NATIONAL RABIES CONTROL AND ELIMINATION STRATEGY

Joint Ministry of Health, Ministry of Livestock and Fisheries, Ministry of Culture and Tourism, Urban Agriculture Bureaus and Ministry of Health Implementation Plan

2018 – 2030 GC

Federal Democratic Republic of Ethiopia

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FOREWORD

This document describes Ethiopia's strategic plan for the elimination of dog-mediated human rabies, a consistently fatal disease in humans, livestock and other mammals by 2030. Rabies is a classic example of a zoonotic disease that is preventable in humans by controlling the disease in animals. Elimination of human rabies is achievable through mass dog vaccination because dogs are responsible for transmission of over 98% of all human rabies cases.

WHO reports that rabies causes approximately 70,000 human deaths worldwide annually, with one person dying of rabies every 15 minutes. The highest burden of rabies is reported in the developing world, with more than 95% of all human deaths occurring in Africa and Asia. Most populations under rural settings and children aged below 15 years are at greatest risk of rabies exposure. The cost associated with post-exposure prophylaxis in humans is high and exceeds the cost of rabies control in animals through dog vaccinations.

In comparison to other communicable diseases, rabies is 100% fatal and 100% preventable; which needs special attention to be given to control and eliminate dog-mediated human rabies in Ethiopia. Elimination of rabies from the dog population is the key target to stopping human rabies. Success in canine rabies elimination has been demonstrated in developing countries including Latin America and Asia, where sustained mass vaccination of dogs was shown to be the most cost effective intervention for controlling and eliminating canine rabies and consequently human rabies.

The Ministry of Health (MoH-EPHI) and the Ministry of Livestock and Fisheries (MoLF) collaborated with relevant ministries and developed this rabies prevention and control strategy with technical backstopping and support from international partners. The strategy will guide stepwise reduction of rabies burden through enhanced surveillance, prevention of rabies in dogs, prevention of rabies in humans, and education/advocacy.

In 2015, Ethiopia prioritized the top five priority zoonotic diseases from over 200 zoonotic diseases. Rabies is among the top five priority zoonotic diseases identified for inter-sectoral collaboration. Establishment of the inter-sectoral National Rabies Technical Working Group have led to the development of this National Strategy document. This strategy is based on activities planned in accordance with the Stepwise Approach to Rabies Elimination (SARE) tool for the country to move from an endemic state to a disease free status. Successful implementation of this strategy requires inter-sectoral collaborative approach with involvement and support of various stakeholders. Rabies prevention and control in Ethiopia is the responsibility of different local actors and together with support from our international partners we are optimistic that we will eliminate dog-mediated human rabies in Ethiopia by 2030.

Dr Kebede Worku
State Minister
Federal Ministry of Health

Dr. Misrak Mekonnon
State Minister
Federal Ministry of LF

EXECUTIVE SUMMARY

Rabies, resulting from infection by Rabies virus (RABV) and related lyssa viruses, is one of the most deadly zoonotic diseases known to man. RABV is caused by the Lyssa virus genus in the family Rhabdoviridae. Lack of strong surveillance of lyssa viruses and limited number of diagnostic laboratories through most of the country are large contributors to lack of information about the incidence of these viruses. The lyssa virus has been sporadically identified in different wildlife (fox, hyena and wolf) and domestic species (cats and dogs) throughout Ethiopia (Deressa et al., 2010).

According to the World Health Organization (WHO, 2005) human deaths occur worldwide due to rabies, amounting to one fatality and 300 exposures every 15 minutes. Almost all human fatalities occur in developing countries with 56% occurring in Asia and 44% in Africa.

This strategy aims to eliminate human cases of dog-mediated rabies by the year 2030 in Ethiopia. The strategy provides a guide for systematic reduction of rabies risk through sustained mass dog vaccinations, pre and post-exposure prophylaxis and public education until the country is completely free of human dog-mediated rabies. This strategy is based on activities planned in accordance with the Stepwise Approach to Rabies Elimination (SARE) for the country to move from an endemic state to a disease free status. SARE is a stepwise progression towards becoming a rabies disease-free country, consisting of 6 stages (Stage 0 to 5), each with a set of activities that build on each other to continuously reduce the risk of disease, with the country being declared completely free of human dog-mediated rabies when it reaches Stage five.

The critical steps in the various stages include:

1. developing and adopting a national rabies elimination strategy,
2. implementation of elimination plan in pilot areas,
3. implementation of the elimination strategy throughout the country and
4. Maintaining freedom from human dog- mediated rabies and canine rabies.

To move from one stage to the other, a set of targets must be reached and confirmed. The implementation of the strategy will begin with selected pilot areas to gain valuable lessons in creating and maintaining a rabies-free zone that will be used during the roll-out of the elimination campaign in the rest of the country.

LIST OF TABLES

The technical contributions, commitment and overall leadership of the members of the National Rabies Technical Working Group (NRTWG) in drafting this strategy document are highly appreciated. We specifically like to acknowledge the institutions listed below whose representatives have played a large role in the development of this strategy.

1. Federal Ministry of Health (FMOH)
2. Federal Ministry of Livestock and Fisheries (MOLF)
3. Federal Ministry of Culture and Tourism (MOCT)4. Center for Disease Control (CDC), Global Health Security Agenda (GHSA)
4. Food and Agriculture Organization, (FAO)
5. The Ohio State University (OSU)
6. World Health Organization (WHO)
7. Global Alliance for Rabies Control (GARC)
8. USAID, P&R

A list of major contributors can be found in the annex.

LIST OF ABBREVIATIONS

ADNIS	Animal Disease Notification and Investigation System
CDC	U.S. Center for Disease Control and Prevention
CRF	Case-Based Reporting Format
DERF-W	Daily Epidemic Reporting Format for Woreda
DFAT	Direct Fluorescent Antibody Test
DOVAR	Disease Outbreak and Vaccination Activity Reporting
DPMP	Dog Population Management Program
DRIT	Direct, Rapid Immunohistochemical Test
ENRBS	National Rabies Baseline Survey
EPHI	Ethiopian Public Health Institute
ECTAD	Emergency Centre for Transboundary Animal Diseases
FAO	Food and Agriculture Organization of the United Nations
FMHACA	Food, Medicine and Health Care Administration and Control Authority of Ethiopia
FMOH	Federal Ministry of Health
GARC	Global Alliance for Rabies Control
IEC	Information, Education, and Communication
MOLF	Ministry of Livestock and Fishery
MVC	Mass Vaccination Campaign
NAHDIC	National Animal Health Diagnostic and Investigation Centre
NTV	Nerve Tissue Vaccine
NVI	National Veterinary Institute
OIE	World Organization for Animal Health
ORV	Oral Rabies Vaccine
PANVAC	Pan-African Veterinary Vaccine Centre
PARACON	Pan-African Rabies Control Network
PCR	Polymerase Chain Reaction
PDS	Participatory Disease Surveillance
PEP	Post-Exposure Prophylaxis
PV	Pasteur Virus
Qrt-PCR	Quantitative Real Time PCR
SARE	Stepwise Approach towards Rabies Elimination
SOP	Standard Operating Procedure
STOP-R	Strategic Framework for the Control and Elimination of Rabies
TWG	Technical Working Groups
WHO	World Health Organization

CHAPTER 1

1.1. INTRODUCTION

Rabies is present on all continents of the world with the exception of Antarctica and several small pacific islands. However, more than 95% of human deaths due to the disease occur in Asia and Africa. A recent global burden study estimated the human mortality from rabies to be 70,000 per year worldwide, with about 56% of the cases occurring in Asia and 43.6% in Africa, mostly in rural areas. This translates to 1 death due to rabies every 15minutes in the world. Official data on human rabies deaths submitted to World Health Organization (WHO) from Africa are a gross under-estimate of the true burden of the disease. The reasons for this include: rabies victims are often too ill to travel to hospital or die before arrival; families recognize the futility of medical treatment once signs develop so they do not seek treatment; and the difficulty in laboratory confirmation of clinical clinically suspected cases which leads to misdiagnosis.

In addition to human mortality, the economic burden attributable to rabies is significant. The high cost of post exposure prophylaxis in human creates a heavy burden to both government and household budgets. At the household level, costs of post-exposure prophylaxis (PEP) arise directly from rabies vaccines and indirectly from costs associated with travel, medical fees and income loss. The indirect household losses represent more than 50% of total costs. The total PEP costs have been estimated at US$40 per patient in Africa and US$ 49 in Asia, accounting for 6% and 4% of annual per capita Gross National Income, respectively. In addition, victims of rabid dog bites and their families suffer from psychological trauma resulting from the uncertainty and resignation to the inevitable outcome. Weak surveillance and lack of reliable data on the number of animal rabies cases is a major constraint to assessing the economic impact of rabies on the local communities when livestock and working animals die due to rabies or infect humans. In addition, the control of rabies in dogs protects wildlife from rabies including the endangered wild canids whose existence is threatened by rabies.

Successful elimination of human rabies has been demonstrated in many countries, including in parts of developing countries such as the Philippines, Mexico and Indonesia. In the province of Bohol, located in the Visayas islands region in the Philippines, a rabies elimination program was launched in 2007 involving mass dog vaccination, dog population control, improved dog bite management, public education, and improved diagnosis surveillance and monitoring. Similar control efforts are underway in the south-eastern part of the United Republic of Tanzania and Kwa-Zulu Natal in South Africa (Hampson et al., 2015)

In Ethiopia, it is estimated that up to 2,700 human deaths occur annually due to rabies. Progress in preventing human rabies through control of the disease in the dogs has been slow due to a number of barriers including; limited information and awareness about the extent of the problem, lack of suitable diagnostic and response capacity, lack

of appropriate and sustainable strategy for prevention and control, lack of inter-sectoral collaboration and organizational and financial challenges. Successful elimination of human rabies in Ethiopia will require a multi-sectoral and collaborative approach. Prevention of dog rabies, effective surveillance in humans and animals, better public awareness and improved access to human rabies vaccines are essential for the elimination of human rabies.

1.2. COST EFFECTIVENESS OF RABIES ELIMINATION

The current rabies prevention and control efforts in Ethiopia are restricted to human post-exposure prophylaxis (PEP) and local area dog vaccination campaigns. This approach has not been successful in reducing the incidence of rabies in animals and humans, owing to inadequate vaccination coverage and unavailable or unaffordable PEP for most of the affected individuals.

There are three main strategies for the control of rabies; a) Prevention in humans through intensified post-exposure treatment (PEP), b) Controlling the disease in the reservoir host through dog vaccination, c) Combination of the two. To determine the most cost-effective method of the three studies have been conducted in Chad and Philippines. In the Philippines, cost–benefit analysis of mass dog vaccination versus human PEP over a six-year period indicated that the use of intensified human PEP alone was associated with increased medical costs to the government over the years in the absence of a dog vaccination program (Jibat T, 2015).

In Chad, the cumulated cost of the combined strategy of human PEP and dog vaccination was found to be more cost effective than the human PEP alone in the first four years, and then it became lower than human PEP cost after the fifth year of the program. The studies also showed that the cumulated cost of PEP alone would be greater than the combined approach after the sixth year of the elimination program. Lessons from these studies indicated that rabies control using the current strategy (ad hoc vaccinations without reaching the optimal 100%, supply of PEP to dog bite victims) is less cost-effective compared to an elimination strategy that focuses on mass dog vaccinations (reaching and maintaining the 70% vaccination coverage) accompanied by residual PEP for dog-bite victims. The benefit of mass dog vaccination and elimination of rabies in the animal reservoir will result to saving human lives, reduction of expenditures on human PEP and additional income from livestock whose death is prevented.

1.3. EPIDEMIOLOGY OF RABIES

1.3.1. RESERVOIR

In Africa, evidence indicates that the primary rabies virus maintenance cycle is among domestic dogs, although other carnivores may be involved as non-maintenance populations. This finding suggests that mass vaccination targeting domestic dogs would

have the greatest impact in reducing the risk of infection in all other species including humans, livestock and wildlife. The role of bats and other carnivores in human rabies transmission in Africa appears minimal.

1.3.2. TRANSMISSION

Humans are usually infected following a bite or scratch by an infected animal. Transmission can also occur when infectious material such as saliva comes into direct contact with human mucosa or fresh skin wounds. Human-to-human transmission through bite is possible but has not been documented; transmission via transplantation of an organ from an infected donor has occurred multiple times. Though cooking of meat would inactivate the virus, there is risk of exposure during the butchering of a rabid animal that could lead to rabies.

1.3.3. CLINICAL FEATURES

CLINICAL FEATURES IN ANIMALS

The incubation period in animals can vary considerably. In dogs and cats, it is typically between 2 to 12 weeks, although cases have developed up to a year following exposure.

There are two distinct forms of rabies in animals; furious and dumb forms. The furious form of rabies is the classic “mad-dog syndrome”, and may be seen in all species. The animal becomes irritable and may viciously and aggressively use its teeth, claws, horns, or hooves to attack humans and other animals, without provocation. Such animals lose caution and fear of humans and other animals. The dumb/paralytic form of rabies manifests with ataxia and paralysis of the throat and jaw muscles, often with profuse salivation and the inability to swallow. These animals may not be vicious.

In either form, initial and predominant signs include a marked change in behavior. Rabid dogs or cats die within 10 days of onset of symptoms.

CLINICAL FEATURES IN HUMANS

In humans, the incubation period for rabies is typically 1–3 months, but may vary from below one week to more than one year. The initial symptoms of rabies are fever and often pain or an unusual or unexplained tingling, pricking or burning sensation (paraesthesia) at the bite site. As the virus spreads through the central nervous system, progressive, fatal inflammation of the brain and spinal cord develops.

Two forms of the disease can follow; furious or paralytic rabies. People with furious rabies exhibit signs of hyperactivity, excited behavior, and hydrophobia (fear of water) and death after a few days. Paralytic rabies accounts for about 30% of the total number of human cases. This form of rabies runs a less dramatic and usually longer course than the furious form. The muscles gradually become paralyzed, starting at the site of the bite or scratch. A coma slowly develops, and death eventually occurs. The paralytic form of rabies is often misdiagnosed, contributing to the underreporting of the disease. Once symptoms of the disease develop, the disease is fatal.

1.4. DIAGNOSIS OF RABIES

In animals and humans the direct Fluorescent Antibody Test (dFAT) is the recommended diagnostic test. This test detects the presence of rabies antigens in brain tissue. Other diagnostic tests that have been used are quantitative real time PCR (qRT-PCR) and direct, rapid immunohistochemical test (DRIT) assays.

1.5. PREVENTION AND ELIMINATION OF RABIES

Prevention and elimination of rabies in humans can be achieved by eliminating rabies in dogs and other reservoirs. Rabies in dogs can be eliminated through sustained mass vaccination programs, control of dog population and responsible dog ownership. To prevent human rabies, rapid intervention following a dog bite incident, consisting of appropriate bite wound management and administration of post exposure prophylaxis when indicated is important. Also critical is an efficient and effective surveillance system that detects exposures in humans and cases in animals followed by the initiation of an integrated approach in the management of identified disease risks.

1.6. RABIES SITUATION IN ETHIOPIA

1.6.1. HISTORY OF RABIES IN ETHIOPIA

The early 19thcentury travelers including Edward Ruppel, Rochetd' Hericourt, A. d'Abbadie and others reported either seeing a rabid dog or people bitten by apparently rabid dogs and the first and only recorded rabies epidemic in Addis Ababa occurred in August 1903(Pankrust,1990). Furthermore, the continued existence of traditional medicine practitioners in the various parts of the country to date is a testimony for the significance of the disease in Ethiopia. Even more alarming is the detection of unique strain of the rabies virus in saliva of dogs that showed remission after the onset of the disease in view of the danger it may pose to people who come in contact with healthy-looking dogs. Within the country, rabies has been known for centuries as a "Mad Dog Disease" (Fekadu, 1982). On the other hand, the isolation of two rabies related viruses, Mokola and Lagos bat viruses from domestic animals in Ethiopia by (Mebatsion et al., 1992) is of public and veterinary concern in view of the difficulty of proper diagnosis and lack of effective vaccines against these agents.

1.6.2. BURDEN OF RABIES IN ETHIOPIA

HUMAN

In Ethiopia, about 10,000 human deaths per year were reported to WHO in 1990s'. However, the national rabies baseline survey (ENRBS, 2012) estimates the incidence of human rabies death to be 1.6/100,000 population annually. The most recent estimate showed death incidence of 1.1/100,000 population (Asefa, D., 2017). Human exposure to rabid animals has been reported to be 12 exposure cases/100,000 population (ENRBS, 2012). In addition with regard to more at risk age group, 60% fatal human rabies cases occur in children under 15 years.

WILDLIFE

All available evidence suggests that domestic dogs are the reservoir for rabies throughout Ethiopia; genetic analysis identified the virus to be of canid type. Though wildlife do not play a significant role in rabies transmission to humans, they are also victims of dog rabies. This has had a significant impact on endangered animals such as the Ethiopian Wolf.

More than 32 domestic dogs and 20 cattle exhibiting clinical signs consistent with rabies were reported in communities adjacent to the Bale Mountains National Park in (ENRBS, 2012), and at least three people and ten wolves from the population were bitten by suspect dogs. Efforts have been made to reduce the threat of rabies to Ethiopian wolves in this areas since 1996 through the vaccination of dogs. More than 70% of domestic dogs in core wolf areas within the National Park have been vaccinated against rabies. Where resources have allowed the dog vaccination campaign has been extended to surrounding communities. Case trace back in this outbreak suggests rabies may have been brought into wolf habitat by an unvaccinated immigrant dog accompanying people and livestock searching for seasonal grazing. Rabies was confirmed on October 28, 2003 and advice on its management was sought from a range of person and institutions including the World Conservation Union/Species Survival Commission Canid Specialist Group and Veterinary Specialist Group. After recommendations were submitted, the Ethiopian Wildlife Conservation Organization decided to intervene with a trial emergency measure; on the grounds that the species is rare and endangered and that rabies was apparently in advertently introduced as a byproduct of human activities.

1.6.3. AVAILABILITY OF RABIES VACCINES

HUMAN

Ethiopia still uses Nervous tissue vaccine (NTV) derived from PV 12 rabies virus strain propagated in the brains of infected sheep. The vaccine is inactivated by phenol. The vaccine requires 17 daily injections given subcutaneously. Even though the vaccine is more affordable, NTV is banned by WHO for its potential serious side effects in the form of vaccine-induced auto-immune encephalomyelitis, which afflicts 1200 vaccines. Additionally, NTV induce a low or a moderate immune response.

WHO recommends the use of cell culture-based rabies vaccine for pre-and post-exposure prophylaxis. This type of rabies vaccine is expensive and unaffordable for the majority of Ethiopians. In Ethiopia on average 30,000- 35,000 doses of NTV vaccines are administered annually. When administered appropriately, the cell culture based vaccine is extremely effective at preventing rabies.

Production of cell culture based rabies vaccine is underway at the Ethiopian Public Health Institute (EPHI). The vaccine is based on vero and BHK 21 cell lines. EPHI's strategic plan shows, Nervous Tissue vaccine will be replaced by locally produced cell culture type by June, 2018.

ANIMAL

Currently, the National Veterinary institute (NVI) produces cell culture based animal rabies vaccine which is certified by PANVAC. The vaccine is also undergoing proficiency and potency testing in CDC Atlanta to check if it meets the OIE standards. In the future, vaccine production capacity of NVI will depend on the demand and request of regions while some of the gaps in vaccine supply will be fulfilled through importation. In 2015 and 2016, NVI produced 15,588 and 7,371 vials of vaccine (5 dose per vial), respectively.

1.6.4. RABIES SURVEILLANCE SYSTEM

PUBLIC HEALTH SURVEILLANCE & LABORATORY

Surveillance of both human and animal rabies cases is essential to detect high-risk areas and outbreaks quickly and to monitor the impact of canine vaccination and other interventions. Surveillance for rabies exposures (usually bites) to suspected rabid animals is essential to human health as it allows life-saving interventions (including vaccination) to be started early. Rabies events/elements that will be included in rabies surveillance include animal bites, animal rabies cases, post-exposure prophylaxis administered and human rabies cases.

As part of the key element of the surveillance system in the public health emergency management (PHEM), the human rabies surveillance and case management has been developed. This includes the standard rabies case definitions in humans for detection of bite exposures, the reporting system and reporting frequency, reporting tools and reporting channels as outlined below;

Detection-based on case definition

The case definitions are based on:

- Standard human rabies clinical case definition
- Human exposure to rabies: Classification of Human exposure
- Community case definition

All cases identified by standard case definition and the exposure cases should be taken as “rabies” and reported.

Reporting

All detections (cases and exposures) should be reported immediately to Woreda or Health Center or their designated PHEM or local rabies focal person immediately as rabies is one of the immediately reportable diseases. A single suspected case is considered as a suspected outbreak.

Disease under surveillance is classified into immediately reportable diseases. Key elements of the immediately reportable diseases

1. Alert notification is based on alert threshold: a single suspected human case OR confirmed human case is considered as a suspected outbreak notified from level to level within 30 minutes of identification. The Federal Ministry of Health MOH/EPHI report to WHO within 24 hours of detection. The notification is the responsibility of the Woreda health office Rapid Response Team (RRT)

2. Verification is also undertaken by the Woreda health office
3. Outbreak investigation and initial response- Jointly by Woreda, zone, region and federal

PHEM different reporting format as indicted below

- The Case-based Reporting Format (CRF).
- The PHEM Line list used to report daily
- Daily Epidemic Reporting Format for Woreda (DERF-W)
- Weekly reporting format

Reporting channel

The reporting means include Telephone, E-mail, Short message, Fax, Toll free hot-line (8335) and on line software or web application.

NATIONAL ANIMAL HEALTH SURVEILLANCE SYSTEM

The primary objective of surveillance is to understand the epidemiological situation of diseases in the country and to identify the level of threat. Surveillance thus assists in preparing for control and eradication. Surveillance systems can also contribute to the identification of priority diseases in the area. Currently both active and passive surveillance systems are being implemented nationally. The implementation of the surveillance system with its passive and active components as well as additional surveys have led to a good understanding of the disease dynamics in the country including status of rabies (Source: Epidemiology Directorate, 2017).

Passive surveillance

Animal health Information system plays an important role in surveillance and provides information for economic assessment of diseases in addition to fulfilling international reporting needs. The passive surveillance system mainly depends on a paper based system from woreda to the regional veterinary laboratory covering the respective woredas that laboratory is mandated to cover. The monthly disease outbreak reports received from woreda level are entered in a web-based Disease Outbreak and Vaccination Activity Reporting (DOVAR-II) system. This reporting system is designed to collect information of any kind regarding animal health related issues such as diseases occurrences or vaccination activities performed in the woreda, including Rabies. Currently the proportion of woredas reporting is around 50%, which is below the international standard of 80% (Source: DOVAR-II database, 2016).

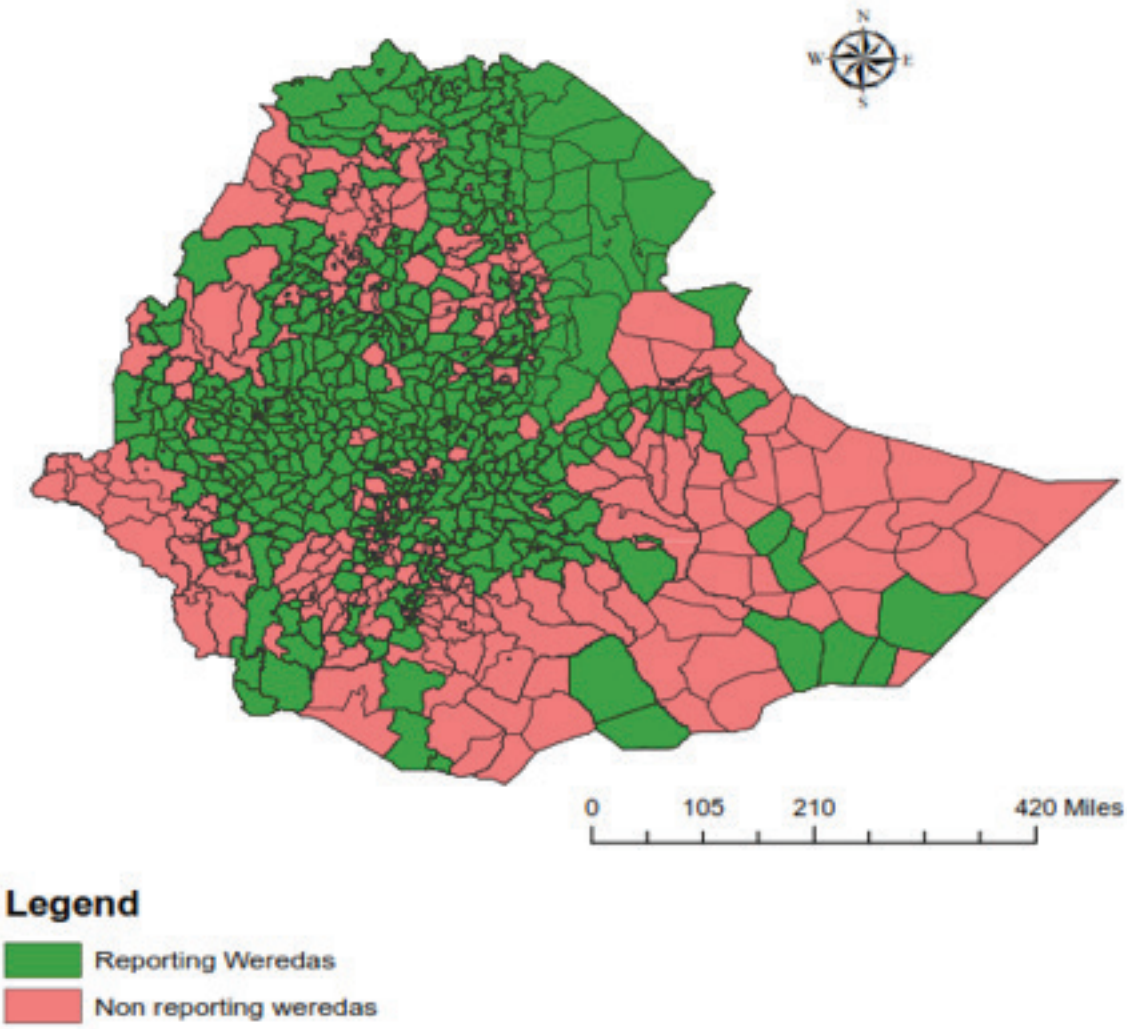


Figure 1. Map of reporting and non-reporting woredas in 2016 (DOVAR)

Syndromic surveillance is practiced in some selected areas using a mobile based daily notification system known as Animal Disease Notification and Investigation System (ADNIS). It allows for immediate notification and early detection of some selected animal diseases including Rabies. This system is mainly intended to serve the pastoral areas that have a very low or poor reporting rate. Currently there are around 300 sites practicing this reporting system, and there is a plan to reach 3,600 sites at the end of GTP-2 as a national plan.

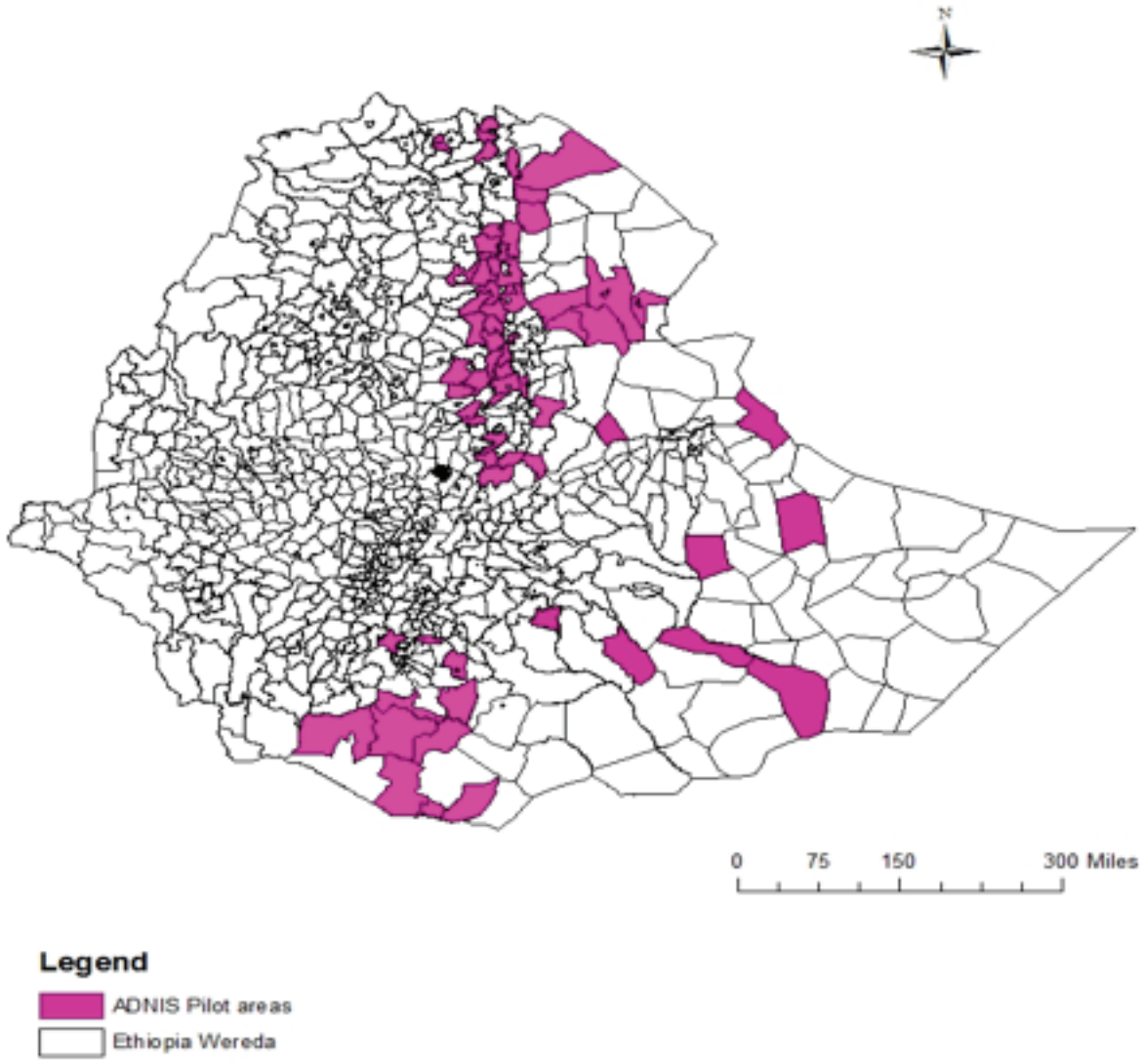


Figure 2. ADNIS pilot areas - November 11, 2016

Major gaps of passive surveillance system

- Low return rate and poor quality of the reports received, as most of the outbreak reports are not confirmed or not supported by laboratory diagnosis. Hence, mapping of the distribution of confirmed clinical outbreaks is only partially practiced due to the low reporting rate of lab confirmed outbreaks.
- Lack of good quality internet connection both at regional veterinary labs for the purpose of accessing semi-web based system, DOVAR-II server and for the immediate notification system server from field sites.
- Lack of post-assessment evaluation to quantify the clinical and the socio-economic impact of disease outbreaks.
- Another gap in the national surveillance system is that it is not able to capture Rabies events in wildlife. There is no list of wildlife susceptible to Rabies and there is no case definition for Rabies in wildlife.

Active surveillance

Active surveillance is an essential tool for early detection of diseases and introduction of exotic diseases. Additionally, it provides information for declaring a country or a zone disease free. Currently there are 15 regional veterinary laboratories conducting active surveillance, in addition to NAHDIC.

- Annual sero-surveillance is being conducted for priority diseases and trade sensitive diseases.
- Regarding introduction of exotic diseases, annual risk based sero-surveillance is conducted around border areas of the country and other areas with the risk of introduction of exotic diseases.
- For other endemic diseases annual surveillance is conducted to know their status and gathering information for national control program.
- In order to detect areas with active disease transmission, participatory disease surveillance (PDS) is conducted for some selected diseases.

Major gaps regarding active surveillance

Poor planning, lack of alignment of surveillance plans between regional and national plans resulting in redundancy of activities and less result based active surveillance actions.

RABIES SURVEILLANCE STATUS

Rabies surveillance in Addis Ababa

A total of 6392 animal species were brought to EPHI for possible rabies examination. Out of these, 6100(95%) were dogs. Among these, 4880 (80%) of the dogs were unvaccinated. The vaccination status of 509(7.96%) dogs was unknown. Number of examined animals range from 1040 in 2016 to 1672 in 2012. Among the dogs brought for clinical examination 329 (5.4%) dogs were freely roaming.

High percentages of FAT confirmed animals for rabies came from Kolfe-Karaniyo, Nifas Silk Lafto and Yeka (16.95%, 16.65% and 16.25%) respectively but lower numbers from Kirkos, Addis-Ketema and Lideta and (3.86%, 5.05% and 5.55% respectively) sub cities (Figure 2).

Table 1: Species of animal examined for rabies using FAT from each sub city, Addis Ababa, 2012-2016

Animal species	Akaki Kaliti	Addis Ketem	Arada	Bole	Gullele	Kirkos	Kolfe	Lafto	Lideta	Yeka	Total
Canine	64	46	68	90	103	35	154	152	51	148	**911**
Feline	4	3	4	5	6	2	9	9	3	8	**53**
Simian (Ape, monney)	0	0	0	1	1	0	2	1	0	1	**6**
Bovine	1	1	2	1	0	1	2	1	2	2	**13**
Equine	0	0	1	1	0	1	0	1	0	2	**6**
Vulpine (Fox)	1	0	0	0	2	0	2	2	0	2	**9**
Ovine (Sheep)	0	1	0	1	1	0	1	1	0	0	**5**
Caprine (Goat)	1	1	0	1	0	0	1	1	0	1	**6**
Hyenine(Hyena)	0	0	0	0	1	0	0	0	0	0	**1**
Total FAT positive samples	**71**	**52**	**75**	**100**	**114**	**39**	**171**	**168**	**56**	**164**	**1010**

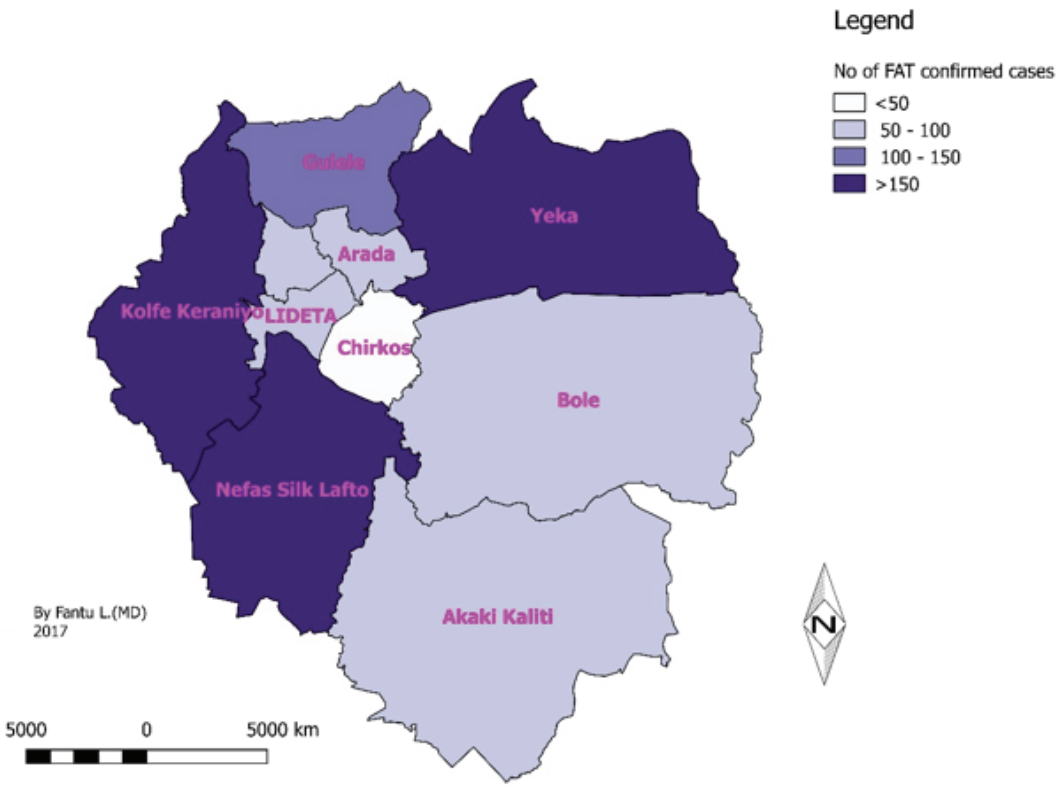


Figure 3. Distribution of FAT confirmed animal rabies cases in Addis Ababa, 2012 - 2016

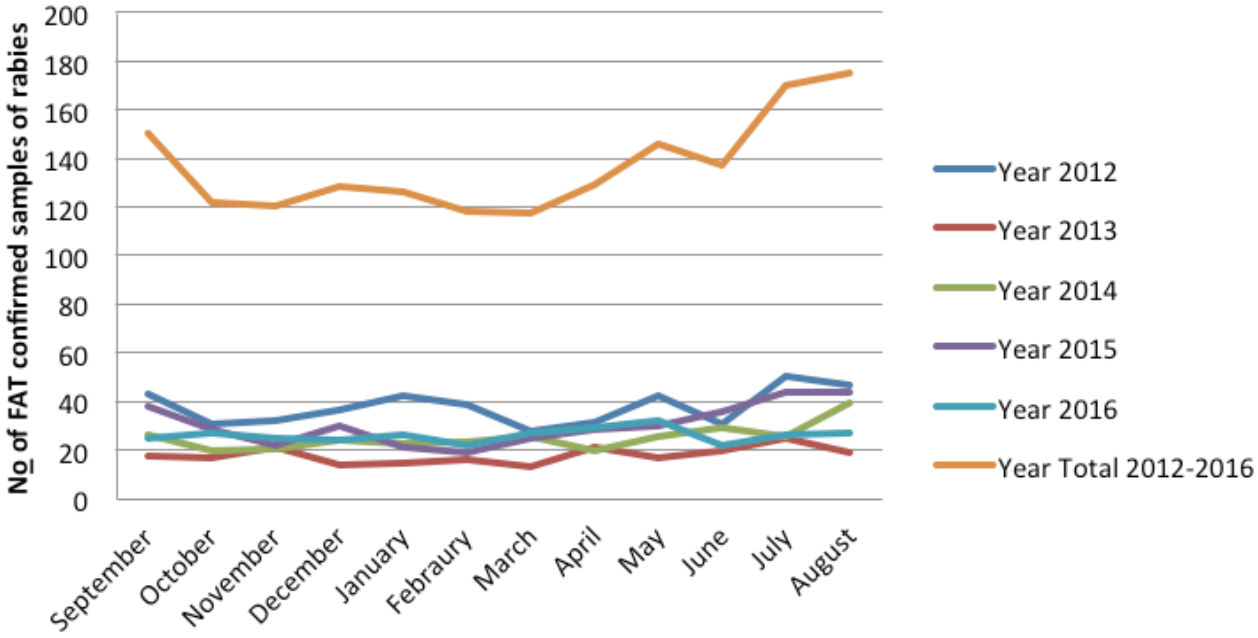


Figure 4. Time trend of laboratory confirmed rabies in the months of the year 2012-2016 in Addis Ababa

Rabies is one of the most significant diseases of animals in Ethiopia due its public health significance. Thus, rabies is selected one of the notifiable diseases through the daily notification system. In 2016 there were 30 rabies outbreaks throughout the country, mainly in Oromia, Amhara and SNNPR regions with 133 cases. All species of animals are susceptible; canines are reported more frequently (Source: DOVAR-II database, 2016).

Table 2: Rabies OBs occurrence in 2016 in different species

Species	Number of OBs
Canine (Dog)	19
Bovine (Cattle)	6
Equine (Horses)	5
Total	**30**

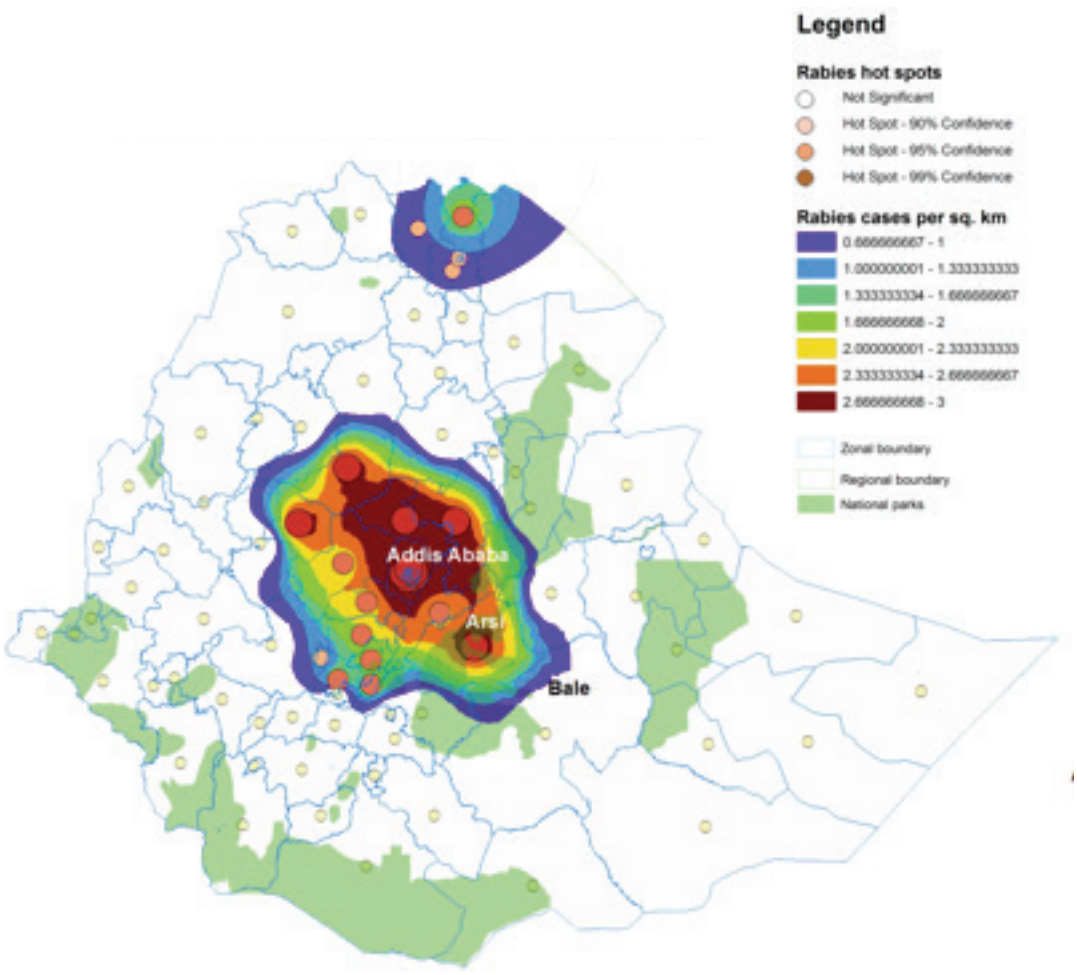


Figure 4a. Rabies hotspots in animals (Source: MOLF Epidemiology Directorate 2007 - 16)

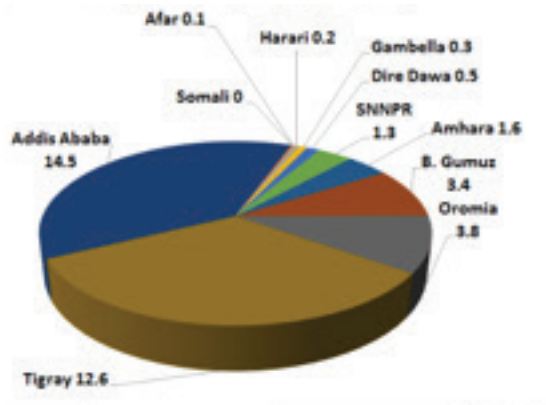


Figure 4b. Rabies cases in humans per 100,000 people (EPHI, 2012)

LABORATORY DIAGNOSTIC SYSTEM

Veterinary rabies diagnostics in Ethiopia is a function of the federal NAHDIC and 15 regional veterinary laboratories following the segregation of mandates at the two hierarchies of the governance. The federal government is mandated with the control and prevention of trans-boundary diseases and quarantine operations. The regional states are mandated with all the remaining diseases of both economic and public health importance. (Source: Ethiopian Animal Health Year book, 2015).

NAHDIC, established in 1995, is the national referral and reference laboratory of Ethiopia and works on animal disease surveillance, outbreak investigation, export and import animal testing, research and capacity building. NAHDIC implements a quality management system ISO/IEC 17025/2005 that enables the centre to generate quality diagnostic results and information on animal health. NAHDIC has strong linkages with national, sub-regional and international organizations, OIE reference laboratories and universities working on animal health. It consists of ten laboratories that actively function in various disciplines. Four of the laboratories are engaged in the field of microbiology (viral and bacterial serology, mycology and bacteriology, and virus isolation), two in the field of parasitology (protozoology and acarology-entomology-helminthology), one pathology laboratory with autopsy facilities, one laboratory for molecular diagnosis and one biosecurity level three laboratory (BSL-3) for the diagnosis of zoonotic diseases. NAHDIC has also experimental and laboratory animal facilities to conduct animal health experiments.

Currently NAHDIC is accredited for the following 12 tests

1. Detection of AI A and H5 – H7 sub-type influenza viruses using conventional PCR
2. Detection of Newcastle disease virus in clinical samples using conventional PCR
3. Detection of IgM against RVF using ELISA
4. Detection of antibody for RVF using competition ELISA
5. Detection of PPR antibody using ELISA
6. Detection of antibody against FMDV using 3ABC
7. Rose Bengal agglutination test for Brucellosis
8. Complement Fixation Test (CFT)
9. Haemo-agglutination test
10. Haemo-agglutination inhibition from serum
11. Haemo-agglutination inhibition from allantoic fluid
12. Isolation AI and ND virus by inoculation of embryonated chicken eggs for virus isolation.
13. EPHI is the sole lab for Animal rabies testing until NAHDIC build its capacity

Table 3. Regional vet Laboratories found in the country.

No.	Name of Regional Veterinary Lab	Regional states	Location	Scope in diagnosis of PPR
1	National Animal Health Diagnostic and Investigation Center (NAHDIC)	MOLF	Sebeta	Diagnoses, research surveillance and capacity building
2	Mekele Regional veterinary Laboratory	Tigray	Mekele	Diagnoses and surveillance
3	Kombolcha Regional Veterinary Laboratory	Amhara	Kombolcha	Diagnoses and surveillance
4	Bahir Dar Regional Veterinary Laboratory	Amhara	Bahir Dar	Diagnoses and surveillance
5	Semera Regional Veterinary Laboratory	Afar	Semera	Diagnoses and surveillance
6	Shola veterinary Laboratory	Addis Ababa	Addis Ababa	Diagnoses and surveillance
7	Assosa Regional Veterinary Laboratory	Benshangul Gumuz	Assosa	Diagnoses and surveillance
8	Bedelle Regional Veterinary Laboratory	Oromia	Bedelle	Diagnoses and surveillance
9	Asela Regional Veterinary Laboratory	Oromia	Arsi	Diagnoses and surveillance
10	Hirna Regional Veterinary Laboratory	Oromia	Hirna	Diagnoses and surveillance
11	Yabello Regional Veterinary Laboratory	Oromia	Yabello	Diagnoses and surveillance
12	Sodo Regional Veterinary Laboratory	SNNPRS	Wolayita Sodo	Diagnoses and surveillance
13	Mizan Regional Veterinary Laboratory	SNNPRS	Mizan Aman	Diagnoses and surveillance
14	Jinka Regional Veterinary Laboratory	SNNPRS	Jinka	Diagnoses and surveillance
15	Jigjiga Regional Veterinary Laboratory	Ethiopia Somali	Jigjiga	Diagnoses and surveillance
16	Dire Dawa Regional Veterinary Laboratory	Dire Dawa	Dire Dawa	Diagnoses and surveillance

1.6.5. LEGAL FRAMEWORK FOR RABIES CONTROL

EXISTING LAWS/PROVISIONS

General terms and conditions on rabies management and control are accepted from the WHO/OIE legislation as it listed below.

For the purposes of the Legislation, the incubation period for rabies shall be 6 months, and the infective period in domestic carnivores starts 10 days before the onset of the first clinical signs and ends when the animal dies.

Standards for diagnostic tests and vaccines are described in the Legislation for Laboratory Diagnosis of Rabies.

RABIES REPORTING AND FREEDOM FROM RABIES

Rabies must be a reportable disease in Ethiopia. All the rabies cases recorded must be reported to Ethiopian Public Health Institute (EPHI). EPHI reports rabies situation on quarterly reporting system to Ministry of Health and the Veterinary Service of Ministry of Agriculture.

A country or region in the country may be considered free from rabies when the disease is notifiable, an effective system of disease surveillance is in operation, all regulatory measures for the prevention and control of rabies have been implemented including effective importation procedures, no case of indigenously acquired rabies infection has been confirmed in man or any animal species during the past 2 years, and no imported case in carnivores has been confirmed outside a border quarantine station for the past 6 months. However, this status would not be affected by the isolation of a Bat Lyssavirus,

IMPORT & EXPORT OF ANIMALS

When importing from rabies free countries, Ethiopian Veterinary Authorities should require for domestic mammals, and wild mammals reared under confined conditions, the presentation of an international veterinary certificate attesting that the animals:

1. Showed no clinical sign of rabies on the day of shipment;
2. Were kept since birth for the 6 months prior to shipment

When importing from rabies free countries, Ethiopian Veterinary Authorities should require for wild mammals not reared under confined conditions the presentation of an international veterinary certificate attesting that the animals:

1. Showed no clinical sign of rabies on the day of shipment;
2. Have been captured in a rabies free country, at a sufficient distance from any infected country. The distance should be defined according to the species exported and the reservoir species in the infected country.

When importing from countries considered infected with rabies, Ethiopian Veterinary Authorities should require for dogs and cats the presentation of an international veterinary certificate attesting that the animals:

1. Showed no clinical sign of rabies within 48 hours of shipment;
2. Were vaccinated against rabies:
    a) Not less than 6 months and not more than one year prior to shipment in the case of a primary vaccination, which should have been carried out when the animals were at least 3 months old;
    b) Not more than one year prior to shipment in the case of a booster vaccination;
    c) With an inactivated virus vaccine or with a recombinant vaccine expressing the rabies virus glycoprotein and were identified by a permanent mark (including a microchip) before the vaccination (their identification number shall be stated in the certificate);

3. Were subjected not less than 3 months and not more than 24 months prior to shipment to an antibody test with a positive result equivalent to at least 0.5 IU/ml;
4. If the animal has not been vaccinated against rabies or does not meet all of the conditions set out in points 1, 2 and 3 above; the Ethiopian Veterinary Authorities may require the placing of the animal in a quarantine station located on its territory, to be held in compliance with the conditions stipulated in its animal health legislation.

When importing from countries considered infected with rabies, Ethiopian Veterinary Authorities should require for domestic ruminants, equines and pigs the presentation of an international veterinary certificate attesting that the animals:

1. showed no clinical sign of rabies on the day of shipment;
2. Were kept for the 6 months prior to shipment in an establishment where separation from wild and feral animals was maintained and where no case of rabies was reported for at least 12 months prior to shipment.

When importing from countries considered infected with rabies, Ethiopian Veterinary Authorities should require for laboratory reared rodents and lagomorphs, and lagomorphs or wild mammals (other than non-human primates) reared under confined conditions the presentation of an international veterinary certificate attesting that the animals:

1. showed no clinical sign of rabies on the day of shipment;
2. Were kept since birth, or for the 6months prior to shipment, in an establishment where no case of rabies was reported for at least 12 months prior to shipment.

When importing from countries considered infected with rabies, Ethiopian Veterinary Authorities should require for wild mammals not belonging to the orders of primates or carnivores and not reared under confined conditions the presentation of an international veterinary certificate attesting that the animals:

1. Showed no clinical sign of rabies on the day of shipment;
2. Were kept in a quarantine station for the 6 months prior to shipment.

When importing from countries considered infected with rabies, Ethiopian Veterinary Authorities should require for frozen semen of dogs the presentation of an international veterinary certificate attesting that the donor animals showed no clinical sign of rabies during the 15 days following collection of the semen.

BIOSAFETY CONSIDERATIONS

Rabies has the highest case-fatality rate of any currently recognized infectious disease. Safety is of paramount importance when working with lyssaviruses. In general, biosafety level 2 safety practices are adequate for routine laboratory activities such as diagnosis and animal handling. Besides basic facility design, precautions should also include appropriate personal protection equipment and pre-exposure vaccination.

Certain situations may entail consideration of a biosafety level 3 classification, including production of large quantities of concentrated virus, conducting procedures that may generate aerosols and when working with lyssaviruses for which the effectiveness of current prophylaxis is not known. All national safety guidelines for working with infectious agents should be followed.

TRANSPORT OF SPECIMENS

Specimens for rabies diagnosis should be shipped according to the national and international regulations to avoid exposure hazards. Information on classification (UN 2814) and packing instructions (P620 packaging) can be found in Transport of infectious substances (WHO). Diagnostic specimens should either be refrigerated or shipped at room temperature in 50% glycerin-saline solution.

SOURCE OF SPECIMENS FOR DIAGNOSIS AND STORAGE CONDITIONS

Rabies diagnosis can be performed on fresh specimens from several different tissue sources or on appropriate specimens stored at proper temperatures, preferably refrigerated. The choice of specimens depends on the test to be performed and the stage of the disease in humans.

Formalin fixation of brain tissues is not recommended. If specimens are nevertheless received in formalin, the duration of fixation should be less than 7 days. The specimens should be transferred rapidly to absolute ethanol for subsequent molecular diagnosis.

1.6.6. CURRENT RABIES PREVENTION AND CONTROL ACTIVITIES

RABIES CONTROL IN DOGS

Dog vaccination

Many countries have successfully reduced the number of human deaths and exposures through prevention of rabies in animals, particularly in dog populations. Dog vaccination is an effective way to prevent rabies cases in dogs and other animals. In Ethiopia, mass dog vaccination is carried out annually in some regions by local animal health offices. Successful mass dog vaccination campaign is being carried out in Ethiopia by collaborative efforts of EPHI, MoLF, Addis Ababa urban agriculture bureau, CDC and OSU through central and door to door vaccination methods. The campaign is being carried out in 4 sub cities (Kirkos, Gulele, Addis Ketema and Lideta) and over 8000 dogs and 1000 cats are vaccinated.

Dog population management

The risk of rabies can be reduced by controlling dog population through surgical or chemical sterilization. Selective removal of unwanted dogs through humane killing has also proven beneficial in other countries provided vaccination levels remain high and

other population control measures are also implemented. Reduction of food sources for free-roaming dogs is also recommended. In Ethiopia, dog population management is done annually through removal of unwanted/free rooming dogs by chemicals means which is inhumane.

PREVENTION IN HUMANS

The current prevention and control of rabies in public health is mainly based on:

Pre-Exposure anti-rabies vaccination

Recommended for persons in high-risk groups, such as animal handlers, dog catchers, veterinarians, and persons working with live rabies virus in diagnostic laboratories, vaccine production and research laboratories

First-Aid

Immediately or as soon as possible wash the wound as described in the SOP and take the bite victim to the closest hospital or clinic. At Health Facility: - Immediately wash the wound with soap and running water in case suspicion arise in the at home first aid. Tetanus prophylaxis and measures to control bacterial infection also should be administered as per the prescription by clinicians. Prophylactic antibiotics should be administered as per the algorithm.

Post-Exposure Prophylaxis (PEP)

Currently both nerve tissue vaccine and cell culture vaccines are being used as post-exposure prophylaxis in Ethiopia. Though, the initiation is towards the use of modern, safer and effective cell culture vaccine in the future, the nerve tissue anti-rabies vaccine is still extensively used throughout the country mainly because of unavailability, and costs incurred to the cell culture vaccines.

Health Education

Though Education for the general public and to children under 16 can reduce or prevent human exposures to potentially rabid animals and decreases human exposure to rabies it has not been extensively undertaken in the country.

Prevention and control of rabies related to wildlife

The public should be warned not to handle or feed wild mammals. Wild mammals and hybrids that bite or otherwise expose persons, pets, or livestock to rabies should be considered for euthanasia and rabies diagnosis. A person exposed by any wild mammal should immediately wash the wound as described in the SOP visit the closest hospital or clinic. At Health Facility: - Immediately wash the wound with soap and running water in case suspicion arise in the at home first aid. Tetanus prophylaxis and measures to control bacterial infection also should be administered as per the prescription by clinicians. Prophylactic antibiotics should be administered as per the algorithm. Carnivores: The use of oral rabies vaccines (ORV) for the mass vaccination of free-ranging wildlife should be considered in selected situations under the regulation of appropriate authorities.

There have been documented successes using ORV to control rabies in wildlife in North America. This method should be considered for the protection of valuable wildlife species in Ethiopia.

In addition, parenteral vaccination (trap-vaccinate-release) of wildlife rabies reservoirs may be integrated into coordinated ORV programs to enhance their effectiveness. Continuous and persistent programs for trapping or poisoning wildlife are not effective in reducing wildlife rabies reservoirs on a state wide basis. However, limited population control in high-contact areas (e.g., picnic grounds, camps, and suburban areas) might be indicated for the removal of selected high-risk species of wildlife.

1.7. CHALLENGES IN RABIES CONTROL IN ETHIOPIA

Inadequate laboratory capacity

- Limited supply of diagnostic materials
- Lack of regional laboratory capacity on rabies diagnosis
- Lack of infrastructure and quarantine facilities

Inadequate Surveillance

- Under reporting of rabies exposures and cases
- No laboratory based surveillance

Inadequate inter-sectoral collaboration and partnerships

- Poor joint rabies investigation and response
- No data sharing and surveillance linkage between sectors
- Lack of One Health/multi-sectoral approach to address rabies

Low awareness of rabies prevention and control

- Poor public education and awareness on rabies prevention and control
- Neglected disease with less focus on its burden and control

Inadequate Enforcement of Laws and Regulations

- No inter-sectoral legal framework for coordination of rabies prevention and control
- Lack of Integrated National Guidelines and directives on Rabies Prevention and Control
- Inadequate legal enforcement on rabies prevention and control

Inadequate Research on Rabies

Limited supply of rabies vaccine

- Inadequate supply and access to PEP
- No cell-cultured rabies vaccine production
- Lack of infrastructure for rabies vaccine and PEP distribution and use

Funding Constraints

- Less funding due to competing priorities

Inadequate human resource capacity on rabies prevention and control

- Inadequate knowledge and skill on rabies case management and vaccine administration by health care providers and animal health professionals

1.8. OPPORTUNITY FOR RABIES ELIMINATION

ESTABLISHMENT OF ONE HEALTH COORDINATION MECHANISM

- Establishment of national One Health Steering committee
- Establishment of disease specific technical working groups
- Development of multi-sectoral zoonotic diseases memorandum of understanding
- Government commitment to rabies prevention and control, identified as a Priority disease
- Global and regional initiatives on dog-medicated rabies elimination by 2030

INCREASED INTEREST IN RABIES ELIMINATION BY PARTNERS

The burden of rabies and the fact that rabies is a neglected zoonotic disease that affects almost all mammalian species has resulted in many different agencies working together towards its control and elimination by 2030. Additionally, there is global recognition that human rabies is primarily caused by canine rabies and that it can be eliminated by sustained mass dog vaccination.

The partners interested in rabies prevention include major international agencies such as WHO FAO, OIE, GARC, OSU and CDC in partnership with regional organizations like the Pan-African Rabies Control Network (PARACON) and vaccine manufacturing companies are all working towards elimination of rabies.

CHAPTER 2: THE STRATEGIC FRAMEWORK

2.1. GUIDING PRINCIPLES OF THE STRATEGY

- Rabies control is a public good (for the benefit or well-being of the public); elimination of human rabies in Ethiopia requires a multi-sectorial collaborative approach.
- Domestic dogs cause upwards of 95% of human rabies deaths on the African continent
- The strategic maintenance of a vaccination rate of at least 70% in identified dog populations will result in the elimination of endemic canine rabies cycles, resulting in the elimination of canine-mediated human rabies and continued / maintained vaccination.
- Rabies elimination through mass dog vaccination is a cost-effective strategy, saves lives and results in decline in the use of costly human post exposure prophylaxis (PEP)

2.2. VISION

To eliminated human rabies in Ethiopia by 2030

2.3. MISSION

To undertake and lead the multi-sectoral activities, projects and programs related with prevention and control of rabies in domestic dogs and humans in Ethiopia

2.4. GOAL

To effectively eliminate all human rabies deaths by 2030, as a result of strategic vaccination campaign that achieves and maintains a vaccination rate of at least 70% of the domestic dog population in the country

2.5. GENERAL OBJECTIVE

- To strengthen sectoral and multi-sectoral rabies surveillance systems
- To strengthen rabies diagnostic laboratory capacity
- To increase anti-rabies vaccine production and accessibility (cell culture)
- To undertake rabies prevention and control activities
- To enhance rabies control and prevention capacity in terms of trained personnel and communication/education materials
- To enhance commitment by decision makers
- To improve resource and community mobilization
- To increase strategic information on rabies prevention and control (M&E)

2.6. STRATEGIC FRAMEWORK FOR THE CONTROL AND ELIMINATION OF RABIES (STOP-R)

Many steps towards international control and elimination of dog-transmitted human rabies have already been taken. At the global level, FAO, OIE and WHO declared rabies a priority disease. Besides national strategies developed by individual countries, several regional strategies for the elimination of dog-mediated human rabies already exist or are under development. In December 2015, the global rabies meeting in Geneva, Switzerland, developed a framework for the elimination of dog-mediated human rabies. The strategic vision of this framework is to reach zero human deaths from dog rabies by 2030.

The framework, developed by the OIE, WHO, FAO and GARC, revolves around 5 pillars, abbreviated as STOP-R.

S: Socio-cultural

This context influences rabies perceptions and dog-keeping practices of at-risk populations. Socio-cultural activities include aspects of rabies awareness, responsible dog ownership, bite prevention and treatment, and community engagement.

T: Technical

Activities in this pillar include efficacious vaccines and vaccination programs/strategies, logistical support, diagnostics and surveillance.

O: Organization

Rabies is a very good model/fit for One Health (OH) and activities include promotion of this OH concept, coordination, governance, monitoring and evaluation.

P: Political

Political will and support are critical for the elimination of rabies. Activities include international support, legal frameworks and regional engagement.

R: Resources

Sustained long-term support is necessary for the ultimate elimination of rabies. The framework promotes the case for investment in rabies control, as well as the development of a business plan and vigorous encouragement for investment in the elimination of rabies as a global public good.

2.7. STEPWISE APPROACH TOWARDS RABIES ELIMINATION (SARE)

The Stepwise Approach towards Rabies Elimination (SARE) has been developed as a practical planning, monitoring and evaluation tool to guide, develop and refine rabies

control programs. The SARE assessment was developed to simplify and capture the vital information and demarcate the critical steps that need to be achieved to systematically progress the control and elimination of rabies. In this manner, governmental stakeholders and policy-makers are exposed to a simplified, yet comprehensive, tool that enables productive discussions and establishment of structured decisions that may facilitate any disease intervention programs. The SARE tool is aligned with the STOP-R framework, and follows the principle of strengthening inter-sectoral collaboration with the goal of sustained rabies risk reduction over time.

2.7.1. COMPONENTS OF THE RABIES CONTROL AND ELIMINATION PROGRAM WITH COMPLEMENTING OUTCOMES AND INDICATOR MEASURES

2.7.1.1. SURVEILLANCE AND RESPONSE SYSTEMS (SARE: DATA COLLECTION AND ANALYSIS)

Surveillance is a critical element in the elimination of rabies. Effective rabies surveillance in humans and animals enhances early detection and reporting of cases, vital for initiating timely responses and enabling informed decisions about when and where to intensify rabies control efforts. Once rabies interventions are implemented, surveillance is essential in generating data to monitor progress or impact of the control efforts, which is essential for their sustainable implementation. As control efforts progress towards rabies elimination, surveillance becomes even more critical in ascertaining rabies-free status.

Specific objectives and activities include the following:

1. Strengthen existing national animal and human rabies surveillance systems
2. Establish a multi-sectoral and linked rabies surveillance and response system (Integrated Bite Case Management)
3. Strengthen national and subnational level capacity to analyze dog and human rabies data

2.7.1.2. DATA REPORTING AND SHARING (SARE: DATA COLLECTION AND ANALYSIS)

There is an inordinate disconnect between the data that is officially reported by governments and that of the estimates provided by predictive models (Hampson et al. 2015). The ultimate goal of each country and stakeholder involved in rabies control and elimination should be to drive accurate data collection, reporting and analysis in order to ensure that the reported data reflects the true burden of rabies in their country.

Specific objectives and activities include the following:

1. Establish a mechanism (database) to strengthen and improve reporting of all cases of human and animal rabies from the local to national
2. Establish a mechanism for linking reports of suspected rabid animals, rabies exposures, and lab results between relevant sectors.
3. Establish a national and subnational level database linking animal and human rabies surveillance and laboratory data.

4. Establish a mechanism for reporting, feedback, and information sharing of rabies data among stakeholders and relevant sectors (national and international).
5. Establish and maintain communication with countries within the East African Rabies Community (e.g. PARACON)

2.7.1.3. PREVENTION OF RABIES IN HUMANS

Strategies for the prevention of human rabies are aimed at protecting those at highest risk of exposure, post exposure treatment and supportive management for the clinically ill.

Specific objectives and activities include the following:

1. Increase access to modern cell culture rabies vaccines for human post-exposure prophylaxis.
2. Increase access to pre-exposure prophylaxis using modern cell culture rabies vaccine for human among high-risk professionals.
3. Strengthen local cell culture vaccine production capacity based on WHO quality and safety standards at EPHI in order to phase-out nerve tissue vaccine utilization.
4. Strengthen national regulatory authority capacity for licensing of locally produced human vaccines (e.g. FMHACA).
5. Reduce overutilization and unnecessary administration of human rabies vaccine for post-exposure prophylaxis (PEP).

2.7.1.4. CONTROL AND ELIMINATION OF RABIES IN DOGS

Domestic dogs are the main source of infection to humans, with at least 95% of human rabies cases attributable to rabid domestic dogs. The principal method of dog rabies control is mass vaccination, and has been successfully used to eliminate human dog-mediated rabies in areas including Malaysia, Philippines, Tunisia, Western Europe and North America among others. Rabies elimination in Ethiopia will therefore be achieved through mass dog vaccinations, targeting 70% and above vaccination coverage for consecutive years followed by a maintenance phase to ensure that the rabies-free status is ensured.

Specific objectives and activities include the following:

1. Increase national capacity to accurately estimate dog population size.
2. Increase access to quality cell culture animal rabies vaccine for dogs in Ethiopia.
3. Increase local cell culture animal rabies vaccine production capacity at National Veterinary Institute.
4. Improve quality and safety of locally produced cell culture rabies vaccine based on OIE quality and safety standards.
5. Increase national capacity to mass vaccinate at least 70% of dogs.
6. Establish a legal framework for quarantine, inspection, and vaccination of animals involved in transboundary movement.

2.7.1.5. PREVENTION AND ELIMINATION OF RABIES IN WILDLIFE

Even though dogs account for upwards of 95% of all human rabies cases, Ethiopian wildlife should also be considered when working towards rabies control and elimination. This consideration is due to the fact that wild carnivores, including the endangered Ethiopian wolf (Canis simensis), are threatened by spillover infections from domestic dogs.

Specific objectives and activities include the following:

1. Enhance wildlife and livestock rabies surveillance for intervention

2.7.1.6. DOG POPULATION MANAGEMENT PLAN

The uncontrolled increase in domestic dog populations will result in either a reduced vaccination coverage or an increase in resources that are required annually. As such, the building and implementing of a nation-wide comprehensive and sustainable dog management plan and strategy is required.
Specific objectives and activities include the following:

1. Increase national and subnational capacity to manage dog population size.

2.7.1.7. RABIES DIAGNOSTIC LABORATORY CAPACITY

Laboratory diagnosis plays a key role in confirming the presence of rabies and in turn contributing to the burden indication within the country.

Specific objectives and activities include the following:

1. Increase national and regional animal health laboratory capacity for rabies diagnostic testing.
2. Increase national and regional public health laboratory capacity for rabies diagnostic testing.
3. Establish a mechanism for animal sample submission to regional and national level laboratories for rabies diagnostic testing
4. Establish a national rabies reference laboratory.
5. Establish a mechanism to report all test results of animal rabies cases from regions to the national rabies reference laboratory.
6. Establish a quality management program between international OIE/WHO rabies reference laboratory (ies) (e.g. Onderstepoort, CDC, etc) and national rabies reference laboratory for rabies confirmatory testing and variant typing.
7. Establish a mechanism for regular sample collection, transportation, and storage of suspected rabid animals (including livestock and wildlife) to animal rabies laboratories.

2.7.1.8. INFORMATION, EDUCATION AND COMMUNICATION

The continued training and improvement of professional proficiency ensures that animal and human professionals involved with implementing the project are working in humane and safe ways, while also relying on the most up to date methodology.
Raising awareness on rabies prevention and control is essential in preventing exposures, increasing public awareness and practices on bite prevention, proper dog-bite wound

management and seeking medical attention and increasing support (political, financial and technical) for the program. Enhanced awareness can also improve rabies control efforts in animals by increasing reporting of potential rabid animals, and practices of responsible dog ownership.

Specific objectives and activities include the following:

1. Increase animal and public health professionals' knowledge on rabies.
2. Increase general public awareness on rabies prevention

2.7.1.9. MULTI-SECTORAL COLLABORATION AND SHARING

Partnerships and multi-sectoral collaboration among national and county governments, NGO's and private sector will be required for successful implementation of the rabies elimination program and for best utilization of the available resources. Government agencies involved in rabies control include; ministries (health, livestock, education, finance, interior and coordination of national government), regulatory bodies responsible for human and animal health, wildlife service and state law office. International organizations like WHO, OIE, FAO, CDC, GARC and OSU are also important in giving technical and financial support for the planning and implementation of the program. A multi-sectoral technical working group (with agreed upon terms of reference) consisting of representation from the various sectors will be established to coordinate rabies implementation of the rabies elimination strategy at the national level.

Specific objectives and activities include the following:

1. Strengthen existing national level multi-sectoral rabies technical working groups (TWG).
2. Establish regional multi-sectoral rabies technical working groups (TWG) using a One Health Approach.
3. Obtain buy-in and secure resources for implementation of national rabies plan.

2.7.1.10. LEGISLATION

Legislation related to rabies control and elimination allows certain activities to be enforced. Legal documents such as Laws, Ordinances, Decrees, Decisions, Guidance and guiding documents need to be reviewed and improved in order to effectively implement them.

Specific objectives and activities include the following:

1. Identify gaps in national and regional level legislation related to rabies prevention and control.
2. Increase enforcement of existing rabies related legislation

CHAPTER 2: IMPLEMENTATION PLAN OF THE STRATEGY

3.1. PHASE 1 (2018-2020): PLANNING AND PREPARATION FOR IMPLEMENTATION OF THE ELIMINATION STRATEGY

During the first phase of the rabies control and elimination strategy (2018-2020), the Ethiopian rabies multi-sectoral technical working group will focus on working together in a One Health approach to prepare the following items in preparation for the wide-spread implementation of the national rabies control strategy: overall responsibility for implementing rabies elimination strategy, resource mobilization, situation analysis/gap assessment on the existing rabies surveillance, prevention, control, database, reporting and communication systems, training and capacity building, internally monitor (progress reports) implementation of the strategy, provide regular update to the public and stake-holders on implementation of the rabies elimination strategy, review, propose changes and amendments of regulations and laws on rabies prevention and control.

3.1.1. SPECIFIC ACTIVITIES TO BE COMPLETED IN THE STIPULATED TIMEFRAME

St. 1. Surveillance and response systems

1.1 Strengthen existing national animal and human rabies surveillance systems

- 1.1.1. Standardize animal rabies case definition based on international standards
- 1.1.2. Standardize suspected rabies exposures case definition for humans and for anlmals based on international standards
- 1.1.3. Standardize human rabies case definition based on international standards
- 1.1.4. Evaluate existing rabies surveillance systems (i.e. Public Health Emergency Management, National Animal Disease Surveillance System, Wildlife surveillance) and compare to international standards and proposed system for Ethiopia to identify gaps
- 1.1.5. Develop a monitoring and evaluation plan for routine evaluation of rabies surveillance systems
- 1.1.6. Integrate wildlife animal rabies surveillance into existing animal surveillance system
- 1.1.7. Train all animal and public health surveillance officers on key principles of rabies surveillance systems (case definitions, reporting, etc)

1.2 Develop a joint SOP for human bite and suspected rabid animal investigations and response
    1.2.1. Develop a joint SOP for human bite and suspected rabid animal investigations and response
    1.2.2. Customize and standardize data collection forms for joint rabies field investigations (suspected rabid animal investigations, human exposure investigation, lab data collection)
    1.2.3. Develop a protocol for quarantine and euthanasia of suspected rabid animals
    1.2.4. Train all animal health professionals on safe and humane animal handling, animal sample collection, and euthanasia. (Consider certification)
    1.2.5. Jointly identify pilot region(s) to implement a linked rabies surveillance system based on objective data (surveillance, human resource, etc)
    1.2.6. Obtain endorsement from pilot region governments and identify resources (funding, human) for implementation
    1.2.7. Establish a national level linked rabies surveillance system

1.3. Strengthen national and sub national level capacity to analyze dog and human rabies data
    1.3.1. Train all relevant animal and public health surveillance officers on how to collate and analyze rabies surveillance data
    1.3.2. Train all relevant animal and public health professionals on development of epidemiological bulletins/reports for data sharing

St 2: Data reporting and sharing

2.1. Improve a mechanism (database) to strengthen reporting of all cases of human and animal rabies from the local to national
    2.1.1. Explore electronic tools and/or platforms to improve reporting of cases in selected institutions
    2.1.2. Provide financial and material resources to improve timely reporting of rabies cases

2.3. Integrate a national and sub national level database linking animal and human rabies surveillance and laboratory data
    2.3.1. Select a web-based platform (e.g. DHIS2, etc) to enter, link, and share national and sub national rabies data

2.4. Establish a mechanism for reporting, feedback, and information sharing of rabies data among stakeholders and relevant sectors (national and international)
    2.4.1. Share rabies data to Ministry websites (MOLF, EWCA, MOH, etc) on a monthly basis
    2.4.2. Report key indicator human rabies and exposure data to WHO
    2.4.3. Report key indicator animal rabies data to OIE

2.5. Establish and maintain communication with countries within the East African Rabies Community (e.g. PARACON)
    2.5.1. Continue communications with Regional East African Rabies Community
    2.5.2. Attend and participate in national, regional and international rabies meetings (i.e. PARACON, East African Regional, etc)

St.3: Prevention of rabies in humans

3.1. Increase access to modern cell culture rabies vaccines for human post-exposure prophylaxis
    3.1.1. Conduct an assessment to evaluate animal bite incidence in all regions and administrative cities
    3.1.2. Evaluate health facilities in all regions and administrative cities in order to identify appropriate facilities for cell culture vaccine distribution
    3.1.3. Pilot introduction of cell culture rabies vaccine in 4 regions
    3.1.4. Train relevant health care professionals on proper administration of cell culture rabies vaccine (includes vaccination schedule)
    3.1.5. Conduct evaluation of cell culture vaccine in pilot introduction regions to generate recommendations for large scale distribution

3.2. Increase access to pre-exposure prophylaxis using modern cell culture rabies vaccine for human among high-risk professionals
    3.2.1. Identify all high-risk professionals/workers for rabies pre-exposure vaccination 3.2.2. Provide pre-exposure prophylaxis to all identified high-risk professionals
    3.2.2. Perform routine serological testing for adequate anti-rabies antibody titers
    3.2.3. Administer booster vaccination for high-risk individuals based on serology testing results

3.3. Strengthen local cell culture vaccine production capacity based on WHO quality anD safety standards at EPHI in order to phase-out nerve tissue vaccine utilization
    3.3.1. Seek technical expertise from international and national vaccine production experts
    3.3.2. Identify equipment, material and human resource needs for cell culture vaccine production
    3.3.3. Train all vaccine production staff on vaccine production and quality assurance methods
    3.3.4. Implement and maintain a quality management system for vaccine production
    3.3.5. Procure equipment and material resources needed for cell culture vaccine production (e.g. through technology transfer from international institutions, etc)
    3.3.6. Promote for vaccine development facility infrastructure improvement in order to meet international GMP standards
    3.3.7. Undergo appropriate vaccine licensing and registration procedures for national use

3.4. Strengthen national regulatory authority capacity for licensing of locally produced human vaccines (e.g. FMHACA)
    3.4.1. Assess national regulatory capacity to license locally produced human vaccines
    3.4.2. Identify resource needs for licensing of human rabies vaccines
    3.4.3. Avail resource based on identified needs

3.5. Reduce overutilization and unnecessary/improper administration of human rabies vaccine for post-exposure prophylaxis (PEP)
    3.5.1. Revise human PEP recommendations based on confirmed animal rabies diagnostic test results
    3.5.2. Revise human PEP recommendations based on animal rabies surveillance system and reliability and timeliness of reporting animal rabies assessment outcomes

St. 4: Control and elimination of rabies in dogs

4.1. Increase national capacity to accurately estimate dog population size
    4.1.1. Identify responsible authority (ies) for dog population estimation at national, regional and (TWG to explore) zonal level
    4.1.2. Develop SOPs for dog population estimation and monitoring
    4.1.3. Conduct surveys to estimate dog population and determine owned versus stray dogs

4.2. Increase access to quality cell culture animal rabies vaccine for dogs in Ethiopia
    4.2.1. Assess regional and administrative cities' cold chain and storage capacity, and vaccine supply needs at veterinary clinics (Gov't and private)
    4.2.2. Identify additional sources to obtain vaccine in cases of stock outs and vaccine shortage (e.g. importation)
    4.2.3. Distribute appropriate consumable and supplies to all veterinary clinics (private and public)
    4.2.4. Conduct routine monitoring of vaccine supply chain, vaccine use, and proper disposal
    4.2.5. Conduct regular community surveys to assess affordability and access to dog rabies vaccine
    4.2.6. Secure funding to provide additional subsidization of vaccine cost based on survey findings
    4.2.7. Assess existing veterinary staff capacity at district
    4.2.8. Fill identified gaps in human resource need (e.g. hiring of veterinary staff)
    4.2.9. Train veterinary professionals at local veterinary clinics (public and private)

4.3. Increase local cell culture animal rabies vaccine production capacity at National Veterinary Institute
    4.3.1. Utilize estimated dog population to assess animal rabies vaccine need
    4.3.2. Assess NVI production capacity (including human resources, etc) to meet estimated demand

4.3.3. Procure supplies and equipment necessary for increased production
4.3.4. Hire additional staff for vaccine production
4.3.5. Train additional staff on SOP for cell culture animal rabies vaccine production

4.4. Improve quality and safety of locally produced cell culture rabies vaccine based on OIE quality and safety standards
4.4.1. Perform safety and potency testing for all vaccine batches produced by NVI 4.4.2. Perform efficacy testing of NVI's rabies vaccines
4.4.2. Obtain external quality assurance certification for local and international distribution
4.4.3. Establish field level vaccine safety and effectiveness monitoring system for local level

4.5. Increase national capacity to achieve and maintain a vaccination rate of at least 70% of dogs
4.5.1. Develop SOP for planning and implementing MVCs and post vaccination monitoring
4.5.2. Distribute SOP for MVC and post vaccination monitoring to all regions and administrative cities
4.5.3. Train relevant professionnels on the MVC and post vaccination monitoring SOP
4.5.4. Select zone(s) in specific regions for piloting canine mass vaccinations
4.5.5. Establish/review existing legislation for annual MVC implementation at federal and regional levels
4.5.6. Revise annual MVC strategy based on risk assessments (e.g. surveillance and lab data)

4.6. Establish a legal framework for quarantine, inspection, and vaccination of animals involved in transboundary movement
4.6.1. Develop legal framework based on assessment
4.6.2. Obtain endorsement from appropriate authorities for legal framework
4.6.3. Monitor enforcement of framework

St. 5: Prevention and Elimination of Rabies in Wildlife and Livestock
5.1. Enhance wildlife and livestock rabies surveillance
5.1.1. Utilize routine rabies surveillance data from livestock and wildlife to refine the national rabies strategy for integration

St. 6: Dog population management (DPM) plan
6.1. Develop and implement DPM plan
6.1.1. Develop a national DPM strategy using available resources and share with relevant stakeholders
6.1.2.. Sensitize community on DPM strategy prior to implementation
6.1.3. Train animal health professionals on DPM strategy and relevant techniques

St. 7: Rabies Diagnostic Laboratory Capacity

7.1. Increase national and regional animal health laboratory capacity for rabies diagnostic testing
- 7.1.1. Perform assessment of all national and regional Animal health laboratories for rabies diagnostic testing capacity
- 7.1.2. Select 4 pilot regional/national labs for animal rabies diagnostic testing based on assessment results
- 7.1.3. Procure all supplies and equipment needed for rabies diagnostic testing
- 7.1.4. Develop and distribute SOP for rabies diagnostic testing
- 7.1.5. Train all laboratory staff in pilot labs on SOP

7.3. Establish a mechanism for animal sample submission to regional and national level laboratories for rabies diagnostic testing
- 7.3.1. Assess local level (woredas) and regionals capacity to submit suspected rabies animal samples to the regional and national level
- 7.3.2. Develop standardized operating procedures for animal sample collection, storage, and transportation
- 7.3.3. Train professional on proper sample collection, handling and submission
- 7.3.4. Supply animal sample collection, transportation and storage materials to district vet clinic and regional labs for sample collection
- 7.3.5. Supply animal sample collection, transportation and storage materials to district vet clinic and regional labs for sample collection
- 7.3.6. Review/develop animal sample submission forms to ensure all necessary epidemiologic data are collected on submitted samples

7.5. Establish a mechanism to report all test results of animal rabies cases from regions to the national rabies reference laboratory
- 7.5.1. Assess regional laboratory level capacity to report test results to national level and identify gaps
- 7.5.2. Develop a strategy to address identified gaps (e.g. electronic reporting, etc)

7.6. Establish a quality management program between international OIE/WHO rabies reference laboratory (ies) (e.g. Onderstepoort, CDC, etc) and national rabies reference laboratory for rabies confirmatory testing and variant typing
- 7.6.1. Develop/review/ update SOP for appropriate animal sample packaging and international shipment
- 7.6.2. Provide training to national reference laboratory staff on SOP for international sample shipment and package
- 7.6.3. Establish relevant material transfer agreement (s) for shipment of animal sample to international rabies reference laboratory (ies)
- 7.6.4. Participate on bi-annual proficiency testing of national rabies reference laboratory
- 7.6.5. Undertake in annual competency testing of national rabies reference laboratory staff
- 7.6.6. Periodically submit a proportion of rabies positive animal samples to international reference laboratory for variant typing

St. 8: Information, education and communication

8.1. Increase animal and public health professionals' knowledge on rabies

- 8.1.1. Conduct an assessment of animal and public health professionals on rabies related knowledge (e.g. rabies virus transmission, clinical signs, prevention, etc)
- 8.1.2. Train animal and public health professionals on identified knowledge gaps (GARC and blue print courses),
- 8.1.3. Adapt education training materials (GARC and Blueprint materials)
- 8.1.4. Gather rabies information and education materials in-country and from other relevant sources
- 8.1.5. Review materials for completeness and cultural appropriateness
- 8.1.6. Adapt and/or develop materials based on review
- 8.1.7. Perform field level testing of adapted and/or newly developed materials
- 8.1.8. Distribute information and education materials to relevant regional public health and animal health institutions

8.2. Increase general public awareness on rabies prevention

- 8.2.1. Conduct community survey to assess behaviors, knowledge, and practices related to rabies (e.g. KABP survey, etc) in target audience(s)
- 8.2.2. Develop appropriate rabies related messages based on survey findings from target audience(s)
- 8.2.3. Develop relevant awareness raising materials based on various communication channels
- 8.2.4. Develop national rabies communication strategies involving relevant stakeholders (e.g. media, internet, etc)
- 8.2.5. Train relevant professionnels on communication stratégies
- 8.2.6. Conduct routine community awareness campaigns for target audience(s) and activities

St. 9: Multi-sectoral collaboration and sharing

9.1. Strengthen existing national level multi-sectoral rabies technical working groups (RTWG)

- 9.1.1. Review existing terms of references (TOR) and revise as necessary
- 9.1.2. Support regular meeting of the RTWG for information sharing, review implementation progress of activities relevant to each Ministries and encountered challenges

9.2. Establish regional multi-sectoral rabies technical working groups (RTWG) using a One Health Approach

- 9.2.1. Develop and implement work plans for 4 regional RTWGs

9.3. Obtain buy-in and secure resources for implementation of national rabies plan

- 9.3.1. Develop an advocacy plan to obtain buy-in (e.g. use of success stories, world rabies day, etc)
- 9.3.2. Obtain official endorsement of rabies strategy including the budget plan from all relevant Ministries

9.3.3. Identify and secure potential sources of funding for implementation of rabies strategy (e.g. private sector, etc)

St. 10: Legislation

10.1. Identify gaps in national and regional level legal framework related to rabies prevention and control

10.1.1. Review existing national, regional, and administrative city legal framework for rabies prevention and control related provisions

10.1.2. Consult relevant experts and authorities for suggested legislation improvements and/or additions

10.2. Increase enforcement of existing rabies related legislation

10.2.1 Publicizing the legal framework

10.2.2. Assess current level of enforcement of any existing rabies related legal framework

10.2.3. Identify methods to improve legislation enforcement at the local level (e.g. fees, etc) in consultation with relevant legal bodies

3.1.2. EXPECTED SARE ASSESSMENT STAGE AT END OF PHASE 1: STAGE 1

3.2. PHASE 2 (2021-2023): IMPLEMENTATION OF THE ELIMINATION STRATEGY IN PRE-SELECTED LOCAL AREAS

During this specific phase, the national rabies elimination strategy will be initiated by launching mass vaccination campaigns in pre-selected zones (local areas) in four selected regions of the country. These pre-selected zones will act as the starting point from where the progressive roll-out of mass vaccination campaigns will originate, based on lessons learned, will be expanded to other parts of the country in Phase 3 Specific activities to be completed in the stipulated timeframe.

St.1: Surveillance and response systems enhanced

1.1 Strengthen existing national animal and human rabies surveillance systems (phase one)

1.1.1. Implement changes to rabies surveillance systems (MOLF, EPHI, EWCA) based on evaluation findings and recommendations

1.1.2. Integrate wildlife animal rabies surveillance into existing animal surveillance system

1.2 Develop a joint SOP for human bite and suspected rabid animal investigations and response

1.2.1. Evaluate linked surveillance system in pilot regions to identify strengths and challenges

1.3. Strengthen national and sub national level capacity to analyze dog and human rabies data
    1.3.1. Train all relevant animal and public health surveillance officers on how to collate and analyze rabies surveillance data
    1.3.2. Train all relevant animal and public health professionals on development of epidemiological bulletins/reports for data sharing

Strategy Output 2: Data reporting and sharing strengthened

2.1. Improve a mechanism (database) to strengthen reporting of all cases of human and animal rabies from the local to national
    2.1.1. Explore electronic tools and/or platforms to improve reporting of cases in selected institutions
    2.1.2. Provide financial and material resources to improve timely reporting of rabies cases

2.4. Establish a mechanism for reporting, feedback, and information sharing of rabies data among stakeholders and relevant sectors (national and international)
    2.4.1. Share rabies data to Ministry websites (MOLF, EWCA, MOH, etc) on a monthly basis
    2.4.2. Report key indicator human rabies and exposure data to WHO
    2.4.3. Report key indicator animal rabies data to OIE

2.5. Establish and maintain communication with countries within the East African Rabies Community (e.g. PARACON)
    2.5.1. Continue communications with Regional East African Rabies Community
    2.5.2. Attend and participate in national, regional and international rabies meetings (i.e. PARACON, East African Regional, etc)

Strategy Output 3: Prevention of rabies in humans

3.1. Increase access to modern cell culture rabies vaccines for human post-exposure prophylaxis
    3.1.1. Conduct an assessment to evaluate animal bite incidence in all regions and administrative cities
    3.1.2. Evaluate health facilities in all regions and administrative cities in order to identify appropriate facilities for cell culture vaccine distribution
    3.1.3. Conduct evaluation of cell culture vaccine in pilot introduction regions to generate recommendations for large scale distribution
    3.1.4. Conduct operational research to assess best method to increase access and cost-effectiveness

3.2. Increase access to pre-exposure prophylaxis using modern cell culture rabies vaccine for human among high-risk professionals
    3.2.1. Provide pre-exposure prophylaxis to all identified high-risk professionals
    3.2.2. Perform routine serological testing for adequate anti-rabies antibody titers
    3.2.3. Administer booster vaccination for high-risk individuals based on serology testing results

3.3. Strengthen local cell culture vaccine production capacity based on WHO quality and safety standards at EPHI in order to phase-out nerve tissue vaccine utilization
    3.3.1. Implement and maintain a quality management system for vaccine production
    3.3.2. Procure equipment and material resources needed for cell culture vaccine production (e.g. through technology transfer from international institutions, etc)
    3.3.3. Promote for vaccine development facility infrastructure improvement in order to meet international GMP standards
    3.3.4. Undergo appropriate vaccine licensing and registration procedures for national use

3.4. Strengthen national regulatory authority capacity for licensing of locally produced human vaccines (e.g. FMHACA)
    3.4.1. Avail resource based on identified needs

3.5. Reduce overutilization and unnecessary/improper administration of human rabies vaccine for post-exposure prophylaxis (PEP)
    3.5.1. Revise human PEP recommendations based on confirmed animal rabies diagnostic test results
    3.5.2. Revise human PEP recommendations based on animal rabies surveillance system and reliability and timeliness of reporting animal rabies assessment outcomes

St.4: Control and elimination of rabies in dogs

4.2. Increase access to quality cell culture animal rabies vaccine for dogs in Ethiopia
    4.2.1. Identify additional sources to obtain vaccine in cases of stock outs and vaccine shortage (e.g. importation)
    4.2.2. Distribute appropriate consumable and supplies to all veterinary clinics (private and public)
    4.2.3. Conduct routine monitoring of vaccine supply chain, vaccine use, and proper disposal
    4.2.4. Conduct regular community surveys to assess affordability and access to dog rabies vaccine
    4.2.5. Secure funding to provide additional subsidization of vaccine cost based on survey findings
    4.2.6. Fill identified gaps in human resource need (e.g. hiring of veterinary staff)
    4.2.7. Aware the community to mass dog vaccination

4.3. Increase local cell culture animal rabies vaccine production capacity at National Veterinary Institute
    4.3.1. Procure supplies and equipment necessary for increased production
    4.3.2. Hire additional staff for vaccine production

4.4. Improve quality and safety of locally produced cell culture rabies vaccine based on OIE quality and safety standards
    4.4.1. Perform safety and potency testing for all vaccine batches produced by NVI
    4.4.2. Obtain external quality assurance certification for local and international distribution
    4.4.3. Establish field level vaccine safety and effectiveness monitoring system for local level

4.5. Increase national capacity to mass vaccinate at least 70% of dogs
    4.5.1. Conduct MVCs in the selected rabies pilot areas
    4.5.2. Use information from pilot MVCs to inform future MVCs (scale up implementation based on findings and availability of resources)
    4.5.3. Conduct post-vaccination monitoring to obtain coverage estimates

4.6. Establish a legal framework for quarantine, inspection, and vaccination of animals involved in transboundary movement
    4.6.1. Monitor enforcement of framework

St.5: Prevention and Elimination of Rabies in Wildlife and Livestock

5.1. Enhance wildlife and livestock rabies surveillance
    5.1.1. Utilize routine rabies surveillance data from livestock and wildlife to refine the national rabies strategy for integration
    5.1.2. Conduct wildlife rabies research to explore potential reservoirs, estimate burden, and identify resources

St.6: Dog population management (DPM) plan

6.1. Develop and implement DPM plan
    6.1.1.. Sensitize community on DPM strategy prior to implementation
    6.1.2. Implement the national DPM strategy at the local and national levels
    6.1.3. Revise national DPM strategy based on epidemiological and ecology surveys (e.g. KAP survey, etc)

St. 7: Rabies Diagnostic Laboratory Capacity strengthened

7.1. Increase national and regional animal health laboratory capacity for rabies diagnostic testing
    7.1.1. Procure all supplies and equipment needed for rabies diagnostic testing

7.2. Establish a mechanism for animal sample submission to regional and national level laboratories for rabies diagnostic testing
    7.3.1. Supply animal sample collection, transportation and storage materials to district vet clinic and regional labs for sample collection

7.3. Establish a national rabies reference laboratory
    7.3.1. Identify laboratory to serve as the national rabies reference laboratory

7.4. Establish a quality management program between international OIE/WHO rabies reference laboratory (ies) (e.g. Onderstepoort, CDC, etc) and national rabies reference laboratory for rabies confirmatory testing and variant typing
    - 7.4.1. Establish relevant material transfer agreement (s) for shipment of animal sample to international rabies reference laboratory (ies)
    - 7.4.2. Participate on bi-annual proficiency testing of national rabies reference laboratory
    - 7.4.3. Undertake in annual competency testing of national rabies reference laboratory staff
    - 7.4.4. Periodically submit a proportion of rabies positive animal samples to international reference laboratory for variant typing

St. 8: Information, education and communication

8.1. Increase animal and public health professionals' knowledge on rabies
    - 8.1.1. Adapt education training materials (GARC and Blueprint materials)
    - 8.1.2. Gather rabies information and education materials in-country and from other relevant sources
    - 8.1.3. Review materials for completeness and cultural appropriateness
    - 8.1.4. Adapt and/or develop materials based on review
    - 8.1.5. Perform field level testing of adapted and/or newly developed materials
    - 8.1.6. Distribute information and education materials to relevant regional public health and animal health institutions

8.2. Increase general public awareness on rabies prevention
    - 8.2.1. Conduct community survey to assess behaviors, knowledge, and practices related to rabies (e.g. KABP survey, etc) in target audience(s)
    - 8.2.2. Develop appropriate rabies related messages based on survey findings from target audience(s)
    - 8.2.3. Develop relevant awareness raising materials based on various communication channels
    - 8.2.4. Train relevant professionnels on communication stratégies
    - 8.2.5. Conduct routine community awareness campaigns for target audience(s) and activities
    - 8.2.6. Train relevant professionnels on communication stratégies

St. 9: Multi-sectoral collaboration and sharing strengthened

9.1. Strengthen existing national level multi-sectoral rabies technical working groups (RTWG)
    - 9.1.1. Support regular meeting of the RTWG for information sharing, review implementation progress of activities relevant to each Ministries and encountered challenges

9.2. Establish regional multi-sectoral rabies technical working groups (RTWG) using a One Health Approach
    - 9.2.1. Establish regional TWG in all regions
    - 9.2.2. Develop and implement work plans for 4 regional RTWGs

9.3. Obtain buy-in and secure resources for implementation of national rabies plan
    9.3.1. Identify and secure potential sources of funding for implementation of rabies strategy (e.g. private sector, etc)

St. 10: Legislation
10.2. Increase enforcement of existing rabies related legislation
    10.2.1. Publicizing the legal framework

3.2.2. EXPECTED SARE ASSESSMENT STAGE AT END OF PHASE2: STAGE 1,5

3.3. PHASE 3 (2024-2017): IMPLEMENTATION OF THE RABIES ELIMINATION STRATEGY OUTSIDE THE PRE-SELECTED LOCAL AREAS

The third phase of implementing the rabies elimination strategy will rely on the systematic roll-out of the mass vaccination campaigns beyond the pilot areas identified during the first phase and covered during the second phase. The roll-out will continue until the mass vaccination campaigns are implemented throughout the country up until apparent elimination of dog mediated human rabies and suppression of canine rabies in the country.

3.3.1. SPECIFIC ACTIVITIES TO BE COMPLETED IN THE STIPULATED TIMEFRAME

St.1: Surveillance and response systems
1.1 Strengthen existing national animal and human rabies surveillance systems
    1.1.1. Implement changes to rabies surveillance systems (MOLF, EPHI, EWCA) based on evaluation findings and recommendations
    1.1.2. Integrate wildlife animal rabies surveillance into existing animal surveillance system
    1.1.3. Train all animal and public health surveillance officers on key principles of rabies surveillance systems (case definitions, reporting, etc)

1.2 Develop a joint SOP for human bite and suspected rabid animal investigations and response
    1.2.1. Train all animal health professionals on safe animal handling, animal sample collection, and euthanasia. (Consider certification)
    1.2.2. Scale up implementation of linked surveillance system based on evaluation findings and availability of resources to increase national coverage

1.3. Strengthen national and sub national level capacity to analyze dog and human rabies data
    1.3.1. Train all relevant animal and public health surveillance officers on how to collate and analyze rabies surveillance data
    1.3.2. Train all relevant animal and public health professionals on development of epidemiological bulletins/reports for data sharing

Strategy Output 2: Data reporting and sharing strengthened

2.1. Improve a mechanism (database) to strengthen reporting of all cases of human and animal rabies from the local to national
    2.1.1. Explore electronic tools and/or platforms to improve reporting of cases in selected institutions
    2.1.2. Provide financial and material resources to improve timely reporting of rabies cases
    2.4.3. Share rabies data to Ministry websites (MOLF, EWCA, MOH, etc) on a monthly basis
    2.4.4. Report key indicator human rabies and exposure data to WHO
    2.4.5. Report key indicator animal rabies data to OIE

2.5. Establish and maintain communication with countries within the East African Rabies Community (e.g. PARACON)
    2.5.1. Continue communications with Regional East African Rabies Community
    2.5.2. Attend and participate in national, regional and international rabies meetings (ie PARACON, East African Regional, etc)

St.3: Prevention of rabies in humans

3.1. Increase access to modern cell culture rabies vaccines for human post-exposure prophylaxis
    3.1.1. Conduct an assessment to evaluate animal bite incidence in all regions and administrative cities
    3.1.2. Evaluate health facilities in all regions and administrative cities in order to identify appropriate facilities for cell culture vaccine distribution
    3.1.3. Train relevant health care professionals on proper administration of cell culture rabies vaccine (includes vaccination schedule)
    3.1.4. Conduct operational research to assess best method to increase access and cost-effectiveness

3.2. Increase access to pre-exposure prophylaxis using modern cell culture rabies vaccine for human among high-risk professionals
    3.2.1. Provide pre-exposure prophylaxis to all identified high-risk professionals
    3.2.2. Perform routine serological testing for adequate anti-rabies antibody titers
    3.2.3. Administer booster vaccination for high-risk individuals based on serology testing results

3.3. Strengthen local cell culture vaccine production capacity based on WHO quality and safety standards at EPHI in order to phase-out nerve tissue vaccine utilization
    3.3.1. Train all vaccine production staff on vaccine production and quality assurance methods
    3.3.2. Implement and maintain a quality management system for vaccine production
    3.3.3. Procure equipment and material resources needed for cell culture vaccine production (e.g. through technology transfer from international institutions, etc)
    3.3.4. Promote for vaccine development facility infrastructure improvement in order to meet international GMP standards

3.4. Strengthen national regulatory authority capacity for licensing of locally produced human vaccines (e.g. FMHACA)
    3.4.1. Avail resource based on identified needs

3.5. Reduce overutilization and unnecessary/improper administration of human rabies vaccine for post-exposure prophylaxis (PEP)
    3.5.1. Revise human PEP recommendations based on confirmed animal rabies diagnostic test results
    3.5.2. Revise human PEP recommendations based on animal rabies surveillance system and reliability and timeliness of reporting animal rabies assessment outcomes

St.4: Control and elimination of rabies in dogs

4.2. Increase access to quality cell culture animal rabies vaccine for dogs in Ethiopia
    4.2.1. Identify additional sources to obtain vaccine in cases of stock outs and vaccine shortage (e.g. importation)
    4.2.2. Distribute appropriate consumable and supplies to all veterinary clinics (private and public)
    4.2.3. Conduct routine monitoring of vaccine supply chain, vaccine use, storage and proper disposal
    4.2.4. Conduct regular community surveys to assess affordability and access to dog rabies vaccine
    4.2.5. Secure funding to provide additional subsidization of vaccine cost based on survey findings
    4.2.6. Train veterinary professionals at local veterinary clinics (public and private)

4.3. Increase local cell culture animal rabies vaccine production capacity at National Veterinary Institute
    4.3.1. Procure supplies and equipment necessary for increased production
    4.3.2. Hire additional staff for vaccine production
    4.3.3. Train additional staff on SOP for cell culture animal rabies vaccine production)

4.4. Improve quality and safety of locally produced cell culture rabies vaccine based on OIE quality and safety standards

4.4.1. Perform safety and potency testing for all vaccine batches produced by NVI

4.4.2. Obtain external quality assurance certification for local and international distribution

4.5. Increase national capacity to mass vaccinate at least 70% of dogs

4.5.1. Train relevant professionnels on the MVC and post vaccination monitoring SOP

4.5.2. Use information from pilot MVCs to inform future MVCs (scale up implementation based on findings and availability of resources)

4.2.3. Secure funding to provide additional subsidization of vaccine cost based onsurvey findings

4.5.4. Conduct post-vaccination monitoring to obtain coverage estimates

4.6. Monitor enforcement of framework

St.5: Prevention and Elimination of Rabies in Wildlife and Livestock

5.1. Enhance wildlife and livestock rabies surveillance

5.1.1. Utilize routine rabies surveillance data from livestock and wildlife to refine the national rabies strategy for integration

5.1.2. Conduct wildlife rabies research to explore potential reservoirs, estimate burden, and identify resources

St.6: Dog population management (DPM) plan

6.1. Develop and implement DPM plan

6.1.1. Train animal health professionals on DPM strategy and relevant techniques 6.1.4. Implement the national DPM strategy at the local and national levels

6.1.2. Revise national DPM strategy based on epidemiological and ecology surveys (e.g. KAP survey, etc)

St. 7: Rabies Diagnostic Laboratory Capacity

7.1. Increase national and regional animal health laboratory capacity for rabies diagnostic testing

7.1.1. Procure all supplies and equipment needed for rabies diagnostic testing

7.1.2. Train all laboratory staff in pilot labs on SOP

7.1.3. Include additional laboratories for rabies diagnostic testing as resources become available

7.2. Establish a mechanism for animal sample submission to regional and national level laboratories for rabies diagnostic testing

7.2.1.Train professional on proper sample collection ,handling and submission

7.2.2. Supply animal sample collection, transportation and storage materials to district vet clinic and regional labs for sample collection

7.3. Establish a quality management program between international OIE/WHO rabies reference laboratory (ies) (e.g. Onderstepoort, CDC, etc) and national rabies reference laboratory for rabies confirmatory testing and variant typing

- 7.3.1. Select international OIE/WHO rabies reference laboratories for rabies confirmatory testing of suspected animal rabies samples submitted to national rabies reference laboratory
- 7.3.2. Provide training to national reference laboratory staff on SOP for international sample shipment and package
- 7.3.3. Establish relevant material transfer agreement (s) for shipment of animal sample to international rabies reference laboratory (ies)
- 7.3.4. Participate on bi-annual proficiency testing of national rabies reference laboratory
- 7.3.5. Undertake in annual competency testing of national rabies reference laboratory staff
- 7.3.6. Periodically submit a proportion of rabies positive animal samples to international reference laboratory for variant typing

St. 8: Information, education and communication

8.1. Increase animal and public health professionals' knowledge on rabies

- 8.1.1. Train animal and public health professionals on identified knowledge gaps (GARC and blue print courses)
- 8.1.2. Adapt education training materials (GARC and Blueprint materials)
- 8.1.3. Gather rabies information and education materials in-country and from other relevant sources
- 8.1.4. Review materials for completeness and cultural appropriateness
- 8.1.5. Adapt and/or develop materials based on review
- 8.1.6. Perform field level testing of adapted and/or newly developed materials
- 8.1.7. Distribute information and education materials to relevant regional public health and animal health institutions

8.2. Increase general public awareness on rabies prevention

- 8.2.1. Conduct community survey to assess behaviors, knowledge, and practices related to rabies (e.g. KABP survey, etc) in target audience(s)
- 8.2.2. Develop appropriate rabies related messages based on survey findings from target audience(s)
- 8.2.3. Develop relevant awareness raising materials based on various communication channels
- 8.2.4. Train relevant professionnels on communication stratégies
- 8.2.5. Conduct routine community awareness campaigns for target audience(s) and activities

St. 9: Multi-sectoral collaboration and sharing strengthened

9.1. Strengthen existing national level multi-sectoral rabies technical working groups (RTWG)

- 9.1.1. Support regular meeting of the RTWG for information sharing, review implementation progress of activities relevant to each Ministries and encountered challenges

9.2. Establish regional multi-sectoral rabies technical working groups (RTWG) using a One Health Approach

- 9.2.1. Establish regional TWG in all regions
- 9.2.2. Develop and implement work plans for 4 regional RTWGs

9.3. Obtain buy-in and secure resources for implementation of national rabies plan

- 9.3.1. Develop an advocacy plan to obtain buy-in (e.g. use of success stories, world rabies day, etc)
- 9.3.2. Identify and secure potential sources of funding for implementation of rabies strategy (e.g. private sector, etc)

St. 10: Legislation

10.1. Identify gaps in national and regional level legal framework related to rabies prevention and control

- 10.1.1. Review existing national, regional, and administrative city legal framework for rabies prevention and control related provisions
- 10.1.2. Consult relevant experts and authorities for suggested legislation improvements and/or additions

10.2. Increase enforcement of existing rabies related legislation

- 10.2.1 Publicizing the legal framework
- 10.2.2. Assess current level of enforcement of any existing rabies related legal framework
- 10.2.3. Identify methods to improve legislation enforcement at the local level (e.g. fees, etc) in consultation with relevant legal bodies

3.3.2. EXPECTED SARE ASSESSMENT STAGE AT END OF PHASE 3: STAGE 2

3.4. PHASE 4 (2028-2029): MAINTAINING FREEDOM FROM CANINE-MEDIATED RABIES AND ELIMINATION OF CANINE RABIES

During the fourth phase of the rabies elimination strategy, mass vaccination campaigns and the accompanying analysis of vaccination coverage will continue until all regions of the country can be publically declared free from all dog and human rabies cases.

3.4.1. SPECIFIC ACTIVITIES TO BE COMPLETED IN THE STIPULATED TIMEFRAME

St.1: Surveillance and response systems

1.1 Strengthen existing national animal and human rabies surveillance systems

- 1.1.1. Implement changes to rabies surveillance systems (MOLF, EPHI, EWCA) based on evaluation findings and recommendations
- 1.1.2. Integrate wildlife animal rabies surveillance into existing animal surveillance system

St.2: Data reporting and sharing

2.1. Improve a mechanism (database) to strengthen reporting of all cases of human and animal rabies from the local to national

- 2.1.1. Explore electronic tools and/or platforms to improve reporting of cases in selected institutions
- 2.1.2. Provide financial and material resources to improve timely reporting of rabies cases

2.2. Establish a mechanism for reporting, feedback, and information sharing of rabies data among stakeholders and relevant sectors (national and international)

- 2.2.1. Share rabies data to Ministry websites (MOLF, EWCA, MOH, etc) on a monthly basis
- 2.2.2. Report key indicator human rabies and exposure data to WHO
- 2.2.3. Report key indicator animal rabies data to OIE

2.3. Establish and maintain communication with countries within the East African Rabies Community (e.g. PARACON)

- 2.3.1. Continue communications with Regional East African Rabies Community For joint surveillance and intervention)
- 2.3.2. Attend and participate in national, regional and international rabies meetings (i.e. PARACON, East African Regional, etc)

St.3: Prevention of rabies in humans

3.1. Increase access to modern cell culture rabies vaccines for human post-exposure prophylaxis
- 3.1.1. Conduct an assessment to evaluate animal bite incidence in all regions and administrative cities
- 3.1.2. Evaluate health facilities in all regions and administrative cities in order to identify appropriate facilities for cell culture vaccine distribution

3.2. Increase access to pre-exposure prophylaxis using modern cell culture rabies vaccine for human among high-risk professionals
- 3.2.1. Provide pre-exposure prophylaxis to all identified high-risk professionals
- 3.2.2. Perform routine serological testing for adequate anti-rabies antibody titers
- 3.2.3. Administer booster vaccination for high-risk individuals based on serology testing results

3.3. Strengthen local cell culture vaccine production capacity based on WHO quality and safety standards at EPHI in order to phase-out nerve tissue vaccine utilization
- 3.3.1. Implement and maintain a quality management system for vaccine production
- 3.3.2. Procure equipment and material resources needed for cell culture vaccine production (e.g. through technology transfer from international institutions, etc)
- 3.3.3. Promote for vaccine development facility infrastructure improvement in order to meet international GMP standards

3.4. Strengthen national regulatory authority capacity for licensing of locally produced human vaccines (e.g. EFMHACA)
- 3.4.1. Avail resource based on identified needs

3.5. Reduce overutilization and unnecessary/improper administration of human rabies vaccine for post-exposure prophylaxis (PEP)
- 3.5.1. Revise human PEP recommendations based on confirmed animal rabies diagnostic test results
- 3.5.2. Revise human PEP recommendations based on animal rabies surveillance system and reliability and timeliness of reporting animal rabies assessment outcomes

St.4: Control and elimination of rabies in dogs

4.1. Increase access to quality cell culture animal rabies vaccine for dogs in Ethiopia
- 4.1.1. Identify additional sources to obtain vaccine in cases of stock outs and vaccine shortage (e.g. importation)
- 4.1.2. Distribute appropriate consumable and supplies to all veterinary clinics (private and public)
- 4.1.3. Conduct routine monitoring of vaccine supply chain, vaccine use, and proper disposal

4.1.4. Conduct regular community surveys to assess affordability and access to dog rabies vaccine
4.1.5. Secure funding to provide additional subsidization of vaccine cost based on survey findings
4.1.6. Aware the community to mass dog vaccination

4.2. Increase local cell culture animal rabies vaccine production capacity at National Veterinary Institute
4.2.1. Procure supplies and equipment necessary for increased production

4.3. Improve quality and safety of locally produced cell culture rabies vaccine based on OIE quality and safety standards
4.3.1. Perform safety and potency testing for all vaccine batches produced by NVI
4.3.2. Obtain external quality assurance certification for local and international distribution

4.4. Increase national capacity to mass vaccinate at least 70% of dogs
4.4.1. Conduct post-vaccination monitoring to obtain coverage estimates

4.5. Establish a legal framework for quarantine, inspection, and vaccination of animals involved in transboundary movement

St.5: Prevention and Elimination of Rabies in Wildlife and Livestock
5.1. Enhance wildlife and livestock rabies surveillance
5.1.1. Utilize routine rabies surveillance data from livestock and wildlife to refine the national rabies strategy for integration
5.1.2. Conduct wildlife rabies research to explore potential reservoirs, estimate burden, and identify resources

St.6: Dog population management (DPM) plan established
6.1. Develop and implement DPM plan
6.1.1. Implement the national DPM strategy at the local and national levels
6.1.2. Revise national DPM strategy based on epidemiological and ecology surveys (e.g. KAP survey, etc)

St. 7: Rabies Diagnostic Laboratory Capacity
7.1. Increase national and regional animal health laboratory capacity for rabies diagnostic testing
7.1.1. Procure all supplies and equipment needed for rabies diagnostic testing

7.2. Establish a mechanism for animal sample submission to regional and national level laboratories for rabies diagnostic testing
7.2.1. Supply animal sample collection, transportation and storage materials to district vet clinic and regional labs for sample collection

7.3. Establish a quality management program between international OIE/WHO rabies reference laboratory(ies) (e.g. Onderstepoort, CDC, etc) and national rabies reference laboratory for rabies confirmatory testing and variant typing
    7.3.1. Establish relevant material transfer agreement (s) for shipment of animal sample to international rabies reference laboratory (ies)
    7.3.2. Participate on bi-annual proficiency testing of national rabies reference laboratory
    7.3.3. Undertake in annual competency testing of national rabies reference laboratory staff
    7.3.4. Periodically submit a proportion of rabies positive animal samples to international reference laboratory for variant typing

St. 8: Information, education and communication

8.1. Increase animal and public health professionals' knowledge on rabies
    8.1.1. Adapt education training materials (GARC and Blueprint materials)
    8.1.2. Gather rabies information and education materials in-country and from other relevant sources
    8.1.3. Review materials for completeness and cultural appropriateness
    8.1.4. Adapt and/or develop materials based on review
    8.1.5. Perform field level testing of adapted and/or newly developed materials
    8.1.6. Distribute information and education materials to relevant regional public health and animal health institutions

8.2. Increase general public awareness on rabies prevention
    8.2.1. Conduct community survey to assess behaviors, knowledge, and practices related to rabies (e.g. KABP survey, etc) in target audience(s)
    8.2.2. Develop appropriate rabies related messages based on survey findings from target audience(s)
    8.2.3. Develop relevant awareness raising materials based on various communication channels
    8.2.4. Train relevant professionnels on communication stratégies
    8.2.5. Conduct routine community awareness campaigns for target audience(s) and activities

St. 9: Multi-sectoral collaboration and sharing

9.1. Strengthen existing national level multi-sectoral rabies technical working groups (RTWG)
    9.1.1. Support regular meeting of the RTWG for information sharing, review implementation progress of activities relevant to each Ministries and encountered challenges

9.2. Establish regional multi-sectoral rabies technical working groups (RTWG) using a One Health Approach
    9.2.2. Develop and implement work plans for 4 regional RTWGs

9.3. Obtain buy-in and secure resources for implementation of national rabies plan
    9.3.1. Develop an advocacy plan to obtain buy-in (e.g. use of success stories, world rabies day, etc)
    9.3.2. Identify and secure potential sources of funding for implementation of rabies strategy (e.g. private sector, etc)

St. 10: Legislation

10.1. Increase enforcement of existing rabies related legislation
    10.1.1 Publicizing the legal framework

3.5. PHASE 5 (2030): MAINTAIN FREEDOM FROM RABIES IN HUMANS AND DOGS

During the fifth, and final, phase of the rabies elimination strategy in Ethiopia, the disease intervention strategies will be modified and contiguously maintained through risk-based approach in the country. This phase will be lead by a contingency plan to prevent re-introduction/re-emergence of rabies while clearing foci areas based on risk assessment. This approach will ensure that Ethiopia maintains its freedom from dog and human rabies.
Specific activities to be completed in the stipulated timeframe

St. 2: Data reporting and sharing strengthened

2.1. Improve a mechanism (database) to strengthen reporting of all cases of human and animal rabies from the local to national
    2.1.1. Explore electronic tools and/or platforms to improve reporting of cases in selected institutions
    2.1.2. Provide financial and material resources to improve timely reporting of rabies cases

2.2. Establish a mechanism for reporting, feedback, and information sharing of rabies data among stakeholders and relevant sectors (national and international)
    2.2.1. Share rabies data to Ministry websites (MOLF, EWCA, MOH, etc) on a monthly basis
    2.2.2. Report key indicator human rabies and exposure data to WHO
    2.2.3. Report key indicator animal rabies data to OIE

2.3. Establish and maintain communication with countries within the East African Rabies Community (e.g. PARACON)
    2.3.1. Continue communications with Regional East African Rabies Community
    2.3.2. Attend and participate in national, regional and international rabies meetings (i.e. PARACON, East African Regional, etc)

St.3: Prevention of rabies in humans

3.1. Increase access to modern cell culture rabies vaccines for human post-exposure prophylaxis
- 3.1.1. Conduct an assessment to evaluate animal bite incidence in all regions and administrative cities
- 3.1.2. Evaluate health facilities in all regions and administrative cities in order to identify appropriate facilities for cell culture vaccine distribution

3.2. Increase access to pre-exposure prophylaxis using modern cell culture rabies vaccine for human among high-risk professionals
- 3.2.1. Provide pre-exposure prophylaxis to all identified high-risk professionals
- 3.2.2. Perform routine serological testing for adequate anti-rabies antibody titers
- 3.2.3. Administer booster vaccination for high-risk individuals based on serology testing results

3.3. Strengthen local cell culture vaccine production capacity based on WHO quality and safety standards at EPHI in order to phase-out nerve tissue vaccine utilization
- 3.3.1. Implement and maintain a quality management system for vaccine production
- 3.3.2. Procure equipment and material resources needed for cell culture vaccine production (e.g. through technology transfer from international institutions, etc)
- 3.3.3. Promote for vaccine development facility infrastructure improvement in order to meet international GMP standards (All)

3.4. Strengthen national regulatory authority capacity for licensing of locally produced human vaccines (e.g. EFMHACA)
- 3.4.1. Avail resource based on identified needs

3.5. Reduce overutilization and unnecessary/improper administration of human rabies vaccine for post-exposure prophylaxis (PEP)
- 3.5.1. Revise human PEP recommendations based on confirmed animal rabies diagnostic test results
- 3.5.2. Revise human PEP recommendations based on animal rabies surveillance system and reliability and timeliness of reporting animal rabies assessment outcomes

St.4: Control and elimination of rabies in dogs

4.1. Increase access to quality cell culture animal rabies vaccine for dogs in Ethiopia
- 4.1.1. Identify additional sources to obtain vaccine in cases of stock outs and vaccine shortage (e.g. importation)
- 4.2.2. Distribute appropriate consumable and supplies to all veterinary clinics (private and public)
- 4.2.3. Conduct routine monitoring of vaccine supply chain, vaccine use, and proper disposal

4.2.4. Conduct regular community surveys to assess affordability and access to dog rabies vaccine
4.2.5. Secure funding to provide additional subsidization of vaccine cost based on survey findings

4.3. Increase local cell culture animal rabies vaccine production capacity at National Veterinary Institute
4.3.1. Procure supplies and equipment necessary for increased production

4.4. Improve quality and safety of locally produced cell culture rabies vaccine based on OIE quality and safety standards
4.4.1. Perform safety and potency testing for all vaccine batches produced by NVI
4.4.2. Obtain external quality assurance certification for local and international distribution

4.5. Increase national capacity to mass vaccinate at least 70% of dogs
4.5.1. Conduct post-vaccination monitoring to obtain coverage estimates

4.6. Establish a legal framework for quarantine, inspection, and vaccination of animals involved in transboundary movement
4.6.1. Monitor enforcement of framework

St.5: Prevention and Elimination of Rabies in Wildlife and Livestock
5.1. Enhance wildlife and livestock rabies surveillance
5.1.1. Utilize routine rabies surveillance data from livestock and wildlife to refine the national rabies strategy for integration
5.1.2. Conduct wildlife rabies research to explore potential reservoirs, estimate burden, and identify resources

St.6: Dog population management (DPM) plan
6.1. Develop and implement DPM plan
6.1.1. Implement the national DPM strategy at the local and national levels
6.1.2. Revise national DPM strategy based on epidemiological and ecology surveys (e.g. KAP survey, etc)

St. 7: Rabies Diagnostic Laboratory Capacity
7.1. Increase national and regional animal health laboratory capacity for rabies diagnostic testing
7.1.1. Procure all supplies and equipment needed for rabies diagnostic testing

7.2. Establish a mechanism for animal sample submission to regional and national level laboratories for rabies diagnostic testing
7.2.1. Supply animal sample collection, transportation and storage materials to district vet clinic and regional labs for sample collection

7.3. Establish a quality management program between international OIE/WHO rabies reference laboratory(ies) (e.g. Onderstepoort, CDC, etc) and national rabies reference laboratory for rabies confirmatory testing and variant typing
    7.3.1. Establish relevant material transfer agreement (s) for shipment of animal sample to international rabies reference laboratory (ies)
    7.3.2. Participate on bi-annual proficiency testing of national rabies reference laboratory
    7.3.3. Undertake in annual competency testing of national rabies reference laboratory staff
    7.3.4. Periodically submit a proportion of rabies positive animal samples to international reference laboratory for variant typing

St. 8: Information, education and communication

8.1. Increase animal and public health professionals' knowledge on rabies
    8.1.1. Adapt education training materials (GARC and Blueprint materials)
    8.1.2. Gather rabies information and education materials in-country and from other relevant sources
    8.1.3. Review materials for completeness and cultural appropriateness
    8.1.4. Adapt and/or develop materials based on review
    8.1.5. Perform field level testing of adapted and/or newly developed materials
    8.1.6. Distribute information and education materials to relevant regional public health and animal health institutions

8.2. Increase general public awareness on rabies prevention
    8.2.1. Conduct community survey to assess behaviors, knowledge, and practices related to rabies (e.g. KABP survey, etc) in target audience(s)
    8.2.2. Develop appropriate rabies related messages based on survey findings from target audience(s)
    8.2.3. Develop relevant awareness raising materials based on various communication channels
    8.2.4. Train relevant professionnels on communication stratégies
    8.2.5. Conduct routine community awareness campaigns for target audience(s) and activities

St. 9: Multi-sectoral collaboration and sharing

9.1. Strengthen existing national level multi-sectoral rabies technical working groups (RTWG)
    9.1.1. Support regular meeting of the RTWG for information sharing, review implementation progress of activities relevant to each Ministries and encountered challenges

9.2. Establish regional multi-sectoral rabies technical working groups (RTWG) using a One Health Approach
    9.2.1. Develop and implement work plans for 4 regional RTWGs

9.3. Obtain buy-in and secure resources for implementation of national rabies plan
    9.3.1. Identify and secure potential sources of funding for implementation of rabies strategy (e.g. private sector, etc)

St. 10: Legislation
10.1. Increase enforcement of existing rabies related legislation
    10.1.1. Publicizing the legal framework

3.5.1. EXPECTED SARE ASSESSMENT STAGE AT END OF PHASE 5: STAGE 5

3.6. ACTION PLANS FOR IMPLEMENTING EACH PHASE

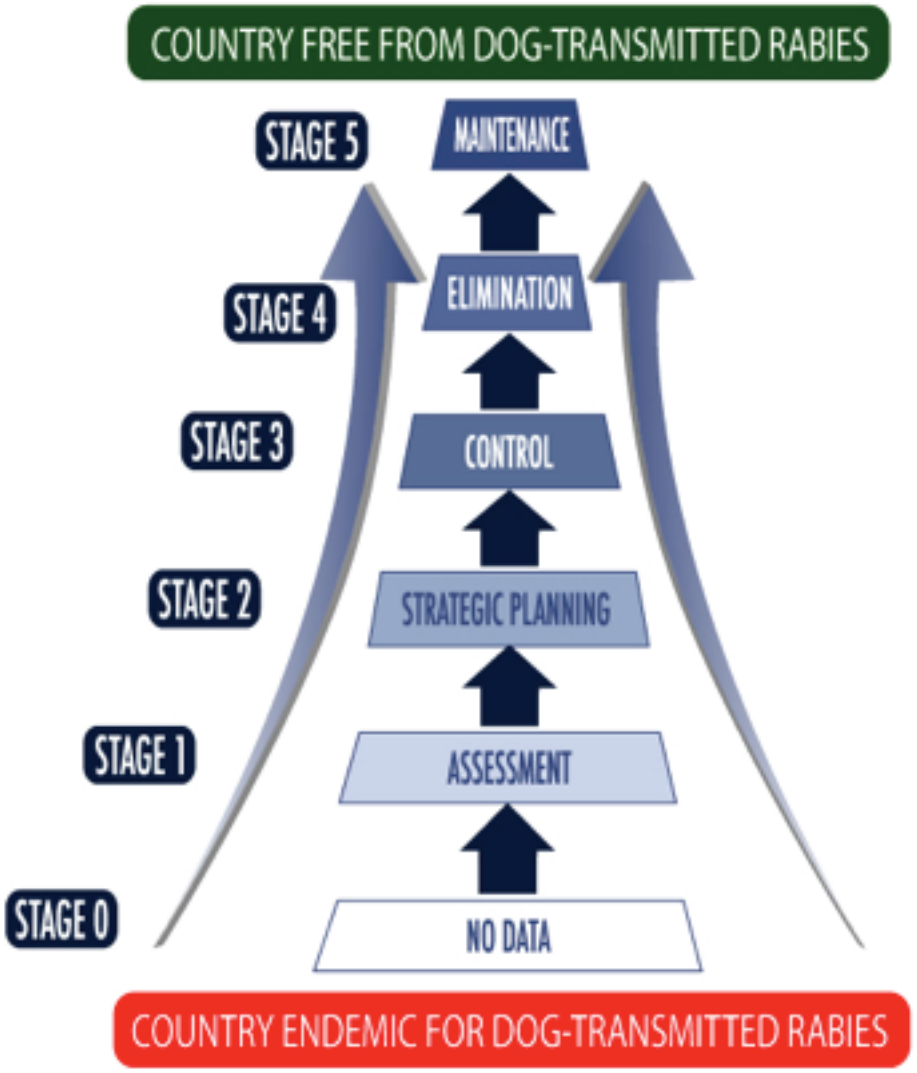
The implementation of each phase's activities will be based on a phase-specific action plan that will be developed by the Ethiopian rabies multi-sectoral technical working group. The phase-specific action plans will be detailed documents that will supplement the national elimination strategy by providing in-depth detail on the following items:

- Specific activities and how they will be prioritized within the stipulated timeframe of the specific phase
- Stakeholders that will take responsibility for specific activities
- Key indicators that will result in an activity being considered as "accomplished"
- Budgetary requirements to complete the phase. This budget will form part of the larger budget allocated to the rabies elimination strategy

3.7. MONITORING AND EVALUATION OF PROGRESS

As this strategy is based on the comprehensive SARE assessment model, the objective is for Ethiopia to address the rabies-specific activities discussed in this national strategy in order to progress from Stage 0 (country endemic for rabies) to Stage 5 (country free from dog rabies). The SARE assessment consists of six stages (stage 0 to 5) and these stages can be broadly summarized as follows (see figure below):

- Stage 0: No information on rabies available, but rabies is suspected to be present
- Stage 1: Assessment of the local rabies epidemiology, elaboration of a short-term rabies action plan:
- Stage 2: Development of a national rabies prevention and control strategy
- Stage 3: Full-scale implementation of the national rabies control strategy
- Stage 4: Maintenance of human rabies freedom, elimination of dog rabies
- Stage 5: Freedom from human and dog rabies being monitored



The monitoring and evaluation will rely on regular SARE assessment undertaken by the Ethiopian rabies multi-sectoral technical working group in order to ensure a progressive reduction of disease risk, enabling regional or synchronized activities towards disease elimination.

CHAPTER 4: EXPENDITURE ESTIMATES

4.1. SUMMARY ESTIMATED BUDGET

(Summary description of the total amount of the budget to implement activities listed under phase 1 of the implementation period. Brief description of the budget items as depicted in the table below and the amount of budget as compared to the total, expressed in percentages. Brief description of the strategic pillar areas and the major responsible government sectors)

Table 4. Rabies Prevention and Control Strategy - Phase 1

No.	Name of Regional Veterinary Lab	Amount - ETB	Amount - USD
1	Training (Workshop)	31,845,100	1,161,806
2	Consultant Subject Matter Expert (SME)	1,818,800	66,355
3	Travel	5,445,771	198,678
4	Supplies and equipment	507,498,002	18,515,068
5	Shipment, commuication and others	222,500	8,117
	Total	**546,830,173**	**19,950,025**

4.2. PHASE I ACTIVITY BUDGET WITH INPUT DESCRIPTION

Table 5. Detailed activity budget - Phase 1

Budget headings and inputs description	Amount - ETB	Amount - USD
Training (Workshop)		
Standardize animal rabies case definition based on international standards (workshop)	263,000	9,595
Standardize suspected rabies exposures case definition for humans and for animals and human rabies case definitions based on international standards (Activities 1.1.2 and 1.1.3)	284,200	10,368
Train all animal and public health surveillance officers on key principles of rabies surveillance systems (case definitions, reporting, etc)	3,801,000	138,672
Develop a joint SOP for human bite and suspected rabid animal investigations and response; and protocol for quarantine and euthanasia of suspected rabid animals (writeshop and validation workshop)	261,200	9,529

Budget headings and inputs description	Amount - ETB	Amount - USD
Train all animal health professionals on safe animal handling, animal sample collection, and euthanasia	1,172,400	42,773
Obtain endorsement from pilot region governments and identify resources (funding, human) for implementation (stakeholder workshop)	125,700	4,586
Train all relevant animal and public health surveillance officers on how to collate, analysis and development of epidemiological bulletins on rabies surveillance data	724,200	26,421
Provide financial and material resources to improve timely reporting of rabies cases	724,200	26,421
Train relevant health care professionals on proper administration of cell culture rabies vaccine (includes vaccination schedule)	1,294,200	47,216
Train all vaccine production staff on vaccine production and quality assurance methods	1,314,000	47,939
Develop SOPs for post-mass dog population estimation vaccination monitoring (Write work shop)	261,200	9,529
Training to conduct surveys to estimate dog population	1,361,600	49,675
Train veterinary professionals at local veterinary clinics (public and private)	1,714,000	62,532
Train additional staff on SOP for cell culture animal rabies vaccine production (technical training)	193,000	7,041
Develop SOP for planning and implementing MVCs and post vaccination monitoring(write work shop)	295,000	10,762
Train relevant professionals on the MVC and post vaccination monitoring SOP	434,400	15,848
Establish/review existing legislation for annual MVC implementation at federal and regional levels (Write work shop)	284,200	10,368
Obtain endorsement from appropriate authorities for legal framework (validation)	278,700	10,168
Develop a national DPM strategy using available resources and share with relevant stakeholders	572,200	20,876
Sensitize community on DPM strategy prior to implementation	2,136,000	77,928
Train animal health professionals on DPM strategy and relevant techniques	686,200	25,035
Develop and distribute SOP for rabies diagnostic testing (2 writeshop and a validation)	418,500	15,268
Train all laboratory staff in pilot labs on SOP	1,672,800	61,029
Develop standardized operating procedures for animal sample collection, storage, and transportation (2 writeshops and a validation)	418,500	15,268
Train professional on proper sample collection, handling and submission	1,672,800	61,029
Review/develop animal sample submission forms to ensure all necessary epidemiologic data are collected on submitted samples (2 writeshop and a validation)	418,500	15,268
Develop strategy to address identified gaps (e.g. electronic reporting, etc) (validation of 7.3.2)	166,700	6,082
Develop/review/ update SOP for appropriate animal sample packaging and international shipment	139,500	5,089

Budget headings and inputs description	Amount - ETB	Amount - USD
Provide training to national reference laboratory staff on SOP for international sample shipment and package	418,200	15,257
Train animal and public health professionals on identified knowledge gaps (GARC and blue print courses)	1,672,800	61,029
Adapt education training materials (GARC and Blueprint materials)	279,000	10,179
Review materials for completeness and cultural appropriateness	139,500	5,089
Adapt and/or develop materials based on review (writeshop and validation)	279,000	10,179
Develop appropriate rabies related messages based on survey findings from target audience(s) (validation of what the consultant developed)	125,700	4,586
Develop relevant awareness raising materials based on various communication channels (1 writeshop and 1 validation workshop)	251,400	9,172
Develop national rabies communication strategies involving relevant stakeholders (e.g. media, internet, etc) (1 writesop and 1 validation workshop)	251,400	9,172
Train relevant professionals on communication strategies	125,700	4,586
Conduct routine community awareness campaigns for target audience(s) and activities	2,136,000	77,928
Support regular meeting of the RTWG for information sharing, review implementation progress of activities relevant to each Ministries and encountered challenges	1,534,800	55,994
Develop and implement work plans for 4 regional RTWGs	1,023,200	37,329
Obtain official endorsement of rabies strategy including the budget plan from all relevant Ministries (validation workshop of the strategy)	269,100	9,818
Consult relevant experts and authorities for suggested legislation improvements and/or additions (expert consultation)	125,700	4,586
Identify methods to improve legislation enforcement at the local level (e.g. fees, etc) in consultation with relevant legal bodies	125,700	4,586
Total	**31,845,100**	**1,161,806**
Consultant Subject Matter Expert (SME)		
Seek technical expertise from international and national vaccine production experts	1,000,000	36,483
Assess national regulatory capacity to license locally produced human vaccines	82,800	3,021
Develop quarantine, inspection, and vaccination legal framework based on assessment	184,000	6,713
Assess local level (wereda) and regionals capacity to submit suspected rabies animal samples to the regional and national level	138,000	5,035
Conduct community survey to assess behaviors, knowledge, and practices related to rabies and develop rabies related messages and awareness raising materials (e.g. KAP survey, etc) in target audience(s)	138,000	5,035
Review existing national, regional, and administrative city legal framework for rabies prevention and control related provisions	184,000	6,713
Assess current level of enforcement of any existing rabies related legal framework	92,000	3,356
Total	**92,000**	**66,355**

Budget headings and inputs description	Amount - ETB	Amount - USD
Travel		
Evaluate existing rabies surveillance systems (i.e. Public Health Emergency Management, National Animal Disease Surveillance System, Wildlife surveillance) and compare to international standards and proposed system for Ethiopia to identify gaps	329,132	12,008
Attend and participate in national, regional and international rabies meetings (i.e. PARACON, East African Regional, etc)	1,702,800	62,123
Conduct an assessment to evaluate animal bite incidence in all regions and administrative cities	246,849	9,006
Conduct evaluation of cell culture vaccine in pilot introduction regions to generate recommendations for large scale distribution	161,849	5,905
Conduct surveys to estimate dog population	858,264	31,312
Distribute appropriate consumable and supplies to all veterinary clinics (private and public)	858,264	31,312
Conduct routine monitoring of vaccine supply chain, vaccine use, and proper disposal	830,547	30,301
Conduct regular community surveys to assess affordability and access to dog rabies vaccine	412,283	15,041
Assess NVI production capacity (including human resources, etc) to meet estimated demand	22,283	813
Perform field level testing of adapted and/or newly developed materials	23,500	857
Total	**5,445,771**	**198,678**
Supplies and equipment		
Provide financial and material resources to improve timely reporting of rabies cases	18,700,000	682,233
Pilot introduction of cell culture rabies vaccine in 4 regions	45,135,000	1,646,662
Perform routine serological testing for adequate anti-rabies antibody titers	9,600,000	350,237
Identify equipment, material and human resource needs for cell culture vaccine production	9,600,000	350,237
Procure equipment and material resources needed for cell culture vaccine production (e.g. through technology transfer from international institutions, etc)	19,093,813	696,600
Procure supplies and equipment necessary for increased vaccine production	25,369,188	925,545
Total	**127,498,002**	**4,651,514**

Budget headings and inputs description	Amount - ETB	Amount - USD
Shipment, communication and others		
Obtain external quality assurance certification from OIE for local and international distribution	2,500	91
Periodically submit a proportion of rabies positive animal samples to international reference laboratory for variant typing	100,000	3,648
Distribute information and education materials to relevant regional public health and animal health institutions	40,000	1,459
Publicizing the legal framework	80,000	2,919
Total	**222,500**	**8,117**
GRAND TOTAL	**166,830,173**	**6,086,471**

Table 6: Budget summary

Phase Two	$10,705,500
Phase Three	$5,398,469
Phase Four	$608,018
Phase Five	$353,653

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ANNEX 1:
WORK PLAN AND BUDGET (PHASE ONE)

NATIONAL RABIES CONTROL AND ELIMINATION STRATEGY; WORK PLAN AND BUDGET (PHASE ONE)

Vision: To see Ethiopia with eliminated dog mediated human rabies by 2030

Mission: To significantly reduce and ultimately control the public health impact of Rabies in humans and animals in Ethiopia through sustained surveillance, laboratory diagnosis, prevention and control system and community awareness.

Goal: To effectively eliminate all human rabies deaths by 2030, as result of strategic vaccination of 70% of the domestic dog population in the country

Strategic Plan Owner- EPHI/MoLF/EWCA

Strategy Output	Activities	Detail Activities	Budget Required	Respon-sibility	Progress	Remark
St.1. Surveillance and response systems enhanced	1.1 Strengthen existing national animal and human rabies surveillance systems	1.1.1. Standardize animal rabies case definition based on international standards	263,000			
		1.1.2. Standardize suspected rabies exposures case definition for humans and for animals based on international standards	284,000			
		1.1.3. Standardize human rabies case definition based on international standards				Budget included with Activity 1.1.2
		1.1.4. Evaluate existing rabies surveillance systems (i.e. Public Health Emergency Management, National Animal Disease Surveillance System, Wildlife surveillance) and compare to international standards and proposed system for Ethiopia to identify gaps	329,132			
		1.1.5. Develop a monitoring and evaluation plan for routine evaluation of rabies surveillance systems (desktop)				
		1.1.6. Integrate wildlife animal rabies surveillance into existing animal surveillance system (through official communications)				
		1.1.7. Train all animal and public health surveillance officers on key principles of rabies surveillance systems (case definitions, reporting, etc)	3,801,000			

Strategy Output	Activities	Detail Activities	Budget Required	Respon-sibility	Progress	Remark
St.1. Surveillance and response systems enhanced	1.2 Develop a joint SOP for human bite and suspected rabid animal	1.2.1. Develop a joint SOP for human bite and suspected rabid animal investigations and response	161,200			
		1.2.2. Customize and standardize data collection forms for joint rabies field investigations (suspected rabid animal investigations, human exposure investigation, lab data collection) (desktop and official communication)				
		1.2.3. Develop a protocol for quarantine and euthanasia of suspected rabid animals				Budget included under 1.2.
		1.2.4. Train all animal health professionals on safe animal handling, animal sample collection, and euthanasia	1,172,400			
		1.2.5. Jointly identify pilot region(s) to implement a linked rabies surveillance system based on objective data (surveillance, human resource, etc)				
		1.2.6. Obtain endorsement from pilot region governments and identify resources (funding, human) for implementation	125,700			
		1.2.7. Establish a national level linked rabies surveillance system (through official communications)				

Strategy Output	Activities	Detail Activities	Budget Required	Respon-sibility	Progress	Remark
St.1. Surveillance and response systems enhanced	1.3. Strengthen national and sub national level capacity to analyze dog and human rabies data	1.3.1. Train all relevant animal and public health surveillance officers on how to collate and analyze rabies surveillance data	724,200			
		1.3.2. Train all relevant animal and public health professionals on development of epidemiological bulletins/reports for data sharing				Budget included under 1.3.1
St.2. Data reporting and sharing strengthened	2.1. Improve a mechanism (database) to strengthen reporting of all cases of human and animal rabies from the local to national	2.1.1. Identify appropriate electronic tools and/or platforms to improve reporting of cases in selected institutions (official communications and desktop analysis)				
		2.1.2. Provide financial and material resources to improve timely reporting of rabies cases	18,700,000			
	2.2. Integrate a national and subnational level database linking animal and human rabies surveillance and laboratory data	2.2.1. Select a web-based platform (e.g. DHIS2, etc) to enter, link, and share national and sub national rabies data				Linked with Activity 2.1.1
	2.3. Establish a mechanism for reporting, feedback, and information sharing of rabies data among stakeholders and relevant sectors (national and international)	2.3.1.Share rabies data to Ministry websites (MOLF, EWCA, MOH, etc) on a monthly basis (MOU and official communication)				
		2.3.2. Report key indicator human rabies and exposure data to WHO				
		2.3.3. Report key indicator animal rabies data to OIE				

Strategy Output	Activities	Detail Activities	Budget Required	Respon-sibility	Progress	Remark
St.2. Data reporting and sharing strengthened	2.4. Establish and maintain communication with countries within the East African Rabies Community (e.g. PARACON)	2.4.1. Continue communications with Regional East African Rabies Community				
		2.4.2. Attend and participate in national, regional and international rabies meetings (ie PARACON, East African Regional, etc)	1,702,800			
St.3. Prevention of rabies in humans	3.1. Increase access to modern cell culture rabies vaccines for human post-exposure prophylaxis	3.1.1. Conduct an assessment to evaluate animal bite incidence in all regions and administrative cities	246,849			
		3.1.2. Evaluate health facilities in all regions and administrative cities in order to identify appropriate facilities for cell culture vaccine distribution (Communication with regional bureaus)				
		3.1.3. Pilot introduction of cell culture rabies vaccine in 4 regions	45,135,000			
		3.1.4. Train relevant health care professionals on proper administration of cell culture rabies vaccine (includes vaccination schedule)	1,294,200			
		3.1.5. Conduct evaluation of cell culture vaccine in pilot introduction regions to generate recommendations for large scale distribution	161,849			

Strategy Output	Activities	Detail Activities	Budget Required	Respon-sibility	Progress	Remark
St.3. Prevention of rabies in humans	3.2. Increase access to pre-exposure prophylaxis using modern cell culture rabies vaccine for human among high-risk	3.2.1. Identify all high-risk professionals/workers for rabies pre-exposure vaccination				
		3.2.2. Provide pre-exposure prophylaxis to all identified high-risk professionals				
		3.2.3. Perform routine serological testing for adequate anti-rabies antibody titers	9,600,000			
		3.2.4. Administer booster vaccination for high-risk individuals based on serology testing				
	3.3. Strengthen local cell culture vaccine production capacity based on WHO quality and safety standards at EPHI in order to phase-out nerve tissue vaccine utilization	3.3.1. Seek technical ex-pertise from international and national vaccine production experts	1,000,000			
		3.3.2. Identify equipment, material and human resource needs for cell culture vaccine production	9,600,000			
		3.3.3. Train all vaccine production staff on vac-cine production and qual-ity assurance methods	1,314,000			
		3.3.4. Implement and mentain a quality management system for vaccine production				
		3.3.5. Procure equipment and material resources needed for cell culture vaccine production (e.g. through technology transfer from internation-al institutions, etc)	19,093,813			
		3.3.6. Promote for vaccine development facility infrastructure improvement in order to meet international GMP standards				
		3.3.7. Undergo appropri-ate vaccine licensing and registration procedures for national use				

Strategy Output	Activities	Detail Activities	Budget Required	Respon-sibility	Progress	Remark
St.3. Prevention of rabies in humans	3.4. Strengthen national regulatory authority capacity for licensing of locally produced human vaccines (e.g. EFMHACA)	3.4.1. Assess national regulatory capacity to license locally produced human vaccines	82,800			
		3.4.2.Identify resource needs for licensing of human rabies vaccines				
	3.5. Reduce overutilization and unnecessary/ improper administration of human rabies vaccine for post-exposure prophylaxis (PEP)	3.5.1. Revise human PEP recommendations based on confirmed animal rabies diagnostic test results				
		3.5.2. Revise human PEP recommendations based on animal rabies surveillance system and reliability and timeliness of reporting animal rabies assessment outcomes				
St.4. Control and elimination of rabies in dogs	4.1. Increase national capacity to accurately estimate dog population size	4.1.1. Identify responsible authority (ies) for dog population estimation at national ,regional and (TWG to find out) zonal level				
		4.1.2. Develop SOPs for post-mass dog population estimation vaccination monitoring	261,200			
		4.1.3. Conduct surveys to estimate dog population and Determine	858,264			

Strategy Output	Activities	Detail Activities	Budget Required	Respon-sibility	Progress	Remark
St.4. Control and elimination of rabies in dogs	4.2. Increase access to quality cell culture animal rabies vaccine for dogs in Ethiopia	4.2.1. Assess regional and administrative cities' cold chain and storage capacity ,and vaccine supply needs at veterinary clinics (Gov't and private)				
		4.2.2. Identify additional sources to obtain vaccine in cases of stock outs and vaccine shortage (e.g. importation)				
		4.2.3. Distribute appropriate consumable and suppliesto all veterinary clinics (private and public)	858,264			
		4.2.4. Conduct routine monitoring of vaccine supply chain, vaccine use, and proper disposal	830,547			
		4.2.5. Conduct regular community surveys to assess affordability and access to dog rabies vaccine	412,283			
		4.2.6. Secure funding to provide additional subsidization of vaccine cost based on survey findings				
		4.2.7. Assess existing veterinary staff capacity at district				
		4.2.8. Fill identified gaps in human resource need (e.g. hiring of veterinary staff)				
		4.2.9. Train veterinary professionals at local veterinary clinics (public and private)	1,714,000			

Strategy Output	Activities	Detail Activities	Budget Required	Respon-sibility	Progress	Remark
St.4. Control and elimination of rabies in dogs	4.3. Increase local cell culture animal rabies vaccine production capacity at National Veterinary Institute	4.3.1. Utilize estimated dog population to assess animal rabies vaccine need				
		4.3.2. Assess NVI production capacity (including human resources, etc) to meet estimated demand	22,283			
		4.3.3. Procure supplies and equipment necessary for increased production	25,369,188			
		4.3.3. Procure supplies and equipment necessary for increased production	193,000			
		4.3.4. Hire additional staff for vaccine production				
		4.3.5. Hire additional staff for vaccine production				
		4.3.6. Train additional staff on SOP for cell culture animal rabies vaccine production				
	4.4. Improve quality and safety of locally produced cell culture rabies vaccine based on OIE quality and safety standards	4.4.1. Perform safety and potency testing for all vaccine batches produced by NVI				
		4.4.2. Perform efficacy testing of NVI's rabies vaccines				
		4.4.3. Obtain external quality assurance certification for local and international distribution	2,500			
		4.4.4. Establish field level vaccine safety and effectiveness monitoring system for local level				

Strategy Output	Activities	Detail Activities	Budget Required	Respon-sibility	Progress	Remark
St.4. Control and elimination of rabies in dogs	4.5. Increase national capacity to mass vaccinate at least 70% of dogs	4.5.1. Develop SOP for planning and implementing MVCs and post vaccination monitoring	295,000			
		4.5.2. Distribute SOP for MVC and post vaccination monitoring to all regions and administrative cities				
		4.5.3. Train relevant professionnels on the MVC and post vaccination monitoring SOP	434,400			
		4.5.4. Select zone(s) in specific regions for piloting canine mass vaccinations				
		4.5.5. Establish/review existing legislation for annual MVC implementation at federal and regional levels	284,200			
		4.5.6. Revise annual MVC strategy based on risk assessments (e.g. surveillance and lab data)				
	4.6. Establish a legal framework for quarantine, inspection, and vaccination of animals involved in transboundary movement	4.6.1. Develop legal framework based on assessment	184,000			
		4.6.2. Obtain endorsement from appropriate authorities for legal framework	278,700			
		4.6.3. Monitor enforcement of framework	45,000			
St.5. Prevention and Elimination of Rabies in Wildlife and Livestock	5.1. Enhance wildlife and livestock rabies surveillance	5.1.1. Utilize routine rabies surveillance data from livestock and wildlife to refine the national rabies strategy for integration				

Strategy Output	Activities	Detail Activities	Budget Required	Respon-sibility	Progress	Remark
St.6. Dog population management (DPM) plan established	6.1. Develop and implement DPM plan	6.1.1. Develop a national DPM strategy using available resources and share with relevant stakeholders	572,200			
		6.1.2.. Sensitize community on DPM strategy prior to implementation	2,136,000			
		6.1.3. Train animal health professionals on DPM strategy and relevant techniques	686,200			
St.7. Rabies Diagnostic Laboratory Capacity strengthened	7.1. Increase national and regional animal health laboratory capacity for rabies diagnostic testing	7.1.1. Perform assessment of all national and regional Animal health laboratories for rabies diagnostic testing capacity	7,283			
		7.1.2. Select 4 pilot regional/national labs for animal rabies diagnostic testing based on assessment results (desktop work)				
		7.1.3. Procure all supplies and equipment needed for rabies diagnostic testing	20,000,000			
		7.1.4. Develop and distribute SOP for rabies diagnostic testing	418,500			
		7.1.5. Train all laboratory staff in pilot labs on SOP	1,672,800			

Strategy Output	Activities	Detail Activities	Budget Required	Respon-sibility	Progress	Remark
St.7. Rabies Diagnostic Laboratory Capacity strengthened	7.2. Establish a mechanism for animal sample submission to regional and national level laboratories for rabies diagnostic testing	7.2.1. Assess local level (wereda) and regionals capacity to submit suspected rabies animal samples to the regional and national level	138,000			
		7.2.2. Develop standard-ized operating proce-dures for animal sample collection, storage, and transportation	418,500			
		7.2.3.Train professional on proper sample collection, handling and submission	1,672,800			
		7.2.4. Supply animal sample collection, trans-portation and storage materials to district vet clinic and regional labs for sample collection	4,000,000			
		7.2.5. Review/develop animal sample submis-sion forms to ensure all necessary epidemiologic data are collected on submitted samples	418,500			
	7.3. Establish a mechanism to report all test results of animal rabies cases from regions to the national rabies reference laboratory	7.3.1. Assess regional laboratory level capacity to report test results to national level and identify gaps	7,283			
		7.3.2. Develop strategy to address identified gaps (e.g. electronic reporting, etc)	166,700			
	7.4. Establish a quality manage-ment program between interna-tional OIE/WHO rabies reference laboratory (ies) (e.g. CDC) and national rabies reference labo-ratory for rabies confirmatory testing and variant typing	7.4.4. Participate on bi-annual proficiency testing of national rabies reference laboratory	147,000			
		7.4.5. Undertake in annual competency testing of national rabies reference laboratory staff				Budget included under Activity 7.4.4
		7.4.6. Periodically submit a proportion of rabies positive animal samples to international reference laboratory for variant typing	100,000			

Strategy Output	Activities	Detail Activities	Budget Required	Respon-sibility	Progress	Remark
St. 8: In-formation, education and commu-nication	8.1. Increase animal and public health professionals' knowledge on rabies	8.1.1. Conduct an assessment of animal and public health professionals on rabies related knowledge (e.g. rabies virus transmission, clinical signs, prevention, etc)	2,500			
		8.1.2. Train animal and public health professionals on identified knowledge gaps (GARC and blue print courses)	1,672,800			
		8.1.3. Adapt education training materials (GARC and Blueprint materials)	279,000			
		8.1.4. Gather rabies information and education materials in-country and from other relevant sources				
		8.1.5. Review materials for completeness and cultural appropriateness				
		8.1.6. Adapt and/or develop materials based on review	279,000			
		8.1.7. Perform field level testing of adapted and/or newly developed materials	23,500			
		8.1.8. Distribute information and education materials to relevant regional public health and animal health institutions	40,000			

Strategy Output	Activities	Detail Activities	Budget Required	Respon-sibility	Progress	Remark
St. 8: Information, education and communication	8.2. Increase general public awareness on rabies prevention	8.2.1. Conduct community survey to assess behaviors, knowledge, and practices related to rabies (e.g. KAP survey, etc) in target audience(s)	138,000			
		8.2.2. Develop appropriate rabies related messages based on survey findings from target audience(s)	125,700			
		8.2.3. Develop relevant awareness raising materials based on various communication channels	251,400			
		8.2.4. Develop national rabies communication strategies involving relevant stakeholders (e.g. media, internet, etc)	251,400			
		8.2.5. Train relevant professionals on communication strategies	125,700			
		8.2.6. Conduct routine community awareness campaigns for target audience(s) and activities	2,136,000			
St. 9: Multi-sectoral collaboration and sharing strengthened	9.1. Strengthen existing national level multi-sectoral rabies technical working groups (RTWG)	9.1.1. Review existing terms of references (TOR) and revise as necessary				
		9.1.2. Support regular meeting of the RTWG for information sharing, review implementation progress of activities relevant to each Ministries and encountered challenges	1,534,500			
	9.2. Establish regional multi-sectoral rabies technical working groups (RTWG) using a One Health Approach	9.2.1. Develop and implement work plans for 4 regional RTWGs	1,023,200			

Strategy Output	Activities	Detail Activities	Budget Required	Respon-sibility	Progress	Remark
St. 9: Multi-sectoral collaboration and sharing strengthened	9.3. Obtain buy-in and secure resources for implementation of national rabies plan	9.3.1. Develop an advocacy plan to obtain buy-in (e.g. use of success stories, world rabies day, etc) (Office work)				
		9.3.2. Obtain official endorsement of rabies strategy including the budget plan from all relevant Ministries	269,100			
		9.3.3. Identify and secure potential sources of funding for implementation of rabies strategy (e.g. private sector, etc) (GTP planning for next fiscal year)				Total budget secured for implementa-tion of this strategy
St. 10: Legislation reviewed	10.1. Identify gaps in national and regional level legal framework related to rabies prevention and control	10.1.1. Review existing national, regional, and administrative city legal framework for rabies prevention and control related provisions	184,000			
		10.1.2. Consult relevant experts and authorities for suggested legislation improvements and/or additions	125,700			
	10.2. Increase enforcement of existing rabies related legislation	10.2.1 Publicizing the legal framework	80,000			
		10.2.2. Assess current level of enforcement of any existing rabies related legal framework	92,000			
		10.2.3. Identify methods to improve legislation enforcement at the local level (e.g. fees, etc) in consultation with relevant legal bodies	125,700			

ANNEX 2:
PERFORMANCE MONITORING PLAN OF THE NATIONAL RABIES PREVENTION AND CONTROL STRATEGY
(BRIEF DESCRIPTION OF THE IMPORTANCE OF THE AN M&E PLAN AND RESPONSIBLE SECTORS)

Activity	Subactivity	Measurable indicators of achievement	Deliverable	Target	Means of verification
Strategy Output 1: Surveillance and response systems enhanced (SARE: Data collection and analysis)					
1.1 Strengthen existing national animal and human rabies surveillance systems	1.1.1. Standardize animal rabies case definition based on international standards	# of rabies case definitions standardized	Approved animal case definitions for Ethiopia	3	Jointly endorsed document
	1.1.2. Standardize suspected rabies exposures case definition for humans and for animals based on international standards		Approved case definitions for human exposures and animal exposures		
	1.1.3. Standardize human rabies case definition based on international standards		Approved human case definitions		
	1.1.4. Evaluate existing rabies surveillance systems (i.e. Public Health Emergency Management, National Animal Disease Surveillance System, Wildlife surveillance) and compare to international standards and proposed system for Ethiopia to identify gaps	Existing rabies surveillance system described	Rabies surveillance gaps documented	N/A	Assessment Report

Activity	Subactivity	Measurable indicators of achievement	Deliverable	Target	Means of verification
1.1 Strengthen existing national animal and human rabies surveillance systems	1.1.5. Implement changes to rabies surveillance systems (MOLF, EPHI, EWCA) based on evaluation findings and recommendations	Proportion of gaps / recommendations in the rabies surveillance systems assessment addressed	Fully functional surveillance system implemented	N/A	Performance/ evaluation report
	1.1.6. Develop a monitoring and evaluation plan for routine evaluation of rabies surveillance systems	Existence of M&E plan for rabies surveillance systems	M&E plan for rabies surveillance systems developed	1	M&E plan
	1.1.7. Integrate wildlife animal rabies surveillance into existing animal surveillance system	Animal surveillance system integrating wildlife animal rabies described	Integrated rabies surveillance system	N/A	Survelance reports
	1.1.8. Train all animal and public health surveillance officers on key principles of rabies surveillance systems (case definitions, reporting, etc)	# of professionals trained on key principles of rabies surveillance systems	Competencies in key principles of rabies surveillance system acquired	TBD based on 1.1.5	Training report
1.2 Develop a joint SOP for human bite and suspected rabid animal investigations and response	1.2.1. Develop a joint SOP for human bite and suspected rabid animal investigations and response	SOP for human bite and suspected rabid animal investigations and response described	SOP for human bite and suspected rabid animal investigations and response developed and approved	1	SOP for human bite and suspected rabid animal investigations and response adopted and implemented
	1.2.2. Customize and standardize data collection forms for joint rabies field investigations (suspected rabid animal investigations, human exposure investigation, lab data collection)	#, list of data collection tools for joint rabies field investigations developed	Data collection tools approved	TBD based on 1.2.1	Data collection tools adopted and data summary reports
	1.2.3. Develop a protocol for quarantine and euthanasia of suspected rabid animals	Protocol for quarantine and euthanasia of suspected rabid animals described	Protocol for quarantine and euthanasia of suspected rabid animals developed	1	Summary reports of quarantine and euthanasia/ testing activities

Activity	Subactivity	Measurable indicators of achievement	Deliverable	Target	Means of verification
1.2 Develop a joint SOP for human bite and suspected rabid animal investigations and response	1.2.4. Train all animal health professionals on safe animal handling, animal sample collection, and euthanasia. (Consider certification)	Proportion of professionals trained on safe animal handling, animal sample collection, and euthanasia	Competencies in safe animal handling, animal sample collection and euthanasia acquired	TBD	Training report
	1.2.5. Jointly identify pilot region(s) to implement a linked rabies surveillance system based on objective data (surveillance, human resource, etc)	# of pilot regions selected for rabies surveillance	Pilot regions prioritized	2-3 small, well-defined sites	Pilot site recommendations
	1.2.6. Obtain endorsement from pilot region governments and identify resources (funding, human) for implementation	# of endorsed instruments with resources.	Endorsement instruments (MOU/TOR)	2-3	Signed agreement that includes responsibilities and resources
	1.2.7. Evaluate linked surveillance system in pilot regions to identify strengths and challenges	Surveillance system in pilot regions described	Gaps and strengths in surveillance system documented including recommendations for change	N/A	Assessment report
	1.2.8. Scale up implementation of linked surveillance system based on evaluation findings and availability of resources to increase national coverage	# of new regions (with necessary resources) identified	New regions implementing surveillance system	TBD	Surveillance reports from new regions
	1.2.9. Establish a national level linked rabies surveillance system	National rabies surveillance system described	National rabies surveillance system established	1	National surveillance reports summarizing data from all zones

Activity	Subactivity	Measurable indicators of achievement	Deliverable	Target	Means of verification
Strategy Output 2: Data reporting and sharing strengthened (SARE: Data collection and analysis)					
2.1. Improve a mechanism (database) to strengthen reporting of all cases of human and animal rabies from the local to national	2.1.1. Explore electronic tools and/or platforms to improve reporting of cases in selected institutions	#, list of le tools available	Assessment findings documented	TBD	Assessment and recommendations report
	2.1.2. Provide financial and material resources to improve timely reporting of rabies cases	# of reporting resources distributed	Document resources availed by relevant agencies (MOLF, EPHI, EWCA, etc.)	TBD	Asset register and/or handover notes
2.3. Establish an interoperable national and subnational level database linking animal and human rabies surveillance and laboratory data	2.3.1. Select a web-based platform (e.g. DHIS2, etc) to enter, link, and share national and sub national rabies data	Web-based platform for rabies data described	Web-based platform for rabies data integrated with existing system	1	Joint national data summary reports
2.4. Establish a mechanism for reporting, feedback, and information sharing of rabies data among stakeholders and relevant sectors (national and international)	2.4.1.Share rabies data to Ministry websites (MOLF, EWCA, MOH, etc) on a monthly basis	Existence of web-based data in Ministry websites and shared reports	Rabies data uploaded and shared on a monthly basis	12	Database reports
	2.4.2. Report key indicator human rabies and exposure data to WHO	# of human rabies cases and exposure reported timely to WHO	WHI notfied	TBD	Disease notification reports
	2.4.3. Report key indicator animal rabies data to OIE	# of animal rabies cases reported timely to OIE	OIE notified	N/A	Disease notification reports
2.5. Establish and maintain communication with countries within the East African Rabies Community (e.g. PARACON)	2.5.1. Continue communications with Regional East African Rabies Community	# of communications made	Documented communications	N/A	Communication summaries (ie. Agendas, minutes, summary reports, emails)
	2.5.2. Attend and participate in national, regional and international rabies meetings (ie PARACON, East African Regional, etc)	# of meetings attended	Meeting agenda and proceedings	TBD	Meeting communique (ie. Agendas, minutes, summary reports)

Activity	Subactivity	Measurable indicators of achievement	Deliverable	Target	Means of verification
Strategy Output 3: Prevention of rabies in humans (SARE: Prevention and Control)					
3.1. Increase access to modern cell culture rabies vaccines for human post-exposure prophylaxis	3.1.1. Conduct an assessment to evaluate animal bite incidence in all regions and administrative cities (Addis Ababa, Dire Dawa)	number of assessment	Animal bite incidences recorded	1 per year	Assessment reports
	3.1.2. Evaluate health facilities in all regions and administrative cities in order to identify appropriate facilities for cell culture vaccine distribution	#, list of health facilities assessed for cell culture vaccine distribution	Health facilities identified	TBD	Asset register
	3.1.3. Pilot introduction of cell culture rabies vaccine in 4 regions	proportion of people vaccinated from exposed	exposed people vaccinated	100%	Vaccination reports
	3.1.4. Train relevant health care professionals on proper administration of cell culture rabies vaccine (includes vaccination schedule)	# of professionals trained on administration of cell culture rabies vaccine	Competencies in cell culture rabies vaccine administration acquired	1005	Training report
	3.1.5. Conduct evaluation of cell culture vaccine in pilot introduction regions to generate recommendations for large scale distribution	# of regions where cell culture vaccine has been scaled up	Cell culture vaccine scaled up	4piot area	Assessment report
	3.1.6. Conduct operational research to assess best method to increase access and cost-effectiveness	best methods to increase access and cost-effectiveness determined	Findings for access and cost effectiveness of cell culture vaccine documented	1	Study report

Activity	Subactivity	Measurable indicators of achievement	Deliverable	Target	Means of verification
3.2. Increase access to pre-exposure prophylaxis using modern cell culture rabies vaccine for human among high-risk professionals	3.2.1. Identify all high-risk professionals/workers for rabies pre-exposure vaccination	#, list of identified high-risk professionals/ workers for rabies pre-exposure vaccination	High risk professionals inventoried	TBD	Database of high risk professionals/ workers
	3.2.2. Provide pre-exposure prophylaxis to all identified high-risk professionals	Proportion of high-risk professionals vaccinated	High risk professionals vaccinated	100%	Vaccination report
	3.2.3. Perform routine serological testing for adequate anti-rabies antibody titers	Proportion of professionals serologically tested among vaccinated	Level of protection assessed and documented	100%	Lab results report
	3.2.4. Administer booster vaccination for high-risk individuals based on serology testing results	proportion of individual who receive booster vaccination	All professional at high risk are protected	100%	vaccination records
3.3. Strengthen local cell culture vaccine production capacity based on WHO quality and safety standards at EPHI in order to phase-out nerve tissue vaccine utilization	3.3.1. Seek technical expertise from international and national vaccine production experts	# of expert recommendations adopted	List of recommendations proposed	TBD	Project reports
	3.3.2. Identify equipment, material and human resource needs for cell culture vaccine production	# and type of equipment and supplies for cell culture vaccine production identified	Supplies and resources needed for cell culture vaccine production documented	TBD	Assessment report
	3.3.3. Train all vaccine production staff on vaccine production and quality assurance methods	# of professional staff trained on vaccine production and QA methods	Competencies in vaccine production and QA methods acquired	TBD	Training report
	3.3.4. Implement a quality management system for vaccine production	Quality management system for vaccine production described	Quality management system for vaccine production rolled out	1	third party accreditation
	3.3.5. Procure equipment and material resources needed for cell culture vaccine production (e.g. through technology transfer from international institutions, etc)	national lab equipped with vaccine production equipment and supplies	Vaccine production supplies and equipment received	TBD	Asset register

Activity	Subactivity	Measurable indicators of achievement	Deliverable	Target	Means of verification
3.3. Strengthen local cell culture vaccine production capacity based on WHO quality and safety standards at EPHI in order to phase-out nerve tissue vaccine utilization	3.3.6. Advocate for vaccine development facility infrastructure improvement in order to meet international GMP standards	# of policy makers reached with advocacy for vaccine development	Policy makers sensitized	TBD	Advocacy materials
	3.3.7. Undergo appropriate vaccine licensing and registration procedures for national use	license and registration acquired	Vaccine licenses and registration obtained	1	vaccine licenses

Activity	Subactivity	Measurable indicators of achievement	Deliverable	Target	Means of verification