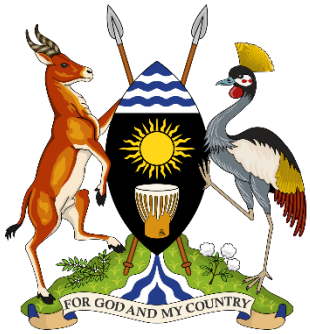


REPUBLIC OF UGANDA

MINISTRY OF AGRICULTURE, ANIMAL INDUSTRY AND FISHERIES

CASE DEFINITIONS FOR PRIORITY ANIMAL DISEASES IN UGANDA

OCTOBER, 2023

Case definitions for priority animal diseases in Uganda

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FOREWORD

The mandate of the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) is to support, promote and guide production of crops, livestock and fisheries so as to improve quality and increased quantity of agricultural produce and products for domestic consumption, food security and export. The Directorate of Animal Resources has three departments: Animal Health, Animal Production and Entomology. The Department of Animal Health through its division of Veterinary diagnostics and Epidemiology is tasked with supporting control of animal diseases for improved food security and household income.

Animal diseases affect productivity, food security, trade, public health and livelihoods. To reduce the impact of animal diseases, it is imperative that the animal health practitioners and other key stakeholders have adequate knowledge for early detection, and identification for efficient and effective prevention and control. Case definitions thus become handy in enhancing capacities to promptly detect diseases.

This booklet has been developed to guide animal health practitioners and other key stakeholders involved in disease surveillance, detection and reporting of the country's priority animal diseases for appropriate and timely action. It is thus hoped that it will improve animal disease surveillance and outbreak investigation.

I would like to implore all animal health workers and other key stakeholders to utilize the case definitions and action thresholds in this booklet for detection of all priority animal diseases in real time to allow immediate response and consequently strengthen the animal sector in Uganda.



.....

Maj. Gen. David Kasura - Kyomukama

Permanent Secretary

Ministry of Agriculture, Animal Industry and Fisheries

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Very special gratitude goes out to the Infectious Diseases Institute, Makerere University who provided financial and technical support for the development of the case definition booklet. Honest thanks to the program manager of the National Action Plan for Health Security "Acceleration" Team (Resolve to Save Lives) and her entire team for the endless support given to the development process. Acknowledgments also go to the International Health Regulations Focal point and the One Health Focal Point. Greatest appreciation goes to the National Animal Diagnostics and Epidemiology Centre (NADDEC) team for their invaluable inputs. Lastly, we would like to thank the assistant commissioner, Veterinary Diagnostics and Epidemiology for strategic and technical direction throughout the entire process that led to the successful completion of the booklet.

.....

Dr. Anna Rose Ademun Okurut (PhD)

Commissioner for Animal Health and Chief Veterinary Officer,

Ministry of Agriculture, Animal Industry and Fisheries

1.0 INTRODUCTION

Healthy animals are important components of the agricultural and wildlife (tourism) sectors of Uganda's economy. Uganda currently has 14.2 million cattle, 16 million goats, 4.5 million sheep, 4.1 million pigs, 47.6 million poultry and 1.5 million dogs and cats[1]. The country has a unique diversified wildlife population of 13 species of primates (more than half the world's endangered mountain gorillas) and five (5) species of carnivores. Uganda also has over 1,000 species of birds and hosts migratory birds from Asia and Europe. The annual national animal productivity growth is 4.6%. Between 1971 and 2020, meat production increased from 116,541 tonnes to 439,323 tonnes. Milk production increased from 2.51 billion liters to approximately 3.85 billion liters between 2018 and 2022, an average annual growth rate of 11%, which is among the highest of any sector in the Ugandan economy. The contribution of livestock to the national Gross Domestic Product (GDP) is at least 4% while wildlife contributes 10% in the form of tourist resources, employment and foreign exchange revenue[2].

Surveillance systems play a vital role in detection of potential outbreaks of animal diseases for early warning and guide investigations to identify risk factors for spread, management and control. In the recent past, Uganda has experienced an increase in animal disease outbreaks including those transmissible between animals and humans (zoonoses). In 2009, tick-borne diseases accounted for 75% of losses in cattle with tick control costs constituting 68% of total animal mortality losses[3]. According to the Ministry of Agriculture Animal Industry and Fisheries (MAAIF) annual performance reports during 2017 - 2020, 44% of districts reported Foot and Mouth Disease while 30 districts reported outbreaks of *Peste des Petits Ruminants* (PPR) and Contagious Caprine Pleuropneumonia (CCPP). Between 2017- 2019, 17 outbreaks of African swine fever were reported[4]. Annually, Uganda reports outbreaks of zoonoses like Anthrax, Rift Valley fever and

[1] Uganda Bureau of Statistics (2019), Uganda Statistical Abstract, https://www.ubos.org/wp-content/uploads/publications/01_20202019_Statistical_Abstract_-Final.pdf
[2] Uganda Bureau of Statistics, 2020, https://www.ubos.org/wp-content/uploads/statistics/AGDP_CY_2020_Publication_tables-published.xlsx
https://www.researchtecglobal.com/report/dairy-industry-in-uganda-2022-2023
[3] Ocaido M, Otim C P and Kakaire D 2009: Impact of major diseases and vectors in smallholder cattle production systems in different agro-ecological zones and farming systems in Uganda. *Livestock Research for Rural Development. Volume 21, Article #155.* Retrieved February 24, 2022, from http://www.lrrd.org/lrrd21/9/ocai21155.htm
[4] 2020 MAAIF Annual Performance Report https://www.agriculture.go.ug/wp-content/uploads/2020/10/MAAIF-Annual-Performance-Report-FY-2019-2020-Draft-D.pdf

Rabies among animals and humans. Furthermore, Uganda's tropical climate favors the occurrence and spread of vectors of animal diseases like ticks, mosquitoes and tsetse flies, and parasites such as flukes and schistosomes. Uganda's location in the El-Nino Southern Oscillation predisposes it to extreme weather events leading to epidemics including zoonoses such as Rift Valley fever.

In 2010, the Food and Agricultural Organization (FAO), World Organization for Animal Health (WOAH) and World Health Organization (WHO) signed a tripartite agreement to strengthen multi-sectoral collaboration for One Health (animal, human and environment health). The WOAH and WHO encourage countries to improve capacity to detect, notify and respond to trans-boundary and epidemic prone animal diseases (including zoonoses). This calls for robust surveillance systems that enable prompt detection and response to improve productivity and mitigate the socio-economic impact of animal disease outbreaks.

The 2017 Joint External Evaluation (JEE) of the International Health Regulations (IHR) capacities by the WHO identified the need to strengthen Uganda's animal diseases surveillance capacity[5]. Specifically, Uganda did not have local case definitions to guide standard reporting but used case definitions developed for International and African Regional audiences. Therefore, MAAIF developed standard case definitions for use in surveillance for animal diseases in Uganda.

1.1 RATIONALE

Case definitions are important elements of animal health surveillance systems. They ensure comparability and consistency of surveillance data from community to district, national and international levels. Animal health workers in Uganda have relied on case definitions developed by WOAH[6] and FAO[7]. However, these guidelines don't include some animal diseases of importance to Uganda and some diseases have different clinical presentations. There was a need for MAAIF to adapt and develop appropriate case definitions that can be utilized by the community and animal health workers.

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[5] Uganda Joint External Evaluation Mission Report (2017) https://apps.who.int/iris/bitstream/handle/10665/259164/WHO-WHE-CPI-REP-2017.49-eng.pdf?sequence=1

[6] OIE (2022) https://www.OIE.int/en/what-we-do/animal-health-and-welfare/animal-diseases/

[7] Case Definitions for Livestock Diseases, FAO, 2010, https://www.fsnnetwork.org/resource/case-definition-livestock-diseases

1.2 TARGET AUDIENCE

This document is intended to guide veterinarians and veterinary paraprofessionals to quickly detect, investigate, report, and respond appropriately to animal diseases so as to prevent death and/or further spread. The community case definitions included within the document can also empower the community to support detection of animal diseases. The ability to promptly detect and report diseases is paramount to a functional surveillance system that is able to control outbreaks and limit their impact on productivity.

1.3 SURVEILLANCE SYSTEM FOR ANIMAL DISEASES

Surveillance is the systematic collection, collation, analysis, interpretation, and dissemination of information on disease related events to stakeholders to guide interventions. In Uganda, surveillance for animal diseases involves the community, veterinary extension workers, district veterinary officers and MAAIF.

1.3.1 Organization of Uganda's Animal Surveillance System

Surveillance starts at farm level where community members contact the nearest animal health workers to report suspected animal disease events. Animal health workers submit data from their routine field visits through reports to their DVO. The DVOs utilize a standard paper-based report to compile monthly district surveillance data which they send to the respective Chief Administrative Officers and NADDEC. DVOs also utilize an electronic Event Mobile Application (EMA-i) for submitting event-based surveillance data to NADDEC. Uganda also reports on trade sensitive, transboundary and epidemic prone diseases to WOAH. The NADDEC and Ministry of Health (MoH) routinely share surveillance information on zoonotic diseases to guide prevention and response in animal and human populations. Figure 1 shows the flow of surveillance information in Uganda.

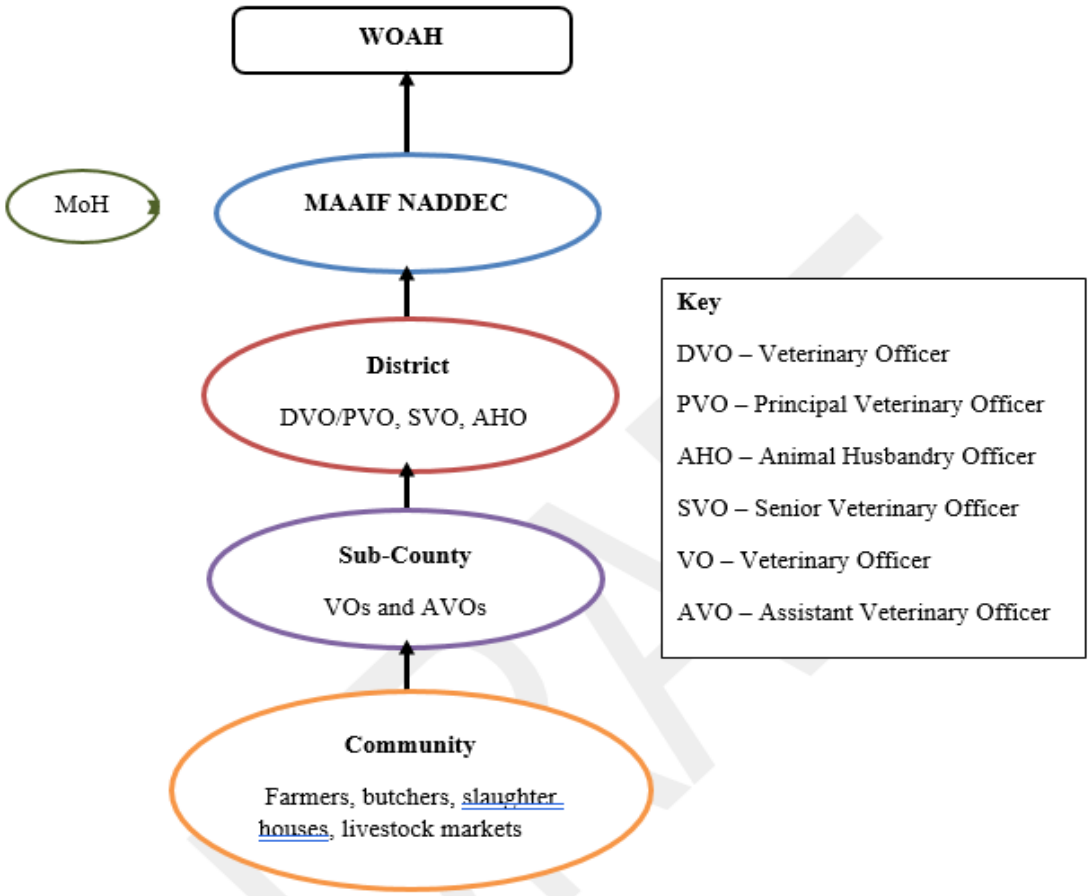


Figure 1: Flow of surveillance information in MAAIF, Uganda

1.4 LABORATORY ROLE IN SURVEILLANCE

Confirmation of diseases for surveillance is dependent on Laboratory data. Samples from animals suspected to have a disease undergo laboratory testing to identify and or confirm the presence of the disease causative agent, antigen or antibodies. National Animal Disease Diagnostics and Epidemiology Center (NADDEC) is Uganda's National Reference Laboratory for the Veterinary laboratory network. The laboratory was established to detect diseases and improve on the status of domestic and wild animal health and is responsible for diagnosis of notifiable and non-notifiable animal diseases. The NADDEC has the following functions:

- Identifying circulating serotypes or pathotypes in the affected population
- Provide evidence to inform decisions regarding the control of diseases
- Center for disease confirmation and follow up during outbreaks

- Detect new or re-emerging pathogens
- Monitor resistance to antimicrobial drugs
- Support disease profiling
- Determine incidence and prevalence of diseases in given populations
- Guide choice of vaccines through detection of circulating pathogen serotypes e.g., Foot and Mouth Disease has multiple serotypes including: O, A, SAT1
- Provide feedback to districts and farmers

The NADDEC is supported by regional and district laboratories, some of which have got the capacity to screen for a number of diseases which include tick borne diseases, bacterial and a few viral diseases such as brucellosis or Newcastle disease. There are two wildlife laboratories: Murchison (Biosafety level 1) and Queen Elizabeth National Park Mweya (Biosafety Level 2). These laboratories are responsible for routine testing, identification and confirmation of diseases among domestic and wild animals. There are private laboratories that provide diagnostic services at a cost such as the Central Diagnostic Laboratory at Makerere College of Veterinary Medicine, Animal Resources and Biosecurity.

1.5 APPROACH TO DEVELOPMENT OF GUIDE

1.5.1 Team

The MAAIF convened workshops consisting of multi-disciplinary subject matter experts who reviewed existing case definitions. The team used literature and field experience to develop criteria that can support identification of animal diseases.

1.5.2 What are case definitions?

A set of standard criteria for classifying whether an animal has a disease, syndrome, or other health condition. These criteria guide community, animal health workers, laboratories and researchers to identify and report diseases in a uniform way.

1.5.3 Why use case definitions?

Standard case definitions allow for a common understanding of clinical signs of animal diseases that limits variability in classification regardless of when or where the disease occurred and who

is reporting. Limiting variability is important for surveillance data to represent the true (real) occurrence of animal disease. This in turn should support monitoring trends (changes over time) in animal diseases by species and geographical location. Consistent case definitions allow for comparison of disease occurrence, evaluation of effectiveness of intervention activities and even detecting changes in disease presentation. The case definitions developed can enable lower levels of the surveillance system to suspect diseases, initiate the process of sample collection to confirm the diagnosis and initiate control measures. Ultimately, case definitions should guide prompt initiation of case management, prevention of spread across geographical areas and generally mitigate the negative impact of disease outbreaks.

1.5.4 Process of case definition development

A good case definition should separate the animal disease of interest from other diseases or conditions. However, there is no perfect case definition that completely segregates true cases from non-cases since some diseases have similar clinical features in the same species. To cater for this, case definitions are divided into levels where each level has additional restrictive criteria that will exclude other diseases.

To develop case definitions, participants reviewed literature and used field experience to identify disease specific species, causative agents (and vectors) and the disease epidemiology. The following were listed:

- Signs and symptoms (clinical features)
- Response to treatment
- Laboratory tests
- Epidemiology criteria such as time (incubation period), place (geographical location), animal (species) and host factors (underlying illness).

1.5.5 Case definition levels

Suspected: a list of unique signs in a sick animal to enable an animal health worker to suspect a disease diagnosis. At community level, a simple list of unique signs easily identifiable in a sick animal can be availed. This should be simple enough for a lay person to be alerted of a potentially sick animal or risky event that necessitates reporting to an animal health worker.

Probable: includes additional criteria to increase the degree of suspecting a case e.g. an epidemiological link with a confirmed case, postmortem lesions and preliminary laboratory test results such as Rapid Diagnostic Tests (RDT).

Confirmed: a suspected or probable case verified by the gold standard laboratory diagnosis.

1.5.6 Criteria for prioritizing animal diseases

The team prioritized 60 diseases that lie in one or more of the following categories of importance:

- Notifiable under WOAH and IHR requirements
- Reported in MAAIF monthly surveillance report
- Transboundary animal diseases i.e. epidemic prone diseases which are highly contagious or transmissible and have the potential for rapid spread across international borders and serious economic and public health consequences
- Zoonotic diseases prioritized by Uganda
- Emerging or re-emerging infectious diseases
- Production and trade sensitive diseases

2.0 CASE DEFINITIONS

1. Actinobacillosis

Actinobacillosis, more commonly known as Wooden Tongue, is a disease caused by the bacterium *Actinobacillus lignieresi*. The bacteria is commonly found in the soil and is a normal inhabitant of the bovine mouth. Animals get infected when the bacteria penetrate the skin or mucous membranes through cuts or abrasions caused by coarse feed or traumatic injury[8]. Poorly prepared feeds can increase risk of animals getting oral abrasions that allow entry of the bacteria from the contaminated environment.

Species affected: Cattle, sheep, goats, pigs, and horses.

Community signs: Eating with difficulty, hard and swollen tongue protruding from the mouth.

Suspected case: Swelling and reddening of the gums, hard and swollen tongue which may protrude from the mouth, inability to eat and drops food, abscesses forming nodules in the mouth, dehydration and/or weight loss.

Confirmed: A suspected case with bacteria identified in tissue samples by culture or PCR or ELISA.

2. Actinomycosis

Actinomycosis, also referred to as Bottle Jaw is a bacterial disease caused by *Actinomyces bovis* and *Actinomyces suis. Actinomyces bovis* is part of the normal bacterial flora of the upper digestive tract. *Actinomyces* spp bacteria enter through cuts and wounds of the mucosa e.g. through teeth eruptions or coarse feed, and migrate to the bone, leading to osteomyelitis (inflammation and infection of the bony tissues)[9]. The mandible is affected more commonly than the maxilla. The defining feature of Actinomycosis is the presence of a non-painful swelling under the jaw. This swelling can rupture and drain pus-type, smelly fluid contaminating the environment. Treatment is rarely successful in long-term cases in which bone is involved due to the poor penetration of antibacterial drugs into the affected area, necessitating early detection and salvage slaughter.

[8] https://www.evolutionfarmvets.co.uk/wooden-tongue-actinobacillosis
[9] https://www.msdvetmanual.com/horse-owners/disorders-affecting-multiple-body-systems-of-horses/actinomycosis-in-horses?query=Actinomycosis

Species affected: Cattle, pigs, and horses

Community sign: Hard non-movable swelling on the jaw.

Suspected: Swelling of the mandible (lower jaw) or maxillae (upper jaw), difficulty in chewing and breathing, dropping of feed from the mouth, swelling of the pharynx (back of the throat), excessive salivation (due to pain).

Probable: Suspected case with smelly discharge from the swollen jaw.

Confirmed case: A suspected case confirmed through Culture of the organism from the lesion (aspirated purulent sample) under anaerobic conditions. Cytology: a gram stain of purulent material will reveal gram-positive, club-shaped rods and filaments (sulfur granules).

3. African Swine Fever

This is a disease of domestic and wild swine, caused by the African swine fever virus ASFV)[10] transmitted by soft ticks and contact between sick and healthy pigs. Transmission also occurs when pigs are fed on feed and fomites contaminated with the ASV virus. Poor biosecurity is the greatest risk factor for indirect transmission (e.g., in freely scavenging pigs). Domestic pigs manifest clinical disease, while warthog, bush pig, and giant forest hog are reservoirs. The incubation period in nature is usually 4–19 days; acute form 3–4 days[10].

Species affected: Domestic pigs, warthogs, bush pigs, and giant forest hogs

Community signs: Reports of pigs dying within one to three days after a short illness, reports of sudden death among pigs in a specified location or farm.

Suspected case: High fever (> 40^{o}C), shivering, rapid or labored breathing, loss of appetite or dullness, huddling together, reddening of the skin or ears or lower abdomen (Purple-blue discoloration on the ears, abdomen, and feet with dark red spot progressing to ulcers), affected pigs may have swaying gait, non-response to treatment interventions between 50% to 100% of the pigs dying either on the farm or in the community.

[10] https://www.OIE.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/Disease_cards/AFRICAN_SWINE_FEVER.pdf

Probable case: A suspected case with reddening of visceral organs, a very enlarged and elongated spleen, and swelling of the intestinal lymph nodes at postmortem.

Confirmed case: A suspected case confirmed with Polymerase Chain Reaction (PCR) using mesenteric lymph nodes and whole blood.

Alert threshold: One suspected case in a location/farm.

Outbreak threshold: One death of a pig suspected of African Swine Fever in a location/farm.

4. Anaplasmosis

The disease affects domestic ruminants (cattle and goats) and large wild ruminants (buffalo). This is caused by *Anaplasma marginale* and *Centrale*. It is a tick-borne disease vectored by *Rhipicephalus* species (*Appendiculatus, Annulatus, Bursa, Calcatus, Sangunus,* and *Decolaratus*). The prevalence of anaplasmosis may rank first among tick-borne diseases. Anaplasmosis occurs widely in Uganda [11] with an average incubation period of 3 to 8 weeks. Risk factors include livestock movements within the cattle corridor, grazing close to wildlife parks[4], acaricide resistance, and poor adherence to tick control measures.

Species: Ruminant domestic (cattle, sheep, and goats), wildlife (buffalo, antelope), and dogs

Community signs: Animal failing to eat, reports of cattle excreting dry dung, and hard /dry pellets like that of goats.

Suspected case: High fever (> 40 ^{0}C), constipation (Pelleted fecal matter), pale mucous membranes or jaundice, and standing hair

Probable case: A suspected case with dry omasum and distended gall bladder at postmortem.

[11] https://www.OIE.int/fileadmin/Home/eng/Health_standards/tahm/3.04.01_BOVINE_ANAPLASMOSIS.pdf

Confirmed case: A suspected case confirmed through microscopic examination of Giemsa stained thin smears to confirm *Anaplasma marginale* and *Centrale* from whole blood collected from the ear and jugular veins[12].

Alert threshold: One suspected case of Anaplasmosis in a specific location/farm.

Outbreak threshold: Cluster of suspected cases in a specific location/farm.

5. Anthrax

Anthrax is caused by the spore-forming, gram-positive rod-shaped bacterium *Bacillus Anthracis*. The disease has worldwide distribution and is a zoonosis[13]. Animals become infected by ingesting spores in the soil or in feed. Risk factors include low land feeding, heavy rains, and land excavation. The disease has an incubation period of 1-20 days[14]. Most infections become apparent after 3 to 7 days. In pigs, the incubation period is usually 1 to 2 weeks.

Species affected: Herbivorous animals (cattle, goats), wild animals (warthogs, buffalos, hippos, elephants, kobs, zebras, donkeys, camels)[15,] and pigs.

Community signs: Sudden death in a ruminant, e.g., sheep, goat, or cow with blood oozing from natural body openings.

Suspected case: High fever (> 40°C), muscle tremors with sudden collapse or sudden death in seemingly healthy animals with bloating or dark unclotted blood oozing from natural orifices, severely extended abdomen with weak or absence of Rigor Mortis

Probable case: A suspected case that tests positive by Anthrax Active Detect Rapid Diagnostic Test.

Confirmed case: A suspected case that tests positive by polymerase chain reaction.

Alert threshold: One suspected case in a specific location/farm.

Outbreak threshold: Same as alert

[12] https://www.OIE.int/fileadmin/Home/eng/Health_standards/tahm/3.04.01_BOVINE_ANAPLASMOSIS.pdf
[13] https://www.OIE.int/fileadmin/Home/eng/Health_standards/tahm/2.01.01_ANTHRAX.pdf
[14] https://www.OIE.int/fileadmin/Home/eng/Health_standards/tahc/current/chapitre_anthrax.pdf
[15] https://www.OIE.int/fileadmin/Home/eng/Health_standards/tahc/current/chapitre_anthrax.pdf

6. Aspergillosis

Aspergillus is a sporulated Mold with broad nutritional requirements. *Aspergillus fumigatus* and *Aspergillus flavus* are the most common species causing aspergillosis in poultry[16]. Their wide-ranging thermal tolerance makes them ubiquitous organisms on farms and in hatcheries and laboratories. Quite resistant to common disinfectants, *Aspergillus* can grow in solutions of sanitizing fluids and in formalin-fixed tissues

Species affected: All Poultry, dogs, cats, cattle, horses, and humans

Community signs: Birds are seen with difficulty breathing, accelerated respiratory rate, and silent gasping. In cattle abortions following the history of consumption of mouldy feeds.

Suspected Cases: Poultry: (In respiratory aspergillosis): Difficulty in breathing, accelerated respiratory rate, and silent gasping, which is one of the most common findings in poultry (the disease has been called silent pneumonia in the past), incoordination and poor balance. Opacity of the eyes in cases of ocular infection.

Ruminants: Pyrexia, nasal discharges, productive cough, abortions at 6-9 months, fetal membranes are often retained, broncho-pneumonia, mastitis.

Dogs: Nasal pain, ulceration and depigmentation of the nares, sneezing, unilateral or bilateral bleeding, and discharge that is purulent and mixed with blood arising from the nares.

Probable: Suspected case with a postmortem of white, creamy nodules in and on the air sacs and viscera. The nodules can be found inside the airways, especially near the syrinx, severely occluding air flow and causing the silent gasping condition

Confirmed case: Suspected case confirmed by Culture. However, growth of only a few colonies should never be considered sufficient evidence for diagnosis, because *Aspergillus* is ubiquitous and can contaminate plates.

[16] https://extension.psu.edu/aspergillosis-in-poultry

7. Avian Influenza

Avian influenza (AI) is a highly contagious, notifiable viral disease affecting several species of domestic, pet, and wild birds. Zoonotic influenza occurs when humans are infected with influenza viruses circulating in animals. Wild migratory birds spread it to domestic birds. Influenza virus type A causes "bird flu" with virus subtypes A (H5N1) and A (H9N2) in birds and "swine flu" with virus subtypes A (H1N1) and A (H3N2) in swine. The incubation period ranges from 1 – 10 days, with an average of five days. Risk factors for spread include seasonal migration of wild birds, live bird markets[17], poor biosecurity, and free-range poultry keeping.

Species affected: Wild migratory birds (e.g. black winged tern), domestic birds (ducks, chicken, turkeys, quails, and guinea fowl), wild birds (e.g., waterfowl), and swine.

Community signs: Increase in deaths in wild migratory birds around lake shores and free-ranging birds.

Suspected case: In birds: Sudden death or swelling of head, eyes, legs, combs, and wattles and any of purple swollen combs and wattles or red streaks on legs, mucus discharge from nose and mouth, birds appear tired and refuse to eat, coughing and sneezing. In swine: Onset of fever, depression, coughing or discharge from nose and eyes, breathing difficulties, and red eyes.

Probable case: Suspected case that tests positive for Avian Influenza using Bio-note Rapid Diagnostic Test (RDT) OR Suspected case with reddened combs and wattles or conjunctivitis or lesions in the trachea or edematous and hemorrhages on shanks or gastrointestinal at post mortem[18]. At postmortem, there are numerous epicardial petechiae, swollen (edema) and extensively reddened (hemorrhages) shanks; diffusely reddened, wet, and swollen (congestion and edema) lungs; and multiple hemorrhages on the mucosal surface of the proventriculus, serosal hemorrhages over the Peyer's patches.

Confirmed case: A suspected case whose cloacal, tracheal, nose, and mouth swabs from avian test positive by PCR.

Alert threshold: Cluster of dead birds in a specific location/farm

Outbreak threshold: Same as alert

[17] https://pubmed.ncbi.nlm.nih.gov/25154979/

[18] https://www.cfsph.iastate.edu/diseaseinfo/disease-images/?disease=avian-influenza

8. Babesiosis

Babesiosis is a tick-borne disease caused by protozoan parasites of the genus *Babesia* like *Babesia bovis, Babesia bigemina,* and *Babesia divergens*. Rodents such as mice, rats, voles, and shrews are known as *Babesia* reservoirs. Different genera are identified by the different hosts they affect, for example, *B. bovis and B. bigemina* affect buffalo and impala; *B. divergens* affects cattle; *B. leo* affects lions and *B. bicornis* affects rhinos. The incubation period is between 1-4 weeks after tick infestation[19]. Babesiosis has been reported in carnivores[20], transmitted by tick species *Rhipicephalus appendiculatus, R. evansi, R. dicloratus R. annulatus, R. geigyi*.

Species affected: Ruminants (cattle, buffalo, camels, goats, sheep, kudu, and impala), pigs, canines, primates, and rhinos.

Community signs: Reports of animals urinating dark red or brown-reddish urine.

Suspected case: Passing out of dark red or brown urine in an animal and with one or more of the following signs and symptoms:

- High fever (> 40°C),
- Pale or yellow mucous membranes,
- Dry muzzle
- OR signs of hemolytic anemia, loss of appetite, weakness, and increased respiratory and/or heart rates.

Probable case: A suspected case with a markedly enlarged, dark, pulpy spleen with or without a friable consistency at post-mortem[21].

Confirmed case: A suspected case confirmed using the Giemsa staining technique and PCR.

Alert threshold: One suspected case in a specific location/farm.

Outbreak threshold: Cluster of suspected cases in a specific location/farm.

[19] https://www.OIE.int/app/uploads/2021/03/bovine-babesiosis.pdf
[20] https://doi.org/10.1016/j.vetpar.2006.01.036s
[21] https://www.cfsph.iastate.edu/Factsheets/pdfs/bovine_babesiosis.pdf

9. Black Quarter

Black quarter is an acute bacterial disease of mainly cattle characterized by emphysematous swelling usually in heavy muscles. It is caused by *Clostridium chauvoei*. It also affects sheep but buffaloes usually suffer from a milder form of the disease. Contaminated pasture is a major source of infection. Healthy animals in the age group 6 months to 2 years e.g. calves below 1 year are at increased risk of Black Quarter[22]. The incubation period is estimated to be 2 – 6 days.

Species affected: Cattle, sheep, and buffaloes

Community signs: Community reports of any animal with lameness, limping, and swollen hind or neck or chest or hind hip and or back muscles.

Suspected case: Onset of lameness, fever (> 40°C)[22] edematous and crepitant swelling in the hip or shoulder or chest or back and neck, hot and painful swellings, tremors and prostration and abnormal breathing[23].

Probable case: A Suspected case with dark red muscles and rancid odor at post-mortem[23].

Confirmed case: A suspected case with *Clostridium* positive culture results of tissues OR biochemical characterization and gram staining/ microscopy.

Alert threshold: One suspected case in a specific location/farm.

Outbreak threshold: A cluster of suspected cases in a specific location/farm.

10. Bovine Tuberculosis

Tuberculosis is a zoonotic disease that affects most mammals, causing a general state of illness, coughing and can eventually cause death. Bovine tuberculosis (TB) is a chronic disease of animals caused by *Mycobacterium bovis*, (*M. bovis*)[24]. Bovine TB is contagious and is transmitted directly by inhalation of droplets from infected animals, contact with infected domestic and wild animal fluids, or indirectly by ingestion of contaminated materials. The common route of transmission

[22] https://www.dairyknowledge.in/article/black-quarter-bq

[23] https://assets.publishing.service.gov.uk/media/57a08dbfed915d3cfd001bba/R5499-Diseases-of-Small-Ruminants.pdf

[24] https://www.OIE.int/fileadmin/Home/eng/Media_Center/docs/pdf/Disease_cards/BOVINE-TB-EN.pdf

within cattle herds is through inhalation of infected aerosol expelled from the lungs (by coughing). Calves can be infected by ingesting colostrum or milk from infected cows. Humans can become infected by ingesting raw milk from infected cows, or through contact with infected tissues at abattoirs or butcheries, or by inhalation of infected droplets from the lungs of infected cattle. Cattle-associated risk factors of tuberculosis transmission include household herd positivity and raw milk consumption. Bovine TB is of concern among wildlife populations of national parks. In 2000, Uganda confirmed the disease in buffaloes in the Kidepo Valley National Park. The incubation period ranges from months to years based on the immune status of the animal.

Species affected: Cattle, goats, cats, sheep, dogs, swine, equine, avian species, human and wildlife (boars, antelope, elephants, squirrels, primate, tigers, predatory feline, buffalos)

Community signs: Reports of chronic cough and weight loss.

Suspected case: Often subclinical, or appearance of non-distinctive clinical signs including one or more of the following signs: chronic cough and emaciation/ weight loss with fluctuant fever or loss of appetite or enlarged prominent lymph node, breathing difficulties, prominent bones, body weakness, and diarrhea.

Probable case: A suspected case with positive Tuberculin test among live animals (swelling is monitored at the injection site and measuring the thickness). At post-mortem, localized and generalized tubercles in organs are observed and crepitus sounds in the lungs.

Confirmed case: A suspected case confirmed with a positive Modified ZN test of respiratory discharge and aspirates from prominent lymph nodes.
Alert threshold: One suspected case in a specific location/farm.
Outbreak threshold: Cluster of suspected cases in a specific location/farm.

11. Bovine Spongiform Encephalopathy

Bovine Spongiform Encephalopathy (BSE) of the nervous system of cattle is caused by the accumulation of an abnormal protein called ‘prion’ in nervous tissue. It develops over 2 – 8 years into a fatal disease. Although the incidence of BSE is low, the disease is considered zoonotic due to its epidemiological link to the emergence of variant Creutzfeldt-Jakob disease in humans. Cattle

are infected when they consume feed contaminated by prions during their first year of life; feed containing products derived from ruminants, such as meat-and-bone meal has been highlighted[25]. Humans can be infected with Creutzfeldt-Jakob disease (CJD) through the consumption of contaminated beef products. BSE is one of the diseases required for notification by WOAH. The course of disease is usually sub-acute to chronic, and affected animals display progressive neurological signs.

Species affected: Cattle, humans

Suspected case: Appearance of nervous or aggressive behavior including at least one of the following: depression, hypersensitivity to sound and touch, twitching, tremors, abnormal posture, lack of coordination, difficulty in rising from a lying position, weight loss, or decreased milk production.

Confirmed case: A suspected case confirmed with post-mortem microscopic examination of the medulla oblongata or immunochemical methods[26].

12. Brucellosis

Brucellosis is a zoonotic disease mainly characterized by abortion and/or reproductive failure in animals. Its prevalence in animals is higher in pastoral grazing areas specifically in cattle population in central and south Western Uganda[26] than in the urban and peri-urban areas. Brucellosis is caused by bacteria of the genus *Brucella*, which tend to be mostly host specific (*B. abortus* mostly affects cattle, *B. melitensis* mostly affects goats and sheep, and *B. suis* mostly affects pigs), However, these *Brucella* species are able to infect other animal species. The incubation period is variable, but abortion typically occurs in the late stages of pregnancy[27]. In humans, it is known as undulant fever because of the severe intermittent fever accompanying human infection.

Species affected: Domestic ruminants, pigs, one-humped camel, wildlife (ruminants, wild pigs, primates)

[25] https://www.OIE.int/en/disease/bovine-spongiform-encephalopathy/
[26] https://www.panafrican-med-journal.com/content/article/33/99/full/
[27] https://www.OIE.int/fileadmin/Home/fr/Health_standards/tahm/3.01.04_BRUCELLOSIS.pdf

Community signs: Abortions, retained placenta or dead and weak young ones which die afterward.

Suspected case: Late-term abortions, retained placenta, swelling of testicles (orchitis in males), arthritis, weak young ones, and low milk yield (in females).

Probable case: A suspect case with placenta, fetal fluids, and vaginal discharges that test positive by Rose Bengal test kits OR with cotyledonous uterine lesions identified at postmortem[28].

Confirmed case: A suspected case confirmed with Indirect ELISA detection of Brucella Immunoglobulin G antibodies OR isolation of Brucella from abortion material, udder secretions, or from tissues removed at post-mortem.

Alert threshold: One suspected case in a specific location/farm.

Outbreak threshold: Cluster of suspected cases in a specific location/farm.

13. Canine Distemper

Viral disease is caused by the Canine distemper virus (CDV), a paramyxovirus closely related to the viruses that cause measles and rinderpest. Dogs are the reservoirs of the disease. Outbreaks can occur in wild species, domestic dogs, and exotic animals held in zoos and parks. The incubation period is 3–6 days after infection.

Species affected: Canidae (dog), Mustelidae (otter), and large Felidae (lions)

Suspected case: Onset of fever, anorexia, serous nasal discharge, mucopurulent ocular discharge, general body weakness, gastro-intestinal (diarrhea) and respiratory signs. Animals that have had a long illness may develop neurologic symptoms including localized involuntary muscle twitching (myoclonus, chorea, flexor spasm, and hyperkinesia), convulsions, salivation, and chewing movements of the jaw (chewing-gum fits).

[28] https://www.cfsph.iastate.edu/diseaseinfo/disease-images/?disease=brucella-abortus

Probable case: A suspected case with thymic atrophy at postmortem OR Hyperkeratosis of the nose and footpads in dogs with neurologic manifestations.

Confirmed case: A suspected case whose conjunctival, tracheal, vaginal, or other epithelium tissue, buffy coat of the blood, urine sediment, or bone marrow aspirates test positive by RT-PCR.

14. Coccidiosis

Coccidiosis is a serious gastrointestinal parasitic disease in animals that affects the liver and or intestines. The incubation period is 4-7 days[29]. Coccidiosis is caused by *Emeria* species.

Species affected: cattle, sheep, goats, pigs, poultry, and rabbits

Community signs: Emaciation, diarrhea or brick red brownish fecal droppings and swollen abdomen in rabbits and ruminants.

Suspected case: Onset of diarrhea which may be bloody depending on the affected species, dehydration, general body weakness, and loss of appetite.

Probable case: A suspected case with emaciation, diarrhea which may be blooded, peeling of the epithelial lining, associated with thickened intestines, blood tinge or clots of blood in caeca of poultry or in the gastro-intestinal lining of affected animal species with a history of unhygienic living conditions including dampness, poor ventilation, and poorly cleaned feeding utensils, white necrotic patches of the liver in rabbits.

Confirmed case: A suspected case confirmed through identification of oocysts from fecal samples or intestinal scrapings by microscopy.

Alert threshold: Cluster of suspected cases in a specific location.

Outbreak threshold: Cluster of dead suspected cases in a specific location/farm.

15. Colibacillosis

Colibacillosis is caused by systemic infection with a pathogenic strain of *Escherichia coli*. In poultry, it is one of the most commonly occurring and economically devastating bacterial diseases[30]. The bacteria can enter birds through the respiratory tract, skin trauma, cloaca, damaged

[29] https://www.msdvetmanual.com/poultry/coccidiosis/overview-of-coccidiosis-in-poultry

[30] https://www.msdvetmanual.com/poultry/colibacillosis/colibacillosis-in-poultry?query=Colibacillosis

intestinal mucosa, and navel. Systemic infection usually requires predisposing environmental factors like dust or other infectious causes. It affects all ages of poultry and other kinds of birds; most outbreaks occur in chicken under poor sanitary conditions. Infection is acquired by ingestion or trans-ovarian. The severity of the disease is determined by the virulence of the *E. coli* strain. The bacteria is shed in feces; poor hygiene and sanitary conditions can facilitate the transmission of the disease. Infection prevention and control at farms is key since *E. coli* isolates are increasingly resistant to antibiotics[30].

Species affected: Poultry and other kinds of birds, pigs, cattle, sheep, and goats

Community case: Sudden increase in mortality in mature birds associated with sick-chicken syndrome, for younger birds there is high mortalities from day 0-4 with open navels and high rejection rates at the hatcheries.

Suspected case: Droopy wings, general body weaknesses, difficulty in breathing, and reduced feeding.

Probable: Any suspected case that is associated with a crowded and dusty environment, has a compromised immunity due to disease or poor nutrition and presents with an enlarged liver and spleen with multifocal whitish-tan areas of necrosis. The cases also present with increased fluid in the body cavities at post-mortem.

Confirmed case: A suspected case confirmed through isolation of a pure culture of *E. coli* from heart blood, liver, and spleen samples.

16. Contagious Bovine Pleuropneumonia

Contagious bovine pleuropneumonia (CBPP) is a bacterial disease of major economic importance in sub-Saharan Africa[31]. It is caused by *Mycoplasma mycoides*. Cattle and buffalos are the main hosts. Camels are usually resistant[32]. CBPP is spread mainly by inhalation of droplets from infected animals when they cough, especially if they are in the acute phase of the disease. The incubation period ranges from 3 weeks to 6 months.

[31] https://era.ed.ac.uk/bitstream/handle/1842/4379/Mtui-Malamsha2009.pdf?sequence=1

[32] https://www.OIE.int/app/uploads/2021/03/contagious-bovine-pleuropneumonia.pdf

Community signs: Arched back with spread legs turned outwards, weakness, opened mouth with protruding tongue, depression and/or isolation from the rest of the herd, rapid breathing, and dry cough.

Suspected case: Arched back and legs stand out with fever (> 40°C) rapid difficulty in breathing, dry cough, loss of appetite, nasal discharge, and/or isolated from the rest of the herd, and reluctant to move in hot weather, the head is lowered and extended, dry cough, especially after exercise.

Probable case: Any suspected case above that at postmortem presents with fluids in the thoracic cavity, adhesions, and/or fibrinous deposits and lungs characterized with consolidation and have a typical marbling appearance and caseous lesions associated with high morbidity and a Case fatality of more than half of the herd.

Confirmed case: A suspected case with positive competitive ELISA and complement fixation test using sera.

Alert threshold: One suspected case in a specific location/farm.

Outbreak threshold: Cluster of suspected cases in a specific location/farm.

17. Contagious Caprine Pleuropneumonia

Contagious caprine pleuropneumonia (CCPP) is one of the most severe diseases that affect goats. CCPP affects the respiratory tract, is extremely contagious, and is frequently fatal. In some naive flocks, the morbidity and mortality rates may reach 100%. The incubation period is six to ten days. Animals with chronic illness may turn into carriers post treatment.

Species affected: sheep, goats, and some small wild ruminants

Community case: Community reports of chronic cough, general body weakness, isolation from the rest of the herd, or emaciation with shoats walking with spread-out legs.

Suspected case: High fever (> 40°C), general body weakness, anorexia, coughing, nasal discharge with labored breathing. The goat may be unable to move and stands with its front legs wide apart and its neck stiff and extended with a protruding tongue. Saliva drooling continuously from the

mouth, and the animal may grunt or bleat in pain. Frothy nasal discharge and stringy saliva may be seen terminally. Acutely affected goats generally die within seven to ten (7-10) days.

Probable case: Any suspected case that presents with enlarged and firm lungs, bloody, and sometimes gets stuck to the coastal surface with granular lung appearance at post-mortem. The disease is associated with high morbidity and mortality. Straw-colored fluids in the thoracic cavity, pea-sized, yellow nodules found on the lungs surrounded by areas of congestion, and necrotic lesions in the respiratory system.

Confirmed case: A suspected case with positive competitive ELISA and complement fixation test using sera.

Alert threshold: One suspected case in a specific location/farm.

Outbreak threshold: Cluster of suspected cases in a specific location/farm.

18. Crimean Congo Hemorrhagic Fever

Crimean–Congo hemorrhagic fever (CCHF) is a zoonotic tick-borne disease caused by the CCHF virus from the genus *Orthonairovirus* of the family *Nairoviridae*. The virus is transmitted to animals from infected ticks through tick bites, animal-to-animal transmission, and contact with blood, other body secretions, or tissues of infected animals. The exposure risk factors include contact with infected ticks), herding together, and increasing age and sex (being female). In Uganda, eight outbreaks between 2013 and 2017 were reported in the cattle corridor districts of Nakaseke, Kiruhura, Mbarara, Lyantonde, Kakumiro, Ssembabule, Kabale, Gomba, and Kiboga[33].

In livestock, CCHF viremia is short-lived and does not result in clinical signs. However, animals play a crucial role in the life cycle of ticks and virus transmission when ticks that feed on infected livestock subsequently feed on humans. Humans can also get infected when they come in contact with infectious blood or body secretions of livestock or humans. In humans, CCHF symptoms

[33]Notes from the Field: Crimean-Congo Hemorrhagic Fever Outbreak - Central Uganda, August-September 2017. *Kizito S, Okello PE, Kwesiga B, Nyakarahuka L, Balinandi S, Mulei S, Kyondo J, Tumusiime A, Lutwama J, Ario AR, Ojwang J, Zhu BP. MMWR Morb Mortal Wkly Rep. 2018 Jun 8; 67(22):646-647.*

include sudden high-grade fever, headache, vomiting, back pain, joint pain, and stomach pain. In the late stages of the disease, hemorrhaging may occur; the case fatality rate ranges between 10% and 40%. This makes CCHF a disease of public health importance. Suspected animal cases should trigger strengthening surveillance and preventive interventions in humans.

Species affected: Sheep, goats, cattle, wild herbivores, hares, hedgehogs, rodents, and humans

Community signs: Any animals aborting or recently aborted and reddening around the nose in calves.

Suspected case: Abortion or recent abortion with hemorrhage around the nose and weakness in calves. Signs and symptoms are hard to identify in adult animals with transient fever.

Probable: Any suspected case with a known history of contact with an animal that has aborted and or a calf with a reddened nose and has Hyalomma ticks isolated from its body.

Confirmed: A suspected case with a Positive PCR test with whole blood[34]

19. Cutaneous Filariasis

It's a zoonotic skin disease caused by infection with nematodes (*Filaridae* and *Stephanofilaria* species). Nematodes of the family *Filariidae* have been identified in Rothschild's giraffes in Murchison Falls National Park, Uganda[35]. Infection with *Stephanofilaria* sp. can also affect black and white rhinos.

Species affected: Giraffes, rhinos, cattle, and humans

Suspected case: Gross skin lesions showing alopecia, crusting, and hyperkeratosis of the skin that is parasitized. Chronic cases present with smooth lesions with hair loss at the posterior of the navel

[34] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5893389/

[35] Christopher A. Whittier, Suzan Murray, Kali Holder, Sabrina McGraw, Robert Fleischer, Nandadevi Cortes-Rodriguez, Peter Black, Robert Yordi, Michael Keigwin, Eric Enyel, Patrick Atimnedi "Cutaneous Filariasis in Free-Ranging Rothschild's Giraffes (*Giraffa camelopardalis rothschildi*) in Uganda," Journal of Wildlife Diseases, 56(1), 234-238, (6 January 2020)

covered with blood and exudates. Circumscribed dermatitis mostly around the ventral midline between the brisket and navel.

Confirmed case: A suspected case confirmed through identification of microfilaria in the blood smear or PCR (Specimen includes dried blood spots, serum, and skin scrapes)

20. East Coast Fever

East Coast fever (ECF) is a tick-borne disease caused by a protozoan called *Theileria parva.* Bites from infected ticks (*Rhipicephalus appendiculatus*), communal grazing, and tick resistance to acaricides, breed of animal, and age are the common risk factors. The incubation period is 7-12 days. In wildlife, African buffalos and waterbucks are reservoirs[36]. In Uganda, it is distributed country-wide, specifically in warm and humid grassland.

Species: Domestic (Cattle), Wildlife (waterbucks and buffaloes)

Community signs: Dry muzzle (high fever), swellings below the ears, teary eyes, and cough.

Suspected: Onset of fever (above 42^{O}C), swollen lymph nodes (prescapular & parotids), corneal opacity, any nasal discharge, diarrhea, teary eyes, listlessness, and refusal to eat.

Probable: Suspect case with petechial hemorrhages on the mucous membranes, under the tongue, eyes, and vulva. Froth in the trachea, bronchioles, and bronchi, lymph nodes are swollen and edematous, cigar-shaped ulcerations on the abomasum.

Confirmed case: A suspected case with *Theileria Parva* protozoan detected by microscopy in a blood smear.

21. Ebola and Marburg Virus Diseases

These are deadly zoonotic diseases caused by viruses of the *Filoviradae* family. There are three genera within the family: *Cueva, Marburg,* and *Ebola* viruses. Ebolavirus species include: *Zaire*

[36] https://cgspace.cgiar.org/handle/10568/3746

ebolavirus, *Sudan ebolavirus*, *Taï Forest ebolavirus*, *Bundibugyo ebolavirus*, *Reston ebolavirus* and *Bombali ebolavirus.* Certain frugivorous (fruit-eating) and insectivorous bats are the presumed reservoir of Ebola and the confirmed reservoir of Marburg; they do not themselves show signs of illness when infected. In Uganda, fruit-eating bats can be found in forests and caves around areas bordering the Democratic Republic of Congo, Mountain Elgon, Bundibugyo, and Kabarole Districts. Ebola Virus Disease (EVD) and Marburg hemorrhagic fever virus (MARV) are transmitted to animals when they consume fruit partially eaten by bats. Monkeys and duiker antelopes can be intermediary hosts. Animals (primates) get infected when they come in contact with the blood and secretions of infected animals. Inter- and intra-species transmission occurs through direct contact (via ingestion, broken skin, or mucous membranes) with the blood or other bodily fluids of infected animals and/or humans and through indirect contact via contaminated surfaces or materials (fruit, linens, and clothing). Transmission at the wildlife-human interface is most often associated with hunting, gathering wild animals that are sick or dead, and/or handling or consuming raw, contaminated bush meat[37]. The incubation period ranges from 2 to 21 days (average: 4 to 9 days). Affected animals and humans often present with unexplained hemorrhage (bleeding or bruising). EVD and MARV are clinically similar, highly virulent zoonotic diseases with case fatality rates surpassing 50% in humans and approaching 100% in primates[38]. These zoonoses are of public health importance and necessitate communication and immediate notification between human, veterinary, and wildlife health officials at national and international levels.

Species affected: Primates (apes or gorillas, chimpanzees, monkeys), pigs, fruit bats, duiker antelopes and humans.

Community definition: Sudden death in non-human primates with or without blood oozing from natural orifices including the skin

Suspected case: Death of primates in large numbers, or appearance of diarrhea in primates with blood or, fever, facial edema, depression anorexia, weakness, and cough.

[37] Tools and resources - OIE - Africa

[38] Filoviruses (Infection with).pdf (OIE.int)

Probable Case: Lymphopenia, disseminated intravascular coagulation indicated by round spots that appear on the skin, hemorrhagic and septic shock

Confirmed case: A suspected case with a positive laboratory result for either virus antigen or viral RNA detected by RT-PCR or IgM antibodies ELISA against Ebola virus.

Alert and outbreak threshold: Death from unknown and/or suspicious causes of a large number of primates or of other animals susceptible to EVD infection.

22. Elephant Endotheliotropic Herpesvirus (EEHV)

Elephant endotheliotropic herpesvirus (EEHV) disease is caused by EEHV that belongs to the family *Herpesviridae*, subfamily *Betaherpesvirinae*, genus *Proboscivirus*, and species *Elephantid betaherpesvirus.* The EEHV causes an acute, fatal hemorrhagic disease in wild and captive juvenile Asian and African elephants. Elephants that develop severe disease can die within 24 hours. This disease is a threat to the conservation of elephant populations. EEHV disease is transmitted through direct contact with the body fluids of infected elephants (saliva, shedding from skin lesions, etc.). The incubation period is not well characterized, however, viremia has been detectable from 12-72 hours after the onset of clinical signs. EEHV mostly occurs in young animals and during the rainy season.

Species affected: African and Asian Elephants

Suspected case: Lethargy, anorexia, mild colic, tachycardia, edema of the head, neck, trunk, and thoracic limbs. Animals develop progressive cyanosis of the tip of the tongue, hemorrhage of the tongue, oral ulcers, and acute skin nodules throughout the trunk.

Confirmed case: A suspected case confirmed through viral genome detection by Polymerase chain reaction (PCR) in clinically ill elephants or in postmortem on heart, liver, tongue, intestines, and any other hemorrhagic tissue.

23. Erysipelas

Erysipelas is an infectious disease caused by the bacterium *Erysipelothrix rhusiopathiae.* The disease is characterized by sudden death, fever, skin lesions, and arthritis that mainly affects growing pigs. Pigs are the hosts but the disease can affect other species including birds and sheep. The bacteria is excreted via saliva, faeces, or urine by pigs and can survive in their environment for a few weeks and longer in light soils making it difficult to eliminate. Congestion, overstocking, mixing of pigs after weaning , sudden temperature changes, and poor hygiene increase the risk of the diseases especially in animals with weak immune systems, for example, pigs aged 8 to 12 weeks and unvaccinated pigs. The incubation period is 24 to 48 hours in the host.

Species affected: Pigs, sheep, cattle, rabbits, turkeys, wild mammals (including rodents), reptiles, and amphibians, wild birds (bald eagle and eared grebe)[39].

Community signs: Multiple painful wounds on the skin, death, abortion, swollen joints, and lameness.

Suspected case: Appearance of diamond-shaped lesions under the skin especially around the ears, snout, jowls, neck, and ventral abdomen, high temperature of 40-42^{O}C, loss of appetite, lameness, abortion, and sudden death.

Probable case: A suspected case presenting with the following signs at post-modem: congested lymph nodes, sub capsular hemorrhage, Enlarged spleen, petechial hemorrhages on the kidneys, epicardium, and endocardium. The liver is swollen and the capsule is tense. The lungs are congested and edematous.

Confirmed case: A suspect case for which bacteria is identified by culture, microscopy, and PCR

Outbreak threshold: One case in five clusters[40]

[39] https://vetmed.iastate.edu/vdpam/FSVD/swine/index-diseases/erysipelas#:~:text=Erysipelas%20occurs%20in%20swine%2C%20lambs,greater%20during%20warm%20summer%20months

[40] https://www.nadis.org.uk/disease-a-z/pigs/erysipelas/

24. Feline Calicivirus (FCV)

Feline calicivirus is a highly contagious virus that causes mild to severe respiratory infection and oral disease in cats. Feline calicivirus (FCV) belongs to a large family of viruses called *Caliciviridae*. The virus spreads through direct contact with the saliva, nasal mucus, and eye discharge of infected cats and through aerosol droplets that spread when cats sneeze. The incubation period is 2 to 14 days. A survey of 14 lions in QENP found a prevalence of FCV of 79%[41].

Species affected: domestic and wild cats.

Community signs: Wounds in the mouth, sneezing, and lameness

Suspected case: Ulcers in the oral cavity, nodules on the base of the tongue, or mucous membranes of the oral cavity. Cats may develop lethargy, mild lameness (shifting lameness), sneezing, nasal congestion, fever, drooling, lack of appetite, weight loss, gingivitis, swelling of the head and legs, crusting sores and hair loss on the nose, eyes, ears, and footpads. The mouth and ears turn yellowish from liver damage.

Probable case: Pm lesions include subcutaneous edema of the face and limbs, skin and mucosal ulceration and necrosis, bronchopneumonia, pancreatitis, hepatitis, steatitis, and bleeding under the skin and in the gastrointestinal tract.

Confirmed: A suspected case confirmed through detection of FCV antibodies by enzyme-linked immunosorbent assay (ELISA) OR virus detected by reverse transcriptase PCR (RT-PCR)

25. Feline Immunodeficiency Virus (FIV)

Feline immunodeficiency virus (FIV) affects the immune system of domestic and wild felines. FIV-infected cats are more likely to acquire other types of infections that can affect other parts of the body, including the gums, mouth, digestive tract, urinary tract, and skin. The virus is spread

[41] Margaret Driciru, Ludwig Siefert, Katherine C. Prager, Edward Dubovi, Robert Sande, Frank Princee, Tom Friday, Linda Munson; A Serosurvey of Viral Infections in Lions (*Panthera leo*), from Queen Elizabeth National Park, Uganda. *J Wildl Dis* 1 July 2006; 42 (3): 667–671. doi: https://doi.org/10.7589/0090-3558-42.3.667

from cat to cat through saliva, primarily by biting. Studies in Queen ENP indicated extensive exposure of lions to common feline and canine viruses; FIV prevalence among 14 lions was 71%[39]. The acute phase of infection generally occurs 1-3 months after infection which may be mild. Following the acute phase, cats will enter an asymptomatic phase, which may last for months to multiple years. Due to compromised immune systems, cats may develop chronic or recurrent infections, cancer, and immune-mediated blood disorders than healthy cats. Weight loss, seizures, behavioral changes, and neurological disorders are all possible.

Species affected: domestic and wild cats (lions, leopards)

Suspected case: Temporary lymph node enlargement accompanied by fever, depression, weight, and reduced appetite followed by chronic or recurrent infections of the skin, eyes, urinary tract, or upper respiratory tract.

Probable: A suspected case with antibodies detected in blood by ELIZA test kits

Confirmed: A suspected case confirmed through PCR or virus isolation when available

26. Feline Infectious Peritonitis

Feline infectious peritonitis is a viral disease caused by the Feline Corona virus (FCoV) belonging to the family *Coronaviridae*. FIP affects domestic and wild cats. Although FCoV often results in mild to inapparent disease (mild diarrhea), a small subset of cats succumb to the fatal, systemic disease which is feline infectious peritonitis. The Infectious PA study in Serengeti indicated 95% of 38 free-ranging spotted hyenas had prior exposure to coronavirus[42].

Species: domestic and wild cats (leopards, cheetahs, lions) and dogs (hyenas)

Suspected: Mild diarrhea and/or vomiting accompanied by weight loss sometimes with stunted growth

Confirmed: A suspected case confirmed through ELISA or fecal PCR

[42] East ML, Moestl K, Benetka V, Pitra C, Höner OP, Wachter B, Hofer H. Coronavirus infection of spotted hyenas in the Serengeti ecosystem. Vet Microbiol. 2004 Aug 19;102(1-2):1-9. doi: 10.1016/j.vetmic.2004.04.012.

Note: FCV antibodies can be detected by immunofluorescence assay (IFA) where available to increase degree of suspicion.

27. Foot and Mouth Disease

Foot and mouth disease (FMD) is a highly infectious and contagious viral disease of many wild and domestic cloven-hoofed mammals caused by *Aphthovirus.* It is characterized by fever, blister-like sores (vesicles) on the tongue, gum, cheeks, lips, teats and between the hooves, excessive salivation (drooling), reduced production, lameness, smacking of lips, weight loss and teary eyes, Postmortem signs include vesicles or blisters on the tongue, gums, cheeks, lips, nostrils, corona bands, teats and udder, erosions on the rumen pillai, necrosis of the myocardium (tiger heart).

Species affected: Domestic and wild cloven-hoofed animal's e.g., cattle, goats, pigs, sheep, buffalo

Community signs: An animal with drooling OR limping and or wounds in the mouth and hooves.

Suspected case: Limping with blisters or wounds in the mouth, tongue, gums and hooves accompanied with drooling saliva. Other common symptoms are fever, hyper-salivation, loss of appetite, weight loss, and a drop in milk production in a cloven hoofed animal

Note that young animals die before blisters develop due to multifocal myocarditis.

NB. Previously affected or vaccinated animals may not show all the clinical signs.

Probable case: A suspected case showing zebra stripes in the large intestinal mucosa ulcerative lesions on the tongue, palate, gums, pillars of the rumen and feet and inflammation in the abomasum walls plus necrosis of the heart muscle (tiger heart) on postmortem.

Confirmed case: A suspected case confirmed with a positive rapid diagnostic test result for virus antigen against FMD or FMD virus antigen detected by RT-PCR against FMD.

28. Foot Rot

Foot rot is a highly contagious bacterial disease affecting the interdigital (between toes) tissue of ruminants. It can be acute or subacute. It is caused by *Dichelobactor nodosus* and *Fusobacterium necroforum* (goats and sheep) and *Bacteroides mealaninogenicus* (cattle). It presents with lameness, skin between the hooves develops pus and has a foul smell, redness of the corona bands, slothing off of the hoof, acute swelling (sometimes up to the fetlock and coffin joint) of the interdigital hooves and reduced milk production. The exposure risk factors for infection include grazing in swampy places, moist and damp habitats, long distance grazing which wears out the hooves, rainy season, and overgrowth of the hooves.

Species affected: Sheep, goats, cattle, pigs and buffalos

Community signs: Wounds and or limping.

Suspected case: Lameness, blisters and wounds in cloven hoofed animals.

Probable case: A suspected case presenting with hoof blisters on postmortem.

Confirmed case: A suspected case confirmed by bacterial identification of *Dichelobactor nodosus, Fusobacterium necroforum*, and *Bacteroides mealaninogenicus* by culture.

29. Fowl Cholera

It is a contagious bacterial disease of birds caused by *Pasteurella multocida*. It can be acute or chronic. The acute form presents with depression, anorexia, mucoid discharge from the mouth, ruffled feathers, diarrhea, increased respiratory rate and pneumonia .The chronic form presents with swollen wattles, eyes, joint, tendon sheaths, sternal bursae and foot pads with pus, torticollis, darkened purple head and comb, yellowish grey diarrhoea.

Species affected: Birds such as chicken, ducks, geese and turkeys.

Community case: Swollen wattles and combs, sneezing, anorexia, and sudden death.

Suspected case: Onset of acute disease characterized with fever, thirst, cyanosis, anorexia, and ruffled feathers. A bird presenting with a chronic disease presenting with (retraction of the head and neck backwards, otitis (ear infection) emaciation, severe mortality, enlargement of wattles, combs, legs, footpads and wing joints and peritonitis[43].

Probable case: A suspected case presenting with reddening of the carcass, enlarged spleen and liver, blood spots in the subepicardial and subserosal locations on postmortem.

Confirmed case: A suspected case with *Pasteurella multocida* organisms isolated on bacterial culture media.

30. Fowl Pox

Fowl pox is a contagious viral infection of poultry caused by *Avipoxvirus* of the family *Poxviridae.* It has the dry and the wet form. The dry form presents with the wart-like lesions on the unfeathered areas like the head, neck and legs, ruffled feathers, appear lethargic, drop in egg production. The wet form presents with cancer-like lesions in the mouth, pharynx, larynx, and trachea.

Species affected: Domestic (chicken, turkeys) and wild birds

Suspected case: Nodular lesions on feathered and unfeathered skin of chickens and on the head and upper neck of turkeys and has a drop in egg production

Community signs: Dry form: Spots and swellings occur on skin, comb and wattles. Wet form: Wet face with wounds, and respiratory signs.

Probable case: A suspected case presenting with yellowish patches on the mucosa of the mouth, trachea, larynx and esophagus, subcutaneous edema of the head, neck and congestion of muscles, pinpoint hemorrhages of the trachea and proventriculus-gizzard junction.

Confirmed case: A probable case confirming Avipoxvirus by a positive PCR.

[43] https://www.poultryworld.net/topic/fowl-cholera/

31. Fowl Typhoid

Fowl Typhoid is a bacterial disease of poultry caused by *Salmonella gallinarum* in chickens and *Salmonella pullorum* in chicks and turkeys. It presents with anorexia, diarrhea, weakness, high mortality and decreased egg production.

Species affected: Chicken, Turkeys

Suspected case: Younger birds: Anorexia whitish diarrhea, dehydration, weakness and probably death. Older birds: Pale gums, dehydration, and diarrhea[44].

Probable case: A suspected case presenting with inflammation and enlargement of the liver, spleen, heart, ovary and peritoneum. A bird may also present with cecal cores and nodular lesions in the liver, spleen, lungs, heart, gizzard, and intestines at post mortem.

Confirmed case: A suspected case confirmed by isolation, identification, and serotyping of *Salmonella gallinarum.*

32. Gumboro

Gumboro (Infectious Bursal Disease) is a poultry disease caused by infectious bursal disease virus of genus *Avibirnavirus*, family *Birnaviridae*. Two serotypes of IBDV, 1 and 2 are recognized; clinical disease is associated only with serotype 1. Commercial vaccines against serotype 1 exist. Incubation period ranges between 3–4 days. Although other poultry can be affected by the diseases, only young chickens less than 10 weeks old show clinical disease[46]. Young chickens experience severe acute disease and their risk of mortality is high (typically 100% of flock), but generally, mortality may range from 5% to greater than 60%[45]. Additional risk factors for birds include not being vaccinated and overcrowded living conditions.

Affected species: Chicken, turkeys, ducks, guinea fowl and ostriches

Community case: High death numbers and blood spots in the breast and underneath the thigh muscles.

Suspected case: Acute nature presenting with prostration, trembling, roughed feathers, diarrhea, soiled vent feathers, vent picking, sudden death and sticky discharge from the mouth.

Probable case: A suspected case which on postmortem shows swollen, edematous and hemorrhagic cloacal bursal with muscular and proventricular hemorrhages and or nephritis. Observation of sudden death in young birds and high morbidity and moderate mortality.

Confirmed case: A suspected case confirmed with antigen-capture enzyme linked immunosorbent assays (ELISAs) using plates coated with IBDV-specific antibodies OR viral RNA detected by reverse-transcription polymerase chain reaction (RT-PCR).

33. Heart Water

Heart water (HW) is a bacterial disease caused by *Ehrlichia ruminantium* transmitted by the *Amblyomma* tick vector. Ticks become infected by feeding on acutely ill or sub clinically infected animals. Transmission is driven by tick infestation in herds, seasonal changes influencing tick abundance and activity, effectiveness of tick control interventions and presence of wild animal reservoirs[44]. The average incubation period in natural infections is 2–3 weeks, but can vary from 10 days to 1 month[45]. HW causes severe disease in small ruminants (sheep and goats) and in cattle, however, it has caused mortality in the African buffalo. Non-native breeds of sheep, cattle and goats may suffer from the peracute disease. Acute disease is the most common form of HW in domesticated ruminants affecting both non-native and indigenous cattle, sheep and goats; animals usually die within a week with few signs except sudden fever[47].

Species affected: All domestic and wild ruminants

Community case: Cattle, sheep or goats suddenly dying after circling without clear signs, or may exhibit a circling gait.

Suspected case: Peracute cases: Sudden death preceded by a brief interval of fever, difficulty in breathing, increased excitement, lacrimation with or without severe diarrhea. Acute cases: Onset

[44] https://www.OIE.int/app/uploads/2021/03/heartwater-1.pdf
[45] https://www.msdvetmanual.com/generalized-conditions/heartwater/overview-of-heartwater

of fever, anorexia, listlessness, diarrhea (particularly in cattle), and difficulty in breathing and nervous signs [47]. Terminally ill cases present with nervous signs that are usually associated with uncoordinated movement, circling, convulsions, chewing high stepping and/or circling gait and tremors.

Probable case: A suspected case which on postmortem presents with degenerated liver, kidney and heart, Fluid filled body cavities i.e., fluid in the lungs, kidney and heart and enlarged spleen. High mortality in affected animals, whereas morbidity is high in *Amblyomma* tick infested areas

Confirmed case: A probable case confirmed with microscopical identification of rickettsia colonies or a serological test and PCR targeting *E. ruminantium*- specific genes.

34. Helminthiasis

The major groups of worms that affect animals are cestodes, nematodes and trematodes. Among the cestodes, tapeworms include *Echinococcus, Cysticercus bovis* in cattle, *Taenia solium* in pigs and *moniezia* in cattle are of economic importance. The ruminants are intermediate hosts for cysts of tapeworm larvae. Nematodes include *ascaris* (roundworms, common in poultry and pigs), *Haemonchus, Ostertagia, Trichostrongylus, Nematoderus, Strongyloides,* and *Dictiocholus.* Among the trematodes fasciola larvae are of more economic importance than *parasmphistoma* and *schistosoma*. These affect animal productivity and are of public health significance. Some can be transmitted to humans e.g. infestation with the *Taenia solium* (tapeworm) occurs following raw or undercooked infected pork.

a. Echinococcosis (hydatid disease)

Echinococcosis, or hydatid disease, is an infection caused by tapeworms of the genus *Echinococcus.* Carnivores like dogs are the definitive hosts of tapeworms, they pass eggs out in feces on grass or fodder. Eggs shed in dog feces are ingested by intermediate hosts e.g. sheep or pigs. Goats and cattle are also affected as lower intermediate hosts. Within the intermediate hosts, eggs hatch into larvae, the hydatid cysts (grey to white sack containing fluid) in intestines,

organs and muscles[46]. Infection with *Echinococcus* is one of the major causes of diarrhea in herbivores. Visible clinical signs may not be observed but cysts may be seen in organs at meat inspection. Uncontrolled access of dogs to animal slaughter facilities, higher cattle herd sizes and lack of knowledge are known risk factors for transmission between dogs and intermediate hosts. Cystic Echinococcosis is a zoonotic disease transmitted to humans when larvae (cysts) are ingested through eating undercooked meat. In Uganda, a higher human Cystic Echinococcosis prevalence of 3.3% was reported among pastoral communities in Central Karamoja (Napak and Moroto Districts) in comparison to 1.2% in agro-pastoral communities in Teso sub-region[47].

Species affected: Domestic (dogs, pigs, cattle, goats, and sheep), wildlife (hyenas, lions, and leopard) and humans.

Community Case: Livestock present with loss of body condition, poor hair coat, pot belly, diarrhea while in dogs, the disease presents with coughing, and weight loss grass chewing visible segments of the tapeworm (proglottids) in faeces. Some animals may not show any signs.

Suspected case: In carnivores (dogs, hyenas and lions): Coughing, weight loss, loss of appetite, grass chewing, vomiting, visible segments of the tapeworm (proglottids) in faeces. In ruminants and pigs; Pot belly coughing, rough hair coat, weight loss or poor growth and diarrhea may occur.

Probable case: In carnivores a suspected case on postmortem with adult worms in the gastrointestinal system and in ruminants a suspected case with fluid filled cysts in the abdomen. In all affected species morbidity depends on the level of infestation and infected organs. Mortality is usually low.

Confirmed case: A suspected case in carnivores confirmed by microscopy identifying adult worms or proglottids in feces. A suspected case in ruminants is confirmed when cysts are identified in intestines, muscles and organs at post-mortem, or by computerized tomography and magnetic resonance imaging or ELISA specific to Echinococcus.

[46] https://www.OIE.int/en/disease/echinococcosis/

[47] https://www.onehealthjournal.org/Vol.3/1.pdf

b. Bovine Cysticercosis

Bovine Cysticercosis is a parasitic infection of cattle caused by cysticercus (larval stage) of the cestode *Taenia saginata*. The infection is zoonotic, as the lifecycle and transmission of the parasite involves humans, animals and the environment. The adult parasite lives in human intestines who are the definitive host. Humans may release terminal segments containing eggs into the environment which cattle can ingest. In cattle, the parasite migrates to metabolically active muscles where it develops into cysticerci and humans get infected by consuming raw or undercooked meat containing infective cysticerci[48]. Although infections in cattle are normally asymptomatic, they cause losses due to condemnation at postmortem.

Suspected case: Usually asymptomatic.

Probable case: A suspected case which on post-mortem examination reveals cysts in intestines, muscles, organs or identification by histopathology.

Confirmed case: A probable case with enzyme-linked immuno- electro transfer blot or EITB, and commercial enzyme-linked immunoassays positive for cysticercosis.

Note: The suspected case definitions are similar for infection with *Cysticercus bovis* in cattle, *Taenia solium* in pigs and *Moniezia* spp in cattle; however, specimen types and confirmatory tests may differ. Suspected *moniezia* infection in cattle presents with projectile diarrhea, emaciation, anemia and visible segments of the tapeworm (proglotids) in faeces.

35. Infectious Bovine Rhinotracheitis

Infectious bovine rhinotracheitis/ infectious pustular vulvovaginitis (IBR/IPV) is a disease of domestic and wild cattle caused by bovine herpesvirus 1 (BoHV-1); a member of the genus *Varicellovirus*, subfamily: *Alphaherpesvirinae*, family: *Herpesviridae*, order: *Herpesvirales*[49]. The disease is transmitted through direct routes (nasal and genital secretions) and by indirect routes

[48] https://parasitesandvectors.biomedcentral.com/articles/10.1186/s13071-016-1362-3
[49] https://www.msd-animal-health.ie/species/cattle/infectious-bovine-rhinotracheitis-ibr/

(people and equipment/fomites). The incubation period ranges from 2–4 days. Mortality is low, and most infections run a subclinical course.

Species affected: Domestic and wild bovines

Suspected cases: Onset of fever, depression, inappetence, abortions, reduced milk yield and upper respiratory tract disease e.g. (muco purulent nasal discharge, salivation, reddening of the mucous membranes abortion, edema of the lining of the vulva and vagina and conjunctivitis.

Probable cases: A suspected case with congestion of the tracheal lining with very small hemorrhages on postmortem.

Confirmed case: A suspected case confirmed by Real time polymerase chain reaction (RT-PCR).

36. Infectious Bronchitis

Infectious bronchitis is an acute, highly contagious upper respiratory tract disease in chickens caused by the Infectious Bronchitis Virus (IBV). IBV is shed by infected chickens in respiratory discharges and feces. The disease can be spread by aerosol, ingestion of contaminated feed and water, and contact with contaminated equipment and clothing[50]. Introduction of new birds into the flock, poor biosecurity (no footbaths, unrestricted access), not vaccinating birds and vaccination failure increase risk of disease. Typically, morbidity is 100% for affected flocks. The mean incubation period is generally 24 – 48 hours but may be between 1 – 5 days. The disease is endemic in Uganda.

Species affected: Domestic and wild birds

Community case: Reports of birds dying from respiratory symptoms or sudden massive deaths in flocks of about 21 days of age, or deaths usually associated with rales or soft shelled, deformed and miniature eggs in laying flocks.

[50] https://www.msdvetmanual.com/poultry/infectious-bronchitis/infectious-bronchitis-in-poultry

Suspected case: Coughing, sneezing or difficult breathing with or without any one of the following: redness of the eyes (conjunctivitis), and swelling of the eyes and face. In case of layer birds there's a drop in egg production and eggs tend to be soft, wrinkled, rough and discolored. Sometimes, death may occur.

Probable case: A suspected case that lays miss-shaped and soft-shelled eggs, and presents with inflammation of the oviduct and exudates in the trachea on post-mortem. In broilers, there may be inflammation of the trachea, air sacculitis and femoral head necrosis at post mortem.

Confirmed case: A suspected case that is laboratory confirmed by RT-PCR.

Outbreak threshold: Unusual clustering of cases in a farm

37. Infectious Laryngo-tracheitis

Infectious Laryngo-tracheitis (ILT) is caused by *Herpes type-1* virus (ILT virus) that affects birds. The disease is transmitted via aerosol respiratory discharges or by direct contact with fecal matter from infected birds, contaminated equipment/vehicles or by ingestion of contaminated feeds or water. Introduction of new birds into the flock, poor biosecurity (no footbaths, unrestricted access), not vaccinating birds and vaccination failure are risk factors for ILT. The incubation period ranges from 5 – 12 days (average is 6 days). Mortality varies but may reach 50% in adults[51].

Species affected: Domestic and wild birds

Community signs: Birds with difficulty breathing, coughing with blood-like droplets inside the poultry house.

Suspected case: Difficulty in breathing, sneezing, coughing (with bloody mucoid exudate), and rales with or without redness of the eyes (conjunctivitis).

Probable case: A suspected case presenting with bloody exudate in the trachea on post-mortem.

[51] https://www.msdvetmanual.com/poultry/infectious-laryngotracheitis/infectious-laryngotracheitis-in-poultry?query=Infectious%20Laryngo-tracheitis

Confirmed case: A suspected case confirmed by RT-PCR.

Outbreak threshold: Unusual clustering of cases in farm

38. Leptospirosis

Leptospirosis is a zoonotic bacterial disease caused by infection with genus *Leptospira*. The disease affects most mammals and has a broad range of clinical effects, from mild, subclinical infection to multiple-organ failure and death. Rats, dogs, cattle, horses, sheep, goats, and pigs are common carriers of *Leptospira* as chronic renal infection which they can shed in their urine for years[52]. Transmission is facilitated by contact with infected urine and invasion of *Leptospira* through exposed mucous membranes or damaged skin. The incubation period ranges from 4–20 days.

Species affected: cattle, pigs, dogs, rats, sheep, goats, horses and human beings. The most affected animal categories are young and pregnant ones.

Community signs: Abortions, stillbirths, Delivery of weak of young ones which die after a short time, bloody urine

Suspected case: Onset of fever, bloody urine, yellowing of the mucous membranes, still birth, abortions after 1st trimester, and delivery of weak young ones which die after a few days

Confirmed case: A suspected case with positive Serologic test or PCR

[52] https://www.msdvetmanual.com/generalized-conditions/leptospirosis/leptospirosis-in-animals-overview?query=leptospirosis

39. Lumpy Skin Disease

Lumpy Skin Disease (LSD) is a viral disease of cattle caused by the LSD virus *Capripoxvirus* that is characterized by skin eruptions (lumps). The disease is transmitted by mosquito and other insect bites, direct contact with sick animals (fluids), contaminated feeds, grazing lands or watering points. The incubation period is between 4–28 days. LSD can cause a temporary reduction in milk production, temporary or permanent sterility in bulls, and damage to hides and death due to secondary bacterial infections thereby causing economic losses[53]. Lumpy skin disease is endemic in Uganda.

Species affected: Cattle, buffaloes

Community signs: Firm Nodular swellings at early stages that become soft to touch Swellings on the skin which later turn into wounds, especially around the neck and head area, swelling of the subcutaneous tissue, abortions, diarrhea

Suspected case: Generalized nodular swellings and enlarged superficial lymph nodes with or without any one of the following: salivation/drooling, fever (>39.5°c), loss of appetite, drop in milk production, swelling of the joints especially knee joints of the animals.

Probable case: A suspected case with postmortem lesions of nodules in the subcutaneous tissue, muscle fascia, nasopharynx, trachea, bronchi, lungs, rumen abomasum, renal cortex, testicles and uterus among others

.**Confirmed case:** A suspected case confirmed by real-time or conventional polymerase chain reaction (PCR).

40. Mange

Mange is a contagious skin disease, characterized by crusty, pruritic dermatitis, and hair/feather loss, and caused by a variety of parasitic mites burrowing in or living on the skin. Mites that cause mange are a group of arachnid arthropods of any of eleven families of Astigmata or five families

[53] https://www.OIE.int/fileadmin/Home/eng/Health_standards/tahm/2.04.13_LSD.pdf

of Prostigmata. These mites live in or on skin, hair, scales or feathers of multiple species of wild and domestic birds and mammals. Specifically, domestic hosts include livestock, poultry and pets. The mites spread through direct contact with infested animals or contaminated fomites (beddings, litter/ coffee husks, wood shavings). Poor hygiene, poor parasite control (e.g., not spraying animals) increase risk of occurrence and spread of mange. The incubation period ranges from 10 – 48 days[54].

Species affected: Wild and domestic birds, pigs, dogs, cattle, sheep, goat, horse, donkeys, camels.

Community signs: Hair falling off and scratching on objects or by self. In poultry there is pecking of the skin and feet.

Suspected case: Hair/feather loss and crusty or scaly skin with itching or scratching.

Confirmed case: Mites identified in skin scrapings by modified centrifugation-floatation technique.

41. Marek's disease

Marek's disease is an avian viral disease caused by Marek's disease virus, a member of the genus *Mardivirus* within the subfamily *Alphaherpesvirinae.* The virus is released by infected birds into the environment like poultry litter or dust where it can survive for months and readily transmitted among chickens. Marek's disease is highly contagious and easily transmitted among chickens. Vaccination reduces but doesn't prevent shedding of the virus. Incubation period is difficult to determine under field conditions however experimentally clinical signs and gross lesions occur within three to four weeks. Four forms of the disease occur namely; the cutaneous form characterized by swollen hair follicles (bumps on the skin), Neural form characterized by paralysis, ocular form, and the visceral form characterized by tumors in the internal organs.

Species affected: poultry chicken are the most commonly affected, although it may occur in other birds.

[54] https://www.OIE.int/fileadmin/Home/fr/Health_standards/tahm/3.09.07_MANGE.pdf

Community case: Paralysis of the wings and one or both legs leading to lameness and inability to stand and move

Suspected case: Severe depression, inability to eat, uncoordinated movement, emancipation, dehydration and death (40 to 80% mortality from tumors within the age of 8 and 17 weeks of age) The neural form is characterized by paralysis of the legs (One of the legs is extended forward and one tucked under the bird). The Extremities affected are legs, wings and the neck. The visceral form is characterized by tumors in the internal organs (heart, liver, spleen, ovary, lungs). The cutaneous form is characterized by swollen feather follicles (bumps) on the skin. Ocular Marek's disease is characterized by decreased pupil size and irregular diameter of the pupil.

Probable cases: Suspected case with Vision loss, enlarged nerves (brachial and sciatic nerve) and lymphoid tumors in various organs (liver, lungs, gonads, heart and skeletal muscles at post mortem).

Confirmed case: Virus isolation and PCR

42. Mastitis

Mastitis is an inflammation of the udder caused by microorganisms. The disease may be clinical or subclinical. The disease is caused by various species of streptococci, staphylococci, and typically lactose-fermenting organisms, commonly termed coliforms. Mastitis occurs when microbes enter an animal's teat via the teat canal. Most infections are a result of a combination of contagious and environmental factors. Poor hygiene, incomplete milking and teat trauma may increase risk of infection. *Mycoplasma* spp, may spread from cow to cow through aerosol transmission and invade the udder. Contagious invasion by *Staphylococcus aureus*, *Streptococcus agalactiae*, and *Corynebacterium bovis* commonly occurs during milking through milkers' hands or the liners of the milking unit. Opportunistic microbes may also invade the teats from the environment. Exotic diary animals or high milk producers are more susceptible than local indigenous breeds. Mastitis is a major constraint to milk production.

Species affected: Cattle, Goats, Sheep, and Pigs

Community case: swollen painful and sometimes a hard udder resulting in reduced milk production which is watery, sometimes with milk clots, pus, or blood tinged.

Suspected case: Clinical mastitis characterized by swelling of the udder which may be hot and painful (Red in white udders), drop in milk production**,** occurrence of milk clots with or without blood and pus in the milk. Sub clinical cases are characterized by reduced milk production.

Probable case: Change in milk composition (watery, bloody stained or thick creamy milk, PH. Subclinical cases are positive for the California Mastitis Test.

Confirmed: Culture to isolate the organisms

43. Newcastle Disease

Newcastle Disease (NCD) is a highly infectious and contagious viral disease of birds. It is caused by paramyxovirus virus. NCD is transmitted directly through inhalation, contact with fecal matter or respiratory discharges of infected birds, contaminated equipment/vehicles and ingestion of contaminated feeds or water. Introduction of new birds into the flock, poor biosecurity (no footbaths, unrestricted access), and not vaccinating birds can increase risk of transmission. The incubation period is 2-12 days. In a susceptible flock, virtually all the birds can be infected within two to six days. It's a notifiable disease with high mortality and morbidity

Species affected: Wild and domestic birds

Community case: Birds affected passing out greenish diarrhea and dying in large numbers.

Suspected case: Onset of greenish diarrhea, nervous signs (tremors, paralyzed wings and legs, twisted necks or torticollis, circling, spasms, and paralysis), respiratory signs (difficulty breathing, gasping, coughing, sneezing, rales and nasal discharges), swelling and redness of the eyelids and comb with or without any one of the following: drop in egg production, loss of appetite, decreased weight.

Probable case: Hemorrhage in the proventriculus, cecal tonsils, gastrointestinal tract, larynx, trachea, esophagus, and intestines.

Confirmed case: confirmation is by the PCR test.

Outbreak threshold: Unusual clustering of cases in a farm

44. Orf

Orf also known as contagious ecthyma or scabby mouth or sore mouth is caused by Orf virus (poxvirus) that mainly affects goats and sheep but can also affect humans. The incubation period ranges from 3-7 days. Animals infected with Orf virus typically develop scabby sores (lesions) around their lips, muzzle, and in their mouth. The sores appear reddish in the early stages of the disease and later turning black. Transmission is through direct contact with infected animals (fecal matter, respiratory discharges, and fluids), suckling/ bottle/bucket feeding lambs or kids, through skin cuts or abrasions, and ingestion of contaminated feeds or water. Introducing new animals into the herd, poor biosecurity (no footbaths, unrestricted access) and lack of vaccination/ vaccination failure increase risk of Orf. Orf has high infection and high death rates in young animals; the scabs drop off and the animal recovers completely within a month.

Species affected: Sheep, goats

Community signs: Mouth sores in more than one goat/sheep in the affected herd

Suspected case: Dullness, with sores on the lips, nostrils and or tongue, with those on the lips and nostrils becoming scabs while those on the tongue become wounds. There is loss of appetite, high fever (>38.5°C), and or weight loss.

Probable case: Signs seen above in more than one goat or sheep in the affected herd. .

Confirmed case: PCR test

45. Parafilariosis

Parafilariosis is a disease caused by infestation with the nematode parasites *Parafilaria bovicola* and *P. multipapilosa* of the family *Filariidae*. It is characterized by focal hemorrhages on the skin

and damage to the subcutaneous tissues. *P. bovicola* is transmitted by flies in the genus Musca. In Africa, *P. bovicola* larvae are thought to be transmitted to susceptible animals when the fly feeds on wounds or ocular secretions. The larvae migrate under the skin, developing into adults in 5 to 7 months. Approximately 2 months later, the gravid female worms break the skin to deposit their eggs, and the eggs and free larvae are shed in the discharge of blood or serohemorrhagic fluid. Flies become infected when they feed on these lesions. The parasite develops to the infective third stage larva inside the fly in approximately 10- 20 days, depending on the climate. Mature parasites do not appear to survive in lesions from year to year; infestations are newly acquired each year. Cases usually become apparent in 7 to 10 months, when gravid female nematodes break the skin and begin to lay eggs. Risk factors include the presence of the vector flies in the genus *Musca*, a suitable weather conditions i.e. wet weather conditions and a susceptible host i.e. cattle managed under outdoor extensive grazing[55].

Species affected: Cattle, buffaloes, horses

Community case: Blood /bleeding spots on the skin of an animal

Suspected case: Focal hemorrhages (bleeding points) on the skin, or areas of edema or nodules in the subcutaneous tissues. The lesions are painful on palpation, and are most common on the skin of the back, neck, shoulders and withers.

Probable case: A suspected case associated with high fly infestation. Most lesions are superficial; but extensive involvement of the muscles can be seen in more severe cases.

Confirmed case: Parasite eggs and microfilaria demonstrated in a sample of either fresh or dried blood/exudate collected from a bleeding point by microscopy. A PCR test that can be used with exudates was recently published.

46. Para Tuberculosis

Para Tuberculosis also known as Johne's disease is a chronic diarrhoeal disease caused by *Mycobacterium avium* subsp *paratuberculosis* (MAP). The disease in cattle spreads by ingestion

[55] Kretzmann P.M., Wallace H.G.; Weaver J.B., 1984. Manifestation of bovine Parafilariasis.

of MAP from the contaminated environment (pasture, feeds and water). Calves get infected when they ingest milk from infected cows or milk that is contaminated with the feces of diseased cattle. Diagnosis and control of paratuberculosis is complicated by prolonged periods of infection, weak biosafety and biosecurity measures, long incubation period, and the predominantly subclinical nature of the disease and lack of tests for accurate detection of sub clinically infected animals. Failure to vaccinate regularly, parent to offspring transmission, unhygienic practices and failure to isolate and slaughter the clinically sick facilitate spread.

Species affected: Cattle, Sheep, and Goats

Community case: Profuse smelly diarrhea which soils the hocks and does not respond to treatment.

Suspected case: Projectile smelly diarrhea which soils the hock non responsive to treatment with progressive weight loss, sunken eyes and loss of appetite.

Probable case: All the above signs including non-response to treatment

Confirmed case: Demonstration of MAP in the feces by microscopy (Z N staining) or culture or ELISA or PCR

47. Canine parvovirosis

This is a highly infectious and contagious disease that causes gastro-intestinal illness in young dogs caused by the Canine Parvovirus. The disease may be subclinical in adult dogs. The virus is resistant to most detergents and cleaning agents and can persist in the environment for many months. Young (6 week to 6-month old), unvaccinated or incompletely vaccinated dogs are most susceptible to infection. The incubation period ranges from 2–14 days. Control of the disease is through vaccination.

Species affected: Dogs

Community Case: Loss of appetite, bloody diarrhea, and vomiting.

Suspected case: Anorexia or lethargy or High Fever or low body temperature, vomiting and hemorrhagic diarrhea, (often there is a characteristic foul smell) sunken eyes, in young unvaccinated dog

Probable case: Any suspected Dog with no history of vaccination against Parvoviruses.

Confirmed case: Fecal parvoviral antigen testing or viral PCR.

48. Peste des Petits Ruminants

Peste des Petits Ruminants (PPR) also known as sheep and goat plague is caused by *Morbilivirus* or PPR virus. Transmission is through contact with body fluids (feces, saliva, urine, milk, tears), aerosols. Incubation period ranges from 2 – 10 days. PPR is characterized by high spread of infection and death rates and has a high economic impact. It's endemic in many parts of Uganda. The disease is notifiable and control of PPR is through vaccination. Efficient PPR vaccines are available and can induce life-long protective immunity in vaccinated animals; PPR is targeted for eradication by 2030.

Community case: Diarrhea in most of the goats and sheep in the herd with nasal discharge and lacrimation and high deaths in young goats and sheep.

Species affected: Domestic small ruminants (sheep and goats), camels

Suspected case: Diarrhea (foul smelling), oral and nasal sores, fever (>39.5°) or salivation or lacrimation (eye discharge), reduced feeding or abdominal pain (scratching or kicking abdomen or granting), severe pneumonia.

Probable case: A suspected case with high infection rate of up to 90%**,** necrotic lesions in the mouth and nose, engorgement and blackening of folds of the large intestine (zebra striping).

Confirmed case: ELISA and PCR test.

49. Photosensitive Dermatitis

Photosensitive dermatitis is a skin condition characterized by development of painful wounds, scabs on the skin. The lesions frequently occur in those animals with long exposure to sunshine. This occurs when animals ingest plant feeds with phytoactive agents like lantana camara, senecio or toxins or when aberrant compounds enter the skin. The agents can get deposited in the skin or damage the bile duct. This usually affects the unpigmented skin parts like the muzzle, teats, skin back and the vulva once exposed to sunlight or UV light resulting into sloughing off of the skin and eventually necrosis. Feeds or concentrates and pastures contaminated with blue-green algae or pollution are risk factors.

Species affected: Cattle and sheep

Community case: skin wounds on white parts of the animal body and areas of bare skin

Suspected case: Reddening of majorly white parts of the skin, muzzle, and areas of bare skin like the udder, teats, vulva and upper surface of the tail coupled with sloughing of the affected skin. .

Probable: Suspected cases in the same herd, with history of diets containing lantana camara or contamination with blue-green algae.

Confirmed: Measuring porphyrin in blood, feces and urine.

50. Infectious Kerato-conjunctivitis (Pink Eye)

Infectious Kerato-conjunctivitis (Pink Eye) is a bacterial eye disease caused by *Moraxella bovis* in Cattle. Other animals like small ruminants can also be affected by this disease where the causative agents are *M. ovis, Chlamydia pecorum*, M*ycoplasma* spp, *Colesiota conjunctivae*, *Listeria monocytogenes* etc. the incubation period for this disease ranges between 2-3 days but sometimes it can go to 3 weeks in experimental trials. Pink eye outbreaks are most frequently seen in animals confined together during dry periods of the year when flies are more prevalent and ultraviolet radiation is high. This also coincides with the time when mature dry thistles and dusty conditions are more likely. Environmental irritants (dust, wind, tall grass, weeds, pollens, ammonia from excreta from poorly ventilated houses, flies), concurrent infections (*Mycoplasma* spp.),

shipping stress, bright sunlight, unpigmented eyelids and protruding eyes increase animal's risk. Exotic breeds are more susceptible to pink eye than the local breeds.

Species affected: Cattle, Sheep, Goats, dogs and pigs

Suspected: Eyes with signs of twitching of eye muscles, failure to open the eye, blepharospasm frequent opening and closing of the eye) and or tearing from the eye(s) (lacrimation)).

Community signs: Tearing, reddish, cloudy, loss of sight.

Probable: A suspected animal case with one or more of the following signs: - Corneal opacity, central corneal ulceration, mucopurulent ocular discharge, extensive corneal necrosis, corneal neovascularization, dense granulation tissue and corneal fibrosis.

Confirmed: Microbial culture or demonstration of one or of the following bacterial organisms: - *M. bovis, M. ovis, P. pecorum, L. monocytogenes*, *Chlamydia* spp

51. Plague

Plague, caused by *Yersinia pestis,* is an acute and sometimes fatal bacterial zoonosis transmitted primarily by the fleas of rats and other rodents. Most human cases result from the bite of an infected flea, although direct contact with infected wild rabbits, rodents, and occasionally other wildlife and exposure to infected domestic cats are also risk factors. Plague is transmitted by fleas when they bite reservoirs (rodents) and then bite other animals and humans and through contact with contaminated fluids and tissue of rodents. The incubation period ranges from 1 – 7 days. Humans suffer from three types of plague: bubonic plague, septicemic plague, and pneumonic plague. Plague has a high mortality among humans; the infamous 14th Century "Black Death" outbreak was responsible for an estimated 50 million deaths. Since the main risk factor for transmission is poor rodent control, reports of dead rodents and cats should be reported to veterinary and human public health officials. Plague is endemic in the West Nile Region of Uganda.

Species affected: Cats, dogs, rodents (rats, squirrels), rabbits, humans

Community signs: massive death of rodents in an area followed by Cats and dogs also dying in large numbers (after eating infected rodents).

Suspected case: Onset of cough, high fever (>39.5°C) and enlargement of cervical lymph nodes with or without oral lesions especially in dogs.

Confirmed case: Any suspected animal case confirmed by bacterial culture of *Y. pestis* and PCR

52. Psittacosis

Psittacosis or chlamydiosis (known as Parrot fever) is a serious bacterial infection of birds caused by *Chlamydia psittaci* and zoonotic. The bacteria is transmitted through contact with nasal secretions and stool of infected birds. Some bird species are less likely to become infected and these act as carriers. The incubation period of Psittacosis in birds is 5-14 days. Psittacosis can be transmitted from birds to people, usually from sick pets. People are encouraged to observe hygiene when caring for sick birds.

Species: multiple bird species especially (parrots, pigeons, doves, budgies, cockatiels, cockatoos etc.

Community Case: ruffled bird with lime/light green or yellow droppings.

Suspected: Ruffled, depressed, and has labored breathing, discharge from the eyes and nose, loss of appetite, loss of vocalizing, lime-green or yellow droppings. Various internal organs may be affected by psittacosis, including the liver and heart.

Confirmed: A suspected case with laboratory confirmation by PCR or culture of *Chlamydia Psittaci.*

53. Rabies

Rabies is an important viral zoonotic disease caused by the rabies lyssavirus. The disease affects the central nervous system of mammals and is associated with a fatality rate of almost 100%. In infected animals, the rabies virus is present in the saliva and brain and is transmitted primarily by

bites; humans are commonly infected through bites from rabid dogs. Wildlife species such as bats, foxes, wild dogs are reservoirs, these present opportunities for cross-species transmission. The incubation period ranges from a few days to several months (10–80 days) and is dependent on the proximity of the inoculation site to the central nervous system. Once rabies symptoms appear, the disease is fatal. Dog-bite mediated rabies is preventable mainly through strengthening mass vaccination.

Species affected: All mammals

Suspected case: Onset of drooling/salivation, aggressiveness, restlessness, hydrophobia with or without paralysis, seizures.

Community signs: The animals behavior becomes strange (Very aggressive, snapping at objects, howling, swaying movements, drooling of saliva, and restlessness.

Probable case: A case with history of being bitten by dog/cat with no history of rabies vaccination or wild animal positive with RDT

Confirmed case: probable case with Positive indirect Fluorescent Antibody test (IFAT)

Outbreak threshold: One confirmed case

54. Rift Valley Fever

Rift Valley Fever (RVF) is a fatal, arthropod-borne viral zoonotic disease, transmitted to humans from infected animals by the mosquito or contact with infected animal products. RVF is caused by a single sero-type of *Bunyavirus*; a mosquito borne virus of genus *Phlebovirus.* The incubation period (the interval from infection to onset of symptoms) for RVF varies from 2 to 6 days. Outbreaks occur after unusual heavy rainfalls, vegetation cover, presence of the *Aedes* mosquito vector and susceptible hosts, contact with contaminated animal products, infected blood and tissue fluids of animals. Uganda has had outbreaks in Kabale District in 2015; in Kiruhura District in

2019-2021; 2021 (Kyegegwa district)[56] and in Kagadi district 2022. Human sero-positivity correlated with animal sero-positivity, suggesting that animal to human transmission may be the predominant mode of virus spread[57].

Species affected: Sheep (most severe), Goats, Cattle, Camel Buffalo and humans.

Suspected case: Onset of high fever of 40 degrees Centigrade and above, regurgitation, a bad-smelling bloody diarrhea, abortions in pregnant animals and deaths among very young animals.

Community signs: Any storm abortion (Many animals aborting in a herd) in sheep, goats and cattle or abnormally widespread deaths in calves and one-week old lambs.

Probable case: Any suspected case with or without jaundice (yellowing of mucous membranes including eyes) or hemorrhages in internal organs during postmortem or link to abnormally high rainfall, and/ or high mortality of the young animals

Confirmed case: A suspected case positive by PCR or virus isolation or RVF antibodies by ELISA or other tests, 6-7 days post infection.

Alert Threshold: This is a notifiable disease in Uganda. Therefore, a single suspected case should be reported to veterinary and human public health officials.

55. Salmonellosis

Salmonellosis is an infection of *Salmonella* species belonging to the family of *Enterobacteriaceae* that affects most animal species including humans. *Salmonella enterica* serovar *Typhi* (*S typhi*) and *S paratyphi* produce typhoid in humans, *S. gallinarum* produces a similar disease in poultry, *S. abortusovis* in sheep, *S choleraesuis* in pigs, *S dublin* in cattle, etc.[58]. The incubation period for both typhoid and paratyphoid ranges between 6-30 days. Risk factors include poor

[56] Hildah Tendo Nansikombi, Alex Ndyabakira, Irene Kyamwine, Benon Kwesiga, Fred Monje, Luke Nyakahurura, Julie Harris. Rift Valley Fever Outbreak, Kiruhura District, Uganda, June 2021.
[57] Nyakarahuka L, de St. Maurice A, Purpura L, Ervin E, Balinandi S, Tumusiime A, et al. (2018) Prevalence and risk factors of Rift Valley fever in humans and animals from Kabale district in Southwestern Uganda, 2016.

[58] https://www.msdvetmanual.com/digestive-system/salmonellosis/salmonellosis-in-animals?query=salmonellosis

hygiene and sanitation in animal housing, poor disposal and waste handling, and exposure to stress factors (confinement, overcrowding, underfeeding).

Species affected: All domestic animals and humans are affected.

Salmonella was detected in the influent samples from a wastewater treatment plant and waste stabilization ponds that serve the human population; from flush–water samples from ruminant slaughterhouses, from poultry fecal samples from live bird markets and fecal samples from swine at slaughter; water samples from a channel that drains storm–water and effluents from the city.

Salmonella spp are increasingly resistant to antimicrobials with resistance varying across animal species. Ruminants and swine sources are mostly pan–susceptible while poultry isolates are generally more resistant. This poses a serious public health threat since antibiotic-resistant strains of *Salmonella* may also subsequently infect man, which may contribute to anti-microbial resistance (AMR).

Community signs: Smelly Watery or bloody or white or yellow or mucoid diarrhea in cattle, sheep, goats and pigs. In poultry white pasty diarrhea with high mortality in 2 to 4 week old chicks.

Suspected case: Poultry: High mortality in young chicken and turkeys infected with *S. pullorum,* affected birds huddle for warmth and there is white pasty diarrhea, respiratory signs may also occur. S. the adult birds are mainly affected by *S. gallinarium* and have also got white pasty diarrhea.

Cattle, sheep, goats and pigs: There is foul smelling mucoid diarrhea sometimes with bloody spots, fibrinous casts, and shreds of mucous membranes.

Probable case: Suspected case with cecal plugs in the lumen of the ceca in young poultry and fibrin strands at post mortem in the other large domestic animals.

Confirmed case: Positive serological tests or isolation of causative agent

56. Sheep and Goat Pox

Disease of sheep and goats caused by capripoxviruses that result in widespread skin eruption. Sheep and goat get exposed when they get into contact with infected goats or sheep. Transmission may be airborne, through direct contact with lesions, or mechanically by biting insects. Risk factors include movement of animals during grazing and overcrowding of the animals in animal pens. The incubation period of sheep pox is 4–8 days and that of goat pox 5–14 days. Mortality rate is between 5-10% but can go up to 100% in new exotic goats to the farm. There is no treatment; vaccination is recommended for susceptible animals.

Affected species: Sheep and Goats

Community signs: Papules, wounds on skin, mouth, nose and ears.

Suspected case: Onset of fever, generalized papules or nodules, vesicles, lesions that discharge pus on the skin (muzzle, ears) and hairless parts, internal lesions especially in the lungs and eventually death.

Confirmed case: Positive PCR test

57. Simian Immunodeficiency Virus

Simian immunodeficiency viruses (SIV) are members of the Lentivirus genus of Retroviruses that infect nonhuman primates. SIV is transmitted through saliva from bite wounds (in-utero possible) in which the virus causes minimal clinical disease. Hosts are multiple species of primates including African green monkeys, chimpanzees and mangabees which may not develop disease. SIV are the source of the human immunodeficiency viruses (HIV-1 and HIV-2)[59].

Species: Primates e.g. monkeys, mangabees, chimpanzees and gorillas

[59] doi: 10.1101/cshperspect.a007153

Suspected: Immunosuppression including encephalitis, thrombocytopenia, and lymphoma (AIDS-like symptoms).

Confirmed: Polymerase chain reaction (PCR) detection of viral genetic material OR Enzyme-linked immunosorbent assay (ELISA) to detect virus-specific antibodies

58. Staphylococcosis in Poultry

Is a bacterial disease caused by gram-positive cocci of the genus *Staphylococcus*. *S aureus* and other species are ubiquitous in the environment and are part of the normal flora of the skin and other mucous membranes of poultry and other animals. They typically cause disease when they have access to tissue and the bloodstream after physical barriers, such as skin or mucous membranes, break down. They also cause disease in immunocompromised birds. There are two major types of staphylococcosis: systemic infection and localized lesions. Septicemia and gangrenous dermatitis are examples of systemic staphylococcal infections. The most common form of staphylococcosis, however, is localized lesions. Examples include arthritis, tenosynovitis, osteomyelitis, and omphalitis. Economic losses may result from decreased weight gain, mortality, and condemnation at slaughter. *S aureus* can cause food poisoning in people. Enterotoxin-producing strains are found in clinically healthy poultry

Community signs: Swollen footpads (bumble foot) and limping are common, open navels and results in elevated mortality. Chicks with omphalitis have moist and dark navels

Suspected case: Often lethargic with infected yolk sacs retained longer than uninfected yolk sacs, which are normally reabsorbed by the developing chick within the first week of life. Infected yolks are abnormal in color (dark green to brown), have a doughy consistency, and are odorous, swollen, hot joints with limping and reluctance to walk.

Confirmed case: Infection is confirmed by culture of bacteria from lesions

59. Trypanosomiasis

Trypanosomiasis also known as Nagana is a disease caused by a protozoa of genus *Trypanosoma* and transmitted by infected tsetse flies. The disease is endemic in Uganda and is a zoonotic disease. The animals get infected through bites of the infected Tsetse flies. Occurrence of game reserves/game parks, natural forests, certain vegetation cover e.g. Lantana Camara, Rainy seasons, water bodies, poor nutrition or other stress factors of susceptible animals, are risk factors for trypanosomiasis. The distribution, prevalence and impact of Trypanosomiasis is often affected by anthropogenic environmental changes that alter the interactions between the host, the parasite and the vector. For tsetse-transmitted livestock trypanosomiasis these changes are a result of the encroachment of people and their livestock into tsetse-infested wild areas.

Species affected: Cattle, goats, sheep, pigs, camel, dogs, cats, horses, humans,

Suspected case: Swollen lymph nodes, intermittent fever, anemia, abortions or stillbirths, decline in milk production.

Confirmed: A suspected case with demonstrated trypanosomes in thin and thick stained blood smears, wet mounts and at the buffy coat in the hematocrit tube.

60. West Nile Fever

Disease caused by West Nile Virus, a flavivirus related to the virus that causes yellow fever. West Nile fever is a zoonotic disease of public health importance. Transmission of WNV involves birds, mosquitoes, animals and humans. Most infected individuals show few signs of illness, but some develop severe neurological illness which can be fatal. West Nile Virus has an extremely broad host range; it replicates in birds, reptiles, amphibians, mammals, mosquitoes and ticks. Mosquitoes (the vectors) become infected when they bite an infected bird ingesting the virus in the blood[60]. The mosquitoes spread the virus from an infected bird to other birds, animals and humans. Although most humans don't develop symptoms, less than 1% of humans may develop severe disease involving encephalitis. Therefore,

[60] https://www.OIE.int/en/disease/west-nile-fever/

Species affected: Horses, birds and humans

In horses clinical signs of the neurologic disease caused by WNV may include loss of appetite, depression, stumbling, muscle twitching, impaired vision, partial paralysis, impaired vision, head pressing, teeth grinding, aimless wandering, convulsions, circling

Susceptible birds such as geese show signs ranging from lying down to leg and wing paralysis.

Suspected case: Horses: Neurologic disease including combinations of low-grade fever, loss of appetite, depression, stumbling, muscle twitching, partial paralysis, impaired vision, head pressing, teeth grinding, aimless wandering, convulsions, circling and an inability to swallow. Birds: Neurologic disease such as lying down or leg and wing paralysis.

Birds of the crow family (corvidae) are more susceptible than other birds; dead crows can signal presence of West Nile Fever.

Confirmed: laboratory identification of IgM-type antibodies in blood

ANNEX A:

A. Sample collection, transportation and Results communication

Sample collection

The most common samples are blood, serum, tissues, stool, parasite swabs (rectal and anal) and skin lesions. Responsibility for sample collection and preparation depends on the sample origin and expertise available. For example, District Veterinary Officers can work with laboratory technicians to collect, package and refer to NADDEC. In wildlife, samples are routinely collected by the Uganda Wildlife Authority Veterinary Officers and laboratory technicians from the national parks for surveillance. In addition, rangers support tissue collection. Samples from suspected animals are collected, packaged, transported and processed following standard operating procedure (SOPs).

Sample transportation

Samples are transported following recommended transport conditions and means. These include the right container, right temperature and time such as temperature of 2-8^{o}C and or preservative media to the laboratory for processing and testing. Districts can use district vehicles or public transport to transport samples to NADDEC. In West Nile, Gulu and Western Regions, Laboratories have integrated transportation of animal samples into the Hub system and utilize the hub riders. UWA utilizes UWA vehicles to transport samples. Nitrogen tanks are used for lengthy field surveillance activities in order to maintain the cold chain

Communication of laboratory results

At NADDEC, after testing, the results are generated using SILAB, a laboratory information management system and signed by the head of the section. Approved results are reported back to the district (or farmer) using Email or phone call. In UWA, laboratory results are shared with the requesting Veterinary Officers.

Following confirmation of trade sensitive, notifiable or epidemic prone diseases, the DVO or PVO communicates to the Chief Veterinary Officer in writing. Decisions are made on outbreak investigation, response or vaccination needs. For example, a team from the NADDEC Laboratory and Epidemiology units can be deployed to investigate or respond to the outbreak or vaccines provided to affected districts.

The sector has capacity to test and confirm a range of diseases using a network of laboratories. These constitute government laboratories distributed country wide at different levels of capacity starting from District Veterinary Laboratories (DVL), Regional Animal Disease Diagnostic and Epidemiology centers (RADDECs), National Animal Disease Diagnostic and Epidemiology Centre (NADDEC) and Specialized reference Laboratories used as back up. These are as shown in the table one below with detailed capacity for NADDEC and RADDECs in the table below.

Table 1: List of Laboratories within the Laboratory network

Level of Veterinary Laboratory	Number of Labs	List
National Reference Laboratory	1	NADDEC
Specialized National Reference laboratories (Back up)	7	UVRI, COVAB-CDL, NARILLI, UWA, Chemiphar, DGAL & UNBS
RADDECs	8	Mbarara, Arua, Gulu, Mbale, Masaka, Lira, Moroto and Fort Portal
District Veterinary Laboratories	32	Sembabule, Alebtong, Bulambuli, Bushenyi, Busia, Ibanda, Jinja, Kagadi, Kalangala, Kaliro, Kamuli, Kanungu, Kayunga, Kazo, Kiboga, Kitgum, Lyantonde, Mitooma, Mpigi, Mubende, Mukono, Nakasongola, Napak, Ngora, Ntungamo, Serere, Yumbe, Wakiso, Hoima, Tororo and Moyo.
Border health veterinary Laboratories	9	Busia, Elegu, Malaba, Lwakhakha, Katuna, Mpondwe, Nakawa in land Port, Entebbe airport, Mutukula

Table 2: Testing capacity and contacts of public animal health laboratories in Uganda

Laboratory	Type of tests conducted	Samples tested
National Animal Disease Diagnostics and Epidemiology Center (NADDEC)	Stool testing, FMD, PPR, LSD CBPP, CCPP NCD, direct fluorescent antibody test, Anthrax, culture & Sensitivity of bacterial diseases, Automated MALDI-TOFF automated identification Gisema staining, Rapid antigen test, Rose Bengal screening test, ELISA, Trypanosomes, Africa Swine Fever test, PCR, Hematological tests, Avian Influenza rapid tests, Acaricide concentration detection	Whole blood, serum, stool, tissues or organs, swabs, probangs, pass, lymph node aspirate, milk, Mouth, foot and Nasal lesions.

Laboratory	Type of tests conducted	Samples tested
Mbale regional Veterinary Laboratory	Microscopy for tick borne diseases, Trypanosomes, screening for brucellosis (Rose Bengal test), Rapid testing of Newcastle disease (NCD) and stool testing and hematology	whole blood, serum and stool
Mbarara Regional Veterinary Laboratory	Microscopy for tick borne disease, Trypanosomes, culture and sensitivity, Rapid testing of NCD and HPAI, Hematology (blood picture) and stool examination and Rose Bengal testing	Whole blood, Serum, stool and Swabs
Moroto Regional Veterinary Laboratory	Microscopy of tick-borne diseases, trypanosomes, stool examination and Rose Bengal test, Gram staining, ELISA	Samples tested: whole blood, Serum and lymph node aspirates
Moyo District Veterinary laboratory	Microscopy of tick-borne diseases, trypanosomes, stool examination and Rose Bengal test, Gram staining	whole blood, Serum and lymph node aspirates
Kiboga District Veterinary laboratory	Microscopy of tick-borne diseases, trypanosomes, stool examination and Rose Bengal test, Gram staining	whole blood, Serum and lymph node aspirates
Masaka Regional Veterinary laboratory	Microscopy of tick-borne diseases, trypanosomes, stool examination and Rose Bengal test, Gram staining	Samples tested: whole blood, Serum and lymph node aspirates
Gulu Regional Veterinary laboratory	Microscopy of tick-borne diseases, trypanosomes, stool examination and Rose Bengal test, Gram staining	whole blood, Serum and lymph node aspirates
Arua Regional Veterinary Laboratory	Microscopy of tick-borne diseases, trypanosomes, stool examination and Rose Bengal test, Gram staining and ELISA Test for serology	Samples tested: whole blood, Serum and lymph node aspirates
Queen Elizabeth National Park, Mweya Laboratory	Microscopy for tick borne diseases, Trypanosomes, screening for brucellosis (Rose Bengal test), Rapid testing of Newcastle disease (NCD) and stool testing and hematology	Whole blood, serum and stool
Murchison Falls National Park Laboratory	Microscopy for tick borne diseases, Trypanosomes, screening for brucellosis (Rose Bengal test), Rapid testing of Newcastle disease (NCD) and stool testing and hematology	Whole blood, serum and stool

Laboratory	Type of tests conducted	Samples tested
Uganda Wildlife Education Centre (UWEC), Entebbe	Microscopy and parasitology	Whole blood, serum and stool

ANNEX B

List of participants who supported development of the case definitions guide

No.	Name	Position	Organization
1	Anna Rose Ademun Okurut	Commissioner Animal Health	MAAIF
2	James Kakungulu	Assistant Commissioner, Veterinary Inspection and Regulation	MAAIF
3	Peter Wanyama	Assistant Commissioner, Veterinary Diagnostics and Epidemiology	MAAIF
4	John Opolot	Assistant Commissioner, Veterinary Public Health	MOH
5	David Musunga	Assistant Commissioner Biosafety Biosecurity	Ministry of Science and Technology
6	Robert Mwebe	Principal Veterinary Officer (PVO)	MAAIF
7	Paul John Lumu	SVO	MAAIF
8	Lydia Adong Laura	Veterinary Officer (VO)	Mbale DLG
9	Moses Mwanja	Senior Veterinary Officer (SVO)	MAAIF
10	Alfred Wejuli	Public Health VO	MOH
11	Godwin Bagyenzi Bagashe	Security Officer	UPDF
12	Gladys Aber	VO	MAAIF
13	Ronald Bameka	District Veterinary Officer (DVO)	Lyantonde DLG
14	Alice Namatovu	Lecturer	COVAB Makerere
15	Omodo Michael	Laboratory Scientist	MAAIF
16	Tamale Nassali Gloria	SVO	MAAIF
17	Fred Monje	SVO/One Health Focal Point	MAAIF
18	Rashid Mubiru	SVO	Buliisa DLG
19	Gonzaga Kamoga	Pharmacist	Makerere University
20	Bukirwa Justine	Laboratory Technical Officer	IDI
21	Herbert Bakiika	One Health Technical Advisor	IDI
22	Lydia Nakiire	Epidemiology	IDI
23	Maureen Nabatanzi	Surveillance Officer	IDI
24	Immaculate Nabukenya	Project Manager	IDI
25	Ekwaro Obuku	Policy Technical Advisor	IDI
26	Achan Martha Isabella	Legal Advisor	IDI
27	Duncan Kabiito	Monitoring and Evaluation Officer	IDI
28	Herman Mwanja	Surveillance Officer	IDI
29	Aisha Nakanwagi	Administrator	IDI
30	Kaziro Michael	DVO	Amudat DVO
31	Israel Mugezi	VO	MAAIF
32	Ojwang Joseph	Public Health Specialist	CDC
33	Caesar Nyolimati	One Health Technical Officer	IDI

34	Racheal Mbabazi	SVO	Uganda Wildlife Education Centre
35	Diana Namanya	Laboratory Technician	UWA
36	Margaret Driciru	SVO	UWA
37	David Muwanguzi	Public Health Veterinary Officer	MOH
38	Babirye Priscilla	Veterinary Inspector	MAAIF
39	Wabwire Tony	Principal Veterinary Officer	Kiryandongo DLG
40	Ndorwa Patrick	Principal Veterinary Officer	Hoima DLG
41	Mangeni George Otebero	Principal Veterinary Officer	Namayingo DLG
42	Kemiyondo Honest	VI/ Epidemiologist	MAAIF
43	Dan Tumusiime	Senior Veterinary Officer	MAAIF
44	Henry Mulondo	PVO	Kabarole DLG
45	Philip Wakimwere	SVO	Mbale DLG
46	Patrick Barasa	District Production Officer (DPO)	Busia DLG
47	Fred Sserwano Kafeero	PVO	Butambala DLG
48	Dismas Katerana	DVO	Buhweju DLG
49	Moses Okino	DVO	Moroto DLG
50	Stella Acaye Atim	PVO	NADDEC, MAAIF
51	Abubaker Mayanja	Private practitioner	Biyinzika poultry International
52	Lawrence Kisuule	DVO	Nakaseke DLG
54	Isaac Ongom	AHO	Namisindwa DLG
55	Grace Asiimwe	DVO	Kiruhura DLG
56	Immaculate Akusekera	DVO	Kibaale DLG
57	Mukasa Matinda	DVO	Yumbe DLG
58	Esther Nambo	Data Entrant	MAAIF
59	Namayanja Josephine	SVO	MAAIF
60	Olympia Mugarura	Laboratory Technician	MAAIF
61	Mary Gorreti Kulume	PVO	Napak DLG
62	Hilary Arinaitwe	DVO	Ibanda DLG
63	David Kiryabwire	DVO	Mukono DLG
64	Andrew Akashaba	DVO	Mbarara DLG
65	Hannington Katumba	SVO	KCCA
66	Kairu Krizostom	VO	Masindi
67	Henry Mugaya	DVO	Rubirizi
68	Kibaya Yusuf	DVO	Kasese
69	Kalyango Andrew	Veterinary Inspector	MAAIF