and SOPs on Infection Prevention and Control, and ensure their implementation at all levels.

In addition, special emphasis shall be placed on the following areas:

- Hand hygiene
  - Sterilization and disinfection
  - Use of personal protective equipment
  - Environmental cleaning and waste management
  - Isolation and quarantine
  - The control on the movement of livestock, poultry, fish, plants and their products both within and into the country
  - Promotion of Good agricultural and husbandry practices, including Integrated Pest Management and biosecurity
- 6.1.3.3 The Waste management policy of the Ministry of Health shall be implemented in all health care settings
- 6.1.3.4 Guidelines and SOPs on Waste management shall be developed for each of the agencies of the food, agriculture and fisheries sectors; the necessary measures shall be put in place for their implementation.
- 6.1.3.5 Vaccination in animal husbandry and aquaculture shall be promoted as an approach to reducing infections in food animals.
- 6.1.3.6 Promotion of resilience of plant through soil fertility management shall be emphasized Ministry of Environment, Science, Technology and Innovation and Ministry of Foods and Agriculture.
- 6.1.3.7 Promotion of vector control in all sectors shall be emphasized

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## **7 To optimize the use of antimicrobial agents in humans, aquaculture, plant production and in animal health in the ‘one health’ approach**

Government will ensure responsible use of antimicrobials at all levels.

### **7.1 Responsible Use of Antimicrobials**

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- 7.1.3.1 The Ministries, Departments and Agencies involved in antimicrobial resistance shall promote stewardship of all antimicrobial agents.
- 7.1.3.2 The criteria for the selection of antimicrobials at the national level shall include surveillance data on antimicrobial resistance.
- 7.1.3.3 The MOH, VSD, FC (in collaboration with EPA, PPRSD), shall ensure that

the prescribing and dispensing of antimicrobials are informed by laboratory results.

- 7.1.3.4 Promotion and advertisement of antimicrobials shall be restricted to animal, human and plant health professionals and scientific publications only.
- 7.1.3.5 Sale and promotion of antimicrobials shall be in accordance with the Public Health Act 2012 (Act 851)
- 7.1.3.6 There shall be functional Drugs and Therapeutic Committees to institute antimicrobial stewardship programmes in health facilities.

## **7.2 Veterinary, Aquaculture, Apiculture and Plant Health**

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- 7.2.3.1 The Ministries of Food and Agriculture, Fisheries and Aquaculture Development and Environment, Science, Technology & Innovation and their related agencies shall promote responsible use of antimicrobials at all veterinary, fisheries and agricultural practice settings.
- 7.2.3.2 There shall be instituted, monitoring mechanisms for the use of antimicrobials in veterinary, fisheries and agricultural practice settings.
- 7.2.3.3 The roles of veterinary services and PPRSD in animal and plant health respectively, and in antibiotic use shall be promoted to assure public safety.
- 7.2.3.4 The standard treatment guidelines and SOPs for animal and plant health shall be developed, disseminated and implemented.
- 7.2.3.5 There shall be standards set for antimicrobial residue in veterinary, plant production and aquaculture.
- 7.2.3.6 The quality of veterinary and plant pathology laboratory services shall be strengthened to inform selection and prescribing of antimicrobials.

## **7.3 Environment and Industry**

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- 7.3.3.1 Government shall develop and enforce guidelines and standards for biomedical waste and effluent from health facilities, animal production and aquaculture units.
- 7.3.3.2 EPA and FDA shall establish mechanisms for retrieval and disposal of unwholesome and unused antimicrobials from the general public and institutions including effluent from industry.

## **8 Develop the economic case and create an enabling environment for sustainable investment that takes account of the needs of Ghana, and increase investment in new medicines, diagnostic tools, vaccines and other interventions**

Government shall ensure that an effective implementation of the one health concept is fostered through research.

### **8.1 Research and development**

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- 8.1.3.1 The Ministries of Health, Food and Agriculture, Fisheries and Aquaculture Development shall collaborate with other agencies and institutions to conduct research into various aspects of Antimicrobial use and resistance in humans, animals and plants.
- 8.1.3.2 Basic and operational research in antimicrobial use and resistance and development of new antimicrobial agents, vaccines and diagnostics shall be encouraged
- 8.1.3.3 A platform for academia, industry and policy shall be created to share information on research that can inform policy and industry.

### **8.2 Manufacturing, Supply, distribution**

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#### **Supply**

- 8.2.3.1 Sourcing, distribution and supply of antimicrobials shall strictly be in accordance with available regulatory instruments in the country. These shall include:
  - Health Profession Regulatory Bodies Act 2013 (Act 857, 2013)
  - Public Health Act 2012 (Act 851, 2012)
  - Health Institutions and Facilities Regulatory Act, (Act 829, 2011)
  - Fisheries Commission Act 2002 (Act 625, 2002)
  - Environmental Protection Act 1994 (Act 490, 1994)

#### **Manufacture**

- 8.2.3.2 All local manufacturing companies shall have the technical requirements as determined by the FDA and EPA for the manufacture of antimicrobial agents.
- 8.2.3.3 The Ministry of Health shall facilitate the establishment of a national bio-

equivalence Centre to support the manufacture of quality generic antimicrobials

- 8.2.3.4 The FDA shall support local industries manufacturing antimicrobials to meet quality specifications in accordance with Public Health Act 2012 (Act 851, 2012).
- 8.2.3.5 The government through the Ministry of Health, Food and Agriculture, Ministry of Environment Science and Technology shall strengthen collaboration between academia and industry for the development of new antimicrobial agents.
- 8.2.3.6 The government shall provide incentives and financial support for local industries to produce affordable but quality antimicrobials including industries with the capacity to develop APIs for the pharmaceutical sector
- 8.2.3.7 Innovation for new antimicrobial agents shall be encouraged including those from herbal sources

### **8.3 Regulation and enforcement**

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- 8.3.3.1 Supply of antimicrobial agents shall be strictly according to laid down regulations (Public Health Act, Health Professions Regulatory Bodies Act) etc.
- 8.3.3.2 The FDA, EPA and other relevant institutions shall enhance post market surveillance and pharmacovigilance on antimicrobial agents

### **8.4 Stakeholder collaboration, Governance and Leadership of Antimicrobial Resistance**

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- 8.4.3.1 There shall be established an Inter-Ministerial Commission comprising the Ministries of Health, Food and Agriculture, Fisheries and Aquaculture Development, Interior, Defense, Local Government and Rural Development, Environment, Science, Technology and Innovation and others to lead efforts to contain the AMR threat.
- 8.4.3.2 The Ministerial Commission will be advised on technical issues by a team of experts drawn from relevant fields of expertise.
- 8.4.3.3 At the District level, the implementation of the Policy shall be done by the District Committees on AMR. The District AMR Committees shall be supervised by Regional Committees on AMR.
- 8.4.3.4 The Ministry of Health shall coordinate a functional multi-stakeholder plat-

form to drive antimicrobial resistance issues in the country

- 8.4.3.5 The Ministry of Health shall promote collaboration; provide leadership and stewardship, amongst stakeholders, at international and national levels, as well as other sectors on antimicrobial use and resistance.
- 8.4.3.6 There shall be a monitoring and evaluation framework for all aspects of this antimicrobial policy.
- 9.4.1.7. The Ministry of Health in collaboration with relevant ministries, agencies and partners shall develop and implement a 5-year National Action Plan on Antimicrobial Use and Resistance.

## 9 Annexes

### 9.1 Annex I: Some Instances of Antimicrobial Resistance in Livestock in Ghana

Table 2: Antimicrobial resistance in Livestock in Ghana by Location (Turkson P.K et al,2014)

LOCATION	SPECIES	ORGANISMS	RESISTANT ANTIMICROBIALS	REFERENCE
<b>Rural Ghana (Gomoa, Onyadze, Central region)</b>	Chicken, Goats, Sheep	Campylobacter jejuni	Cephalothin Cephalexin Sulphamethazole/trimethoprim	Abrahams et al 1990
<b>Accra Metropolitan Area</b>	Cattle (diary/ beef) Goat, Sheep, Pigs, Poultry (layers/ broilers)	Escherichia coli (animal isolates)	Drug %resistant Cefuroxime 97 Chloramphenicol 82 Gentamicin 74 Cotrimoxazole 67 Tetracycline 95 Ampicillin 96 Cefotaxime 0  Amikacin 61  Top 3 resistant antibiotics  Poultry: tetracycline, ampicillin, chloramphenicol  Sheep: ampicillin, tetracycline, chloramphenicol  Goats: tetracycline, ampicillin, chloramphenicol	Donkor et al 2012

<p><b>Ashanti Region</b></p>	<p>Pigs</p>	<p>Enterobacteriaceae</p>	<p>Streptomycin 72.6% (n=51) Amoxicillin 68% (n =50) Tetracycline 36.5% (n=52) Doxycycline 32% (n=50) Sulphamethoxazole / Trimethoprim 30% (n=50) Ciprofloxacin 15% (n=53) Norfloxacin 3.9% (n=51) Gentamicin 3.9% (n=51)</p>	<p>Osei 2013; Osei Sekyere 2014a</p>
<p><b>Brong Ahafo Region (Techiman)</b></p>	<p>Cattle (meat, tables and knives)</p>	<p>Escherichia coli</p>	<p>Resistant or Intermediate resistant  Amoxycillin/clavulanic acid 13.3% Chlorofloxacin 46.6% Ciprofloxacin 4.4% Ceftriaxone ...37.8% Gentamycin .....24.4% Erythromycin ....97.8% Sulfamethaxazole/ 17.8% Trimethoprim Tetracycline .....44.4% Vancomycin.....88.9%</p>	<p>Adzitey 2015</p>
			<p>E. coli isolates exhibited 25 antibiotic resistant patterns with the pattern VaE (vancomycin and erythromycin) and VaCCro (vancomycin, chloramphenicol and ceftriaxone) being the commonest (each exhibited by five different isolates). Multiple Antibiotic Resistance index (MAR index) ranged from 0.11-0.78 Resistance to seven (MAR index of 0.78) and five (MAR index of 0.56) different antibiotics was exhibited by 1 and 3 isolates, respectively.</p>	

Resistant Bacteria Isolated in Livestock and Poultry in Ghana

## 9.2 Annex 2: Antimicrobials commonly used in Livestock and Poultry in Ghana.

Table 3: Antimicrobials commonly used in Livestock and Poultry in Ghana by Region (Turkson P.K et al,2014)

LOCATION	SPECIES USED IN	ANTIMICROBIALS USED	REFERENCE
Greater Accra, Central and Ashanti Regions	Poultry (layers and broilers)	Tetracyclines (35.7%, n=831) Nitrofurans (23.1%) Penicillin-Streptomycin combi (18%) Sulphonamides (8.3%) Others (15%)	Turkson, 2008.
Greater Accra, Central and Ashanti Regions	Poultry (layers and broilers)	Tylosin (34%, n=50 farms) Penicillin-Streptomycin combi (22%) TCN (Oxytetracycline, chloramphenicol, neomycin sulphate) (22%) Keproceryl (Colistin, oxytet, erythromycin, streptomycin) (18%) Enrococci (Enrofloxacin and Colistin) (10%) Trisul (Trimethoprim, sulphadiazine) (18%) Enrofloxacin (16%) Others (Doxycycline, neomycin, colistin, oxytetracyclines)	Annan-Prah et al 2012
Dormaa (Brong-Ahafo Region)	Poultry	Oxyfuravit (Oxytetracycline, furaladone, vitamins) (35.7%, n=115) Doxin (Doxycycline and tylosin) (n=27%) TCN (4.3%) Antibact. Tylosin, oxytetracycline, neomycin) (13.9%) Enrocoli (Enrofloxacin) (21.7%) Tyodox (tylosin, Doxycycline) (12.2%) Sulfar-based drugs (sulphadimidine, sulphaquinoxaline) (6.1%)	Johnson 2011
Ashanti Region	Pigs	Tetracyclines (59.3%) Penicillin Streptomycin (44.4%) Sulphadimidine (28.7%) Fluroquinolines (Enrofloxacin, norfloxacin) (9.3%) Tylosin (5.6%) Metronidazole (5.6%) Trimethoprim (3.7%) Gentamycin (3.7%) Amoxicillin (0.9%)	Osei 2013

Accra	Cattle, sheep, goats, pigs, poultry	98% of farmers used antibiotics (penicillin, Oxytetracyclines, streptomycin, sulphonamides, Tylosin)	Donkor et al 2012
Ashanti Region	All species	Antibiotics sold by vet shops Tetracycline (48.6%) Sulphonamides (27.3%) Aminoglycosides (22.5%) Macrolides (18.1%) Fluoroquinolones (10.9%) Trimethoprim (9.4%) Penicillin (8.0%) Phenicols (3.6%) Cationic peptides (3.6%) Probiotics (0.7%)	Osei Sekyere 2014

Table 4: Summary of key findings from Situational analysis informing the policy on antimicrobial use and resistance in Ghana

Thematic Area	Key issues identified
I. Use of antimicrobials in veterinary, food, agriculture and fisheries	<ul style="list-style-type: none"> <li>• Widespread indiscriminate use of antibiotics by veterinary officers, farmers, general public (including use in household rearing of animals) and quack veterinary staff in animal health care delivery.</li> <li>• Absence of monitoring mechanisms for the use of antibiotics in veterinary and aquaculture.</li> <li>• Absence of veterinary standard treatment protocols for use in veterinary and aquaculture.</li> <li>• Lack of appropriate legislation.</li> <li>• High illiteracy rate and lack of public education programmes.</li> <li>• The veterinary department is poorly resourced.</li> <li>• General lack of public recognition for veterinary services and functions.</li> <li>• Inadequate veterinary drug and service outlets across the country.</li> <li>• Human drugs are procured for use in veterinary and aquaculture.</li> <li>• Weak collaboration amongst stakeholders.</li> <li>• Antibiotic residue in animals is not being measured. There are no acceptable national standards for; antibiotic residue in veterinary and aquaculture produce, no such testing is done.</li> <li>• The minimum allowable 'wash-out' period before slaughter and processing is not adhered to.</li> </ul>

<p>2. Responsible use of antimicrobials</p>	<ul style="list-style-type: none"> <li>• Only one indicator is being monitored routinely on antibiotic</li> <li>• Widespread and inappropriate use of antibiotics</li> <li>• Levels of prescribing and STGs are not adhered to</li> <li>• SSFFCs antibiotics in circulation</li> <li>• Non- adherence to treatment by patients</li> <li>• Self-medication</li> <li>• Easy access to antibiotics in the open market, on the roads, in buses, in licensed and unlicensed premises/sources and lack of access as a result of poor health systems</li> <li>• Use of antibiotics in traditional medicines</li> <li>• Unregistered persons prescribe antibiotics</li> <li>• Dangerous drug book not kept and managed at health facilities</li> <li>• Data on level of combination of antibiotics and the type of antibiotics prescribed at the OPD level is not readily available</li> <li>• Prescribing antibiotics when they are not indicated</li> <li>• Prescribing of antibiotics is not informed by culture and sensitivity testing</li> <li>• Inadequate counselling of patients on use of antibiotics in hospitals leading to non-compliance</li> </ul>
	<ul style="list-style-type: none"> <li>• Financial barriers resulting in non-compliance to treatment</li> <li>• Inappropriate storage of antibiotics</li> <li>• The frequent change from one antibiotic to another in the course of treatment due to uniformed prescribing</li> <li>• No policy on antimicrobial use for the food, agriculture and fisheries sectors.</li> <li>• No standard treatment guidelines for the food, agriculture and fisheries sectors.</li> <li>• Lack of essential drugs list for the food, agriculture and fisheries sectors.</li> <li>• Low level of awareness of banned antimicrobials.</li> <li>• No list of antimicrobials designated for growth promotion in livestock and fisheries.</li> </ul>
<p>3. Infection prevention and control (IPC)</p>	<ul style="list-style-type: none"> <li>• Poor hand hygiene practices amongst health workers and the community</li> <li>• Inadequate logistics and supplies for IPC</li> <li>• Inadequate implementation of the IPC and Waste management policies</li> <li>• Poor environmental cleaning and healthcare waste management</li> <li>• No waste management policies for the food, agriculture and fisheries sectors</li> <li>• Lack of resources for waste management</li> <li>• Poor monitoring of waste management activities</li> <li>• Farm waste discarded into the environment without initial processing</li> <li>• No standardized procedures for veterinary laboratory waste especially the carcasses</li> </ul>

<p>4. Strengthening disease control programmes</p>	<ul style="list-style-type: none"> <li>• There is lack of funds and logistics for outbreak preparedness</li> <li>• Weak enforcement of regulation on quarantine and movement of animals and products</li> <li>• Lack of public health laboratories for the animal, fisheries and agriculture sector</li> <li>• Human resource challenges for all sectors</li> <li>• Proper records keeping hence lack of data for planning</li> <li>• Weak private- public partnerships on programmes</li> <li>• Poor community support programme activities</li> <li>• Poor or absence of surveillance on the use of antimicrobials in these sectors</li> </ul>
<p>5. Laboratory diagnostics and protocol requirements</p>	<ul style="list-style-type: none"> <li>• Unauthorized laboratory and field staff prescribing antibiotics</li> <li>• Culture and sensitivity not done in most cases leading to patients being blindly treated.</li> <li>• G-DRG payment mechanisms make it difficult to know the cost of laboratory services provided</li> <li>• Human resource issues – inadequate numbers, poor distribution and no motivation for laboratory personnel to upgrade</li> <li>• No national platform for collation of data on culture and sensitivity testing</li> <li>• No standardized laboratory reporting format for AMR</li> <li>• Turnaround time/delay in the release of laboratory findings is a de-motivation factor to request for culture and sensitivity testing prior to therapy</li> <li>• No standardized culture and sensitivity plate</li> <li>• Inadequate number of laboratory to serve the food agriculture, forestry and fisheries sectors.</li> <li>• Laboratories in the food agriculture and fisheries sector generally lack the capacities to work on AMU and AMR</li> <li>• No data base for archiving specimen</li> <li>• Little or no intersectoral collaboration No harmonised standard operating procedures for laboratories</li> </ul>
<p>6. National surveillance system for antimicrobials</p>	<ul style="list-style-type: none"> <li>• Lack of surveillance for all antimicrobials</li> <li>• General lack of national surveillance systems in the food, agriculture and fisheries sectors, especially on AMR and AMU.</li> <li>• Awareness creation of AMR surveillance to civil society</li> </ul>
<p>7. Regulation and enforcement</p>	<ul style="list-style-type: none"> <li>• Although antibiotics are ‘prescription only’ medicine, they’re dispensed over the counter by most practitioners including licensed chemical sellers.</li> <li>• There is also the issue of misuse by patients as full courses prescribed are not adhered to, the immediate impact leads to therapeutic failure.</li> <li>• Weak post market surveillance system.</li> <li>• Affordability for patients where patients can’t afford the full cost of antibiotics prescribed.</li> </ul>

	<ul style="list-style-type: none"> <li>• Inadequate human resource.</li> <li>• Target of profits making by pharmacist over professional ethics and pharmaceutical care</li> <li>• Smuggling of counterfeits antibiotics into the country.</li> <li>• Weak pharmacovigilance system.</li> <li>• There is need for training and general public education about the use of antibiotics</li> <li>• FDA to intensify post market surveillance to ensure compliance with distribution of antimicrobials regulation.</li> <li>• There are many regulations and laws for the food, agriculture and fisheries sectors, but weak enforcement.</li> <li>• Outmoded regulations covering animal health and production.</li> <li>• Non- ratification of international laws and conventions Ghana has signed into pertaining to the food, agriculture and fisheries sectors.</li> <li>• Poor post registration monitoring of drugs in the food, agriculture and fisheries sectors by EPA, FDA, VSD and PPRSD.</li> <li>• Weak collaboration among regulatory bodies in the food, agriculture and fisheries sectors.</li> <li>• Poor storage of drugs in the food, agriculture and fisheries sectors.</li> <li>• Samples of imported drugs not regularly tested.</li> </ul>
<p>8. Antibiotic manufacturing, distribution and use</p>	<ul style="list-style-type: none"> <li>• Inadequate strategic focus and support on the part of government in respect of the pharmaceutical sector. Increasing threat of loss of access to local markets is a stark reality. The local industry has an installed capacity for both liquid and solid forms to supply domestic needs as well as export. However, this capacity is underutilized as a result of inadequate resources.</li> <li>• high production cost</li> <li>• high cost of borrowing making it difficult to compete with imports from SEA</li> <li>• lack of access to investment or developmental capital (Pharmaceutical Manufacturers Association of Ghana, 2014)</li> <li>• inadequate human resource</li> <li>• lack of bioequivalent centre</li> <li>• lack of access to land earmarked specifically for pharmaceuticals production: due to the levels required by the WHO prequalification, pharma industries are to be sited from other industries for fear of contamination</li> </ul>
<p>9. Legislative and legal framework</p>	<ul style="list-style-type: none"> <li>• low tax incentives for the pharmaceutical industry</li> <li>• no market protection for finished product</li> <li>• National Medicines Policy does not speak specifically to antibiotics</li> <li>• Guidance documents exist on antibiotic use with no legal provisions to enforce adherence</li> </ul>

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