



# Zoonotic Disease Prioritization for Inter-sectoral Engagement in Cameroon

Priorisation des  
maladies zoonotiques  
pour l'engagement  
intersectoriel au  
Cameroun

Yaoundé, Cameroon  
March 3–4, 2016





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## ATTENDANCE

### PARTICIPATING ORGANIZATIONS

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Ministry of Livestock, Fisheries, and Animal Industries (MINEPIA)  
Ministry of Forests and Fauna (MINFOF)  
Ministry of Public Health (MINSANTE)  
Ministry of Environment, Nature Protection and Sustainable Development (MINEPDED)  
Ministry of Scientific Research and Innovation (MINRESI)  
Research Center for Emerging and Re-emerging diseases (CREMER)  
National Veterinary Laboratory (LANAVET)  
Military Health Research Center (CRESAR)  
USAID Prepare & Respond Project  
USAID PREDICT-2 Project  
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## SUMMARY

The purpose of this two-day workshop was to identify zoonotic diseases of greatest national concern for Cameroon using input from representatives of human health, livestock, environment, wildlife, research, and higher education sectors. During the workshop, representatives identified a list of zoonotic diseases relevant for Cameroon, defined the criteria for prioritization, and determined questions and weights relevant to each criterion. Five zoonotic diseases were identified as a priority by participants using a semi-quantitative selection tool developed by the U.S. Centers for Disease Control and Prevention (CDC). The five selected zoonotic diseases are rabies, anthrax, highly pathogenic avian Influenza, Ebola and Marburg Virus disease, and bovine tuberculosis (Table 1).

**Table 1. Description of priority zoonotic diseases selected in Cameroon by participants of inter-sectoral prioritization workshop**

Disease	Causative Agent	Human Disease Burden	Animal Disease Burden	Diagnostics, Treatment, and Prevention
<b>Rabies</b>	Virus	Exact number unknown, but cases are regularly reported. <sup>1</sup>	Rabies is endemic in the dog population in Cameroon. <sup>2</sup>	Effective animal vaccine exists. Post-bite treatment for people is very effective. Once symptoms start, all patients die. <sup>3</sup>
<b>Anthrax</b>	Bacteria	Exact numbers unknown, but both skin and intestinal forms reported frequently in neighboring countries. <sup>4</sup>	Outbreaks have been reported in livestock and wildlife. <sup>4,5</sup>	Effective animal vaccine and treatment for people exist. <sup>4</sup>
<b>Avian Influenza</b>	Virus	No human cases have been reported in Cameroon, but there have been human cases reported from neighboring countries. The case fatality rate is approximately 60%. <sup>6</sup>	An outbreak was reported in ducks in 2006. <sup>7</sup>	Treatment for people is mainly supportive. <sup>6</sup>
<b>Ebola/Marburg</b>	Viruses	No cases reported in Cameroon but recent major outbreaks in Sierra Leone, Guinea, Liberia, and Nigeria. The average case fatality rate is approximately 50%. <sup>8</sup>	It is thought that fruit bats of the Pteropodidae family are natural Ebola virus hosts. Primates and forest antelope have also been infected. <sup>8</sup>	Currently, there are no animal vaccines. Human vaccines undergoing clinical trials. Treatment for people is supportive care. <sup>8</sup>
<b>Bovine Tuberculosis</b>	Bacteria	Exact numbers unknown, but human cases of <i>M. bovis</i> have been reported in Cameroon. <sup>9</sup>	It is frequently identified in cattle, and a number of potential wildlife reservoirs are present in Cameroon. <sup>10</sup>	Effective treatment exists for people. New candidate vaccines being tested. <sup>11</sup>

NOTE: For references, see page 14.

## BACKGROUND

Zoonotic diseases are diseases that are spread between animals and people. Most known human infectious diseases and about three-quarters of newly emerging infections originate from animals. Cameroon is particularly vulnerable to the effect of zoonotic diseases because over 70% of the population is engaged in small-scale agriculture, which contributes approximately 20% to the national GDP.<sup>1</sup>

The livestock population of Cameroon is estimated at over 90 million and includes over 72 million poultry, 9 million small ruminants, 5 million cattle, and 3 million swine.<sup>2</sup> The country is also environmentally diverse, ranging from tropical rainforest to high mountains and arid Sahel. Parts of Cameroon lie within the Congo Basin, where repeated outbreaks of Ebola virus disease have been documented. The country's unique landscape can create a wide range of zoonotic disease threats, including persistent diseases

associated with livestock losses in the pastoral north to newly emerging viral pathogens in the forested south.

Zoonotic diseases that occur in large numbers impact the society in three main ways:

1. Threaten the health of animals resulting in illness, loss of productivity, and death.
2. Threaten the livelihood of a large segment of the population dependent on livestock as a major source of income.
3. Cause a large number of illness and death in people, which is associated with significant economic and societal loss.

A synopsis of prevalent zoonotic diseases was produced as part of the situational analysis of the *One Health Strategy and the National Program for Prevention and Fight Against Emerging and Re-Emerging Zoonotic Diseases* (May 2012). Zoonotic diseases prioritization was identified by national representatives as the first step toward addressing the public health challenges associated with zoonotic diseases. To begin addressing these challenges, a zoonotic disease prioritization workshop was held on March 3 and 4, 2016, at the Djeuga Palace Hotel in Yaoundé. The effort was supported by CDC and USAID's Preparedness and Response project as part of the Global Health Security Agenda (GHS) of the United States government.

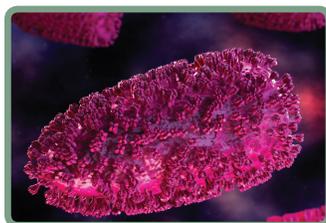
The goal of the workshop was to identify the top five zoonotic diseases of major public health concern that should be jointly addressed by animal (domestic and wildlife), environment, and human health ministries to have maximum impact on the health of people and animals in Cameroon. GHS was launched in Cameroon at a planning meeting in May 2015 between the government of Cameroon and United States government representatives.



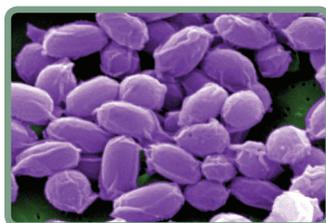
1 Cameroon. The World Fact Book, Central Intelligence Agency. <https://www.cia.gov/library/publications/the-world-factbook/geos/cm.html>. Accessed on 23 March 2016.

2 Animal population of Cameroon, 2015 estimate. World Health Organisation for Animal Health. [http://www.oie.int/wahis\\_2/public/wahid.php/Countryinformation/Animalpopulation](http://www.oie.int/wahis_2/public/wahid.php/Countryinformation/Animalpopulation). Accessed on 23 March 2016.

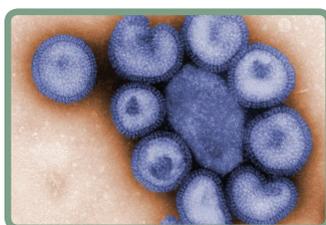
## DESCRIPTION OF THE SELECTED DISEASES



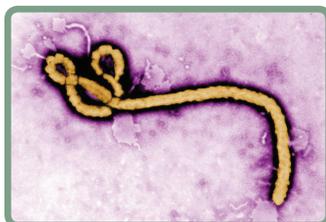
**Rabies** is a disease that attacks the brain, mainly spread to people by bites from dogs that have the disease. Cameroon has one of the largest rabies infection rates in the world. Prompt treatment after a bite by rabies-infected animals can protect people from the illness and death. All infected people die after symptom onset, if proper treatment is not given soon after the bite.



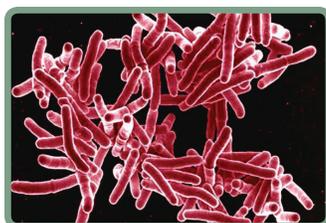
**Anthrax** causes a range of serious illnesses in people. It can lead to a severe infection of skin, infection of the gut, or severe infection of the lungs. It mainly affects animals used for food such as cattle, sheep, and goats. People can get the disease when they eat raw or undercooked meat from infected animals or have close contact with them. Routine vaccination of livestock can protect animals and people from illness and death.



**Avian Influenza** Type A viruses occur naturally among wild aquatic birds worldwide and can sicken and even kill certain domesticated birds, including chickens, ducks, and turkeys. Although these viruses usually do not infect people, rare cases of human infection have been reported. People can get sick after handling infected birds and then touching eyes, nose or mouth, or by breathing in the dust containing feces of infected birds. Illness in humans can range from mild (fever, cough, sore throat, muscle aches) to severe (difficulty breathing, pneumonia, respiratory failure, seizures).



**Ebola Virus Disease** and **Marburg Hemorrhagic Fever** are severe viral diseases, and, in some outbreaks, a fatality rate of up to 90% has been reported. Fruit bats can carry Marburg virus. Scientists believe that another bat species likely carries Ebola virus. Both viruses can be transmitted to humans and non-human primates, like apes and monkeys. The viruses can then spread from person to person through direct contact with a sick person's body fluids, including blood, vomit, urine, feces, sweat, semen, breast milk, and spit. There is no approved vaccine or treatment for these diseases. Recovery depends on patients entering treatment early to receive supportive care.



**Bovine tuberculosis** is caused by the bacterium *Mycobacterium bovis* and is most commonly found in cattle. In people, *M. bovis* causes tuberculosis (TB) disease that can affect the lungs, lymph nodes, and other parts of the body. People are most commonly infected by eating or drinking contaminated, unpasteurized dairy products. Infection can also occur from direct contact with a wound, such as during slaughter or hunting, or by breathing in the bacteria in air coughed out or sneezed out by animals or people infected with *M. bovis*. TB disease is treated with a combination of several antibiotics.

## PRIORITIZATION PROCESS

The prioritization process involved application of a semi-quantitative tool developed by CDC. The methods have been described in detail by Rist et al.<sup>3</sup> The first step of the process was to identify a country-specific list of potential zoonotic diseases of concern. A disease was selected if it was known to be passed from animal to human and thought to occur in Cameroon or the surrounding region. A list of 41 zoonotic diseases, shown in Table 2 of Appendix A, was considered during the prioritization workshop. Next, the workshop participants jointly identified five criteria for quantitative ranking of these 41 diseases. Once the five criteria were chosen, each member of the selection committee individually indicated their preferences for the relative importance of each criterion to help generate a final group of weights for each criterion. The criteria and weights assigned to each criterion are listed in Appendix B.

One categorical question for each criterion was selected through group discussion. All questions had ordinal multinomial (1-5%, 5-10%, 10-20%, etc.) answers. The ordinal nature is necessary for the scoring process, and is determined by the participants and the available data. Data were identified through an extensive literature search, as well as information from the WHO, OIE, and ProMED websites. Data on incidence, prevalence, morbidity, disability-adjusted life years (DALYs), and mortality were collected for the selected zoonotic diseases. If disease information for a particular zoonotic disease was not available for Cameroon, data for other West or Central African countries was used. If regional data was not available, global disease data on prevalence, incidence, morbidity, mortality, and DALYs were used. Over 100 articles were collected with

disease-specific information on prevalence, morbidity, mortality, and DALYs for the African region. These were compiled with over 400 articles researched for zoonotic disease workshops in other African countries. These articles were saved as PDFs, loaded onto an external storage device (USB), and given to the workshop participants for reference.

A decision tree was designed using Microsoft Excel and used for determining the final disease ranking. Each weighted criterion was applied across all diseases, and scores were assigned based on the response to each question. Country-specific, regional, and global data compiled previously for all zoonotic diseases under consideration were used to determine appropriate responses for each question. The scores for all five questions were summed and then normalized such that the highest final score was 1. See Table 2 in Appendix A for a complete listing of normalized scores for all zoonotic diseases that were considered in the workshop.

The list of zoonotic diseases and their normalized scores was presented to the group for discussion. A panel of 12 representatives from different sectors voted on a final list of 5 zoonotic diseases. Rabies, Anthrax, and Avian Influenza were unanimously agreed to be the 3 diseases of highest concern, respectively. The group determined that diseases caused by both Ebola and Marburg viruses should be fourth on the list. And finally, tuberculosis caused by the bacterium *Mycobacterium bovis* was chosen to be the fifth disease on the final list of top five zoonoses in Cameroon.

3 Rist CL, Arriola CS, Rubin C. Prioritizing zoonoses: a proposed one health tool for collaborative decision making. *PLoS One* 2014;9(10):e109986.

## CRITERIA SELECTED FOR RANKING ZONOTIC DISEASES

Criteria selected by the voting members in Cameroon are listed in order of importance below and detailed description can be found in Appendix B.

### 1. The state of the disease in humans, domestic animals, or wildlife in Cameroon

The highest priority category was for diseases that have been known to cause outbreaks in Cameroon. The panel decided all cases from humans, domesticated animals, and wildlife should be considered when answering the question. The criterium attempts to enumerate if a disease is present in Cameroon and if it has a potential epidemic risk. Diseases with reported cases and frequent epidemics were given the highest score of 4, followed by diseases with reported cases and sporadic epidemics the score of 3. Diseases considered to be endemic at low levels were given a score of 2. If no cases of a disease had been reported in Cameroon, but an epidemic risk associated with that disease was high, the disease was given a score of 1. Diseases with no reported cases and low epidemic risk received a 0.

### 2. Mortality, morbidity, and disability in humans

Diseases that cause a heavy burden in human populations were the second most important criterium. Diseases with a high mortality rate (CFR > 10%) received the full weight score of 3. Diseases with high associated morbidities and disabilities (e.g. blindness) and a CFR <10% received a score of 2. Diseases with low associated morbidities and a CFR <10% received a score of 1. Diseases with no reported fatalities and low morbidity burden received a score of 0.

### 3. The potential to spread rapidly amongst animals and humans

The speed and method of transmission was also deemed important to the prioritization process. Diseases with known human-to-human transmission received the highest score of 4. Diseases where there was frequent animal to human transmission received a score of 3. Diseases with infrequent animal-to-human transmission received a score of 2. Diseases known to spread quickly between animals received a score of 1. Diseases with infrequent transmission between either animals or humans received a score of 0.

### 4. Economic, environmental, and social impacts

Diseases with a high social impact (disruption of communities, stigmatization) were considered the most severe and given a score of 3. Diseases with reported significant economic impacts to agriculture and employment were given the next highest score of 2. Diseases with control measures that may have environmental impact (pesticide use) were given a score of 1. Diseases with minimal impact on life, economy, and environment in Cameroon received a score of 0.

### 5. Capacity for detection, prevention, and control of the zoonoses in the country

The ability to detect, prevent, and control a disease was given the lowest criterion weight. Diseases with a laboratory or clinical diagnostic capability available at point of care and that could also be treated or prevented with vaccines or medications were given a 3. Diseases with no current diagnostic capability in country but that have control or prevention capacity were given a 2. Diseases with diagnostic capability but no prevention or control measures were given a 1. Diseases with neither laboratory diagnostics nor pharmaceutical control measures were given a 0.

## PLANS AND RECOMMENDATIONS

### GENERAL RECOMMENDATIONS

After finalizing the list of priority diseases, the workshop participants discussed recommendations and further actions that could be taken to address the five selected zoonotic diseases. This was done in a 2-stage process. To begin, participants were asked to make general recommendations for how to approach the priority diseases without considering the constraints of their respective institution. A summary of the most prominent recommendations organized by theme follows:

#### LABORATORY CAPACITY

- Build surveillance and detection capacities with a network at the national, regional, and local levels
- Strengthen coordination between existing laboratories

#### SURVEILLANCE

- Create standardized case definitions and make sure that the selected zoonotic diseases are included in the mandatory list of reportable diseases
- Develop a common platform for reporting and sharing data on the zoonotic diseases in humans and animals
- Perform reservoir studies particularly for Ebola and Marburg viruses

#### PREVENTION AND CONTROL

- Perform local disease prioritization in each of Cameroon's ten administrative regions
- Develop a plan for community outreach and sensitization as part of prevention and control strategy to address the selected zoonotic disease, which could also be useful for tackling newly emerging diseases
- Strengthen research on hemorrhagic fevers and primate viruses
- Strengthen access to vaccines and establish a vaccine bank in Africa for vaccine-preventable zoonotic diseases

### OUTBREAK RESPONSE

- Strengthen inter-sectorial communication, information sharing and joint outbreak response
- Develop a multi-sectoral national strategic plan and contingency (preparedness and response) plans for the selected zoonotic diseases and update the plans that already exist
- Activate national emergency operations center for both human and animal outbreaks



## SPECIFIC NEXT STEPS

Finally, each government ministry involved in the decision process and the collaborating agencies who observed the process were given an opportunity to make suggestions for specific next steps that agency could take to improve multi-sectoral surveillance and laboratory capacity, develop prevention and control strategies, and conduct joint outbreak investigations. A summary of the next steps suggested by each sector follows:

### ZOO NOTIC DISEASE SECRETARIAT

- Prepare a report of the findings from the workshop and present to the technical committee in the office of the prime minister; suggest that projects for the priority zoonotic diseases be added to the national work plan
- Prepare preparedness and response plans for Ebola and Avian Influenza
- Continue the creation of a Rabies working group
- Make sure technical and financial partners are aware of the list of prioritized zoonotic diseases

### AGRICULTURE, LIVESTOCK, FISHERIES, AND ANIMAL INDUSTRIES

- Develop methods for catching stray dogs and perform a canine census
- Develop an integrated preparedness and response plan for avian influenza
- Develop regional response teams for priority zoonotic disease outbreaks

### PUBLIC HEALTH

- Consider reports of animal disease in the human surveillance system
- Advocate for additional resources for zoonotic diseases
- Perform a gap analysis on the priority diseases utilizing the existing diseases listed by the ministry of health

### ENVIRONMENT AND FORESTRY

- Develop research projects for potential disease reservoirs
- Fight against poaching to prevent animal to human transmission
- Sensitize tourists to the zoonotic disease risks facing Cameroon

### RESEARCH

- Advocate to Ministry of Defense about the importance of a strategic plan for the prioritized zoonotic diseases
- Combine technical expertise from different sectors
- Develop a system to share information between ministries

### INTERNATIONAL PARTNERS

- Further develop the emergency operation center and consider rapid activation for alerts on priority diseases
- Conduct simulations to tests response plans for Ebola and Avian Influenza
- Advocate for other partner agencies and donors to support a national zoonotic disease work plan
- Continue to improve laboratory diagnostic capacity in the country, the reference institutions and the national laboratory
- Engage with the government of Cameroon to focus on aspects of the global health security agenda

## APPENDIX A: FINAL RESULTS OF PRIORITIZATION

**Table 2. Zoonotic diseases considered for prioritization in Cameroon: Final results of prioritization and normalized weights for all zoonotic diseases. The five diseases selected by the committee are shown in bold.**

Rank	Disease	Raw Score	Normalized Final Score
<b>1</b>	<b>Rabies</b>	<b>0.85</b>	<b>1</b>
<b>2</b>	<b>Anthrax</b>	<b>0.78</b>	<b>0.92</b>
<b>3</b>	<b>Zoonotic Avian Influenza</b>	<b>0.77</b>	<b>0.90</b>
4	Brucellosis	0.73	0.86
<b>5</b>	<b>Ebola Virus Disease</b>	<b>0.72</b>	<b>0.84</b>
6	Campylobacteriosis	0.67	0.78
6	Salmonellosis	0.67	0.78
6	Trypanosomiasis	0.67	0.78
9	Lassa Fever	0.65	0.77
10	Plague	0.62	0.73
10	Marburg Hemorrhagic Fever	0.62	0.73
12	Q fever	0.60	0.70
12	Leptospirosis	0.60	0.70
14	<b>Bovina tuberculosis (M. bovis)</b>	<b>0.58</b>	<b>0.69</b>
15	Crimean Congo Hemorrhagic Fever	0.55	0.65
16	E. coli	0.53	0.63
16	Echinococcosis	0.53	0.63
16	Schistosomiasis	0.53	0.63
19	Hanta virus	0.52	0.61
20	Yellow fever	0.52	0.61
21	Tularemia	0.50	0.59
22	Swine influenza	0.48	0.57
23	Scrub Typhus	0.47	0.55
23	Trichinellosis	0.47	0.55
25	MERS-CoV	0.42	0.49
26	Rift Valley Fever	0.42	0.49
27	Monkeypox	0.42	0.49
28	Cysticercosis	0.42	0.49
29	Leishmaniasis	0.40	0.47
29	Toxoplasmosis	0.40	0.47
31	Ehrlichiosis	0.40	0.47
31	Rickettsial disease (spotted fevers)	0.40	0.47
33	Hepatitis E disease	0.38	0.45
34	Listeriosis	0.37	0.43
35	<i>Streptococcus suis</i> infection	0.37	0.43
36	West Nile virus infection	0.35	0.41
37	Chickungunya	0.33	0.39
38	Botulism	0.33	0.39
39	Cat Scratch Disease (Bartonella)	0.25	0.29
40	Hendra and Nipah viruses	0.23	0.27
41	Lyme Disease	0.20	0.23

## APPENDIX B: THE NUMERICAL WEIGHTS FOR THE CRITERIA SELECTED FOR RANKING ZONOTIC DISEASES IN CAMEROON

### 1. The state of the disease in humans, domestic animals, or wildlife in Cameroon (criterion weight= 0.2023)

- ▶ Is the disease occurring in Cameroon?
  - › No cases, low epidemic risk (0)
  - › No cases, high epidemic risk (1)
  - › Endemic (2)
  - › Cases, low epidemic reported (3)
  - › Cases reported, frequent epidemics reported (4)

### 2. Mortality, morbidity, disability in humans (criterion weight= 0.2017)

- ▶ What is the morbidity and mortality of the disease?
  - › Low morbidity, No mortality (0)
  - › Low morbidity, low mortality (1)
  - › High morbidity, low mortality (2)
  - › Low morbidity, high mortality (3)
  - › High morbidity, high mortality (4)

### 3. The potential to spread rapidly amongst animals and humans (criterion weight= 0.1999)

- ▶ What is the mode and speed of transmission?
  - › Low animal-animal transmission (0)
  - › High animal-animal transmission (1)
  - › Low animal-human transmission (2)
  - › High animal-human transmission (3)
  - › Human-to-human transmission (4)

### 4. Economic, environmental, and social impacts (criterion weight= 0.1981)

- ▶ Are there economic, environmental and social impacts of this disease?
  - › Low impact (0)
  - › Environmental impact (1)
  - › Economic impact (2)
  - › Social impact (3)

### 5. Capacity for detection, prevention and control of the zoonoses in the country (criterion weight= 0.1980)

- ▶ Does the country have the capacity to diagnose, prevent and control the disease?
  - › No diagnostic, no control capacity (0)
  - › Diagnostic available, no control capacity (1)
  - › No diagnostic, capacity to control (2)
  - › Diagnostic available, capacity to control (3)

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