WORKING DRAFT

IRAQ CLINICIAN ENGAGEMENT PROGRAM (CEP)

BIOTHREAT PATHOGENS (BP) – CLINICAL GUIDELINES

PREPARED WITH SUPPORT FROM THE BIOLOGICAL THREAT REDUCTION PROGRAM

2022

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1.0 Summary

The Clinical Guidelines for Biothreat Pathogens (BPs) have been developed to improve the detection, diagnosis, and treatment of diseases caused by various biothreat pathogens by Iraqi clinicians and other frontline healthcare workers. The Ministry of Health (MOH) included many of the biothreat pathogen diseases in the clinical guidelines for the infectious diseases that were developed in 2012. The same document was updated in 2019. A 2021 assessment of frontline healthcare workers in the differential diagnosis of BP suspects showed significant gaps in BP knowledge and practices. Currently, there are no guidelines available for differential diagnosis of biothreat pathogens, standards for BP case notification from front-line health workers, or capacities to collect and transport specimens from BP suspects for diagnostic testing. Most suspected BP cases must visit district or teaching hospitals for specimen collection, which in turn ship any specimens to the Baghdad Central Public Health Laboratory (CPHL) for testing. There are currently no guidelines available for engaging communities in preventing and responding to natural BP outbreaks in areas with high levels of human-animal interactions. Similarly, guidelines or systems are lacking in areas that could experience the deliberate and/or accidental release of BP agents. Anecdotal evidence from clinicians interviewed suggested a current turn-around-time from sample collection to result receipt of three to seven days. Timely notification of presumptive or confirmed BP cases to higher levels also remains a challenge, resulting in delayed outbreak investigation response, to reduce the further spread of the specific biothreat pathogens.

The revised clinical guidelines attempt to support clinicians in three key components: 1) strengthening differential diagnosis of biothreat pathogens, 2) providing access to information that would improve the quality of clinical services and case management including patient follow up and strategies for infection prevention and control, and 3) providing a framework for local response to BP outbreaks.

2.0 Anthrax

2.1 Summary

Signs and Symptoms	Symptoms will depend on Fourth type as following: **1.Cutaneous:** Painless, pruritic papules or vesicles that form black eschars, often surrounded by edema or erythema. Fever and lymphadenopathy may occur.
	2.Ingestion: • Oropharyngeal: mucosal lesion in the oral cavity or oropharynx, sore throat, difficulty swallowing, and swelling of neck. Fever, fatigue, shortness of breath, abdominal pain, nausea, /vomiting may occur. • Gastrointestinal: abdominal pain, nausea, vomiting, diarrhea, abdominal swelling. Fever, fatigue, and headache are common.
	3.Inhalation: Biphasic, presenting with fever, chills, fatigue, followed by cough, chest pain, shortness of breath, nausea/vomiting, abdominal pain, headache, diaphoresis, and altered mental status. Pleural effusion or mediastinal widening on imaging.
	4.Injection: Soft tissue infection; no apparent eschar. Fever, shortness of breath, nausea may occur. Occasional meningeal or abdominal involvement.
Incubation	Usually, < 1 week but as long as 60 days for inhalation of anthrax.
Case Classification	**Clinical criteria**: • **Suspected case**: A case that is compatible with the clinical description and has an epidemiological link to confirmed or suspected animal cases or contaminated animal product. • **Probable case**: A suspected case that has a positive serology test or with Gram stain positive. • **Confirmed case:** A case with positive PCR and culture
Differential Diagnosis	Varies by form; mononucleosis, cat-scratch fever, tularemia, plague, sepsis, bacterial or viral pneumonia, mycobacterial infection, influenza, hantavirus
Mode of transmission	a. Contact with infected animals or animal products such as wool, hides, or hair, contact with infected animal carcasses or eating contaminated meat b. Onward transmission – contact with infected patients
Laboratory Testing	Diagnosis of confirmed cases will be done by Gram Stain & Culture. **Ensuring treatment starts after specimen collection and lab confirmation*
Treatment -	Adult Procaine penicillin G, 0.6–1.2 M units IM q 12–24 h, Penicillin G, sodium or potassium 4 M units IV q 4–6 h _ Amoxicillin 500 mg PO q 6–8 h Alternative *: _ Doxycycline 100 mg IV/PO q 12 h Ciprofloxacin 200–400 mg IV q12 h, followed by 500–750 mg PO q 12 h up to 60 days
	Child Give antibiotics according to the body weight. *Antibiotic Susceptibility testing: Change treatment according to result of C/S
Duration of infection	Varies with type/mode of infection, sometimes may be up to 60 days
Case Management and Prevention	a. Using case management + IPC instruction m+ Triage measures for early treatment and prevention of nosocomial infection. b. Reduce exposure to the patient as well as infected animals in the farm or animal products, cadavers, etc. c. Follow-up: Enhance active surveillance in the affected area.

Reporting, Surveillance Public Health Actions,	a. Immediately Report and notify Public Health Directorate (Centers for Disease Control [CDC]/ Zoonotic Section, Surveillance Section, FETP) using MoH forms and reporting protocols b. Identify close contacts or other who may have been potentially exposed
Infection Control	a. **Infection Control** among health Facility, Households and Managing hazardous waste have to be managed according to infection prevention and control guidelines (IPC GL)
Communication	a. Communication with suspected or confirmed patients would be according to Anthrax guideline with highly precautions b. Educational programs have to educate the patients' family and farmer/owner to recognize, and report suspected anthrax and take proper action over the disposal of the carcass.
Coordination	Sharing information and knowledge between the Ministries of Agriculture and Health (MOA and MOH) are essential to control of anthrax and inter-sectoral cooperation with all other stakeholders is crucial to control the disease like Ministry of Environment to monitor Slaughterhouses.
Waste, equipment and laundry Treatment and management	Treat contaminated materials according to IPC GL

2.2 Introduction

Anthrax is an acute infectious disease caused by the spore-forming bacterium *Bacillus anthracis*. Anthrax most commonly occurs in wild and domestic mammalian species (cattle, sheep, goats, camels, antelopes, and other herbivores), but it can also occur in humans when they are exposed to infected animals or to tissue from infected animals or when anthrax spores are used as a bioterrorist weapon.[1]

Anthrax has been reported in agricultural regions of South and Central America, sub-Saharan Africa, central and southwestern Asia, and southern and eastern Europe. Biodefense experts often place Bacillus anthracis at or near the top of the list for potential threat agents. Inhalation anthrax is particularly deadly, as demonstrated by the 1979 accidental release of B. anthracis from a military microbiology facility in the Sverdlovsk region of Russia; 88% (66/75) of patients reported with inhalation anthrax died. More recently, humans have acquired disease from exposure to spores released purposefully as a bioterrorist weapon and accidentally from naturally occurring sources.[2]

1) Human anthrax incidence is dependent on the level of exposure to affected animals and national incidence data for non-industrial cases reflect the national livestock situation and direct human-to-human transmission is exceedingly rare.

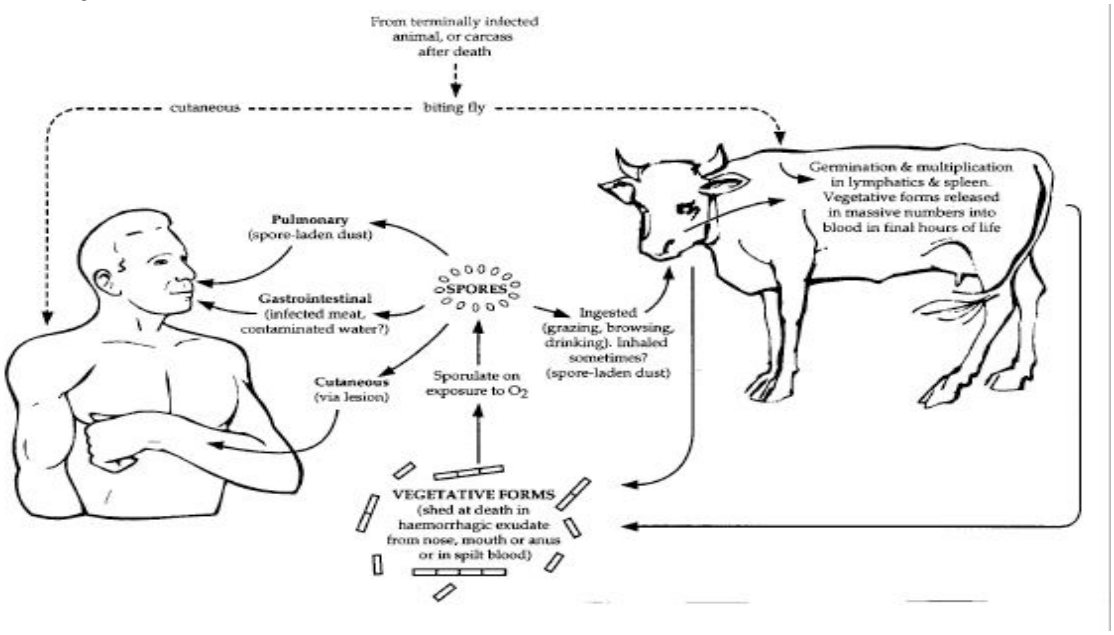
Anthrax is an endemic disease in Iraq and in recent past years several outbreaks were reported. In 2008, an outbreak of cutaneous anthrax occurred in Duhok governorate with 42 human cases. Also in 2021, KRG/MOH reported 14 cutaneous Anthrax cases.

2.3 The causative agent, pathogenesis, and mode of transmission

The causative agent of anthrax is B. anthracis; a non-motile spore-forming, gram-positive, rod-shaped bacterium. The spores of B. anthracis, which can remain dormant in the environment for decades, are the infectious form, but vegetative B. anthracis rarely causes disease.[3]

The spore forms are markedly resistant to biological extremes of heat, cold, pH, desiccation, chemicals (and thus to disinfection), irradiation and other such adverse conditions. Therefore, the spore forms are the predominant phase in the environment. Within the infected host, the spores germinate to produce the vegetative forms, which multiply, eventually killing the host. A proportion of the bacilli released by the dying or dead animal into the environment (usually soil under the carcass) sporulate, ready to be taken up by another animal.[4,5] This cycle of infection is illustrated in Figure 1.

Figure 1. Cycle of infection in anthrax.



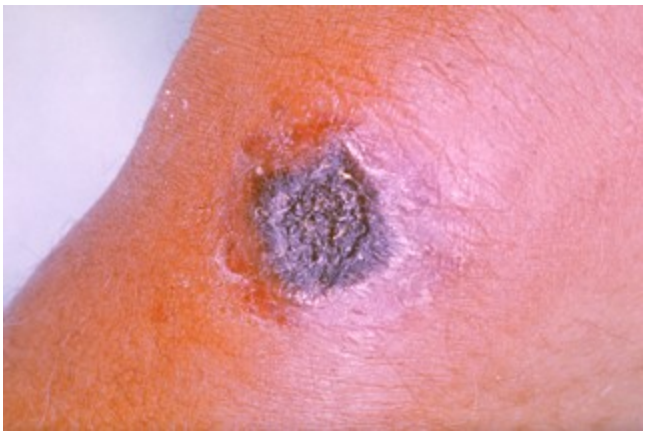
The spore is central to the cycle, although infection can also be acquired through uptake of the vegetative forms when, for example, humans or carnivores eat meat from an animal that died of anthrax or when biting flies transmit the disease. Spores introduced through the skin lead to cutaneous or injection anthrax; those introduced through the gastrointestinal tract led to gastrointestinal anthrax; and those introduced through the lungs lead to inhalation anthrax. After entering a human or animal, B. anthracis spores are believed to germinate locally or be transported by phagocytic cells to the lymphatics and regional lymph nodes, where they germinate; or both. B. anthracis begins producing toxins within hours of germination. [6]

2.4 Description of Illness [4]

a. Cutaneous anthrax (> 95% of human anthrax cases)

Cutaneous anthrax is characterized by one or more painless, itchy papules or vesicles on the skin, typically on exposed skin areas such as the face, neck, forearms, or hands. Within 7–10 days of the initial lesion, a papule lesion forms a skin ulcer (see Figure 2 showing skin lesion caused by Anthrax). The ulcer subsequently crusts over, forming a painless black eschar that is the hallmark of cutaneous anthrax. In addition, localized swelling, painful swollen regional lymph nodes, and systemic symptoms can occur. The untreated case fatality rate is 5–20%; death is rare with appropriate therapy.

Figure 2: A skin lesion caused by anthrax



b. Ingestion anthrax

Ingestion anthrax is an uncommon form of the disease. It can present as two sub-types:

- **Oropharyngea**l: When anthrax spores germinate in the oropharynx, a mucosal lesion may be observed in the oral cavity or oropharynx. Symptoms include sore throat, difficulty swallowing, and swelling of the neck. Symptoms resembling a viral respiratory illness may occur, as well as cervical lymphadenopathy, ascites, and altered mental status. Case fatality was 50% in an oropharyngeal outbreak in Thailand due to contaminated water buffalo meat.
- **Gastrointestina**l: When anthrax spores germinate in the lower gastrointestinal tract, symptoms include abdominal pain, nausea, vomiting or diarrhea (either of which may contain blood), and abdominal swelling. Less specific symptoms such as fever, fatigue, and headache are also common. Altered mental status and ascites may be observed. The case fatality rate is estimated to be 25–60%. While antibiotic treatment may decrease deaths, the nonspecific initial presentation makes diagnosis difficult in the absence of a known exposure or cluster of disease. Recent gastrointestinal outbreaks due to contaminated meat have occurred in Bangladesh, Kenya, the Philippines, and Uganda.

C. Inhalation anthrax

Inhalational anthrax typically progresses through two distinct stages. The first, lasting from several hours to several days, involves influenza-like symptoms such as low-grade fever, non-productive cough, malaise, fatigue, and chest discomfort. The second stage has abrupt onset of high fever, severe respiratory distress (dyspnea and hypoxia), and shock. Non-thoracic symptoms such as nausea, vomiting, abdominal pain, headache, sweating, and altered mental status may occur. Imaging often shows a widened mediastinum. Therapy must be started early in the course of illness to be effective

d. Injection anthrax

Injection anthrax generally presents as a severe soft tissue infection manifested as significant edema or bruising after a contaminated injection. No eschar is apparent. Nonspecific symptoms such as fever, shortness of breath, or nausea are sometimes the first indication of illness. Occasionally patients present with meningeal or abdominal involvement. Injection anthrax has been reported in northern Europe among people injecting heroin.

e. Meningeal anthrax

Meningeal anthrax may complicate any form of anthrax and may also be a primary manifestation. The rarest form of anthrax, it occurs as an acute illness with fever, headache, nausea, vomiting, and fatigue. Meningeal signs altered mental status, and other neurological signs such as seizures or focal signs are usually present. Most patients with anthrax meningitis have CSF abnormalities consistent with bacterial meningitis, and the CSF is often described as hemorrhagic. Mortality is likely 100% even with treatment.

F. Anthrax sepsis

Sepsis develops after the lymphohematogenous spread of *B. anthracis* from a primary lesion (cutaneous, gastrointestinal, or pulmonary). Clinical features are high fever, toxemia, and shock, with death following in a short time. In the differential diagnosis, sepsis due to other bacteria should be considered. Definitive diagnosis is made by the isolation of *B. anthracis* from the primary lesion and from blood cultures.

2.5 Incubation [1]

Most cases occur within 2-7 days of exposure; however, an incubation period of up to 60 days is possible.

2.6 Period of communicability

There is no evidence of direct spread from person to person. Articles and soil contaminated with spores may remain infective for years.

2.7 Susceptibility and resistance [4]

The case fatality rate of cutaneous anthrax usually is about 20% if untreated. Systemic infection resulting from inhalation causes a case fatality rate of 100% and gastrointestinal causes death in 25% to 75 % of cases, if untreated. ***Recovery is usually followed by prolonged immunity.***

2.8 Case classification [4]

- **Suspected case**: A case that is compatible with the clinical description and has an epidemiological link to confirmed or suspected animal cases or contaminated animal product.
- **Probable case**: A suspected case that has a positive serology test or with Gram stain positive.
- **Confirmed case:** A case with positive PCR and culture

2.9 Laboratory diagnosis [5]

Diagnosis of confirmed cases will be done by Gram Stain & Culture.

**Ensuring treatment starts after specimen collection and lab confirmation*

2.10 Shipment and storage of sample

Shipment and storage of samples must be conducted be in accordance with CPHL GL and instruction.

2.11 Reporting [5]

The health institution / health directorates in provinces will report the suspected case and notify CDC/MOH by Phone and official letter within 24 to 48 hours and then CDC/MOH will inform the related health facilities. (more details in Surveillance Chapter)

2.12 Treatment

Suggestion antibiotic therapy for anthrax is summarized [5] in table 1.

Table 1: Suggested antibiotic therapy for anthrax.

Category	Antibiotic	Duration
Naturally occurring anthrax	First choice *: _ Procaine penicillin G, 0.6–1.2 M units IM q 12–24 h Penicillin G, sodium or potassium 4 M units IV q 4–6 h _ Amoxicillin 500 mg PO q 6–8 h Alternative *: _ Doxycycline 100 mg IV/PO q 12 h Ciprofloxacin 200–400 mg IV q12 h, followed by 500–750 mg PO q12 h	3–5 days (up to 3–7 days) for cutaneous anthrax without complications; 10–14 days for systemic anthrax (up to 60 days)
Intravenous/injectional anthrax	Combination of antibiotics, plus surgical debridement, followed by reconstructive surgery if required	10–14 days, with up to 60 days for intranasal drug users
Biological weapon or bio-terrorism-related anthrax	_ Ciprofloxacin 200–400 mg IV q 12 h, followed by 500–750 mg PO q12 h _ Doxycycline 100 mg IV/PO q12 h	42`–60 days
* For mild cutaneous anthrax, antibiotics may be administered orally. For severe cutaneous or systemic anthrax, intravenous antibiotics must be administered initially; therapy may be changed to oral once body temperature has returned to normal. In cases of disseminated infection, the antibiotic selected initially must be combined with one or two of the following: penicillin, ampicillin, ciprofloxacin, imipenem, meropenem, vancomycin, rifampicin, clindamycin, linezolid, streptomycin, or another aminoglycoside. If the patient presents with meningitis, a combination of at least two antibiotics with the ability to penetrate cerebrospinal fluid must be administered. In addition to antibiotics, an antitoxin may also be administered given, if it is available.		

12. Human vaccines

All personnel who have been potentially exposed and have not been previously fully vaccinated should be considered for post-exposure vaccination as soon as it is made available [5]. **Vaccines currently are not available in Iraq.**

2.13 Infection Control measures [5]

Appropriate infection control measures and decontamination procedures are necessary in contaminated zones or areas, with PPE usage according to National IPC GL.

2.13.1 Precautions for exposed personnel [7, 8]

Risk groups should take the following precautions:

2) Be vaccinated against anthrax if their exposure is frequent and **if the human vaccine is available.**
3) Avoid all blood-spilling operations (slaughtering included) on infected or suspect animals/carcasses.
4) Use PPE
5) Avoid any contact with other persons (family included) or animals, without first changing clothing, washing hands, and taking appropriate disinfection measures
6) Report to a physician any suspicious symptoms appearing after contact with infected animals or materials.
7) Where there is a risk of aerosolization of spores, further precautions should be considered according to National IPC GL.
8) Surgical tools should be sterilized immediately after use, and dressings should be incinerated.

2.14 Communication

Sharing information between MOH and MOA and other stakeholders like Ministry of Environment are essential to control anthrax outbreaks. However, for intentional or laboratory accidental release of anthrax, timely coordination with other ministries and departments may be critical.

Appropriate education must also be available for instruction of veterinary, medical, and other officials in confirmation of diagnosis and correct action thereafter. This can be done by informational broadsheets, manuals, videos and films for disseminating information at courses, seminars and community meetings has been addressed in an exemplary manner [9].

2.15 References

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Annex 1:

Table 1: Summarizes the major components of the different types of Human Anthrax[8]

Reference	Cutaneous Anthrax	Gastrointestinal Anthrax	Inhalational Anthrax	Intravenous/Injectional Anthrax (Includes IV and injectional drug misuse)
Occurrence	Endemic areas and middle-income countries	Consumption of undercooked meat in endemic areas	Bioterrorism, bioweapon, sporadic cases in wool handlers, drummers, drum-makers and persons exposed to infected animals	Drug users, industrial Countries
Incubation period	1–17 days	2–5 days	1–6 days; periods up to 43 – 60 days have been observed	1–10 days
Lesion site	Exposure site, mostly superficial	Abdominal pain, vomiting (including hematemesis), hematochezia, and occasional watery diarrhea	Hemorrhagic lymphadenitis, widened mediastinum, meningeal edema and hemorrhage, pleural effusions, pulmonary edema, and hemorrhagic meningitis	Injection site, soft tissue infection with necrosis
Severity of Infection	Mild to severe, rarely complicated, up to 20% die if not treated	Early diagnosis is difficult, resulting in high mortality	Severe	Severe
Diagnosis	Patient history, patient	Patient history, patient examination,	Early diagnosis is difficult. Patient history, examination,	Patient history, patient examination, laboratory results

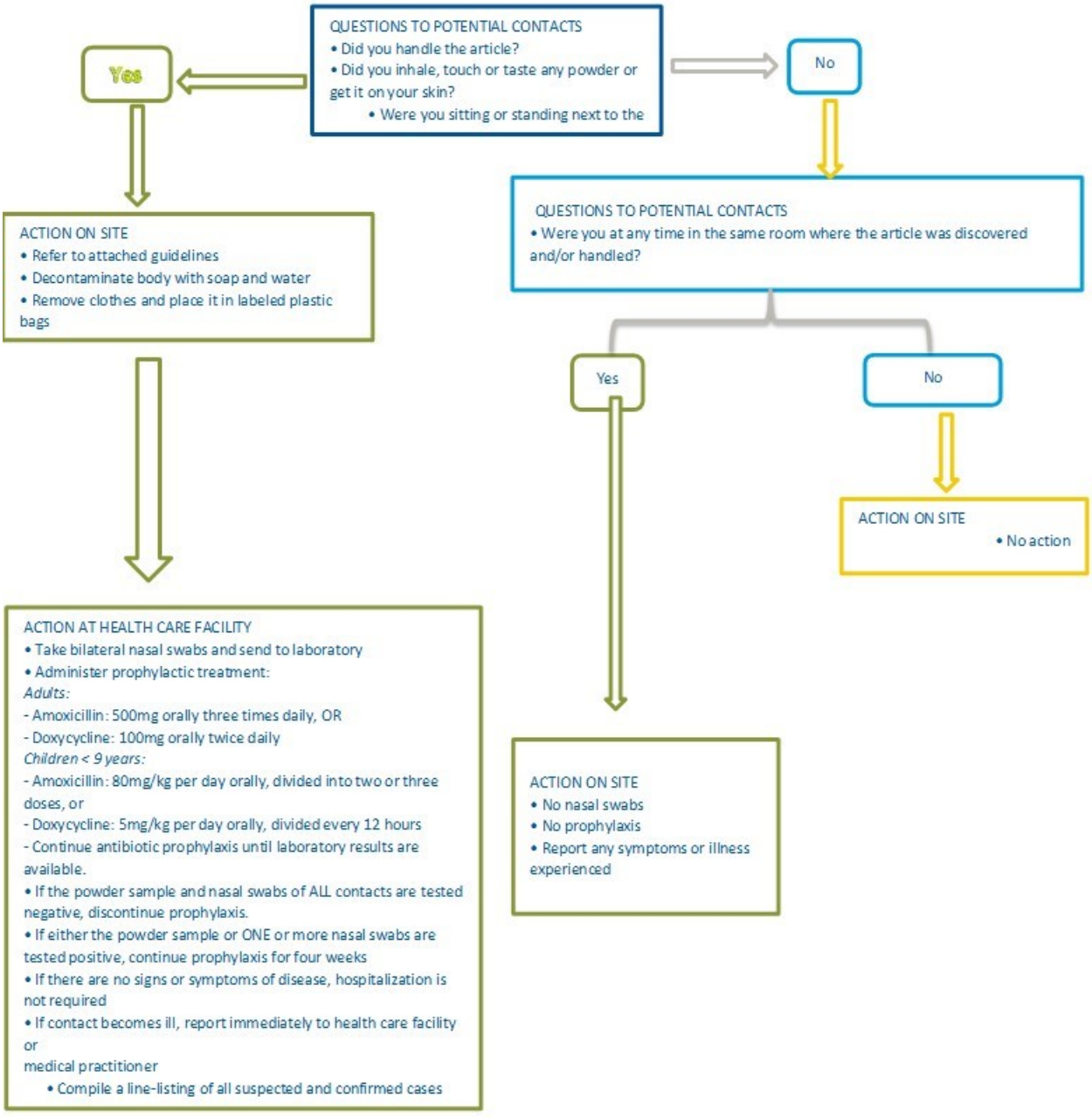
	examination, laboratory results	laboratory results	micro-hemagglutination test specific for PA, X-ray, microbiology (blood, sputum)	
Treatment	Antibiotics, supportive care in severe cases	Antibiotics, supportive care	Antibiotics and supportive care, immunoglobulins	Supportive care, of antibiotic combination treatment
Duration of antibiotic treatment	3–5 days	3–5 days	_2–3 weeks, then 60 days from onset of illness	10–14 days, with up to 60 days for intranasal drug users
Surgical intervention	Rarely	Often due to ascites and/or peritonitis	Rarely	Debridement, reconstructive surgery may be required
Mortality	<1%	4–50%	85–90%. With aggressive treatment, mortality can be reduced to 45%	>30%

Annex 2

Table 2: Protecting Responders' Health Based on Risk Category of Activities [9]

Protective Measure	Guidance for Responders Performing Category 1 Activities	Guidance for Responders Performing Category 2 Activities
Post-Exposure Prophylaxis Antimicrobial Drugs	▪ Recommended for all responders who have not been fully vaccinated previously and for those who have been fully vaccinated but whose PPE has been disrupted ▪ Begin regimen as soon as possible before or after initial exposure	
Post-Exposure Vaccination	Yes, at the recommendation of public health officials and according to vaccine availability	
Personal Protective Equipment	Level C protective ensemble with a full-face piece air purifying respirator (APR) with P100 or N100 filters OR Level C protective ensemble with a full facepiece powered air purifying respirator (PAPR) equipped with high efficiency (HE) filters Disposable hooded coveralls and shoe coverings Nitrile or vinyl gloves	PPE, including respiratory protection and protective clothing, may be required *Note: Appropriate risk assessments will be performed at the time of the event to select the necessary PPE, informed by responder activities, proximity to the release and/or other confirmed contaminated areas, and specific event information available at the time. The use of PPE at the time of the event should be precautionary, with higher levels of PPE used until the response data indicate otherwise. When sufficient data and information are available, the assessment should be repeated with a focus on activities.* _____ *Examples of PPE appropriate for Category 2 activities include filtering facepiece respirators and gloves for responders contacting potentially contaminated surfaces or items.*
Personal Decontamination / Hygiene	After appropriate decontamination procedures, correctly remove and dispose of protective clothing Dispose of undergarments worn under protective clothing Shower with soap and water and wash hair Depending on the type of respirator worn, decontaminate or dispose of respiratory protection *Note: Elastomeric respirators are amenable to decontamination.*	

Annex 3: FLOW CHART FOR SUSPECTED ANTHRAX EXPOSURE



The differential diagnosis of anthrax includes a wide range of infectious and non-infectious conditions as following.

Cut. Anthrax	oropharyngeal anthrax	gastrointestinal anthrax	inhalation anthrax	anthrax meningitis	Sepsis
Boil (early lesion)	Diphtheria	Food poisoning (in the early stages of intestinal anthrax)	Mycoplasma pneumoniae	Acute meningitis	Whole-body inflammatory state caused by infection. Symptoms of sepsis are often related to the underlying infectious process
arachnid bites	Complicated tonsillitis	Acute abdomen	Legionnaires' disease	Cerebral malaria	
Erysipelas	Streptococcal pharyngitis	Hemorrhagic gastroenteritis	Psittacosis	Subarachnoid hemorrhage	
Glanders	Vincent's angina	Necrotizing enteritis caused by Clostridium perfringens	Tularemia		
Plague	Ludwig's angina	Dysentery (amebic or bacterial)	Q fever		
Syphilitic chancre	Parapharyngeal abscess		Viral pneumonia		
Ulcer glandular tularemia	Deep-tissue infection of the neck		Histoplasmosis		
Rickettsia disease			Coccidiomycosis		
Vaccinia			Malignancy		
Cowpox					
Rat-bite fever					
Leishmaniasis					
Ecthyma gangrenosum					
Herpes					

3.0 Crimean-Congo Hemorrhagic Fever (CCHF)

3.1 Summary

Signs and Symptoms	Highly viral infectious disease leads to potentially lethal disease syndrome characterized by fever, malaise, vomiting, mucosal and gastrointestinal bleeding, edema, and hypotension.
Incubation	Incubation period ranges from 3 to 7 days and depends on host
Case Classification	1. **Suspected case**: Patient with sudden onset of illness with high-grade fever over 38.5^{C} for more than 3 days and less than 10 days with history of contact with animals, tick exposure, or contact to patient. 2. **Probable case:** Suspected case with acute history of febrile illness 10 days or less, AND Thrombocytopenia less than 50,000/mm3 AND any two of the following: Petechial or purpuric rash, epistaxis, hematemesis, hemoptysis, Blood in stools, Ecchymosis, gum bleeding, other hemorrhagic symptom, AND No known predisposing host factors for hemorrhagic manifestations. 3. **Confirmed case**: Probable case with Positive laboratory diagnosis of CCHF in blood sample.
Differential Diagnosis	HFVs, Meningococcemia, Influenza, Viral hepatitis, Malaria, Rickettsial diseases, Toxic shock syndrome, Hemolytic uremic Syndrome, Leptospirosis, Idiopathic or thrombotic thrombocytopenic purpura, Acute leukemia, Collagen-vascular diseases.
Mode of transmission	a. Transmission to humans occurs through contact with infected ticks or animal blood. b. Onward transmission occurs through contact with infected patient or animal and its product.
Laboratory Testing	A. General test: Platelet count, Bleeding time, prothrombin time Albumin in urine, SGPT, SGOT, Serum glutamic pyruvic transaminase, Serum glutamic oxaloacetic transaminase b. Confirmed test: PCR, ELISA
Treatment -	a. Adult: supportive treatment, Oral Ribavirin: 2 gm loading dose 4 gm/day in 4 divided doses (8 hourly) for 6 days b. Child: According to body weight. c. antibiotic susceptibility testing should be done for cases.
Duration of treatment	According to Clinical judgment
Case Management and Infection Control	a. Using case management + IPC instructions + Triage measures for early treatment and prevention of nosocomial infection. b. Reduce exposure to the patient as well as infected animals in the farms or animal products, cadavers, etc. c. Follow-up: Enhance active surveillance in the affected area.

Reporting , Surveillance Public Health Actions	a. Immediately Report and notify Public Health Directorate(CDC/ Zoonotic Section, Surveillance Section, FETP) using MoH forms and reporting protocols b. Identify close contacts or other who may have been potentially exposed to risk factors. c. Inform family members the disease is treatable, but household needs to reduce exposure to the patient as well as infected animals in the farm or animal products
Prevention	a. Contact tracing of index cases and preventive therapies where applicable b. Containment of transmission (within the health facility) c. Clinical measures during a mass incident (Triage) d. Community education
Communication	a. Communication with suspected or confirmed patients would be according to CCHF guidelines with general precautions for infection prevention and control b. Educational programs should focus on the patients' family and farmer/owner to recognize, and report suspected CCHF and the mode of transmission through tick bites, handling ticks, and handling and butchering animals, and the means for personal protection
Coordination	Sharing information and integrated surveillance between MOA and MOH are essential to control of CCHF and inter-sectoral cooperation with all other stakeholders is crucial to control the disease.
Waste, equipment and laundry Treatment and management	Treat contaminated materials according to IPC GL

3.2 Introduction

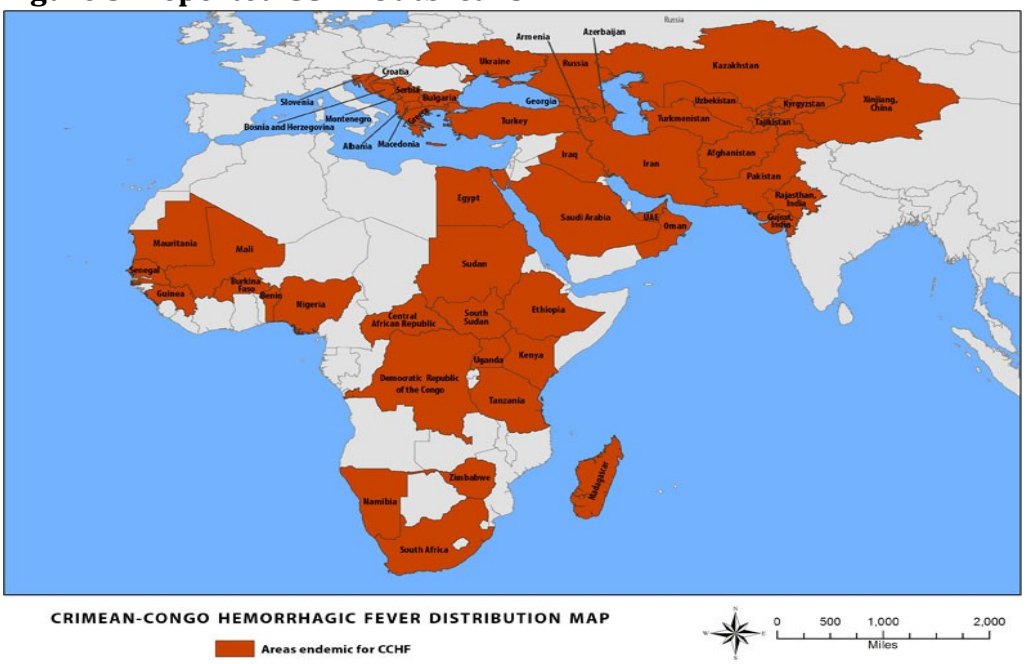
CCHF is a tick-borne zoonotic viral disease that can be severe in humans but does not produce clinical signs in domestic and wild ruminants (cattle, sheep, and goats), insectivores, small lagomorphs and rodents caused by RNA viruses belong to family named Bunyaviridae. General characteristic of this viral family can be found in below tables.[1]

Name/ Bunyaviridae	*Disease*	*Natural Distribution*	*Source of Human Infection*	*Incubation Period (days*
Nairovirus	*Crimean-Congo HF*	*Europe, Asia, Africa*	*Tick* *Slaughter of domestic animal, nosocomial*	*3-12*
Phlebovirus	*Rift Valley Fever*	*Africa*	*Mosquito* *Slaughter of domestic animal*	*2-5*
Hantavirus	*Hemorrhagic fever with Renal Syndrome (HFRS)*	*Asia, Europe, possibly worldwide*	*Rodent*	*9-35*

3.3 Epidemiology

Crimean-Congo hemorrhagic fever (CCHF) is a tick-borne zoonotic viral disease that can be severe in humans but does not produce clinical signs in domestic and wild ruminants. In recent years, outbreaks in Asia and the Middle East have become more common (see Figure 3). Significantly, as no previous sporadic cases or outbreaks had ever been reported there, clinical cases of CCHF were observed in Turkey for the first time in the early 2000s, affecting people who handled livestock or were exposed to infected patients.[2]

Figure 3: Reported CCHF Outbreaks



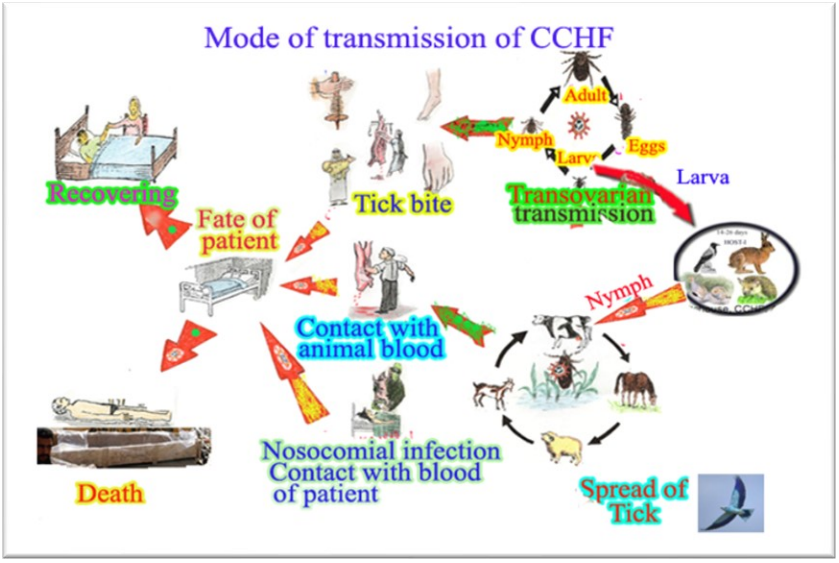
Geographic distribution of CCHF is correlated to the distribution of *Hyalomma* ticks worldwide. Factors that influence tick populations and distributions include weather, climate change, vertebrate host populations, and vegetation. Changes in these factors can alter tick survival, maturation, and egg production.[3]

CCHF is endemic in Iraq with recurrent outbreaks. First case was reported in 1979 in Baghdad. In 2021, Iraq reported many cases of CCHF. Most of the current cases have been reported from Thi Qar (10 cases), Ninewa (2 cases), Erbil (3 cases), Baghdad (3 cases), Babil (2 cases), Diyala (1 case) and Al Anbar (1 case).

3.4 Mode of Transmission

CCHF is a tick-borne disease. Ixodid (hard) ticks, especially those of the genus, *Hyalomma*, are both a reservoir and a vector for the CCHF virus. Numerous wild and domestic animals, such as cattle, goats, sheep and hares, serve as amplifying hosts for the virus. Transmission to humans occurs through contact with infected ticks or animal blood. CCHF can be transmitted from one infected human to another by contact with infectious blood or body fluids. Documented spread of CCHF has also occurred in hospitals due to improper sterilization of medical equipment, reuse of injection needles, and contamination of medical supplies. [6, 7] (see Figure 4)

Figure 4: CCHF Mode of transmission



3.5 Sign and Symptoms [8]

The onset of CCHF is sudden, with initial signs and symptoms including headache, high fever, back pain, joint pain, stomach pain, and vomiting. Red eyes, a flushed face, a red throat, and petechiae (red spots) on the palate are common. Symptoms may also include jaundice, and in severe cases, changes in mood and sensory perception. As the illness progresses, large areas of severe bruising, severe nosebleeds, and uncontrolled bleeding at injection sites can be seen, beginning on about the fourth day of illness and lasting for about two weeks.

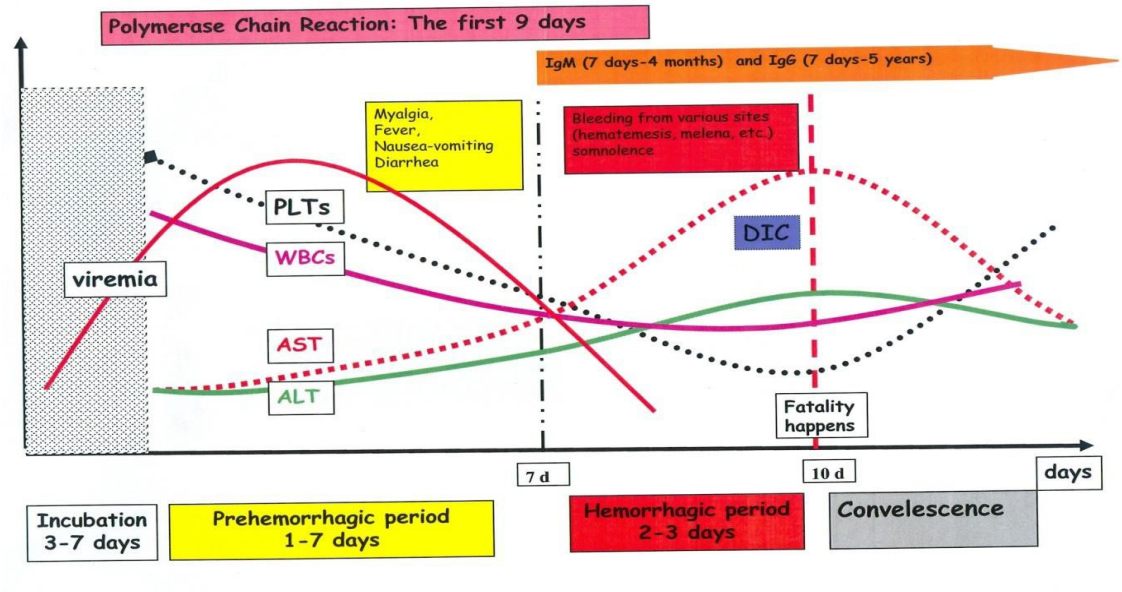
3.6 Susceptibility [8]

Immunity after infection probably lasts for life.

3.7 Incubation period [9, 10]

The incubation period of the virus ranges from 1 to 13 days and depends on host, route of exposure and viral inoculum. (Figure 5)

Figure 5: Incubation Period[11]



3.8 Case Classification [8]

- **Influenza-like symptoms**:
  (fever, chills, headache, and myalgia) present first. As symptoms worsen patients may experience rash, vomiting, abdominal pains, and diarrhea.
- **The hemorrhagic phase:**
  Typically, 2–3 days, consists of bleeding from the nose, gastrointestinal tract, uterus, and/or urinary tract.
- **Neurological symptoms:**
  Such as reduced alertness, agitation, mood swings, and lack of clear thinking or ability to concentrate can develop. Supportive therapy is the main form of treatment. Mortality rates can range from 5–80 percent.

3.9 Case definition [11]

3.9.1 Suspected case- CCHF:

Patient with sudden onset of illness with high-grade fever over 38.5^{C} for more than 3 days and less than 10 days, especially in CCHF endemic area and among those in contact with sheep or other livestock (shepherds, butchers, and animal handlers). ***Note that fever does not respond to antibiotic or anti-malarial treatment***.

3.9.2 Probable case

Suspected case with acute history of febrile illness 10 days or less, **AND** Thrombocytopenia less than 50,000/mm3 **AND** any two of the following:

- Petechial or purpuric rash, Epistaxis, Hematemesis, Hemoptysis, Blood in stools, Ecchymosis, Gum bleeding, Another hemorrhagic symptom **AND**
- No known predisposing host factors for hemorrhagic manifestations.

3.9.3 Confirmed case:

Probable case with positive diagnosis of CCHF by ELISA or PCR

3.10 Differential Diagnosis

The differential diagnosis of CCHF includes a wide range of infectious and non-infectious conditions as shown in Table 2.

Table 2: Differential Diagnosis of CCHF

Communicable /Infectious disease	Non-communicable/Non-infectious diseases
HFVs	Idiopathic or thrombotic thrombocytopenic purpura
Meningococcemia	Acute leukemia
Influenza	Collagen-vascular diseases
Viral hepatitis	
Malaria	
Rickettsial diseases	
Toxic shock syndrome	
Hemolytic uremic Syndrome	
Leptospirosis	
Sepsis	

3.11 Diagnosis of CCHF [12, 13]

3.11.1 Full history

More than 68% of CCHF cases have an initial misdiagnosis of various diseases Consider geographic distribution of diseases therefore Full history from suspected patient should be taken about:

- Tick bite
- Contact with animal
- Slaughter of animal
- Contact with patient
- Traveler history

3.11.2 Laboratory Diagnosis:

- **General test**: Platelet count, Bleeding time, prothrombin time Albumin in urine, SGPT, SGOT,
- **Specific test for CCHF:**
  REAL -TIME PCR (Quantitative real-time RT-PCR (qRT-PCR)
  - Detection of IgM or IgG by ELISA Method

3.12 Treatment [14]

3.12.1 Standard treatment is supportive therapy

Early aggressive intensive care support (plasma if hypo coagulation, Platelet transfusion is warranted to maintain platelet count > 50,000/mm3 in the setting of bleeding and for patients with platelet count < 20,000/mm3 in the absence of bleeding). If the patient meets the case definition for probable CCHF, oral ribavirin treatment protocol needs to be initiated immediately with the consent of the patient/ relatives and strictly in consultation with the attending physician.

Oral Ribavirin: 2 gm loading dose 4 gm/day in 4 divided doses (8 hourly) for 6 days
2 gm/day in 4 divided doses for 6 days.

Please note that the pregnancy should be allowed after completing the Ribavirin course of treatment within 6 months.

3.13 Outcome of disease:

CCHF is a severe disease with a high case fatality rate ranging from 2% to 50%.

3.14 High-risk groups [8]

- Animal herders, livestock workers, and slaughterhouses in endemic areas are at risk of CCHF.
- Healthcare workers in endemic areas that have unprotected contact with infectious blood and body fluids.
- Individuals and international travelers with contact to livestock in endemic regions may also be exposed.

3.15 Management of the CCHF case in the health facilities [14]

- Patients with probable or confirmed CCHF should be isolated and cared for using strict barrier-nursing techniques – masks, goggles, gloves, gowns and proper removal and disposal of contaminated articles.
- Only designated medical / para-medical staff and attendants should attend the patient and wearing PPE.
- All secretions of the patient and hospital clothing in use of the patient and attendants should be treated as infectious and, where possible, should be autoclaved before incinerating.
- Every effort should be made to avoid spills, pricks, injury, and accidents during the management of patients. Needles should not be re-capped but discarded in proper safety disposal box.
- All used material e.g., syringes, gloves, cannula, tubing etc., should be collected in autoclave-able bag and autoclaved before incinerating.
- All instruments should be de-contaminated and autoclaved before re-use.
- All surfaces should be decontaminated with liquid bleach.

- After the patient is discharged, room surfaces should be wiped down with liquid bleach to kill the virus. and the room should be fumigated if there is risk of tick infestation from patient's clothes and tools. Airborne precautions should be added in specific conditions according to WHO recommendations.
- Waste Management: Treat waste contaminated with blood, body fluids, as medical waste, human tissues and laboratory waste that is directly associated with specimen processing should also be treated as medical waste in accordance with IPC GL. Iraqi national IPC guideline.
- Discharge of patients

The main criteria for discharge are resolving fever and signs and symptoms of CCHF with cessation of bleeding, Laboratory tests taken for decision of discharge in rank of order are Platelet count (> 100.000/mm3or 50.000-100.000/ mm3 but in a trend of increase), prothrombin time (PT), activated partial thromboplastin time (apPTT), Transaminases of lower than 5 times of upper limit of normal. Relapse and reinfection after discharge were not reported.

After the patient is discharged,

- Room surfaces should be wiped down with liquid bleach to kill the virus and the room should be fumigated.
- Please see above other instructions for contacts of a CCHF case.

3.16 Prevention and Control measures [5, 8]

3.16.1 Public Measures

- About the mode of transmission through tick bites, handling ticks, and handling and butchering animals, and the means for personal protection
- Tick control with Pesticides in accordance with CDC / MOH and MOA instruction
- To minimize exposure to tick, wear light clothing that covers legs and arms, tuck pants into socks, and apply tick repellent.
- Persons who work with livestock or other animals in the endemic areas should take practical measures to protect themselves. They include the use of repellents on the skin and clothing and wearing gloves or other protective clothing to prevent skin contact with infected tissues or blood.
- *All sexual partners of CCHF patient should be under medical observation with twice daily temperature checks for 14 days*
- In case of death of CCHF patient, family should be informed to follow safe burial in accordance with CDC/MOH instruction.

3.16.2 Health Education

- Public health advice should focus on reducing the risk of tick-to-human transmission as mentioned before.
- Reducing the risk of animal-to-human transmission.

- Wear gloves and other protective clothing while handling animals or their tissues in endemic areas, notably during slaughtering, butchering and culling procedures in slaughterhouses or at home.
- Quarantine animals before they enter slaughterhouses or routinely treat animals with pesticides two weeks prior to slaughter.

3.16.3 Reducing the risk of human-to-human transmission in the community:

- Avoid close physical contact with CCHF-infected people.
- Wear gloves and protective equipment when taking care of ill people.
- Wash hands regularly after caring for or visiting ill people.

3.16.4 Vaccines [15]

Even though there is not a globally recognized vaccine for CCHF, there is a vaccine that has been in use in Bulgaria since 1974. The Bulgarian vaccine originated in the Union of Soviet Socialist Republics (USSR). Vaccines are not available in Iraq for CCHF.

3.17 Reporting and surveillance [6]

Immediately Report and notify Public Health Directorate (CDC/ Zoonotic Section, Surveillance Section, FETP) using MoH forms and reporting protocols

Identify close contacts or other who may have been potentially exposed active surveillance should be continued. Pls. see Surveillance Chapter)

3.18 Communication [8]

Risk communications with close contact (family), Stakeholders and community are very important as following:

- **Contact**

All contacts should simply be monitored for 14 days (maximum) from the day of last contact with the patient or other source of infection ***by taking temperature twice daily.*** They should have baseline blood tests and start ribavirin ***only*** *if* they become genuinely sick, i.e. (i) Temperature equal to or more than 38.5ºC; (ii) Severe headache; (iii) Myalgia (muscle pains).

- **Community:**

The health awareness creating teams should continue to make awareness among the community on control of transmission of CCHF. Organize campaigns in the school and surrounding community regarding prevention of spread of CCHF

- **Stakeholders**

Communication and coordination between MOH, MOA, and other stakeholders to

- Ensure regular vector control measures are taken in the outbreak prone areas through community-based vector control programs.
- Well maintain the logistics and supplies for the communities under risk
- Introduce suitable biological and physical control measures

- Enforce all available legislatives to control the malpractices and strengthen the legislations

3.19 References

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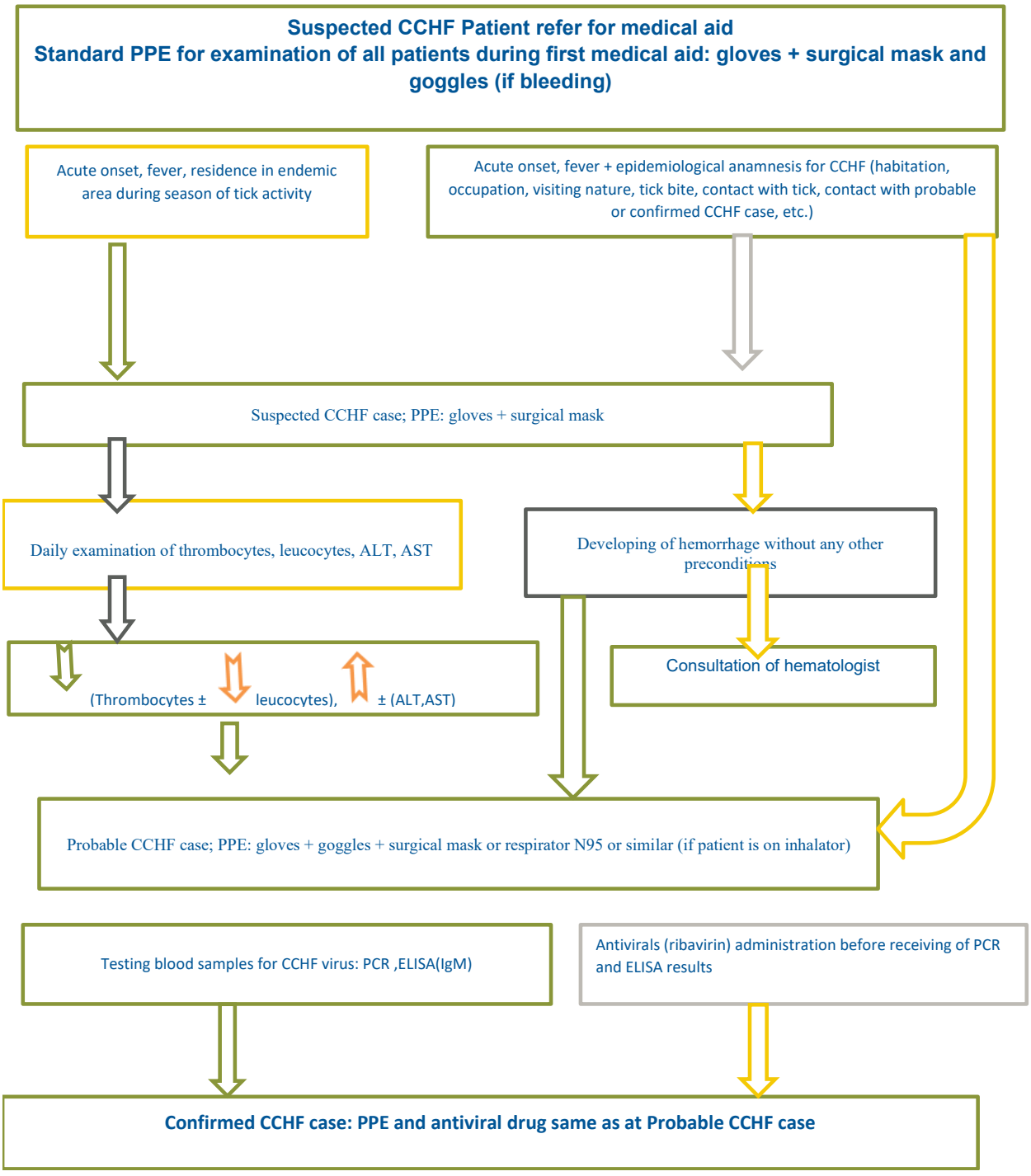
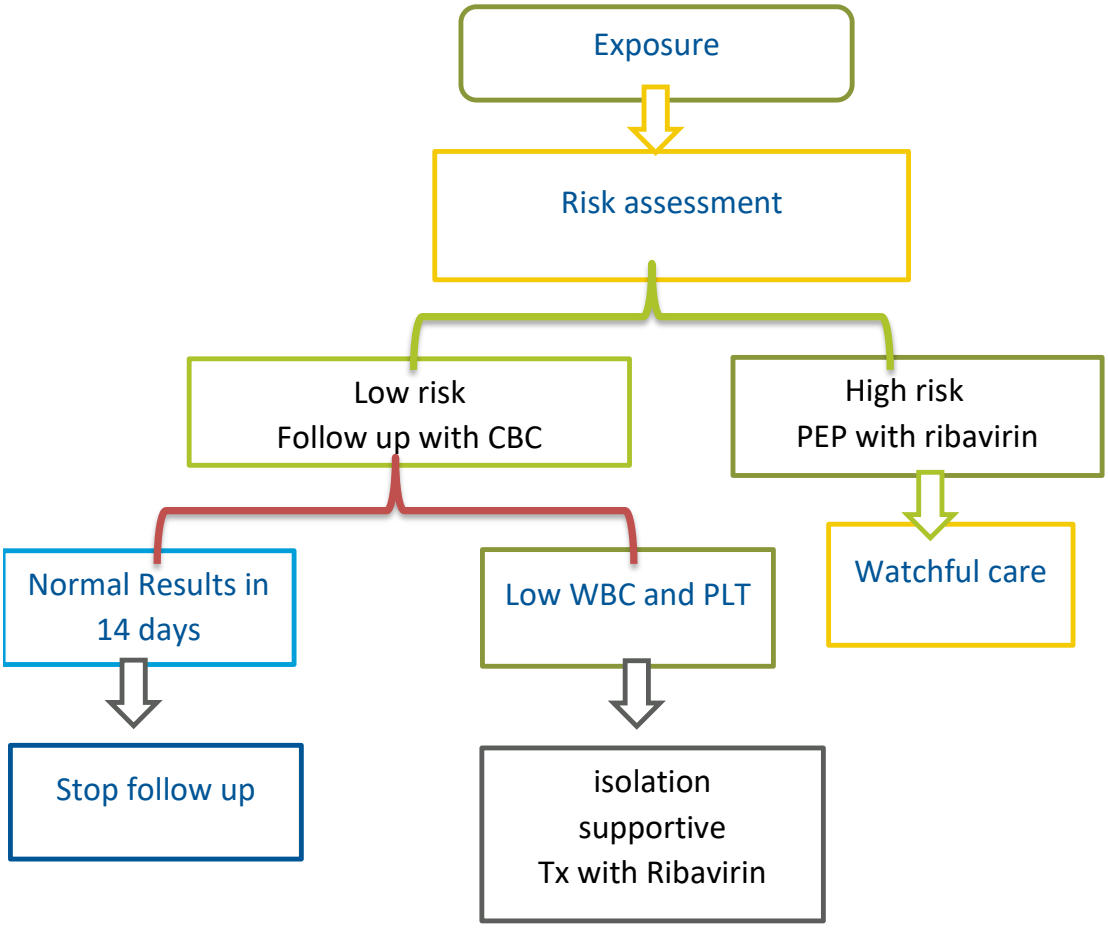
Annex1

Suspected CCHF Patient refer for medical aid
Standard PPE for examination of all patients during first medical aid: gloves + surgical mask and goggles (if bleeding)



Annex 2: Ribavirin in Post-Exposure Prophylaxis for CCHF as showing in below Chart



4.0 Brucellosis

4.1 Summary Guideline

Signs and Symptoms	1. Acute: Fever, Profuse sweating, malaise, anorexia, headache, pain in muscles, joint, and/or back fatigue weakness. 2. Chronic: recurrent fevers, arthritis, swelling of the testicle and scrotum area, swelling of the heart (endocarditis), neurologic symptoms (in up to 5% of all cases), chronic fatigue depression, swelling of the liver and/or spleen, weight loss, Genitourinary involvement, Jaundice
Incubation	The incubation period is highly variable, usually from 5 to 60 days & may occasionally be up to 5 months.
Case Classification	**1. Suspected**: A case that is compatible with the clinical description and is epidemiologically linked to suspected or contaminated animal products. **2. Probable:** A clinically compatible illness with at least one of the following: • Epidemiologically linked to a confirmed human or animal brucellosis case • Presumptive laboratory evidence, but without definitive laboratory evidence, of *Brucella* infection **3. Confirmed**: A suspected or probable case that is confirmed by lab test.
Differential Diagnosis	Malaria, TB, Typhoid fever, Mumps, lymphoma, Arthritis
Reservoir **& Mode of transmission**	a. Reservoirs are cattle, sheep, goats, pigs. Others, including bison, buffalo, camels, dogs, horses, reindeer, and yaks are less important. b. Mode of transmission • Contact with infected animal tissues, blood, urine, vaginal discharges, and aborted animal fetuses and especially placentae. • Ingestion of raw milk and dairy products from infected animals without boiling or pasteurizing milk used. • Inhalation airborne agents in laboratory and Slaughter workers. C. Onward transmission no person to person.
Laboratory Testing	a. Presumptive Positive: Rose Bengal test b. *Confirmatory diagnosis* PCR, Culture, ELISA
Treatment -	a. persons with brucellosis should be treated with a combination of appropriate antibiotics for a prolonged period. There are different regimes for treatment. b. Antibiotic Susceptibility testing must be done before treatment
Duration of treatment	According to Clinical judgment
Case Management & Infection control	a. Using case management + IPC instruction for early treatment and prevention. b. Household Reduce exposure to infected animals in the farm or animal products, c. Follow-up : Enhance active surveillance in the affected area.
Reporting	c. Report and notify Public Health Directorate(CDC/ Zoonotic Section, Surveillance Section, FETP) using MoH forms and reporting protocols

Surveillance Public Health Actions	d. Identify risk group may have been potentially exposed Risk e. Inform family members the disease is treatable, but household needs to reduce exposure to infected animals in the farm or animal products.
Prevention	Contact tracing of index cases and preventive therapies where applicable Containment of transmission (within the health facility) Community education
Reporting and Surveillance	a. Province surveillance unit notify CDC Baghdad Report and notify Public Health Directorate(CDC/ Zoonotic Section, Surveillance Section, FETP) using MoH forms and reporting protocols b. Identify close contacts or other who may have been potentially exposed to same Risk and Inform family members the disease is treatable. c. Data analysis at local level and national level to take action
Communication	a. Communication with suspected or confirmed patients would be according to CDC/MOH guideline. b. Educational programs have to educate the patients' family and farmer/owner to recognize, and report suspected Brucellosis and the mode of transmission and personal protection
Coordination	Sharing information and integrated surveillance between MOA and MOH are essential to control of Brucellosis and inter-sectoral cooperation with all other stakeholders is crucial to control the disease
Waste Treatment and management	Treated as medical waste. (IPC GL)
Treatment of contaminated equipment and laundry	Treated as medical waste (IPC GL)

4.2 Introduction

Brucellosis remains a major zoonotic disease with global significance consequences for public health, animal and international trade in many regions of the world. The disease is known as "undulant fever," "Mediterranean fever" or "Malta fever" which is transmitted by direct or indirect contact with infected animals or their products. It affects people of all age groups and of both sexes, but the disease is very largely occupational, and the majority of cases are males between the ages of 20 and 45 years.[1]

4.3 Epidemiology

Brucellosis is a more common zoonotic disease. It is re-emerging as a public health threat in many regions of the world and is considered as an occupational disease as well as a traveler's disease. The disease is endemic and more than 500,000 new cases have been reported annually in the world, most of them occur in the developing regions.[2]

The most cases of brucellosis occur during the spring and summer. This coincides with the peak period for abortions and parturitions among farm animals and hence for the highest level of exposure of those attending the animals and consuming their milk.[2]

Brucellosis is a common zoonotic disease endemic In Iraq. It has history dating back to 1937 in Iraq when an Iraqi physician first isolated it. The disease is a widely spread in northern Iraqi Provinces, Erbil, Duhok and Sulaymaniyah , and remains a health problem .Sharing borders with Iran, Syria and Turkey, wars and conflicts, deficient protective measurement, the shortage of monitoring plans, and lack of control on animals' transmission through open borders increase the prevalence of Brucella infection. [3,4,5,6]

4.4 The Causative agent

Brucellosis is a zoonotic bacterial disease. There are several different *Brucella* species[5], [7] and the following are of public health importance showing in Table 1:

Table 1: Main Species of Brucellosis

Brucella species	affecting primarily animal
Brucella melitensis	goats, sheep and camels
Brucella abortus	cattle, other bovidae, and cervidae
Brucella suis	Swine
B. canis affecting	Dogs

**B. melitensis* is the type most frequently reported as a cause of human disease and the most virulent type and associated with severe acute disease

4.5 Mode of transmission [8]

Humans acquire the disease through:

- Contact with infected animal tissues, blood, urine, vaginal discharges, and aborted animal fetuses and especially placentae.
- Ingestion of raw milk and dairy products from infected animals without boiling or pasteurizing milk used.
- Inhalation airborne agents in laboratory and Slaughter workers.

****Person-to-person transmission is extremely rare. Occasional cases have been reported in which circumstantial evidence suggests close personal or sexual contact as the route of transmission***

- More potential significance is transmission through blood donation or tissue transplantation. Bone marrow transfer in particular carries a significant risk.

4.6 Reservoirs of infection

Brucellosis is a zoonotic disease; hence, the ultimate sources of infection are infected animals. The key species are the major food-producing animals: cattle, sheep, goats, pigs. Others, including bison, buffalo, camels, dogs, horses, reindeer, and yaks are less important, but they can be very significant local sources of infection in some regions. Recently, the infection has also been identified in marine mammals, including dolphins, porpoises, and seals. [8]

4.7 Pathophysiology

Brucellosis is a zoonotic disease. Humans could be infected by eating undercook meat or raw dairy products, inhalation of the bacteria and direct contact of bacteria with skin wounds or mucous membranes. Following transmission, white blood cells phagocyte the pathogen and transports it via hematologic or lymphatic route to different organs, specially to those of the reticuloendothelial system. Endotoxin lipopolysaccharide LPS plays an important role in: survival of bacteria inside monocytes' cell, suppressing phagosome-lysosome fusion, and internalizing bacteria into endoplasmic reticulum.[9]

4.8 Incubation period

The incubation period is highly variable, usually from 5 to 60 days; 1 – 2 months is common. However, the incubation period may occasionally be up to 5 months.[10]

4.9 Period of Communicability

Direct person-to-person spread of brucellosis is extremely rare. Breast-feeding women may transmit the infection to their infants. Sexual transmission has also been reported. [10]

4.10 Clinical Manifestations

Clinical features: A systemic bacterial disease with acute or insidious onset and Persist symptoms for longer periods as shown in Table 2.[11]

Table 2: Clinical features of Brucellosis

Initial symptoms can include:	Persist symptoms for longer periods.
• Fever • Profuse sweating • malaise • anorexia • headache • pain in muscles, joint, and/or back • fatigue • weakness	• recurrent fevers • arthritis • swelling of the testicle and scrotum area • swelling of the heart (endocarditis) • neurologic symptoms (in up to 5% of all cases) • chronic fatigue • depression • swelling of the liver and/or spleen • weight loss • Genitourinary involvement • Jaundice
**Other sign appearance Pallor, Lymphadenopathy Splenomegaly, Hepatomegaly, Jaundice, Central nervous system abnormalities, Cardiac murmur, Pneumonia.* **If left untreated, patients with brucellosis may progress relapses or chronic brucellosis.* **Some signs and symptoms may persist for longer periods. Others may never go away or reoccur*	

4.11 Differential Diagnosis

Brucellosis must be differentiated from many diseases like Malaria, TB, Typhoid fever , Mumps, lymphoma, Arthritis. (see Annex) [11]

4.12 Clinical Case definition

Case definition is categorized as following: [12,13]

- **Suspected**: A case that is compatible with the clinical description and is epidemiologically linked to suspected or contaminated animal products.
- **Probable:**

A clinically compatible illness with at least one of the following:

- Epidemiologically linked to a confirmed human or animal brucellosis case
- Presumptive laboratory evidence, but without definitive laboratory evidence, of *Brucella* infection
- **Confirmed**: A suspected or probable case that at is laboratory-confirmed through ELISA, culture. PCR
  (Please see Annex)

4.13 Risk factors

Many risk exposure factors may be associated with Brucellosis as following [9]

4.13.1 Occupational exposure

Certain occupations are associated with a high risk of infection with brucellosis. These include people who work with farm animals, especially cattle, sheep, goats and pigs: farmers, farm **laborers**, animal attendants, stockmen, shepherds, sheep shearers, goatherds, pig keepers, veterinarians and inseminators are at risk through direct contact with infected animals or through exposure to a heavily contaminated environment.

4.13.2 Animal products

Persons involved in the processing of animal products may be at high risk of exposure to brucellosis. These include slaughtermen, butchers, meat packers, collectors of fetal calf serum, processors of hides, skins and wool, renderers and dairy workers.

4.13.3 Foodborne transmission

This is usually the main source of brucellosis for urban populations. Ingestion of fresh milk or dairy products prepared from unheated milk is the main source of infection for most populations.

4.13.4 Travel-acquired brucellosis

Tourists or business travelers to endemic areas may acquire brucellosis, usually by consumption of unpasteurized milk or other dairy products.

4.13.5 Persons with achlorhydria

Resulting from disease or through consumption of antacids or H2 antagonists may have an increased risk of acquiring brucellosis through ingestion of contaminated foods.

4.13.6 Individuals with immunodeficiency states

Resulting from disease or treatment with immunosuppressive agents may also be at increased risk of severe Brucellosis, although this is difficult to quantify.

4.14 Laboratory Diagnosis [12]

History of exposure to animals or consumption of raw dairy products often helps in the diagnosis of infection. Recommendations for culture tests of Brucellosis should include additional precautions against aerosolizing biochemical tests and note that Brucellosis is one of the most common laboratory acquired infections. In addition, brucella spp are very slow growing, with very small colonies, increasing risk of misidentification and laboratory acquired infection.

Laboratory test

- Rose Bengal test (RBT) for screening, ELISA
- Confirmation by PCR, ELISA, Culture

Collection of Samples

- for human and Food sample according to CDC / CPHL instruction
- Animal sample testing in accordance with CVL instruction

4.15 Treatment

In general, persons with brucellosis should be treated with a combination of appropriate antibiotics for a prolonged period. There are different regimes for treatment including as following.[8]

Subject	Summary
Adults, Children > 8 years	Combination therapy to decrease the incidence of relapse: Oral doxycycline *(2–4 mg/kg per day, maximum 200 mg/day, in 2 divided doses)* or oral tetracycline *(30–40 mg/kg per day, maximum 2 g/day, in 4 divided doses)* -and- Rifampin (*15–20 mg/kg per day, maximum 600–900 mg/day, in 1 or 2 divided doses*). Recommended for a minimum of 6 weeks. Combination therapy with trimethoprim-sulfamethoxazole (TMP-SMZ) can be used if tetracyclines are contraindicated.
Children < 8 years	Oral TMP-SMZ (*trimethoprim, 10 mg/kg per day, maximum 480 mg/day; and sulfamethoxazole, 50 mg/kg per day, maximum 2.4 g/day*) divided in 2 doses for 4 to 6 weeks. Combination therapy: consider adding rifampin. Consult physician for dosing or if rifampin is contraindicated. Tetracyclines (such as doxycycline) should be avoided in children less than 8 years of age
Complicated Cases (endocarditis, meningitis, osteomyelitis, etc.)	Streptomycin* or gentamicin for the first 14 days of therapy in addition to a tetracycline for 6 weeks (or TMP-SMZ if tetracyclines are contraindicated). Rifampin can be used in combination with this regimen to decrease the rate of relapse. For life-threatening complications, such as meningitis or endocarditis, duration of therapy often is extended for 4 to 6 months. Case-fatality rate is < 1%. Surgical intervention should be considered in patients with complications.
Pregnancy	Tetracyclines are contraindicated for pregnant patients. Consult obstetrician regarding specific antimicrobial therapy instructions

4.16 SURVEILLANCE [12, 14]

Surveillance is a key element for management of any prevention and control programs. **(see surveillance section for additional details)**

4.16.1 Active surveillance in an outbreak

Data should be collected, and line listing of cases kept including case classification (clinical/ probable/ confirmed), age, sex, occupation, exposure history (place, date, conditions of exposure to dairy products or animal contact), signs and symptoms, treatment, status, etc.

4.16.2 Laboratory based surveillance

Isolation followed by typing is essential for surveillance as it provides information about the *Brucella* species in accordance with CPHL instruction.

4.16.3 Food safety surveillance

Monitoring of milk for sale at the farm should be done at regular intervals to ensure Milk is safe for consumption with checking hygiene requirements to prevent the contamination

4.17 Outbreak Response

An outbreak is occurred when more than one probable or confirmed cases of Brucellosis with an epidemiological link within sixty (60) days and outbreaks may be common-source epidemic/ outbreaks can occur because of the ingestion of unpasteurized milk or dairy products. Aerosol infections can occur, such as in laboratory and abattoir workers.

4.18 Prevention of Human Brucellosis

4.18.1 Health education

Health education is the most effective preventive measure to reduce the risk of infection and should be done with close collaboration with stakeholders[10].

1. Health education messages include:
   - Do not consume raw untreated dairy products such as milk, cheese, or ice cream.
   - Dairy products for human consumption should be heat treated such as pasteurization or ultra-heat treatment (UHT).
   - Meat should be thoroughly cooked.
   - Individuals who are unwell/ having fever after consumption of raw/ fresh dairy products need to seek immediate treatment.

All persons carrying out high-risk procedures at risk premises should wear adequate protective clothing or Personal Protective Equipment (PPE).

Exercise care in handling and disposal of animal placenta, discharges, and fetuses.

- Wash / shower with clean water immediately after exposure.
- Any superficial injuries such as cuts or scratches should be treated with an antiseptic and covered with a bandage or self-adhesive dressing.
- Seek immediate medical treatment if develop symptoms within the incubation period.

- Disinfect contaminated areas and work clothes after use. Particular attention should be given to the disinfection of footwear to ensure that infection is not transferred outside the premises.
  ***Any staff that develops clinical disease should be treated promptly**.*

It is advisable that blood and tissue donors be screened for evidence of brucellosis and positive reactors with a history of recent infection be excluded.

4.19 Vaccines

Safe and effective vaccines for the prevention of human brucellosis are not generally available only for animals.[9]

4.20 Laboratory workers Risk Assessment

Once a potential exposure is recognized, the first task is to determine the activities performed that may have led to the exposure. Then identify:

1. who was in the laboratory during the suspected time(s) of exposure
2. where they were in relation to the exposure
3. what they did with the isolates

4.21 Intersectoral collaboration and cooperation

4.21.1 Sharing information

Sharing information and integrated surveillance between MOA and MOH are essential to control of CCHF and inter-sectoral cooperation with all other stakeholders is crucial to control the disease.

4.21.2 Joint epidemiological investigations

Joint epidemiological investigations should be carried out, especially of suspected outbreaks and individual human cases to determine the route of transmission and animal sources of infection.

4.21.3 Personal contacts

Personal contacts between physicians and veterinarians working in both the public and private sectors are strongly promoted, to ensure that both are made aware of the situation in their areas to ensure efficient collaboration.

4.21.4 International cooperation

In relation to the technical aspects of prevention and control of brucellosis, WHO, jointly with FAO and OIE, would wish to encourage and support programs incorporating the above-mentioned international strategies on brucellosis control. Advice on human brucellosis may be sought from WHO.FAO and OIE can advise on the agricultural and international trade aspects of animal brucellosis.

4.21.5 Community participation

The general public, especially communities in endemic areas, has to be made aware of the danger to health and of the economic importance of zoonoses and foodborne diseases by:

- Mass media
- Discussion in small groups. In such discussions, the health worker (educator) suggests some kind of concrete action, for example, formation of working committees soon after the discussions. Such committees have proved to be extremely useful in the initial early phases of several control programs.

4.22 Bioterrorist Event

Brucella has been classified as a "category B" agent for bioterrorism; it is moderately easy to disseminate by aerosol and can cause severe illness but has low mortality rates. An intentional release (bioterrorist event) should be suspected if unusual clusters are seen in otherwise healthy individuals or in people in buildings with common ventilation systems.[8] ***Call Communicable Disease center/ Baghdad if brucellosis is suspected in an unusual cluster.***

4.23 References

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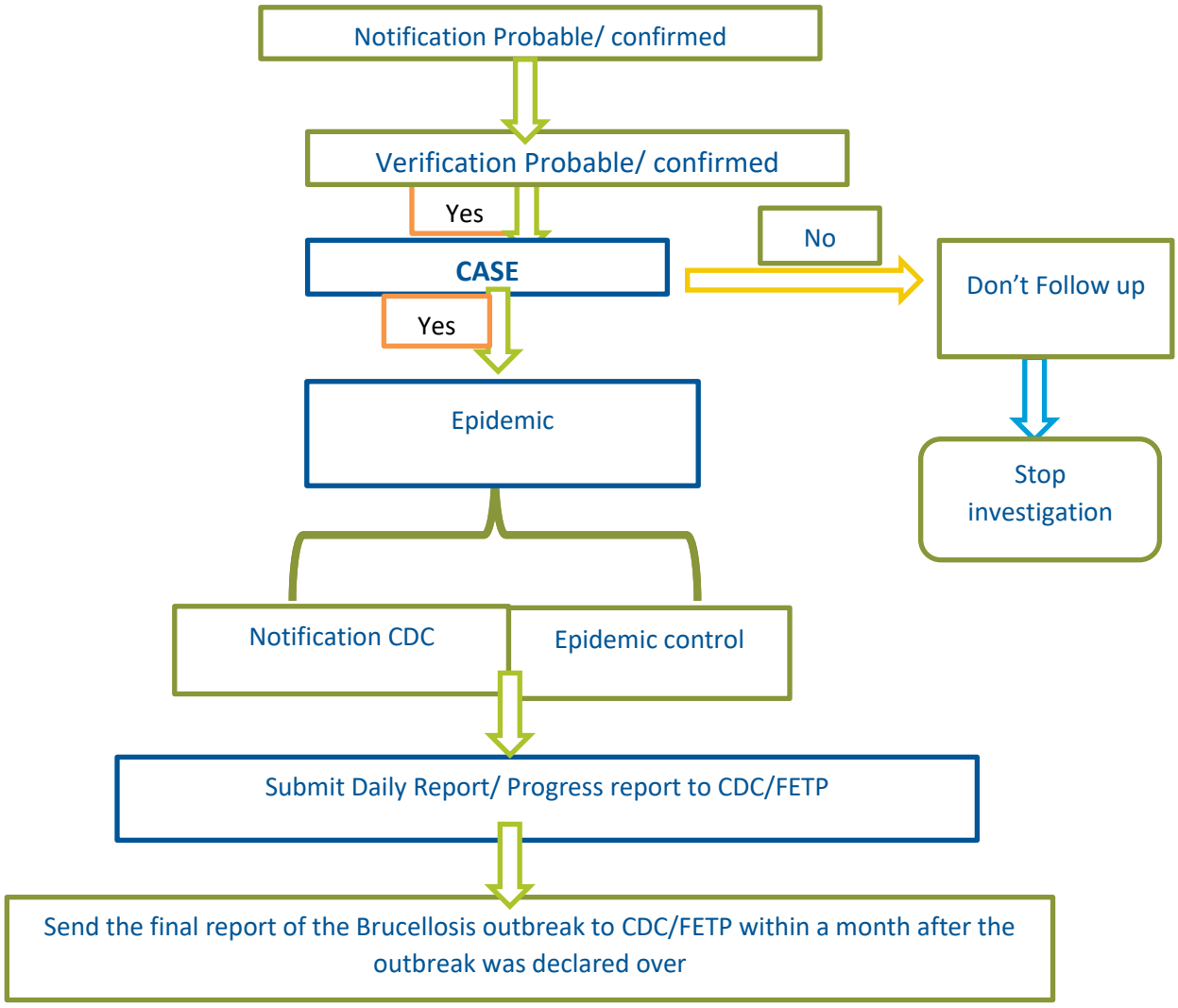
Annex1

Figure 1: **BRUCELLOSIS CASE / OUTBREAK NOTIFICATION CONTROL FLOW CHART**



Annex 2: Differential diagnosis

Differential diagnosis of Brucellosis	Symptoms					Signs			Diagnosis	Additional Findings
	Fever	Rash	Diarrhea	Abdominal pain	Weight loss	Painful lymphadenopathy	Hepatosplenomegaly	Arthritis	Lab Findings	
rucellosis	+	+	-	+	+	+	+	+	Relative lymphocytosis	Night sweats, often with characteristic smell, likened to wet hay
Typhoid fever	+	+	-	+	-	-	+	+	Decreased hemoglobin	Incremental increase in temperature initially and then sustained fever as high as 40°C (104°F)
Malaria	+	-	+	+	-	-	+	+	Microcytosis, elevated LDH	"Tertian" fever: paroxysms occur every second day
Tuberculosis	+	+	-	+	+	+	-	+	Mild normocytic anemia, hyponatremia, and hypercalcemia	Night sweats, constant fatigue
Lymphoma	+	-	-	+	+	-	+	-	Increase ESR, increased LDH	Night sweats, constant fatigue
Mumps	+	-	-	-	-	+	-	-	Relative lymphocytosis, serum amylase elevated	Parotid swelling/tenderness
Rheumatoid arthritis	-	+	-	-	-	-	-	+	ESR and CRP elevated, positive rheumatoid factor	Morning stiffness
SLE	-	+	-	+	+	-	-	+	ESR and CRP elevated, positive ANA	Fatigue
HIV	-	-	-	+	+	+	-	+		Constant fatigue

Annex 3:

Table 4: Case Definition Summary for Brucellosis

Classification	Clinical	Probable	Confirmed
A**cute or insidious onset of fever** AND one or more of the following symptoms: night sweats, fatigue, anorexia, myalgia, weight loss, headache, arthralgia, arthritis/spondylitis, meningitis, or focal organ involvement	+	+	+
Consumption of unpasteurized milk/dairy products or in close occupational contact with livestock in the last 6 months	+	+	+
Epidemiological link to a confirmed Brucellosis case		+	+
Brucella serology		+ IgM or IgG	4-fold rise in titer
Isolation of *Brucella* in blood /tissue			+
PCR for *Brucella* DNA in blood samples			+

5.0 Q Fever

5.1 Summary

Signs and Symptoms	Acute onset of febrile illness Less than 5% of infections become chronic, typically with endocarditis. Roughly half of cases are asymptomatic
Incubation	On average, 2 – 3 weeks (range of 3 – 30 days)
Case Classification	1. Acute clinical criteria: acute fever and one or more of the following: - Rigors - Severe retrobulbar headache - Acute hepatitis - Pneumonia - Elevated enzyme levels 2. Probable acute: Clinically consistent with single supportive IFA IgG titer greater than or equal to 1.128 to phase II antigen or elevated phase II IgG or IgM by ELISA, dot-ELISA, or LA 3. Confirmed acute: clinically consistent or epi link to a lab confirmed case with isolation or fourfold change IgG to phase II antigen by IFA or DNA detected by PCR or positive immunohistochemistry (IHC).

Chronic Clinical Criteria	Confirmed Chronic	Probable Chronic
newly recognized, culture negative endocarditis, particularly with previous valvulopathy or compromised immune system; suspected infection of a vascular aneurysm or vascular prosthesis; or chronic hepatitis; osteomyelitis, osteoarthritis, or pneumonitis in the absence of other known etiology.	clinically consistent case, along with isolation of IgG phase I antigen greater or equal to 1:800 by IFA (phase I titer > phase II titer) or DNA detected by PCR or positive IHC.	Clinically consistent with phase I IgG antigen greater than or equal to 1.128 and less than 1:800 by IFA

Differential Diagnosis	Extensive including: brucellosis, dengue, bacterial endocarditis, influenza, leptospirosis, lupus, lymphoma, meningitis, plague, pneumonia, psittacosis, rickettsioses, sarcoidosis, toxoplasmosis, tuberculosis, tularemia, viral hepatitis
Laboratory Testing	a. General test CBP, Liver function test, ESR etc.. b. Confirmed PCR & ELISA (Not available in Iraq)
Treatment	
Acute: 1. Adult 2. Pregnant Women : 3. Children ≥ 8 years old	Duration: 1. Doxycycline 100 mg/12 hours for 14 days 2. Trimethoptim/sulfamethoxazole, 16mg/800mg 2x daily throughout pregnancy not beyond 32 weeks

4. High risk Children <8 years old 5. Children ≥ 8 years old with uncomplicated illness	3. Doxycycline, 2.2 mg/kg body weight 2x daily for 14 days 4. Doxycycline, 2.2 mg/kg body weight 2x daily for 14 days 5. Doxycycline, 2.2 mg/kg body weight 2x daily for 5 days
Chronic 1. Adult with endocarditis or vascular infection 2. Adult with non-cardiac organ disease 3. Postpartum women with titers elevated 4. Pregnant Women 5. Children	Duration 1. Doxycycline 100 mg/8 hours for 18 months 2. Doxycycline 100mg/12 hours; hydroxychloroquine 200mg/8 hours 3. Doxycycline, 100 mg/12 hours; hydroxychloroquine 200mg/8 hours for 12 months 4. No current recommendations. Consultation with an infectious disease and obstetric specialist is encouraged. 5. Children: no current recommendations. Consultation with a pediatric infectious disease specialist is encouraged
Duration of treatment	Variable: post Q Fever syndrome may occur; chronic illness weeks to years later.
Case Management	a. Using case management + IPC instruction for early treatment and prevention. b. Household Reduce exposure to infected animals in the farm or animal products, c. Follow-up : Enhance active surveillance in the affected area.
Mode of transmission	a. Sheep, cattle, goats, cats, dogs, some wild animals b. Exposure to aerosolized birth products; urine, feces, raw milk, dust from bedding, direct animal contact; sexual (rare), laboratory.
Public Health Actions	Identify risk group may have been potentially exposed Inform family members the disease is treatable, but household needs to reduce exposure to infected animals in the farm or animal products.
Infection Control and prevention	Treated as medical waste (IPC GL)
Reporting and Surveillance	a. Report and notify Public Health Directorate(CDC/ Zoonotic Section, Surveillance Section, FETP) using MoH forms and reporting protocols b. Identify risk group may have been potentially exposed Risk c. Inform family members the disease is treatable, but household needs to reduce exposure to infected animals in the farm or animal products.
Communication	Communication with suspected or confirmed patients would be according to CDC/MOH guideline. Educational programs have to educate the patients' family and farmer/owner to recognize, and report suspected case and the mode of transmission and personal protection
Coordination	Sharing information and integrated surveillance between MOA and MOH are essential to control the infection and inter-sectoral cooperation with all other stakeholders is crucial to control the disease
Waste, Equipment, laundry Treatment and management	Treated as medical waste.(IPC GL)

5.2 Introduction

Q – fever is a zoonotic bacterial infection that can cause mild to severe flu – like illness. Depending on the case, the disease can emerge as acute and remain as such; other cases manifest themselves as chronic Q – fever. *Coxiella burnetii,* the causative bacterium of Q – fever, is transmissible to humans from animal reservoirs – cattle, sheep, goats, among other wild and domestic animals. Persons whose occupations require frequent interaction with animals, animal carcasses, and/or animal byproducts – slaughterhouse and meat workers; livestock and dairy farmers; wool shearers and pelt and hide processors; animal transporters; veterinary and para-veterinary professionals; laboratory workers; animal breeders. Iraq has not notified Q Fever outbreaks in the recent past. However, Q Fever cases were detected and diagnosed among the US military personnel deployed in Iraq in 2005.

5.3 Causative Agent

Coxiella burnetii is a gram-negative bacterium with two antigenic phases, high resistant to heat; to many disinfectants; and can survive long periods under harsh environment conditions. Q – fever from *C. burnetii* infection can arise from a low concentration the bacterium. When in a human or animal, *C. burnetii* can reach high concentrations, especially in birthing fluids and placentas.

5.4 Pathogenesis and mode of transmission

The most common reservoirs for *C. burnetii* are sheep, cattle, and goats. Animals are usually asymptomatic, but fertility issues such as abortion can occur. Animals can shed the bacteria in their urine, feces, milk, and birth products.

Inhalation of aerosols containing *C. burnetii* is the most common way in which Q – Fever is acquired – through the dust from premises contaminated by placental tissues, birth fluids, and excreta of infected animals; establishments processing infected animal products; in necropsy rooms. Direct contact with infected animals, specimens in the laboratory, placentas, or other contaminated materials (wool, straw, fertilizer, laundry) is another method of contracting Q – fever as well as ingestion of contaminated milk, tick bites, or receipt of contaminated blood or bone marrow.

5.5 Description of Illness

Human infections of Q – fever can be asymptomatic or severe, which is characterizable by sudden onset of fever, chills, headache, myalgia, nausea, vomiting, diarrhea, severe sweats, and non-productive cough. The fever can last up to 14 days if un-treated. In 30 – 50% of patients, atypical pneumonia can present itself as well as acute hepatitis. Rarer manifestations of Q – fever have included meningoencephalitis, pericarditis, myocarditis, or cholecystitis. Acute Q – Fever has a low mortality rate, however among pregnant women stillbirths, miscarriages and premature births are risks. Roughly 20% of acute cases will have post Q – fever fatigue syndrome. In less than 5% of acute cases, Chronic Q – fever can occur weeks to years after acute infection and manifests primarily as endocarditis. In some cases, however, chronic hepatitis, chronic vascular infections, osteomyelitis, osteoarthritis, or pneumonitis manifest due to chronic Q – fever.

5.6 Incubation

Depending on the size of the infecting dose, but it is typically around 2 – 3 weeks with a range of 3 – 30 days.

5.7 Period of Communicability

Sexual transmission may occur for Q – fever but fomites have been seen as the source of infection.

5.8 Case Classification

Acute Q – Fever

- **Probable:** A clinically compatible case of acute illness (meets clinical evidence criteria for acute Q fever illness) that has laboratory supportive results for past or present acute disease (antibody to Phase II antigen) but is not laboratory confirmed.
- **Confirmed:** A laboratory confirmed case that either meets clinical case criteria or is epidemiologically linked to a laboratory confirmed case.

Chronic Q- Fever

- **Probable:** A clinically compatible case of chronic illness (meets clinical evidence criteria for chronic Q fever) that has laboratory supportive results for past or present chronic infection (antibody to Phase I antigen).
- **Confirmed case**: A clinically compatible case of chronic illness (meets clinical evidence criteria for chronic disease) that is laboratory confirmed for chronic infection.

Acute Clinical Criteria	Confirmed Acute	Probable Acute
acute fever and one or more of the following: - Rigors - Severe retrobulbar headache - Acute hepatitis - Pneumonia - Elevated enzyme levels	clinically consistent or epi link to a lab confirmed case with isolation or fourfold change IgG to phase II antigen by IFA or DNA detected by PCR or positive immunohistochemistry (IHC).	Clinically consistent with single supportive IFA IgG titer greater than or equal to 1.128 to phase II antigen or elevated phase II IgG or IgM by ELISA, dot-ELISA, or LA
Chronic Clinical Criteria	Confirmed Chronic	Probable Chronic
newly recognized, culture negative endocarditis, particularly with previous valvulopathy or compromised immune system; suspected infection of a vascular aneurysm or vascular prosthesis; or chronic hepatitis; osteomyelitis, osteoarthritis, or pneumonitis in the absence of other known etiology.	clinically consistent with isolation of IgG phase I antigen greater or equal to 1:800 by IFA (phase I titer > phase II titer) or DNA detected by PCR or positive IHC.	Clinically consistent with phase I IgG antigen greater than or equal to 1.128 and less than 1:800 by IFA

5.9 Laboratory diagnosis

- **General Test:** CBP, Liver function test, Renal function Test ESR, positive Coombs' test, antinuclear antibodies. Antimitochondrial antibodies.
- **Specific test**: PCR& ELISA (Not available in Iraq)

5.10 Treatment

Most Q- fever cases can recover without antibiotic treatment, however those who develop Q – fever disease requires two weeks of doxycycline antibiotic. Chronic Q – fever require several months of antibiotic treatment, a combination that can include doxycycline and hydroxychloroquine. Among animals, treatment is more complicated, as the use of recommended antibiotics in flocks and herds have minimal evidence of efficacy. Furthermore, the concern of promoting antibiotic resistance in Q – fever; promoting challenges in human clinical cases.

5.11 Human Vaccines

Q – fever vaccination is the most effective way to prevent infection and highly recommended for those who work, live, or visit high risk environments. To date, Q- fever vaccine is only licensed for use in Australia and persons with allergies to egg protein should be wary of the vaccine.

5.12 Infection Control Measures

5.12.1 Personal Protective Equipment

During any procedure that might generate aerosols of infectious materials (e.g., a procedure involving use of a surgical power instrument such as an oscillating bone saw) in a patient with suspected or confirmed Q fever, health-care personnel should also take the following precautions:

1. Use a fit-tested N-95 (or comparable) respirator and eye protection (e.g., goggles or face shield).

2. Contain and dispose of contaminated waste (e.g., dressings or birth products) in accordance with facility-specific guidelines for infectious waste.

3. Place the patient in an airborne infection isolation room or a private room if one is not available during the procedure. The patient does not need to wear a face mask, because Q fever is not transmitted by sneezing or coughing.

4. Handle used patient-care equipment in a way that prevents contamination of skin and clothing. Ensure that used equipment has been cleaned and reprocessed appropriately.

5. Ensure that procedures are in place for cleaning and disinfecting environmental surfaces in the patient care environment (see #5 in the Research Facility Safety Standards section that follows for chemical disinfectant recommendations).

Precautions used in addition to standard precautions are only recommended during an aerosol-generating procedure. Procedures that do not generate aerosols, such as drawing blood or giving physical examinations, do not pose a risk for transmission of Q fever. Transmission through coughing or sneezing

is not a documented route of infection, and there is no evidence that Q fever is transmitted by any type of casual contact (e.g., hugging, shaking hands, kissing, or sharing food).

Laboratory transmission of C. burnetii is primarily a concern when bacteria are propagated using specialized techniques (i.e., tissue culture), during lapses in standard precautions leading to specimen aerosolization, and through protocols involving passage through animals. Handling of usual biomedical specimens, including routine blood culture testing, from humans or animals collected in medical or veterinary settings is not considered an exposure risk for Q fever and can be processed by routine standard precautions and handling techniques.

a. Decontamination and Hygiene

Laboratory safety and containment recommendations for *C. burnetii* should be followed as described in the CDC Biosafety in Microbiological and Biomedical Laboratories manual (163). Samples known or suspected to contain viable *C. burnetii* (i.e., birth products or other biologic material from infected animals or humans) should be handled in a BSL-3 facility and rendered nonviable or destroyed.

Appropriate personal protective equipment (PPE) can be effective at reducing the risk for exposure in handling these types of specimens. In the BSL-3 laboratory, attire worn while working with viable *C. burnetii* should be sterilized after use. Protective eyewear such as splatter-proof safety goggles or face shields, disposable gloves, and shoe covers also should be worn, and showering after working with *C. burnetii* under BSL-3 conditions is recommended.

In laboratories that work with viable C. burnetii organisms in culture media or live animals, unvaccinated workers should wear respiratory protection such as an N95 respirator. An N95 respirator filters at least 95% of airborne particles when used correctly but might not eliminate infection risk. A powered air purifying respirator with P100 filtration also can be used in research laboratories that experiment with C. burnetii, particularly by employees unable to wear an N95 respirator.

b. Precautions for exposed personnel

Employees in high-risk occupations should be educated about the risk for exposure and the clinical presentation of Q fever. Educational efforts should describe groups vulnerable to development of chronic Q fever, such as workers who have preexisting valvulopathy, a prosthetic heart valve, a vascular prosthesis, an aneurysm, are pregnant or might become pregnant, or are immunosuppressed, because these employees have a higher risk for a severe outcome or death if infected.

Care should be used when handling soiled laundry (e.g., bedding, towels, and personal clothing) of Q fever patients. Soiled laundry should not be shaken or otherwise handled in a way that might aerosolize infectious particles.

c. Administrative and Engineering Controls

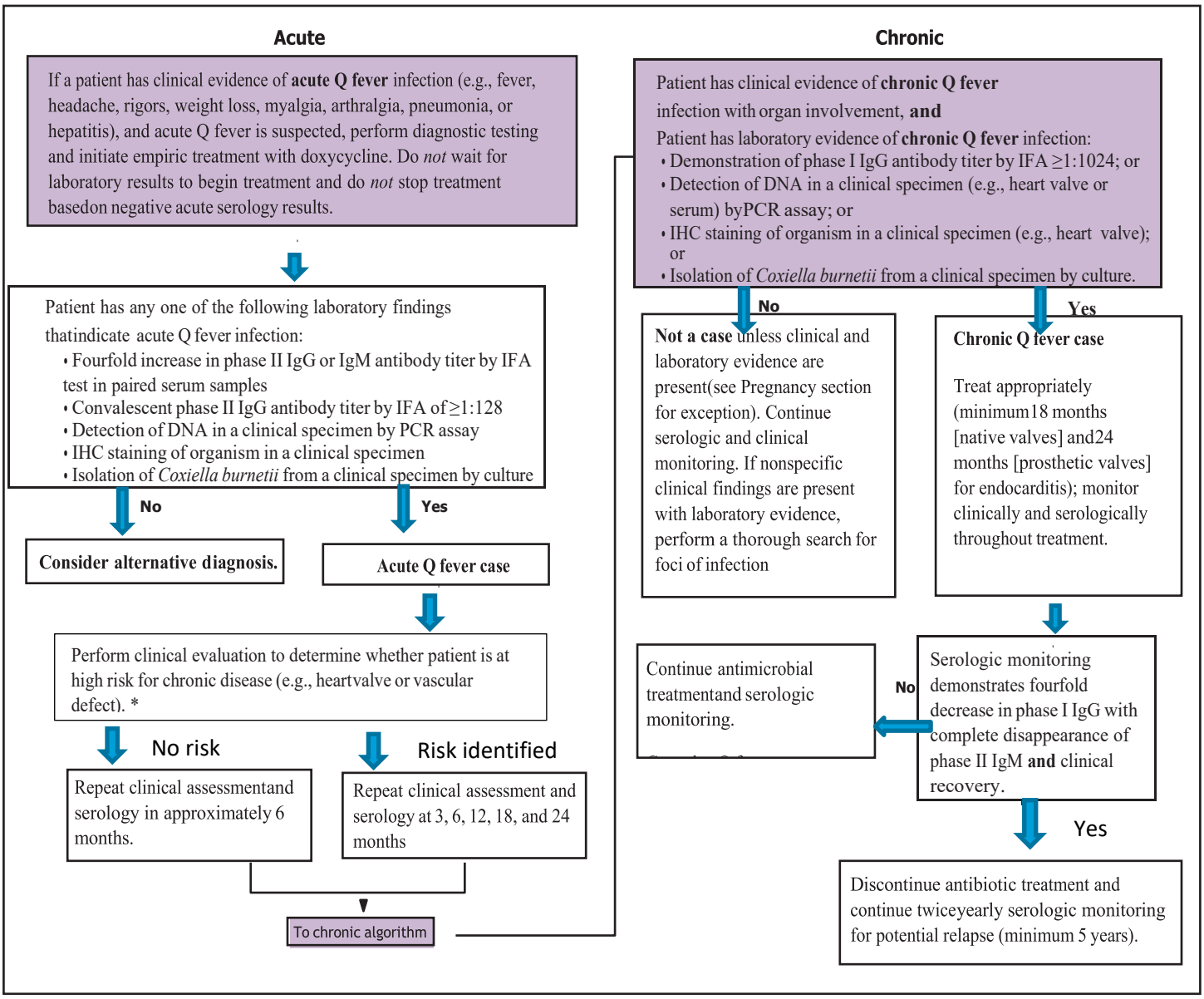
Adherence to standard precautions is recommended to prevent Q fever infection in health-care personnel during routine care (161). During autopsies of patients who have died of Q fever, health-care personnel should use either a BSL-3 facility or use the barrier precautions of BSL-2 and the negative airflow and respiratory precautions of BSL-3 as recommended by the CDC Guidelines for Safe Work Practices in Human and Animal Medical Diagnostic Laboratories (162). During procedures that put health-care personnel at risk for infection from splashing of infected material, such the delivery of an infant from an infected woman, standard precautions including the use of a face mask and eye protection, or a face shield are

recommended. Care should be used when handling soiled laundry (e.g., bedding, towels, and personal clothing) of Q fever patients. Soiled laundry should not be shaken or otherwise handled in a way that might aerosolize infectious particles.

5.13 References

- Q Fever Reporting and Investigation Guideline (wa.gov)
- Department of Agriculture | Q Fever (nj.gov)
- Q Fever (iastate.edu)
- Treatment | Q Fever | CDC
- Diagnosis and Management of Q Fever — United States, 2013 (cdc.gov)
- Q fever vaccination fact sheet - Fact sheets (nsw.gov.au)
- Q Fever Vaccine Development: Current Strategies and Future Considerations - PMC (nih.gov)

Figure 6. Q fever management algorithm*



Abbreviations: CT = computed tomography; IFA = immunofluorescent assay; IgG = immunoglobulin G; IgM = immunoglobulin M; IHC = immunohistochemistry;PCR = polymerase chain reaction; PET = positron emission tomography.

* This algorithm is intended for use as a general guide and does not replace the physician's clinical judgment. It is intended to provide a management strategy for patients under the care of a physician and is not intended for those who might be tested for Q fever as part of an occupational monitoring program. Women infectedduring pregnancy should be treated and monitored as described in the national guidelines.

6.0 Plague

6.1 Summary

Signs and Symptoms			
Bubonic	Septicemic	Pneumonic	Pharyngeal
abrupt fever, headache, chills, weakness, and swollen, tender and painful lymph node(s) or buboes	Fever, chills, extreme weakness, and abdominal pain; progress to shock, disseminated intravascular coagulation (DIC), multiple organ failure, mental confusion, gangrenous extremities	Acute fever, chills, headache, weakness, and myalgias, hemoptysis, shortness of breath, pneumonia, circulatory collapse; primary (inhalation) or secondary (spread in blood with bubonic or septic plague)	pharyngitis and cervical lymphadenitis
Incubation	1 – 7 days for primary plague; Usually shorter. It can be longer for immunized individuals		
Case Classification	1. Clinical criteria: acute fever with disease manifested in one of above clinical forms 2. Suspect: Clinically consistent with no laboratory results with epi linkage, or lab results without clinical information 3. Probable: Clinically consistent with elevated titer to Y. pestis F1 antigen in absence prior plague vaccination or F1 antigen in a clinical specimen by DFA, IHC, or PCR and no epi linkage 4. Confirmed: Clinically consistent with Y. pestis isolation or ≥4-fold change in Y. pestis F1 antigen titer; or with presumptive lab evidence and epi linkage		
Differential Diagnosis	Varies by form. mononucleosis, viral or bacterial sore throat, cat scratch fever, tularemia, sepsis, bacterial or viral pneumonia, mycobacterial infection, influenza, hantavirus		
Laboratory Testing	a. The presumptive diagnosis: immunofluorescence stain b. Confirmed test: Culture & PCR (not available in Iraq)		
Treatment			

Bubonic	Septicemic	Pneumonic	Pharyngeal

Ciprofloxacin Levofloxacin Moxifloxacin Doxycycline Gentamicin Streptomycin	Ciprofloxacin Levofloxacin Moxifloxacin Gentamicin Streptomycin	Ciprofloxacin Levofloxacin Moxifloxacin Gentamicin Streptomycin	Ciprofloxacin Levofloxacin Moxifloxacin Doxycycline Gentamicin Streptomycin	

Case Management	a. Using case management + IPC instruction for early treatment and prevention. b. Follow-up: Enhance active surveillance in the affected area.
Mode of transmission	a. Wild rodents are the natural vertebrate reservoir, but domestic cats, rabbits, and hares can be infection sources b. Rodent-to-human via infected flea vector. Inhalation of infected droplets spread by coughing patients with plague pneumonia or pharyngitis or direct contact with pus from suppurating buboes.
Public Health Actions	Identify risk group may have been potentially exposed Risk Inform family members the disease is treatable, but household needs to reduce exposure to infected animals in the farm or animal products.
Infection Control and prevention	Treated as medical waste. (IPC GL)
Reporting and Surveillance	d. Report and notify Public Health Directorate(CDC/ Zoonotic Section, Surveillance Section, FETP) using MoH forms and reporting protocols e. Identify risk group may have been potentially exposed Risk f. Inform family members the disease is treatable, but household needs to reduce exposure to infected animals in the farm or animal products.
Communication	Communication with suspected or confirmed patients would be according to CDC/MOH guideline. Educational programs have to educate the patients' family and farmer/owner to recognize, and report suspected Brucellosis and the mode of transmission and personal protection
Coordination	Sharing information and integrated surveillance between MOA and MOH are essential to control infection and inter-sectoral cooperation with all other stakeholders is crucial to control the disease
Waste, Equipment, laundry Treatment and management	Treated as medical waste. (IPC GL)

6.2 Introduction

Plague, in its various forms, is an infectious disease that affects humans and mammals; and can present in human in four primary clinical forms, depending on the route of transmission. The disease is vector borne, zoonotic, and transmissible person – to – person. Humans can become infected with plague through the bite of an infected flea (plague's natural vector), contact with contaminated tissue or body fluids of a plague infected animal (zoonotic transmission), and through the contact with infectious droplets from someone who has plague (person – to – person transmission). Although all clinical forms of plague are caused by *Yersinia Pestis,* a gram-negative rod shaped coccobacillus bacterium, the exact clinical manifestation of plague is determined mainly by their route of transmission to the infected person: an infected flea bite, as well as contact with infected animal carcasses, primarily results in bubonic or septicemic plague; whereas infectious droplet inhalation more likely cause pneumonic plague, and

ingestion of plague droplets results in pharyngeal plague. The mortality of plague is high when left untreated: from 50% to 90% depending on the clinical manifestation.

6.3 Causative Agent

All forms of plague result from the same causative agent: *Yersinia Pestis. Y. Pestis* is a gram negative, non-motile, sporeless coccobacillus bacterium. The bacterium is known for its signature safety pin appearance that appears during staining. In terms of survivability and resistance outside of a host or its reservoir, *Y. pestis* is easily destroyed by sunlight, though it can survive in soil for short periods and longer in frozen or soft tissues. Depending on the conditions, the bacterium has been seen to survive up to one hour in the air. Within their vectors – fleas – *Y. pestis* survives and multiples well in environment suited to its vector's proliferation – for fleas this can be 15 – 27 degrees Celsius and in a moist climate of 90 – 95% humidity

6.4 Pathogenesis and mode of transmission

Plague is capable of vector, zoonotic, and person – to – person, transmission. Fleas are the primary plague reservoir, in particular the Oriental Rat Flea *Xenopsylla cheopis*, and can infect humans or animals directly. Alternatively, contact with contaminated fluids or soft tissues of infected animals or their carcasses allows plague transmission zoonotically; and direct contact with infected droplets from human plague cases can result in plague via person – to – person transmission. The disease manifestation of plague can

6.5 Description of Illness (use a table)

Yersinia pestis infection in humans occurs as four main clinical forms depending on route of transmission. Additional rare forms of plague include meningeal and cutaneous. Overall, about 11% of plague cases in the United States are fatal.

Bubonic Plague	Septicemic Plague	Pneumonic Plague	Pharyngeal
The bubonic form accounts for the most common clinical manifestation of plague cases. Patients typically experience a sudden onset of fever, headache, chills, and weakness, and one or more swollen, tender and painful lymph nodes. This form is usually the result of an infected flea bite. Symptoms progress rapidly, with development of lymphadenitis, which becomes very painful.	The primary septicemic form occurs in about 10% of plague cases in the United States. Diagnosis can be difficult because buboes are not seen in primary septicemic plague. Septicemic plague can be secondary to bubonic plague. Fever, chills, extreme weakness, and abdominal pain are common. Patients may progress to endotoxic-shock, disseminated intravascular coagulation (DIC), multiple organ failure, acute respiratory distress syndrome	About 3% of plague patients in the United States develop primary pneumonic plague. Secondary pneumonic plague can also result from the spread of Y. pestis to the lungs in patients with untreated bubonic or septicemic infection. Primary pneumonic plague results from inhaling infectious droplets in the air. Pneumonic plague causes acute onset of fever, chills, headache, weakness, and myalgias, followed within 24 hours by cough with bloody sputum. The pneumonia progresses rapidly, resulting in dyspnea, stridor, and	Sore throat and cervical lymphadenitis from exposure to larger infectious droplets or ingestion of infected tissues.

The bacteria multiply in the lymph node closest to where the bacteria entered the human body. These swollen lymph nodes are known as buboes, which are typically found in the inguinal (groin) region, but also the axillary (armpit) or cervical (neck) region. Untreated bubonic plague can progress to cause septicemic or secondary pneumonic plague. Rarely, it progresses to meningitis.	(ARDS), mental confusion, gangrenous extremities (black plague), and death. This form results from bites of infected fleas or from handling an infected animal.	cyanosis, terminating in respiratory failure, circulatory collapse, and death. Pneumonic plague is the most serious form of the disease and is the only form of plague that can be spread from person to person (by infectious droplets).	

6.6 Incubation

1 – 7 days for plague; bubonic can occur 2 – 6 days post exposure and pneumonic occurring 1 – 3 days post exposure. It can be longer for immunized individuals.

6.7 Period of Communicability

Communicability can vary depending on the clinical form of Plague the patient has. Pneumonic plague cases are communicable at the onset of symptoms. Draining buboes producing plague cases are communicable until their lesions are healed or excised surgically.

6.8 Case Classification

6.8.1 Suspect:

A clinically compatible case with epidemiologic linkage without laboratory evidence, OR confirmed or presumptive laboratory evidence without any associated clinical information

6.8.2 Probable:

A clinically compatible case with presumptive laboratory evidence without epidemiologic linkage in absence of an alternative diagnosis

6.8.3 Confirmed:

A clinically compatible case with confirmatory laboratory evidence, OR a clinically compatible case with presumptive laboratory evidence AND epidemiologic linkage

6.9 Laboratory Criteria for Diagnosis

- The presumptive diagnosis of plague can be made if: an immunofluorescence stain of a relevant sample is positive for the presence of *Y. pestis* Fraction 1 capsular (F1) antigen; and a single serum specimen is tested and the anti-F1 antigen titre by agglutination is >1:10. *
- Confirmed plague is diagnosed if: an isolated culture is lysed by specific bacteriophage; two serum specimens demonstrate a fourfold anti-F1 antigen titre rise by agglutination testing; * and a single serum specimen tested by agglutination has a titre of >1:128 and the patient has no known previous plague exposure or vaccination history.*
  *Agglutination testing must be shown to be specific to *Y. pestis* F1 antigen by hemagglutination inhibition.

6.10 Reporting

Presumptive and confirmed cases should be notified to the Department of Health at provincial and national levels immediately for follow up action.

6.11 Treatment

Treatment should begin as soon a plague is suspected or exposure to plague is confirmed. Treatment duration is on average 10 – 14 days but can be extended in those with ongoing fever or other signs concerning clinicians.

Pneumonic or Septicemic Plague			
Antibiotic	Dose	Route of Administration	Notes
Ciprofloxacin	**Adults:** 400 mg every 8 hours	IV	
	Children: 10 mg/kg every 8 or 12 hours (maximum 400 mg/dose)		
	Pregnant Women: 400 mg every 8 hours		
	Adults: 750mg every 12 hours	PO	
	Children: 15 mg/kg every 8 or 12 hours (maximum 500 mg/dose every 8 hours or 750 mg/dose every 12 hours)		
	Pregnant Women: 500 mg every 8 hours		
Levofloxacin	**Adults:** 750 mg every 24 hours	IV or PO	
	Children: Weight <50kg: 8 mg/kg every 12 hours; Weight ≥ 50kg: 500 – 750 mg every 24 hours		
	Pregnant Women: Same as Adult Dose		
Moxifloxacin	**Adults**: 400 mg every 24 hours	IV or PO	FDA approved based on animal studies; clinical data for
	Children: see notes		

			human plague is limited. Moxifloxacin is a first-line treatment for adults but an alternative for children, since it is not FDA approved for use in children aged ≤17 years.
Gentamicin	**Adults:** 5 mg/kg every 24 hours	IV or IM	Not FDA approved but considered an effective alternative to streptomycin.2
	Children: 4.5 – 7.5 mg/kg every 24 hours		
	Pregnant Women: Same as Adult Dose		
Streptomycin	**Adults:** 1g every 12 hours	IV or IM	FDA approved based on clinical experience. Not widely available in the US. The IV formulation is not approved by FDA; however, the IM formulation has been given IV as an off-label use.4
	Children: 15mg/kg every 12 hours (max 1 g per dose)		
Treatment for Bubonic and Pharyngeal Plague			
Antimicrobial	Dose	Route of Administration	Notes
Ciprofloxacin	**Adults:** 400 mg every 8 hours	IV	
	Children: 10 mg/kg every 8 or 12 hours (maximum 400 mg/dose)		
	Pregnant Women: 400 mg every 8 hours		
	Adults: 750mg every 12 hours	PO	
	Children: 15 mg/kg every 8 or 12 hours (maximum 500 mg/dose every 8 hours or 750 mg/dose every 12 hours)		
	Pregnant Women: 500 mg every 8 hours		
Levofloxacin	**Adults:** 750 mg every 24 hours	IV or PO	FDA approved based on animal studies; clinical data for human plague is limited.
	Children: Weight <50kg: 8 mg/kg every 12 hours; Weight ≥ 50kg: 500 – 750 mg every 24 hours		

	Pregnant Women: Same as Adult Dose		
Moxifloxacin	**Adults**: 400 mg every 24 hours	IV or PO	FDA approved based on animal studies; clinical data for human plague is limited. Moxifloxacin is a first-line treatment for adults but an alternative for children, since it is not FDA approved for use in children aged ≤17 years.
	Children: see notes		
Doxycycline	**Adults**: 200 mg loading dose, then 100mg every 12 hours	IV and PO	Bacteriostatic, but FDA approved and effective in a randomized trial when compared to gentamicin.2 No evidence of tooth staining after multiple short courses.3
	Children: Weight <45kg: 4.4 mg/kg loading dose then 2.2 mg/kg every 12 hours (max 100mg/dose); Weight ≥45 kg: same as adult dose		
Gentamicin	**Adults:** 5 mg/kg every 24 hours	IM or IV	Not FDA approved but considered an effective alternative to streptomycin.
	Children: 4.5 – 7.5 mg/kg every 24 hours		
	Pregnant Women: Same as Adult Dose		
Streptomycin	**Adults:** 1g every 12 hours	IM or IV	FDA approved based on clinical experience. Not widely available in the US. The IV formulation is not approved by FDA; however, the IM formulation has been given IV as an off-label use.
	Children: 15mg/kg every 12 hours (max 1 g per dose)		

Post – exposure prophylaxis

	Antimicrobial	Dose	Route of Administration
Adult	Ciprofloxacin	500-750 mg every 12 hrs.	PO
	Levofloxacin	500-750 mg every 24 hrs.	
	Moxifloxacin	400 mg every 24 hrs.	
	Doxycycline	100 mg every 12 hrs	
Children	Ciprofloxacin	15 mg/kg every 12 hrs (maximum 750 mg/dose)	
	Levofloxacin	Weight <50 kg: 8 mg/kg every 12 hrs (maximum 250 mg/dose)	
	Doxycycline	Weight <45 kg: 2.2 mg/kg every 12 hrs Weight ≥45 kg: 100 mg every 12 hrs	
Pregnant Women	Ciprofloxacin	500 mg every 8 hrs or 750 mg every 12 hrs	
	Levofloxacin	750 mg every 24 hrs	

6.12 Human Vaccines

Vaccines or plague exist and are recommended for field and laboratory personnel who work with *Y. pestis* as well as persons living in locations where plague is endemic.

6.13 Infection Control Measures

6.13.1 Personal Protective Equipment

Pneumonic plague can spread from infected patients to others by droplets through close, sustained contact, so droplet precaution should be used in addition to standard precautions for plague patients. After 48 hours of antimicrobials and markedly decrease sputum production, droplet precautions can be relaxed. Health care providers should wear a mask, eye protection, and a face shield when performing procedures that generate sprays and splashes like bubo aspiration. N95 are not necessary for routine care as plague has not been shown to be airborne.

6.13.2 Decontamination and Hygiene

In situations where there is significant exposure to plague, persons are advised to decontaminate removing contaminated clothes and washing exposed skin with soap and water. Eliminate sources of food and nesting places for rodents around homes, workplaces, and recreation areas; remove brush, rock piles, junk, cluttered firewood, and potential food supplies, such as pet and wild animal food.

6.13.3 Precautions for exposed personnel

Laboratory and clinical personnel working with plague samples and/or patients are advised to be vaccinated for the plague as soon as possible. Where gloves if handling or skinning potentially infected animals. Personnel should also avoid flea bites and autoinoculation when handling potentially infected

live or dead animals (fleas may remain infected for months). Insect repellent can be used to reduce the risk of flea bites. Arthropod containment level 3 (ACL-3) facilities and practices are recommended to reduce the chance of flea bites. If any veterinary staff are exposed to infectious material, they should watch their health for 2 weeks and consider post exposure prophylaxis.

6.13.4 Administrative and Engineering Controls

Arthropod containment level 3 (ACL-3) facilities and practices are recommended to reduce the chance of flea bites.

6.14 References

a. Vector-borne diseases (who.int)
b. Plague (who.int)
c. Ecology and Transmission | Plague | CDC
d. Antimicrobial Treatment and Prophylaxis of Plague: Recommendations for Naturally Acquired Infections and Bioterrorism Response | MMWR (cdc.gov)
e. Resources for Clinicians | Plague | CDC
f. Plague Reporting and Investigation Guideline (wa.gov)
g. Plague Vaccine (cdc.gov)
h. Diagnosis and Treatment | Plague | CDC
i. Antimicrobial Treatment and Prophylaxis of Plague: Recommendations for Naturally Acquired Infections and Bioterrorism Response | MMWR (cdc.gov)
j. Prevention | Plague | CDC

7.0 Tularemia

7.1 Summary

<table>
<tr><td colspan="2">Signs and Symptoms</td><td colspan="3">ever and additional symptoms depending on type and route of exposure</td></tr>
<tr><td>Ulceroglandular</td><td>Oculoglandular</td><td>Oropharyngeal</td><td>Pneumonic</td><td>Typhoidal</td></tr>
<tr><td>Cutaneous Ulcer with regional lymphadenopathy</td><td>Conjunctivitis with preauricular lymphadenopathy</td><td>Stomatitis, pharyngitis, or tonsillitis with cervical lymphadenopathy</td><td>Primary pulmonary disease</td><td>Febrile illness without localizing signs and symptoms</td></tr>
<tr><td colspan="2">Incubation</td><td colspan="3">On average, 3 – 5 days (range of 4 – 14 days</td></tr>
<tr><td colspan="2">Case Classification</td><td colspan="3">5. Confirmed: clinically compatible with detection of F. tularensis by isolation or a greater than fourfold change in serum antibody titer
6. Probable: clinically compatible with detection of F. tularensis by elevated titers without fourfold or greater change in patient with no history of tularemia vaccination or fluorescent assay OR through nucleic acid testing, such as PCR</td></tr>
<tr><td colspan="2">Differential Diagnosis</td><td colspan="3">Extensive depending on presentation, including: anaplasmosis, brucellosis, cat scratch fever, ehrlichiosis, bacterial or viral endocarditis, influenza or parainfluenza, legionellosis, Lyme disease, leishmaniasis, mycobacterial infection (TB and other), mycoplasma, pericarditis, plague, bacterial or viral pharyngitis, bacterial or viral pneumonia, psittacosis, Q fever, rickettsial infection, salmonellosis, syphilis</td></tr>
<tr><td colspan="2">Laboratory Testing</td><td colspan="3">a. Supportive diagnosis
Detection direct immunofluorescence assay (DFA), immunohistochemical staining, or polymerase chain reaction (PCR) assay.
• Detection of antibodies to F. tularensis through a single serologic test
. b. Confirmation:
 Isolation of F. tularensis from a clinical specimen
 Seroconversion from negative to positive IgM and/or IgG antibodies in paired sera.</td></tr>
<tr><td colspan="2">Treatment</td><td colspan="3"></td></tr>
</table>

Adults 1. Streptomycin 2. Gentamicin 3. Ciprofloxacin 4. Doxycycline	Dosage/Duration: 1. 1 g IM twice daily, max 2 grams/daily, minimum 10 days 2. 5 mg/kg IM or IV/ daily (with desired peak serum levels of at least 5 mcg/mL), monitor serum drug levels, minimum 10 days 3. 400 mg IV or 500mg PO 2x/ daily, no maximum, 10 – 14 days 4. 100 mg IV or PO 2x/daily, no maximum, 14- 21 days
Children 1. Streptomycin 2. Gentamicin 3. Ciprofloxacin	1. 15 mg/kg IM 2x/daily, maximum 2 grams/day, minimum 10 days 2. 2.5 mg/kg IM or IV 3x/daily, monitor serum drug levels, minimum 10 days 15 mg/kg IV or PO 2x/daily, maximum 800mg/daily, for 10 days
Case Management	
Mode of transmission	A. Infected animals B. Direct contact with an infected animal, through an arthropod bite, ingestion of contaminated meat or water.
Public Health Actions	Identify risk groups that may have been potentially exposed Inform family members the disease is treatable, but household needs to reduce exposure to infected animals in the farm or animal products.
Infection Control and prevention	Treated as medical waste.(IPC GL)
Reporting and Surveillance	g. Report and notify Public Health Directorate(CDC/ Zoonotic Section, Surveillance Section, FETP) using MoH forms and reporting protocols h. Identify risk group may have been potentially exposed Risk i. Inform family members the disease is treatable, but household needs to reduce exposure to infected animals in the farm or animal products.
Communication	Communication with suspected or confirmed patients would be according to CDC/MOH guideline. Educational programs have to educate the patients' family and farmer/owner to recognize, and report

	suspected cases and the mode of transmission and personal protection
Coordination	Sharing information and integrated surveillance between MOA and MOH are essential to control infection and inter-sectoral cooperation with all other stakeholders is crucial to control the disease
Waste, Equipment, laundry Treatment and management	Treated as medical waste.(IPC GL)

7.2 Introduction

Tularemia is an aerobic zoonotic infection caused by the bacterium *Francisella Tularensis.* The disease is capable of infecting humans following contact with invertebrate vectors and infected animals. Ticks and arthropod vectors have bene known to transmit Tularemia – mosquitos, horse flies, fleas, lice – if they have previously bitten infected animals. Likewise, humans can contract Tularemia from contact with infected animals through trading of wild animals as well as the hunting or skinning of infected mammals. F. tularensis is a facultative intracellular pathogen that replicates primarily within host macrophages by impairing phagosome maturation and phagosome-lysosome fusion. F. tularensis is also capable of delaying, suppressing, or avoiding many other host immune responses. Recovery from infection depends on development of host cell-mediated immunity

7.3 Causative Agent

Francisella tularensis are small, aerobic, non-motile, gram-negative coccobacilli. Most cases in humans are due to *F. tularensis* subspecies *tularensis*, (Jellison type A) and *F. tularensis* subsp *holarctica* (Jellison type F) – with type A leading to more severe disease.

7.4 Pathogenesis and mode of transmission

F. tularensis is highly virulent with its subspecies Jellison type A more commonly associated with severe clinical infection. The bacteria first spreads to the regional lymph nodes and continues spreading through the lyphohematogenous route. At the site of inoculation there is an acute inflammatory reaction, in which granulomas may form and occasionally caseate. In spite of this, the *F. tularensis* bacteria can remain alive in tissues for some time.

7.5 Description of Illness (use a table)

Tularemia illness can fall into one of 6 categories shown below:

Ulceroglandular	Glandular	Oculoglandular
A non-healing skin ulcer appears at the inoculation site (i.e., arthropod or animal bite, or handling of an infected animal),	Patients present with large, tender lymph nodes without skin lesions. This form is generally acquired through the bite of an infected tick or deer fly or from handling sick or dead animals.	Patients present with severe, painful conjunctivitis (usually unilateral) with regional lymphadenopathy in front of the ear (preauricular nodes). This form occurs if bacteria enter through the

accompanied by large, tender regional lymph nodes. This is the most common form of tularemia		eye, such as through touching the eyes while handling an infected animal.
Oropharyngeal	Pneumonic (pulmonary)	Septicemic/Typhoidal
Patients may have severe throat pain, mouth ulcers, exudates on the throat and tonsils, tonsillitis, and cervical lymphadenopathy after ingesting contaminated food or water.	The pneumonic form is the most serious form of tularemia and also the most probable presentation of illness in a bioterrorist attack. Symptoms include fever, non-productive cough, difficulty breathing, and pleuritic chest pain. Patchy bilateral infiltrates, pleural effusion and hilar lymphadenopathy may be seen on chest X-ray. Pneumonic tularemia can be a primary infection following inhalation of organisms, or secondary to other forms when the organism spreads through the blood and localizes in the lung or pleural spaces.	Septicemic tularemia can develop after any mode of acquisition. Patients may present with any combination of symptoms including fever, chills, headache, muscle aches, sore throat, abdominal pain, diarrhea, and vomiting. This form of blood-borne infection can also lead to shock, DIC, or other complications.

7.6 Incubation

Tularemia's incubation ranges from 3 – 5 days on average during a 14-day period.

7.7 Period of Communicability

Tularemia has no human-to-human transmission, however the infectious agent, if left untreated, can remain in blood during the first 2 weeks of the disease and in lesions a month or longer. *F. tularensis* can survive in water, mud, and animal carcasses for prolonged periods.

7.8 Laboratory diagnosis

A. Supportive

- Detection of *F. tularensis* in a clinical specimen by direct immunofluorescence assay (DFA), immunohistochemical staining, or polymerase chain reaction (PCR) assay.
- Detection of antibodies to *F. tularensis* through a single serologic test. Ideally, serum would be collected at least 14 days after illness onset to ensure sufficient time for development and detection of an antibody response.

B, ***Confirmatory***

- Isolation of *F. tularensis* from a clinical specimen; appropriate specimens include swabs or scrapings of ulcers, lymph node aspirates or biopsies, pharyngeal swabs, or respiratory specimens (e.g. pleural fluid), depending on the form of illness. Blood cultures may often

be negative. The laboratory should be alerted if *F. tularensis* is suspected so cultures can be incubated for extended periods, due to the fastidious, slow-growing nature of the bacterium.

- Seroconversion from negative to positive IgM and/or IgG antibodies in paired sera. Ideally, the first serum sample would be collected during the acute phase of illness (within first week of onset) and the second serum sample would be collected 2-3 weeks later.

7.9 Case Classification

Probable: a clinically compatible case with presumptive laboratory results

Confirmed: A clinically compatible case with confirmatory laboratory results

1. Clinical Criteria for Diagnosis:
    - Ulceroglandular (cutaneous ulcer with regional lymphadenopathy)
    - Glandular (regional lymphadenopathy with no ulcer)
    - Oculoglandular (conjunctivitis with preauricular lymphadenopathy)
    - Oropharyngeal (stomatitis, pharyngitis, or tonsillitis with cervical lymphadenopathy)
    - Pneumonic (primary pulmonary disease)
    - Typhoidal (febrile illness without early localizing signs and symptoms).
    - Clinical diagnosis is supported by evidence of or history of a tick or deerfly bite, exposure to tissues of a mammalian host of *F. tularensis,* exposure to potentially contaminated dust or water, or laboratory exposure
2. Laboratory Criteria for Diagnosis
    a. Withdrawing sample and transportation

7.10 Reporting

Presumptive and confirmed cases should be notified to the Department of Health at provincial and national levels immediately for follow up action.

7.11 Treatment

The regimen should be adjusted based on the person's age, medical history and underlying health conditions, pregnancy status, or allergies.

	Drug	Dosage	Maximum	Duration (Days)
Adults	Streptomycin	1 g IM twice daily	2 g per day	Minimum 10
	Gentamicin	5 mg/kg IM or IV daily (with desired peak serum levels of at least 5 mcg/mL)	Monitor serum drug levels	Minimum 10
	Ciprofloxacin	400 mg IV or 500 mg PO twice daily	N/A	10–14

	Doxycycline	100 mg IV or PO twice daily	N/A	14–21
Children	Streptomycin	15 mg/kg IM twice daily	2 g per day	Minimum 10
	Gentamicin	2.5 mg/kg IM or IV 3 times daily**	Monitor serum drug levels and consult a pediatric infectious disease specialist	Minimum 10
	Ciprofloxacin	15 mg/kg IV or PO twice daily	800 mg per day	10

7.12 Infection Control Measures

7.12.1 Personal Protective Equipment

Laboratory personnel should be alerted when tularemia is suspected. Standard diagnostic procedures with clinical materials can be performed in biosafety level 2 conditions. All work with suspect cultures of tularensis should be performed in a biological safety cabinet. Manipulation of cultures and other procedures that might produce aerosols or droplets (e.g., grinding, centrifuging, or vigorous shaking) should be conducted under biosafety level 3 conditions.

7.12.2 Decontamination and Hygiene

Bodies of patients who die of tularemia should be handled using standard precautions. Autopsy procedures likely to produce aerosols or droplets should be avoided. Clothing or linens contaminated with body fluids of patients with tularemia should be disinfected per standard hospital procedure.

Commercially available bleach or a 1:10 dilution of household bleach and water is considered adequate for cleaning contaminated surfaces. After 10 minutes, a 70% solution of alcohol can be used to further clean the area and reduce the corrosive action of the bleach. Following direct exposure to powder or liquid aerosols containing F tularensis, body surfaces and clothing should be washed with soap and water.

Water contamination can be eradicated through standard chlorination. Normal chlorination levels in drinking water will reduce F tularensis strains by 4 log10 in less than 2 hours. Chlorinating natural water sources is generally not feasible, so contaminated natural water sources would need to be contained to prevent public and animal use (Hodges 2010).

7.12.3 Precautions for exposed personnel

Person-to-person transmission of tularemia has not been documented; therefore, Standard Precautions are considered adequate for patients with tularemia

7.13 References

a. https://doh.wa.gov/sites/default/files/legacy/Documents/5100//420-082-Guideline-Tularemia.pdf?uid=626b1cc7798b0
b. https://www.cdc.gov/tularemia/clinicians/index.html
c. https://www.medilib.ir/uptodate/show/3130
d. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3683997/#:~:text=Infection%20by%20F.,by%20inhalation%20of%20aerosolized%20organisms.
e. https://apps.who.int/iris/handle/10665/43793

f. https://www.cidrap.umn.edu/infectious-disease-topics/tularemia#overview&1-8

8.0 MERS

8.1 Summary

Signs and Symptoms	Initial symptoms of fever, cough, shortness of breath, diarrhea, may progress to pneumonia, respiratory distress, and sometimes kidney failure
Incubation	Not definitively defined, up to 14 days
Case Classification	
Person under investigation (PUI) within 14 days of symptom onset	Contact Under Investigation
- Fever and pneumonia or acute respiratory distress syndrome AND: o Travel in or near the Arabian Peninsula or o Close contact with a symptomatic traveler who developed fever and acute respiratory illness with MERS-CoV considered. - Fever and symptoms of respiratory illness and a healthcare facility in or near the Arabian peninsula with recent healthcare – associated cases of MERS - Fever or respiratory illness AND close contact with a confirmed MERS case while ill	Fever or symptoms of respiratory illness within 14 days of close contact with confirmed MERS case while the case was ill.
Probable	Confirmed
- PUI with absent or inconclusive test results for MERS-CoV who is a close contact of a laboratory confirmed MERS CoV case.	Laboratory confirmation of MERS-CoV infection.
Differential Diagnosis	Other respiratory pathogens such as Influenza A and B and other respiratory viruses, streptococcus pneumoniae, and Legionella pneumophila
Laboratory Testing	Presumptive: ELISA, or enzyme-linked immunosorbent assay, is a screening test used to detect the presence and

	concentration of specific antibodies that bind to a viral protein Confirmed: The microneutralization assay is a highly specific confirmatory test used to measure neutralizing antibodies, or antibodies that can neutralize virus., RT-PCR
Treatment	Supportive treatment Antiviral drug
Case Management	Any person who has had close contact with a patient under investigation (PUI), probable or confirmed case while the person was ill, should be carefully monitored for 14 days for the appearance of respiratory symptoms. 2. Close contact is defined as: a) being within approximately 6 feet (2 meters) or within the room or care area, of a confirmed MERS case for a prolonged period of time (such as caring for, living with, visiting, or sharing a healthcare waiting area or room with a confirmed MERS case) while not wearing recommended personal protective equipment (i.e., gowns, gloves, NIOSH-certified disposable N95 respirator, eye protection or, b) having direct contact with infectious secretions (e.g., being coughed on) while not wearing recommended personal protective equipment. Data to inform the definition of close contact are limited. Transient interactions, such as walking by a person with MERS, are not thought to constitute and exposure; however, final determination should be made in consultation with public health authorities. The local health authority should provide contacts of a case with instructions to check daily temperature and other symptoms to watch for and should assess contacts for symptoms at the end of the 14-day period, at a minimum, and more frequently as resources allow. If the contact develops fever, cough, shortness of breath, or breathing trouble, they should be told to wear a mask when around other people and to consult with their healthcare provider and report the MERS-CoV risk exposure. If the contact has an outpatient or emergency department visit, they should be told to put on a mask before entering the facility and to report the potential MERS-CoV exposure. Infection control measures should continue until MERS-CoV testing is done. If severe acute respiratory illness develops within the first 14 days following the contact, the individual should be considered a “Patient Under Investigation” and reported to CDC.

Mode of transmission	A. Dromedary camels are a major reservoir B. Infection, indirect or direct, from infected dromedary camels
Public Health Actions	Immediately implement standard, contact, and airborne precautions for MERS-CoV persons under investigation (PUI). Use gloves, gowns, eye protection and an N95 or higher respirator for all patient care activities. These recommendations are consistent with those recommended for the coronavirus that caused severe acute respiratory syndrome (SARS). Care for PUI in an Airborne Infection Isolation Room (AIIR). If this is not available, transfer the patient as soon as possible to a facility with an AIIR. Pending transfer, place a facemask on the patient, if tolerated, and house in a single-patient room with the door closed. The patient should not be placed in any room where room exhaust is recirculated without high-efficiency particulate air (HEPA) filtration. Once in an AIIR, the patient's facemask may be removed. When outside of the AIIR, patients should wear facemasks to contain secretions. Limit transport and movement of a patient outside of the AIIR to medically essential purposes. Implement staffing policies to minimize the number of personnel that must enter the room. Infection prevention recommendations may be updated as information about transmission and the severity of clinical illness caused by MERS-CoV becomes available. For full details of these precautions, see Appendix A: Type and duration of precautions needed for selected infections and conditions in the 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings.
Infection Control and prevention	Treated as medical waste. (IPC GL)
Reporting and Surveillance	a. Report and notify Public Health Directorate(CDC/ Zoonotic Section, Surveillance Section, FETP) using MoH forms and reporting protocols b. Identify risk group may have been potentially exposed Risk c. Inform family members the disease is treatable, but household needs to reduce exposure to infected animals in the farm or animal products.
Communication	Communication with suspected or confirmed patients would be according to CDC/MOH guideline.

	Educational programs have to educate the patients' family and farmer/owner to recognize, and report suspected case and the mode of transmission and personal protection
Coordination	Sharing information and integrated surveillance between MOA and MOH are essential to control infection and inter-sectoral cooperation with all other stakeholders is crucial to control the disease
Waste, Equipment, laundry Treatment and management	Treated as medical waste. (IPC GL)

8.2 Introduction

MERS – CoV is a newly recognized beta coronavirus first reported in Saudi Arabia. It is different from other coronaviruses that have previously been found in humans. Coronaviruses may also infect many different animals and cause them to have respiratory, gastrointestinal, liver, and neurologic diseases.. The reservoir for MERS – CoV is dromedary camels. However, the related SARS-CoV can infect people and several types of animals, including monkeys, Himalayan palm civets, raccoon dogs, cats, dogs, and rodents.

To date, 27 countries (Algeria, Austria, China, Egypt, France, Germany, Greece, Italy, Malaysia, Netherlands, Philippines, Republic of Korea, Thailand, Tunisia, Turkey, United Kingdom (UK), and United States of America (USA) Bahrain, Iran, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, United Arab Emirates (UAE), and Yemen.) have far reported laboratory-confirmed cases of MERS. Amongst these countries, imported cases that were associated with travel were reported from Egypt, Lebanon, Tunisia, and Yemen.

8.3 Causative Agent

the MERS – CoV is a zoonotic coronavirus member of the family Coronaviridae – enveloped single strand RNA viruses with positive sense – first identified in Saudi Arabia in 2012. The Coronaviridae are known for causing diseases in mammals that include respiratory, hepatic, enteric, and neurologic pathologies that range from the common cold, severe acute respiratory syndrome (SARS), to COVID 19.

8.4 Pathogenesis and mode of transmission

MERS begins with virus entry in the respiratory system where its cell receptor DPP4 interacts with type I and type II pneumocytes in the respiratory tract, non-ciliated bronchial epithelial cells, endothelial cells, and some hematopoietic cells. DPP4 is not found in high abundance in the upper respiratory tract, but it is widely expressed in the epithelial cells of organs such as the kidneys, intestine, liver, thymus, and bone marrow.

Studies have shown that humans are infected through direct or indirect contact with infected dromedary camels. MERS-CoV has been identified in dromedaries in several countries, including Egypt, Oman, Qatar, and Saudi Arabia, and MERS-CoV specific antibodies in dromedaries in the Middle East, Africa and South Asia.

The virus does not pass easily from person to person unless there is close contact, such as providing unprotected care to an infected patient. There have been clusters of cases in healthcare facilities, where human-to-human transmission appears to have occurred, especially when infection prevention and

control practices are inadequate or inappropriate. Human to human transmission has been limited to date, and has been identified among family members, patients, and health care workers. While the majority of MERS cases have occurred in health care settings, thus far, no sustained human to human transmission has been documented anywhere in the world.

8.5 Description of Illness

Initial symptoms of fever, cough, and shortness of breath may progress to pneumonia, respiratory distress, and sometimes kidney failure. Diarrhea has also been reported. Males above the age of 60 with underlying conditions, such as diabetes, hypertension and renal failure, are at a higher risk of severe disease, including death. Approximately 20% of cases are asymptomatic or have mild disease.

8.6 Incubation

The current case definition uses an onset of illness within 14 days for travelers to the Arabian Peninsula or neighboring countries including patients or visitors who were present in a healthcare facility within 14 days before illness onset. Studies also show a median incubation period of 5 – 7 days [2,14] in human-to-human transmission. Five days is also the median time from the onset of symptoms to admission to intensive care units.

8.7 Period of Communicability

The period of communicability for MERS-CoV is unknown at this time. Until further guidance is available, follow isolation recommendations used for SARS; persons with MERS should be isolated (for example, by not going to work or to school) until 10 days after fever has resolved, provided respiratory symptoms are absent

8.8 Laboratory diagnosis

Presumptive case: ELISA, or enzyme-linked immunosorbent assay, is a screening test used to detect the presence and concentration of specific antibodies that bind to a viral protein. Tests by ELISAS for antibodies against two different MERS-CoV proteins, the nucleocapsid (N) and spike (S).

Confirmed case: The microneutralization assay is a highly specific confirmatory test used to measure neutralizing antibodies, or antibodies that can neutralize virus. This method is considered a gold standard for detection of specific antibodies in serum samples.

8.9 Case Classification

Below table shows case classification.

Person under investigation (PUI) within 14 days of symptom onset	**Contact Under Investigation**

- **Fever and pneumonia or acute respiratory distress syndrome AND:**
  ○ **Travel in or near the Arabian Peninsula or**
  ○ **Close contact with a symptomatic traveler who developed fever and acute respiratory illness with MERS-CoV considered.**
- **Fever and symptoms of respiratory illness and a healthcare facility in or near the Arabian peninsula with recent healthcare – associated cases of MERS**
	Fever or symptoms of respiratory illness within 14 days of close contact with confirmed MERS case while the case was ill.

- **Fever or respiratory illness AND close contact with a confirmed MERS case while ill**	
Probable	Confirmed
- **PUI with absent or inconclusive test results for MERS-CoV who is a close contact of a laboratory confirmed MERS CoV case.**	Laboratory confirmation of MERS-CoV infection.

8.10 Treatment

To date, there are no approved vaccines or therapeutic agents to prevent or treat MERS; therefore, supportive care comprises the majority of treatment. Timely administration of IFNa2 with another agent, like ribavirin, can reduce lung virus load, due to their ability to inhibit MERS – CoV replication *in vitro*

8.11 Human Vaccines

To date, there are no approved human vaccines for MERS.

8.12 Infection Control Measures

8.12.1 Personal Protective Equipment

Healthcare workers caring for probable or confirmed MERS-CoV infection should apply contact and droplet precautions: medical mask, eye protection – googles or a face shield – gown and gloves. In performing aerosol generating procedures, the procedure should be done in an adequately ventilated room with all persons wearing a well fitted FFP2 or FFP3 respirator; tight fitting eye protection; and gloves and a long sleeved impermeable protective gown.

8.12.2 Decontamination and Hygiene

Protect workers from exposure when tasked with cleaning surfaces and equipment potentially contaminated with MERS-CoV. Employers are responsible for ensuring worker safety from harmful levels of chemicals used for cleaning and disinfection of areas potentially contaminated with MERS-CoV. For airborne exposures where OSHA has adopted a permissible exposure limit (PEL) (e.g., EtO), feasible engineering controls, such as ventilation, and administrative controls must be used to reduce the exposure to or below the PEL, and these controls are recommended for harmful exposures even when OSHA has not adopted a PEL. In cases where engineering and administrative controls are not implemented

or do not bring the exposure down to safe levels, PPE, such as chemical-resistant or -impermeable garments or a respirator with N95 particulate/chemical combination cartridge must be used.

At this time, there is no EPA-approved list of disinfectants effective against MERS-CoV. EPA does not categorize disinfectants as hospital- or commercial-grade or keep a list of EPA-registered antimicrobial products registered for use in healthcare facilities.2 As a result, products effective at inactivating the virus must be determined based on data associated with inactivating similar or hardier (i.e., more difficult to inactivate) viruses. MERS-CoV is a coronavirus and highly susceptible to inactivation by many commonly used disinfectants. Currently, OSHA recommends following SARS disinfection practices (see section D-10 in the linked document) for environmental areas contaminated with MERS-CoV.3

The CDC advises the use of EPA-registered chemical germicides that provide low or intermediate level disinfection for SARS during general use (surface and noncritical patient-care equipment) because these products inactivate related viruses with similar physical and biochemical properties. CDC's Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008 provides information on the effectiveness of germicides on coronaviruses.

8.12.3 Administrative and Engineering Controls

Administrative controls and policies that apply to acute respiratory infection (ARI) include establishment of sustainable IPC infrastructures and activities; HCW training; patients' care givers education; clear policies on early recognition of ARIs of potential concern, access to prompt laboratory testing for identification of the etiologic agent; prevention of overcrowding especially in the Emergency department; provision of dedicated waiting areas for symptomatic patients and appropriate placement of hospitalized patients promoting an adequate patient-to-staff ratio; provision and use of regular supplies; IPC policies and procedures for all facets of healthcare provisions - with emphasis on surveillance of ARIs among HCWs and the importance of seeking medical care; and monitoring of HCW compliance, along with mechanisms for improvement as needed.

Environmental controls include basic health-care facility infrastructures. These controls address ensuring adequate environmental ventilation in all areas within a health-care facility, as well as adequate environmental cleaning. Spatial separation (social distancing) of at least 1m should be maintained between each ARI patient and others, including HCWs (when not using PPE). Both controls can help reduce the spread of many pathogens during health care.

8.13 References

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b. https://www.who.int/news-room/fact-sheets/detail/middle-east-respiratory-syndrome-coronavirus-(mers-cov)
c. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5353356/
d. https://www.cdc.gov/coronavirus/mers/index.html
e. https://www.cdc.gov/coronavirus/mers/index.html

9.0 Dengue Fever

9.1 Summary

Signs and Symptoms	Infectious viral diseases with Signs and Symptoms as; Headache, retro-orbital pain, myalgia, arthralgia, rash, hemorrhagic manifestations, and bleeding tendencies
Incubation	ranges from 3-14 days
Case Classification	1. Suspected case: A case compatible with the clinical description 2. Probable case: A case compatible with the clinical description with **one or more** of the following: Supportive serology comparable IgG ELISA titer or positive IgM antibody test in late acute or convalescent-phase serum specimens))**(It is not available in Iraq)** Occurrence at same location and time as other confirmed cases of dengue fever 3. Confirmed case: A case compatible with the clinical description that is laboratory confirmed) **(It is not available in Iraq)**
Differential Diagnosis	Flu-like syndromes, Illnesses with a rash, Diarrheal diseases, Illnesses with neurological manifestations, Acute gastroenteritis, malaria, leptospirosis, typhoid, typhus, viral hepatitis, acute HIV, seroconversion illness, bacterial sepsis, septic shock, Acute leukemia and other malignancies, Acute abdomen condition.
Laboratory Testing	a. **General test**: Complete blood count, Liver Function test, Renal Function test, Serum electrolytes, Calcium, and albumin (can be used as markers for plasma leakage) Random Blood sugar. b. confirmed PCR and ELISA (it is not available in Iraq)
Treatment	Supportive treatment: Intravenous fluids, antipyretics, and oral rehydration salts, In severe cases, additional drugs are necessary (vitamin K1, Ca gluconate, NaHCO3, glucose, furosemide, KCl solution, vasopressor, and inotropes). Blood and blood products may be required
Duration of treatment	According to the severity
Case Management	a. Health facility should be a designated for dengue patients, and a high-dependency unit for closer monitoring of those with shock. b. Persons who are epidemiologically linked and may have the same exposure as the case, including household members and persons who work or travelled with the case. c. There is no person-to-person transmission, but may be infected through a mosquito transferring virus from one person to another
Mode of transmission	a. Reservoir. **Man, and mosquito** b. Onward transmission Person-to-person transmission through a mosquito-transferring virus.

Public Health Actions	Educating the community, family and relevant professional groups about the mode of transmission and current procedures used for dengue control
Infection Control and prevention	a. All medical and para-medical staff and attendants should wear PPE b. The health awareness creating teams should continue to make awareness among the community on transmission and control of DF. c. Identify Household or other contacts of the case that may have had the same history. d. Enhance active surveillance.
Reporting and Surveillance	a. Immediately Report and notify Public Health Directorate (CDC/ Zoonotic Section, Surveillance Section, FETP) using MoH forms and reporting protocols b. Identify close contacts or other who may have been potentially exposed to same Risk factor. c. Enhance active surveillance
Communication	Primary prevention is the most effective measure in dengue prevention and control since no vaccine is currently available and timely information for the public should be implemented concurrently with vector control activities in order to engage the community in practices that reduce dengue transmission.
Coordination	Establishment of a multisectoral dengue action committee coordinator with the political mandate to make policy and financial decisions and to coordinate the multisectoral preparedness and response strategy at local and national levels to control DF.
Waste, Equipment, laundry Treatment and management	Treat waste contaminated with blood, body fluids, as medical waste, in accordance with national IPC GL.

9.2 Introduction

Dengue fever is a mosquito-borne tropical disease caused by the dengue virus and the most common vector-borne diseases worldwide and it is known as "break-bone fever." [1] Over the past two decades, there has been global increase in the frequency of DF, DHF and its epidemics, more than 120 countries has been affected In 2013, it caused about 60 million symptomatic infections worldwide, with 18% hospitalized and about 13,600 deaths. 12 countries in Southeast Asia were reported around 3 million infections and 6,000 deaths per year. In 2019, According to 2005 IHR, Philippines declared a national dengue epidemic with deaths reaching 622 people that year. [1,2] Figure 1

Outbreaks of dengue have been documented in the Eastern Mediterranean. Recent outbreaks of suspected dengue have been recorded in Pakistan, Saudi Arabia, Sudan and Yemen, 2005—2006.[3]

In Iraq, No nationwide investigation has been carried out to determine the actual extent of infection in the general population. Study was carried out in in Basra province showed that the majority of population exposed to dengue virus and the prevalence of IgG antibody against dengue virus rises with age.[4]

Figure 1: **Geographical distribution of dengue cases reported worldwide in 2022, as of 8 February 2022** [5]

9.3 Causative agent

Dengue virus (DENV) is an RNA virus of the family Flaviviridae as following [2]:

Virus Flaviviridae	Diseases	Natural Distribution	Source of Human Infection	Incubation Period (days
Yellow Fever	Yellow Fever	Tropical Africa, South America	Mosquito	3-6
Dengue	Dengue fever, Dengue hemorrhagic fever, and Dengue shock syndrome	Asia, Americas, Africa	Mosquito	3-14
Kyasanur forest fever	Kyasanur Forest disease	India	Tick	3-8
Omsk HF	Omsk hemorrhagic fever	Soviet Union	Tick, Muskrat-contaminated water	3-8

9.4 Reservoirs

Man, and mosquito are reservoirs of infection. Trans-ovarian transmission (infection carried over to next progeny of mosquitoes through eggs) has made the control more complicated. [2]

9.5 Transmission

Dengue viruses are transmitted by: [2,]

- The bite of female Aedes mosquitoes, especially Aedes aegypti. Figure (2). They usually biting in the early morning and in the evening but may be spread the infection at any time of the day. Other Aedes species that transmit the disease include **Aedes albopictus**, **A. polynesiensis** and **A. scutellaris**.
- Dengue fever can also be transmitted through infected blood products and organ donation.
- Vertical (mother-to-child) transmission has been reported during pregnancy or at birth.
- Person-to-person transmission, including sexual transmission, have also been reported, but these are very unusual.

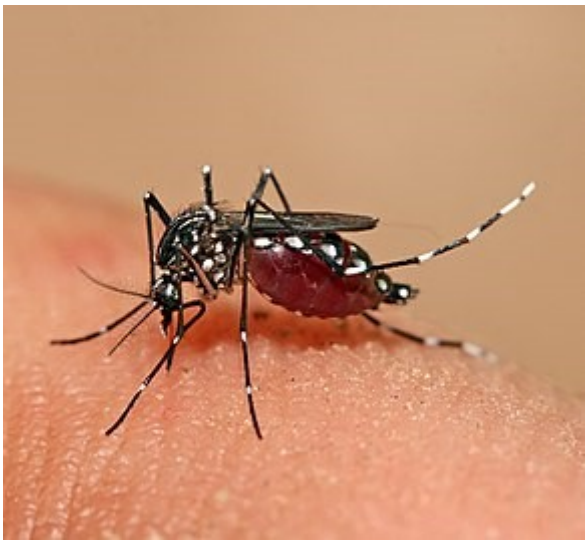

Figure 2: The mosquito *Aedes aegypti*

9.6 Incubation period

The illness typically starts from 4 to 7 days after a person is bitten by an infected mosquito, but ranges from 3-14 days.[2]

9.7 Clinical Case Classification

The clinical classification depends on age, immune status of the host and the virus strain and this classification recommended by WHO are shown in Table 1: [2,6]

Classification	Manifestation
Acute febrile illness	2-7 days duration with two or more of the following manifestations: Headache, retro-orbital pain, myalgia, arthralgia, rash, hemorrhagic manifestations.
Dengue Hemorrhagic Fever	**a)**. A probable or confirmed case of dengue plus **b).** Hemorrhagic tendencies evidenced by **one or more of the following** 1. Positive tourniquet test 2. Petechiae, ecchymoses or purpura 3. Bleeding from mucosa, gastrointestinal tract, injection sites or other sites

	4. Hematemesis or Malena plus **c).** Thrombocytopenia (<100,000 cells per microliter) **d).** Evidence of plasma leakage due to increased vascular permeability, manifested by **one or more of the following :** 1. A rise in average hematocrit for age and sex > 20% 2. More than 20% drop in hematocrit following volume replacement treatment compared to baseline 3. Signs of plasma leakage (pleural effusion, ascites, hypoproteinaemia)
Dengue Shock Syndrome	*All the above criteria for DHF Plus* evidence of circulatory failure manifested by rapid and weak pulse and narrow pulse pressure (<20 mm Hg) or hypotension forage, cold and clammy skin and restlessness.

9. Case classification (Case definition)

Case definition is categorized to followings [2,6]

Category	Manifestation
Suspected	A case compatible with the clinical description
Probable	A case compatible with the clinical description with **one or more** of the following: Supportive serology (reciprocal hemagglutination inhibition titer, comparable IgG ELISA titer or positive IgM antibody test in late acute or convalescent-phase serum specimens) Occurrence at same location and time as other confirmed cases of dengue fever
Confirmed	A case compatible with the clinical description that is laboratory Confirmed

9.8 Sign and symptoms

The characteristic symptoms of dengue are sudden-onset fever, headache (typically located behind the eyes), muscle and joint pains, and a rash. An alternative name for dengue, "breakbone fever", comes from the associated muscle and joint pains. The course of infection is divided into three phases: febrile, critical, and recovery. [6] Figure 3.

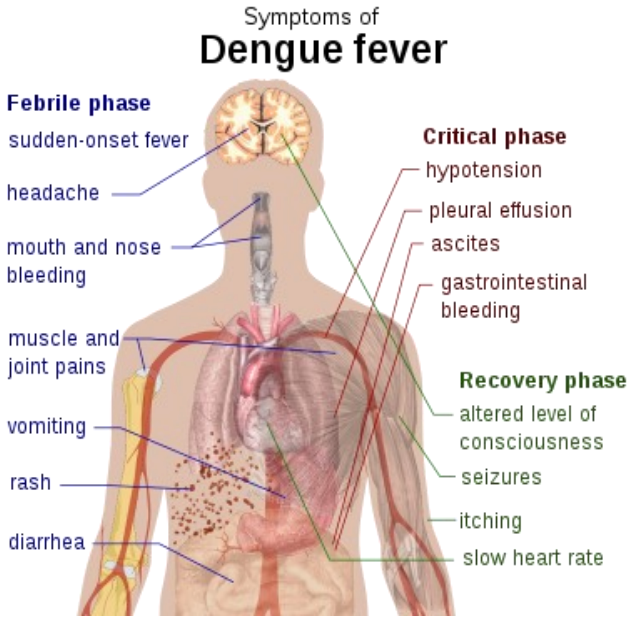

Figure 3: Schematic depiction of the symptoms of dengue fever

9.9 Differential Diagnoses

Dengue fever should be differentiated from other diseases as shown in table2. [7]

Conditions that mimic the febrile phase of dengue infection	
Condition	D DX
Flu-like syndromes	Influenza, measles, Chikungunya, infectious mononucleosis , HIV seroconversion illness
Illnesses with a rash	Rubella, measles, scarlet fever, meningococcal infection, Chikungunya, drug reactions
Diarrheal diseases	Rotavirus, other enteric infections
Illnesses with neurological manifestations	Meningoencephalitis Febrile seizures
Conditions that mimic the critical phase of dengue infection	
Infectious	Acute gastroenteritis, malaria, leptospirosis, typhoid, typhus, viral hepatitis, acute HIV seroconversion illness, bacterial sepsis, septic shock
Malignancies	Acute leukemia and other malignancies
Other clinical pictures	Acute abdomen – acute appendicitis – acute cholecystitis – perforated viscus Diabetic ketoacidosis Lactic acidosis Leukopenia and thrombocytopenia ± bleeding Platelet disorders Renal failure Respiratory distress (Kussmaul's breathing) Systemic Lupus Erythematosus

9.10 12. Laboratory investigations [7]

*Laboratory diagnosis of dengue is not available in Iraq. For your kind information; the laboratory investigations as following:

9.10.1 General investigation

Complete blood count, Liver Function test, Renal Function test, Serum electrolytes, Calcium and albumin(can be used as markers for plasma leakage) ,Random Blood sugar, Other tests to exclude differentials diagnosis: MP, Scrub Typhus, enteric fever, zika and chikungunya.

9.10.2 Rapid diagnostic test (RDT) Figure 3. (it is not available in Iraq)

- RDT test kit for Dengue infections are available in various types; detect both antigen (NS1) and antibody (IgM and IgG), NS1or antibody (IgM and IgG) only.
- NS1 antigen: appears within 24 hours of onset of symptoms and is positive till Day 5
- IgM: Positive by Day 5 of fever and remains positive till 2-3 months
- IgG: Positive by Day 7 of illness and lasts lifelong for particular serotype

* *In a secondary infection IgG response is more robust and appears before IgM for the new infection. When lab reports suggest IgG positive with NS1 Ag and IgM negative, Suspect past dengue infection.*

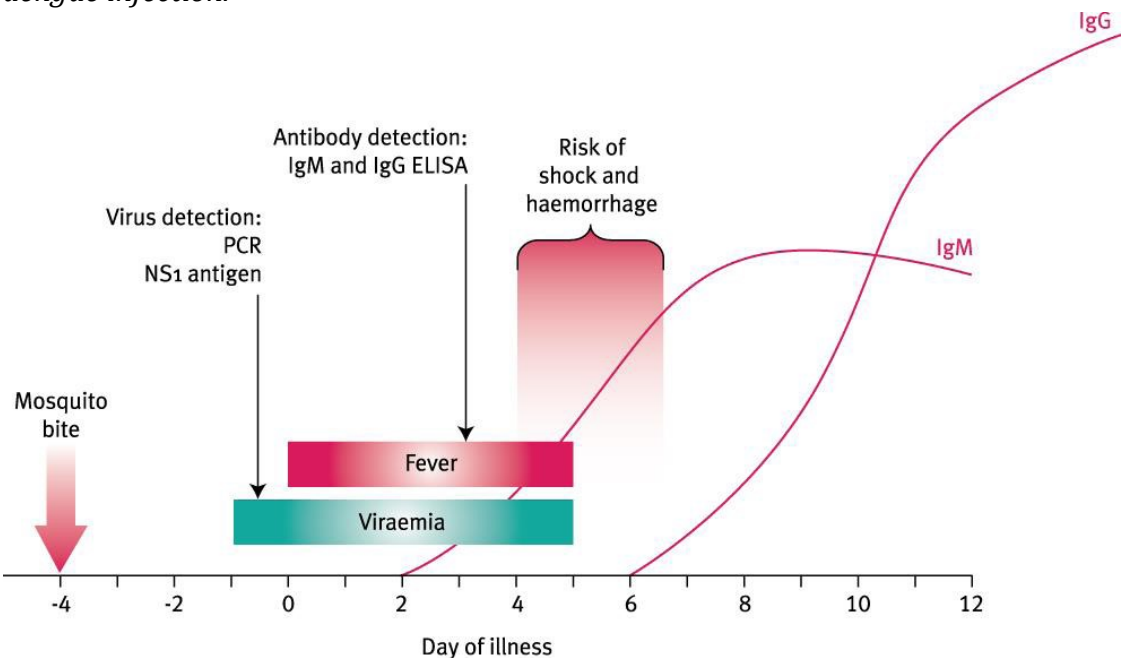

Figure 3: Typical primary dengue infection with timing of diagnostic tests [31]

9.10.3 Confirmatory laboratory testing

PCR and ELISA. (it is not available in Iraq)

9.10.4 Imaging

- **Chest X-ray:** to look for pleural effusion
- **Ultrasound scan chest**: Pleural effusion
- **Ultrasound abdomen:** Enlarged liver and ascites

9.11 Management [6]

- Clinical management of Dengue should be started based on clinical diagnosis without waiting for confirmatory test.
- Both suspected and confirmed dengue cases should be notified.
- Mortality from Dengue can be reduced to almost zero by implementing timely and appropriate clinical management. In the management of dengue.[2]
- **identify Risk group:**
  - Those with underlying conditions: Coronary Artery Disease, Diabetes
  - Mellitus, Chronic Obstructive Pulmonary Disease, hypertension, renal failure, bleeding disorders
  - Patients on antiplatelet (aspirin, clopidogrel), anticoagulants(warfarin, heparin) or immunosuppression therapy
  - Children
  - Pregnant women
  - Elderly >65 years
  - Alcohol abusers
  - Past history of dengue
  - No **treatment**: No specific antiviral agents exist **for dengue**.
  - Supportive care is advised: Patients should be advised to stay well hydrated and to avoid aspirin.
  - **Fever** should be controlled with acetaminophen and tepid sponge baths.
  - Febrile patients should avoid mosquito bites to reduce risk of further transmission.

9.11.1 Recommendations for clinical management

Health-care workers at the first levels of care should apply a stepwise approach as suggested as following:

Step I – Overall assessment

1. The history should include:

- Date of onset of fever/illness
- Assessment of warning signs
- History of travel or live in endemic areas
- Co-existing conditions (e.g., infancy, pregnancy, obesity, diabetes mellitus, hypertension)
- Jungle trekking and swimming in waterfalls (consider leptospirosis, typhus, malaria), recent unprotected sex or drug abuse (consider acute HIV- seroconversion illness).

2. The physical examination should include:

- Assessment of mental state/level of consciousness
- Assessment of hydration status
- Assessment of hemodynamic status (Check for postural hypotension)
- Checking for tachypnoea/acidotic breathing/pleural effusion
- Checking for abdominal tenderness/hepatomegaly/ascites
- Examination for rash and bleeding manifestations

- Tourniquet test (repeat if previously negative or if there is no bleeding manifestation).This test is more specific in children.

3. Investigations

- Do CBC on **first visit** (it may be normal); and repeat daily until the critical phase is over
- Use the HCT in the early febrile phase as the patient's own baseline.
- If the patient's baseline HCT is not available use age-specific population HCT levels as a surrogate during the critical phase
- Decreasing Total Leucocyte Count and platelet counts make the diagnosis of dengue very likely
- Leukopenia usually precedes the onset of the critical phase and has been associated with severe disease
- A rapid decrease in platelet count, concomitant with a rising HCT compared to the baseline, is suggestive of progress to the plasma leakage/critical phase of the disease
- Dengue test

Step II – Diagnosis, assessment of disease phase and severity

On the basis of evaluation of the history, physical examination and/or full blood count, hematocrit and dengue specific tests, clinicians should determine whether the disease is dengue, which phase it is in (febrile, critical or recovery), whether there are warning signs, the hydration and hemodynamic state of the patient, and whether the patient requires admission.

9.12 Activities at the first level of care should focus on:

- Recognizing that the febrile patient could have dengue.
- Notifying early to the public health authorities that the patient is a suspected case of dengue.
- Managing patients in the early febrile phase of dengue.
- Recognizing the early stage of plasma leakage or critical phase and initiating fluid therapy.
- Recognizing patients with warning signs who need to be referred for admission and/or intravenous fluid therapy to a secondary health care facility.
- Recognizing and managing severe plasma leakage and shock, severe bleeding and severe organ impairment promptly and adequately.

9.12.1 Referral centers [9]

Referral centers receiving severely ill dengue patients must be able to give prompt attention to referred cases. Beds should be made available to those patients who meet the admission criteria These centers should be staffed by doctors and nurses who are trained to recognize high-risk patients and to institute appropriate treatment and monitoring.

9.12.2 Referral Criteria

A number of criteria may be used to decide when to transfer a patient to a high dependency unit. These include:

- Early presentation with shock (on days 2 or 3 of illness).
- Severe plasma leakage and/or shock.

- Undetectable pulse and blood pressure.
- Severe bleeding.
- Fluid overload.
- Organ impairment (such as hepatic damage, cardiomyopathy, encephalopathy, encephalitis and other unusual complications).

9.12.3 Discharge patient criteria [10]

All of the following conditions must be present:

Clinical:

- No fever for 48 hours
- Improvement in clinical status (general well-being, appetite, hemodynamic status, urine output, no respiratory distress)

Laboratory

- Increasing trend of platelet count
- Stable hematocrit without intravenous fluids

9.13 Dengue surveillance [11]

Surveillance is a critical component of any dengue prevention and control program as it provides the information necessary for risk assessment, epidemic response, and program evaluation. Surveillance can utilize both passive and active data collection processes. Pl. See surveillance chapter)

9.14 Prevention and Control [12]

9.14.1 Vector control and reducing exposure:

- Indoor Residual Spraying during transmission season
- Thermal Fogging during outbreaks
- Larvicides inoculation
- Wear long-sleeve clothes at dusk and dawn to prevent mosquito bites
- Use mosquito repellents on exposed body parts

9.14.2 Control Cross-border spread and ports of entry

Cross-border control of infected livestock or migrant populations is critical for controlling the spread of the disease among animals and humans.

9.15 Communication.

Primary prevention is the most effective measure in dengue prevention, control since no vaccine is currently available, and timely information for the public should be implemented concurrently with vector control activities in order to engage the community in practices that reduce dengue transmission.

9.15.1 Education and training

To ensure the presence of adequate staffing at all levels, the education and training of doctors, nurses, auxiliary health care workers and laboratory staff are priorities.

9.15.2 Identification of contacts

There is a need to follow up persons who have had the same exposure as the case in receptive areas.

9.16 References

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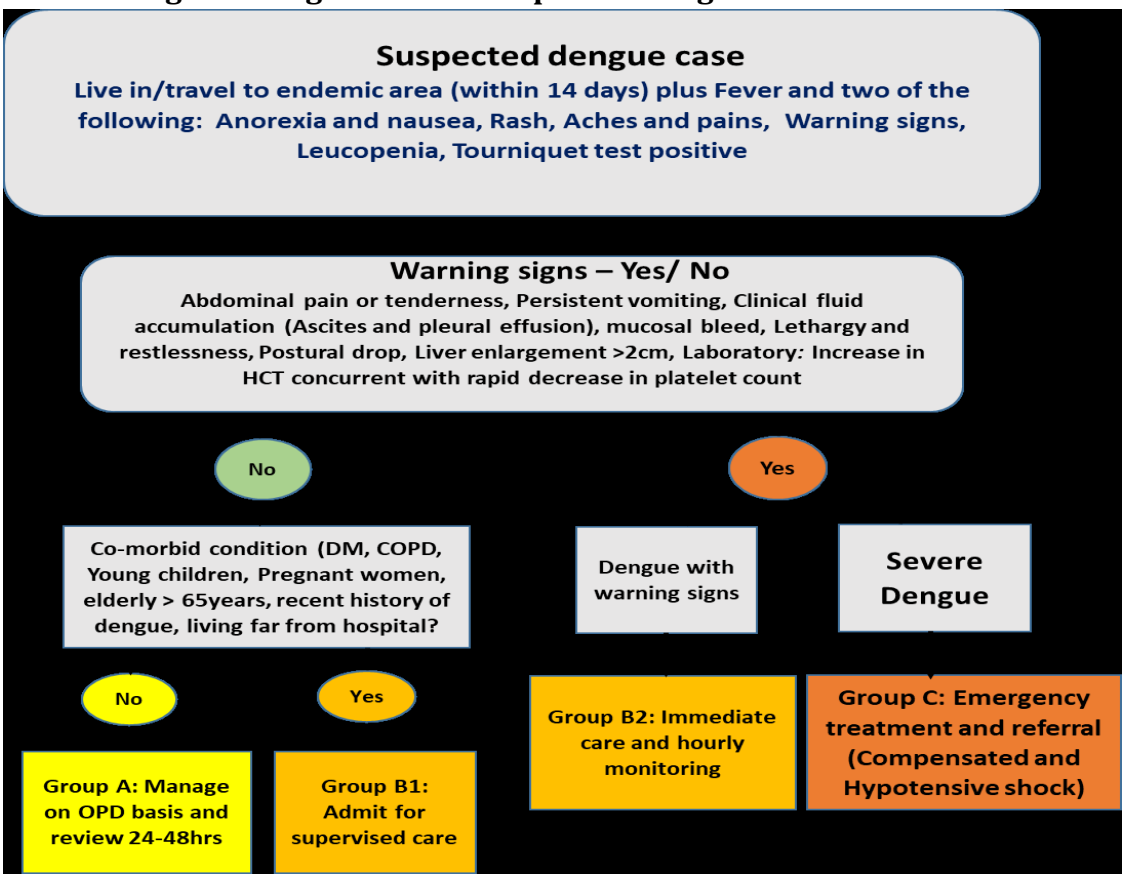
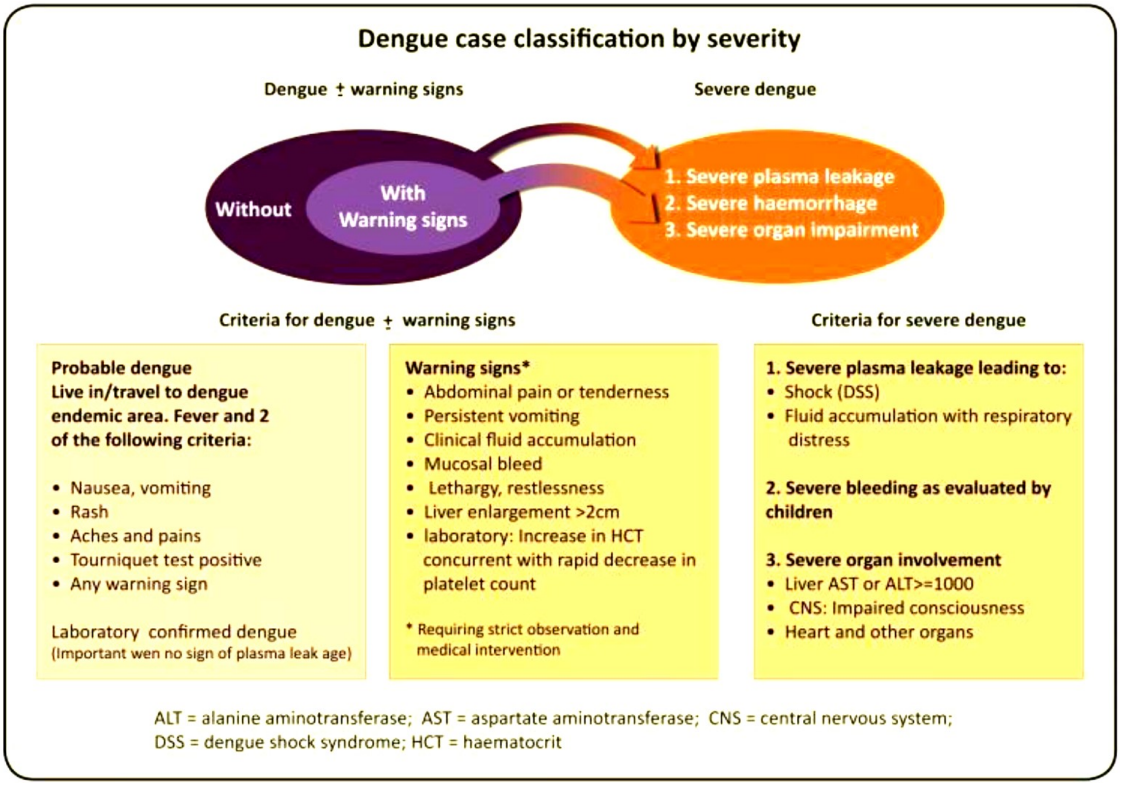
Annex 1: Figure 2: Algorithm for Suspected Dengue Case



Annex2: Dengue case classification by severity



10.0 SOPs for managing Biothreat Pathogen suspects and confirmed cases

Below are Standard Operating Procedure (SOP) for Health Care Facilities - Attending to Suspected biothreat pathogens patients

10.1 Identification of biothreat pathogens suspected cases in a health care facility:

1	**Refer** suspected patients (see case definition) immediately to designated referral facility with special ambulance and team, equipped with adequate PPE.
2	**Isolate** as much as possible until a Biothreat Pathogen suspect or confirmed patient is referred for diagnostics, treatment or care.
3	**Examine** the patient using proper personal protective equipment
4	**Inform** patient and family of referral and on avoidance of unprotected contact
5	**Inform** the receiving health referral facility of the arrival of the patient, to allow for immediate case management.
6	**Register** the patient according to the health facility register format, including full address of patient.

10.2 Patient Management once admitted at the referred health facility:

1	**Isolate patient immediately for initial evaluation.**
2	**Physician should** ▪ Immediately assess patient to determine if case definition is met, using adequate PPE ▪ Complete form (case notification form/ CDC / MOH) and notify immediately hospital communicable disease focal point (verbal followed by hard copy communication) ▪ After initial assessment, admit patient in single isolation room, or cohort according to level of suspicion/severity, if single isolation is not possible ▪ Prescribe treatment according to national protocols, once specimen collected ▪ Treat immediately if specimen collection cannot be done before 1-2 hours. ▪ Inform immediately Lab. team in charge of specimen collection ▪ Inform and reassure patient and family regarding disease ▪ Educate patient and family of procedure for infection control (isolation, PPE, hygiene) ▪ Provide psychological support as required ▪ Ensure monitoring of patient and treatment according to protocols.
3	**Laboratory technicians should** ▪ Ensure safe specimen collection ▪ Prepare specimens for shipment according to National protocols ▪ Fill in form (laboratory testing form) for patient's file ▪ Transport specimen to the referral laboratory with 1 copy of form.
4	**CPHL should** ▪ Sign the laboratory form upon receipt indicating the condition of specimens received ▪ Send a copy for the signed lab form and notification form to CDC Baghdad.
5	**The Directorate of Health (DOH) epidemiologist in charge of case investigation and containment and preventive measures should** ▪ Fill in **form (case investigation/ CDC/ MOH)** after case and contacts interview ▪ Fill in **form (contact monitoring/ CDC/ MOH)** for further contact tracing

	▪ Sends outreach team for contact daily monitoring with a copy of form **contact monitoring**.
6	**The leader of the outreach team should** ▪ Ensure that the house of the patient is being cleaned and disinfected immediately either with 1/10 dilution of household bleach or with detergent by teams using PPE in accordance with National IPC GL. ▪ Set a calendar for visit to eligible patients' contact and ensures that they are placed under surveillance in accordance with Biothreat Pathogens GL after last exposure to the patient (daily fever and symptom check), and that **form (contact monitoring)** is completed. ▪ Ensure that information and education is available for the close contacts being monitored (household contacts, co-workers, schoolmates….) ▪ Ensure immediate referral for evaluation at the referral facility of any contacts developing fever or illness during the observation period. ▪ Ensure availability of antiviral for prophylaxis in close contact of the suspected patient, if recommended by National Protocol
7	**The professional responsible of infection control at health care facility level** ▪ Ensures sufficient availability of PPE according to recommended norms., including health, cleaning, radiology, laboratory, ambulance and mortuary staff ▪ Ensures that procedures and norms for infection control are respected in isolation and while attending to patient, including restriction and monitoring of visits and staff attendance. ▪ Ensures that HCW treating suspected patients do not attend other patients and that shift organization allows recuperation time. ▪ Ensures that HCW are monitored twice daily for occurrence of fever or symptoms and that **form (Monitoring of exposed health care worker)** is completed ▪ Ensures respect of protocols for drugs prophylaxis in HCW, and that **form (monitoring of side effect of drugs intake)** is completed by HCW taking drugs prophylaxis
8	**The local health authority** liaises with related stakeholders to ▪ Ensure that workers exposed to source of infection are monitored for occurrence of symptoms that they are informed regarding prevention measures. **(Monitoring of exposed staff to source of infection)** should be completed ▪ **Monitoring of side effects of treatment** should also be completed by HCW undergoing prophylaxis treatment.
9	**Patient's discharge from the health facility** **In case of patient's recovery, the attending physician,** ▪ Proceeds to case re-evaluation at the end of the treatment ▪ Decides on date of discharge according to National protocols (see GL) ▪ Informs and educates patient and family before discharge on person hygiene, coughing etiquette and hand washing ▪ Set up follow-up appointment for case reassessment and collection of convalescent serum after discharge. ▪ **Fill in form (monitoring of side effects of treatment intake)**
10	**The mortuary staff, in case of patient's death** ▪ Ensures washing and preparation of the body according to infection control procedures ▪ Informs and educates the family on does and don'ts ▪ Ensures that family can proceed with other rituals in a safe manner at health care facility level (supervised ritual using adequate PPE when needed) ▪ Wraps the body in an adapted bag and place the body into the coffin ▪ Provide recommendations for further safe body/coffin management according to National protocols.
11	**If a suspected patient escape from isolation before end of the treatment**:

	The physician informs the hospital communicable disease focal point(PH unit) to take the necessary actions.
12	**The outreach team** ▪ Tries to locate the patient and advise a return to isolation ▪ If the patient refuses re-admission, follows the patient at home until end of treatment, with appropriate PPE and with twice daily fever and symptom checking ▪ Informs and educates patient and family on measures for prevention of spread of infection at household level while taking care of the patient

11.0 Laboratory Supported Biothreat Pathogen Diagnostic Tests

11.1 Anthrax

Criteria, equipment, and materials for laboratory diagnosis of anthrax

LABORATORY		CONDITION	EQUIPMENT AND MATERIALS NEEDED
DIAGNOSIS	**CAPABILITY LEVEL**		
Suspect	Peripheral Intermediate Central/reference	The smear shows gram-positive, square-ended rods in pairs or short chains, occasionally singly, in association with a suggestive clinical history.	specimen transportation kits Sterile swabs Microscope Microscope slides and cover slips Immersion oil and lens paper Ethanol (or methanol) ≥ 95% Stains: polychrome methylene blue stain (quality controlled by reference laboratory for capsule staining); Gram stain Test tubes/screw-capped bottles Gloves, high quality particle-filtering face masks, gowns, Bunsen burner or spirit lamp Disinfectant spray "gun" Disinfectant: sodium hypochlorite (bleach) Autoclave (and spore disks/strips)[a]
Presumptive	Intermediate Central/reference	Smear stained with polychrome methylene blue shows dark blue square-ended rods in pairs or short chains, occasionally singly, surrounded by pink capsule. Primary culture has typical characteristics. Other helpful tests or antigen-detection devices based on protective antigen are becoming available.	As above, plus biological safety cabinet preferably with fumigation capability Incubator Centrifuge Water bath CO_2 incubator/candle jar Equipment for culture: loops, petri dishes, pipettes and tips, screw-capped bottles or tubes, flasks, etc. *Media and reagents* culture media (blood agar, nutrient agar, heart infusion agar, brain-heart infusion broth, etc.) PLET agar (and/or other selective agar) ingredients other stains – spore stain gamma phage (quality-controlled by reference laboratory for efficacy) penicillin discs defibrinated horse blood (blood from other species also suitable) horse serum (serum from other species also suitable) sodium bicarbonate Sterne vaccine strain of *B. anthracis* for controlling phage and penicillin tests or, if possible, a wild-type isolate for controlling phage, penicillin and capsule tests *Further disinfectants* formalin (38%–40% formaldehyde solution) or paraformaldehyde with neutralizer ammonium carbonate/bicarbonate Antigen detection devices if available
Confirmed	Intermediate, if suitably equipped Central/reference	Confirmatory tests show culture is *B. anthracis*. PCR confirms presence of toxin and capsule genes.	As above, plus Hazard-level 3 laboratory with biological class 3 safety cabinet equipment and materials for PCR media and materials for antimicrobial susceptibility testing room fumigation capability when necessary.

a) The destructive function of the autoclave should not be assumed but should be checked with a spore disc or strip (available commercially).

b) The ideal is a BSL (biosafety level) 3 facility containing a class 3 cabinet. In some laboratories, a class 2 cabinet with respirator in a BSL 3 facility or a class 3 cabinet in a BSL 2 facility, are the less ideal alternatives.

11.2 CCHF

Laboratory tests that are used to diagnose CCHF include antigen-capture enzyme-linked immunosorbent assay (ELISA), real time polymerase chain reaction (RT-PCR), virus isolation attempts, and detection of antibody by ELISA (IgG and IgM). Laboratory diagnosis of a patient with a clinical history compatible with CCHF can be made during the acute phase of the disease by using the combination of detection of the viral antigen (ELISA antigen capture), viral RNA sequence (RT-PCR) in the blood or in tissues collected from a fatal case and virus isolation. Immunohistochemical staining can also show evidence of viral antigen in formalin-fixed tissues. Later in the course of the disease, in people surviving, antibodies can be found in the blood. But antigen, viral RNA and virus are no more present and detectable.

11.3 Brucellosis

Presumptive diagnosis of brucellosis can be made by demonstrating high or rising antibody titers to *Brucella* antigens. Diagnosis is confirmed with the isolation of the organism from blood, bone marrow, or tissue cultures.

Evidence in support of the diagnosis of Brucellosis includes:

1. A history of recent exposure to a known or probable source of *Brucella* spp.
2. Isolation of *Brucella* spp. from the patient.
3. Demonstration by validated of the presence of *Brucella* genetic material in blood or other tissue samples.
4. Demonstration by a validated serological method of *Brucella* antigen in blood or other tissue samples.
5. Demonstration of a in any serological test for brucellosis in the absence of exposure to any known source of cross-reacting antigens.
6. Demonstration of a high sustained , or with standardized antigens.

Isolation of *Brucella* spp (Culture method)

Caution: *Brucellae* are highly infectious (Hazard group 3) pathogens. Laboratory-acquired infections can occur following accidental inoculation or inhalation of the organisms. Blood should be collected with great care and the creation of aerosols should be minimized and if possible procedures producing aerosols must be carried under a safety cabinet.

Sample: Blood (5 ml), Bone marrow, Lymph nodes, liver biopsy

Brucella organisms survive the intracellular killing by phagocytes and polymorphonuclear leukocytes and localize in the reticuloendothelial system

Blood cultures are positive in 53.4 to 90% of patients with brucellosis. A biphasic medium (Castenda method of blood culture) consisting of a solid and a liquid phase in the same blood culture is used for the isolation of the *Brucella.*

Brucella is a very slow-growing organism so the Blood culture must be incubated for a period of 6-8 weeks before discarding as culture negative. Periodic transfer (subculture) to serum-supplemented solid media every 3-5 days is needed to isolate the organism.

11.4 Tularemia

- Staining of *F. tularensis* often reveals the presence of tiny, 0.2-0.5-µm X 0.7-1.0 µm, pleomorphic, poorly staining, gram-negative coccobacilli seen mostly as single cells.
- The Gram stain interpretation may be difficult because the cells are minute and faintly staining.
- F. tularensis cells are smaller than Hemophilus influenza.
- Bipolar staining is not a distinctive feature of F. tularensis cells.
- Additional work: Another smear may be prepared for referral to your state public health laboratory.

Culture

- Established inoculation and plating procedures are used. For tissues, established laboratory procedure is used to inoculate media (e.g., grind, touch-preparation, or a sterile wood stick). Plates are taped shut in 2 places to prevent inadvertent opening (alternate to taping is acceptable).
- Incubation of cultures.
    - Temperature: 35-37°C
    - Atmosphere: Ambient, use of 5% CO2 is acceptable.
    - Length of incubation: primary plates are held for 5 days. If it is known that if a patient has been treated with bacteriostatic antibiotics, then plates are held for up to 7 days to allow bacteria recovery time.
- *F. tularensis* grows in commercial blood culture media.
- These organisms require cysteine supplementation; therefore, *F. tularensis* may at first grow on SBA, but upon subsequent passage will fail to grow on standard SBA. *On cysteine supplemented agar plates, it is a gray-white, opaque colony, usually too small to be seen at 24 h on most general media such as CA, TM, and BCYE.
- After incubation for 48 h or more, colonies are about 1-2 mm in diameter, white to grey to bluish-grey, opaque, flat, with an entire edge, smooth, and have a shiny surface.

11.5 Q Fever

- PCR of whole blood or serum provides rapid results and can be used to diagnose acute Q fever in approximately the first 2 weeks after symptom onset but before antibiotic administration.
- A fourfold increase in phase II IgG antibody titer by IFA of paired acute and convalescent specimens is the diagnostic gold standard to confirm diagnosis of acute Q fever. A negative acute titer does not rule out Q fever because an IFA is negative during the first stages of acute illness. Most patients seroconvert by the third week of illness.
- A single convalescent sample can be tested using IFA in patients past the acute stage of illness; however, a demonstrated fourfold rise between acute and convalescent samples has much higher sensitivity and specificity than a single elevated, convalescent titer.
- Diagnosis of chronic Q fever requires demonstration of an increased phase I IgG antibody (≥1:1024) and an identifiable persistent infection (e.g., endocarditis).
- PCR, immunohistochemistry, or culture of affected tissue can provide definitive confirmation of infection by *C. burnetii.*

11.6 Plague

The presumptive diagnosis of plague can be made if: an immunofluorescence stain of a relevant sample is positive for the presence of *Y. pestis* Fraction 1 capsular (F1) antigen; and a single serum specimen is tested and the anti-F1 antigen titre by agglutination is >1:10.

* Confirmed plague is diagnosed if: an isolated culture is lysed by specific bacteriophage; two serum specimens demonstrate a fourfold anti-F1 antigen titre rise by agglutination testing;

* and a single serum specimen tested by agglutination has a titre of >1:128 and the patient has no known previous plague exposure or vaccination history. *Agglutination testing must be shown to be specific to *Y. pestis* F1 antigen by haemagglutination inhibition.

11.6.1 Bacteriological work-up

This includes microscopy, isolation by cultivation, identification and confirmation by NAT tests and animal pathogenicity tests for *Y. pestis.* Specimens should be obtained from relevant sites at the appropriate time to enhance the reliability of the results. The preferred specimen for microscopic examination and isolation from a bubonic case is pus from an accessible bubo, which contains numerous organisms. Blood cultures should be taken whenever possible, particularly in septicemic plague. Bronchial/tracheal washing should be taken from patients suspected of pneumonic plague. Throat swabs are not ideal for isolation of plague bacilli since they often contain many other bacteria that can mask the presence of plague organisms

11.6.2 Nucleic acid tests

Such methods include PCR and DNA hybridization techniques. PCR, utilizing primers derived from the *pla* and *caf 1* genes that are contained in two different *Y. pestis* virulence plasmids, can detect levels as low as 10-50 bacteria and thereby help in presumptive diagnosis of plague.

11.6.3 Rapid tests

The RDT for plague based on F1 antigen has been tested in laboratories and has provided promising results. It is as specific as and at least as sensitive as the available standard methods for plague diagnosis. The excellent specificity of RDT coupled with its lower detection threshold makes it a very useful screening test, in addition to bacteriological tests and ELISA.

11.7 MERS

11.7.1 Molecular Tests

Molecular tests are used to diagnose **active infection** (presence of MERS-CoV) in people who are thought to be infected with MERS-CoV based on their clinical symptoms and having links to places where MERS has been reported.

11.7.2 Real-time reverse-transcription polymerase chain reaction (rRT-PCR)

CDC's current case definition for laboratory confirmation of MERS-CoV infection requires either a positive rRT-PCR result for at least two specific genomic targets, or a single positive target with sequencing of a second target.

11.7.3 Serology Tests

Serology testing is used to detect **previous infection** (antibodies to MERS-CoV) in people who may have been exposed to the virus. Antibodies are proteins produced by the body's immune system to attack and kill viruses, bacteria, and other microbes during infection. The presence of antibodies to MERS-CoV indicates that a person had been previously infected with the virus and developed an immune response.

- If a clinical sample is determined to be antibody-positive by either ELISA, then uses the microneutralization test to confirm the positive result.

The microneutralization assay is a highly specific confirmatory test used to measure neutralizing antibodies, or antibodies that can neutralize virus. This method is considered a gold standard for detection of specific antibodies in serum samples. However, compared with the ELISA, the microneutralization assay is labor-intensive and time-consuming, requiring at least 5 days before results are available.

Notes:

- If a clinical sample is positive by either ELISA, and positive by microneutralization, the specimen is determined to be confirmed positive.
- If a clinical sample is positive by both ELISAs, and negative by microneutralization, the sample is determined to be indeterminate.
- If a clinical sample is positive by only one ELISA, and negative by microneutralization, the sample is determined to be negative.
- If a clinical sample is negative by both ELISAS, the sample is determined negative.

In the end, a final determination of a confirmed positive serology result requires a positive ELISA test and confirmation by microneutralization assay.

11.8 Dengue

Laboratory Diagnostic Methods for the Detection of Dengue Infection

	Clinical Sample	Diagnostic Approach	Methodology	Time to Results
Virus and virus product detection	Acute serum (1–5 d of fever) and necropsy tissue	Virus isolation	Mosquito or mosquito cell culture inoculation	1 wk or more
		Nucleic acid detection	RT-PCR and real-time RT-PCR	1–2 d
		Antigen detection	NS1 Ag rapid test	Minutes
			NS1 Ag capture ELISA	1 d
			Immunohistochemistry	2–5 d
Serological response	Paired sera • S1: acute serum from 1–5 d • S2: convalescent serum 15–21 d	IgM or IgG seroconversion (S1 to S2)	ELISA HI	1–2 d
			Plaque reduction neutralization test	>7 d
	Serum after day 5 of fever	IgM detection	MAC-ELISA	1–2 d
			IgM rapid tests (lateral flow)	Minutes
		IgG detection	IgG ELISA HI	1–2 d
			IgG rapid tests (lateral flow)	Minutes

12.0 Surveillance

12.1 Introduction

Surveillance is ongoing systematic collection, collation and analysis of data and the dissemination of the information to those who need to know in order that action may be taken, should provide information throughout prevention, control and elimination/eradication. infectious disease surveillance is an important epidemiological tool to monitor the health of a population. The goals of infectious disease surveillance are to:

- Describe the current burden and epidemiology of disease, describing the burden and epidemiology (including seasonality, age distribution, age groups, etc.) Of disease is critical for demonstrating the need and advocating for interventions, such as vaccination and mass drug administration. Surveillance is also used to detect antimicrobial resistance in certain pathogens (for example, fluoroquinolone resistance in gonorrhea) and the circulating strains of disease, which helps target vaccine interventions (for example, annual influenza vaccine composition).
- Monitor trends: infectious disease surveillance is used to monitor disease trends, such as the impact of interventions like vaccination. Disease trends do not only mean the number of cases, but also the etiology of cases. For example, after pneumococcal conjugate vaccine introduction, the distribution of serotypes causing disease should be surveyed for serotype replacement, when the incidence of disease caused by serotypes not covered in the vaccine may increase following the decline in disease due to vaccine serotypes from vaccination.
- Identify outbreaks and new pathogens; ongoing surveillance for an outbreak- and epidemic-prone disease can facilitate early detection of an outbreak, allowing a more rapid response and therefore mitigation of the outbreak.

12.2 Type of surveillance

Infectious disease surveillance can have different approaches based on the epidemiology and clinical presentation of the disease and the goals of surveillance as following.

12.2.1 Passive surveillance

In passive surveillance systems, medical professionals in the community and at health facilities report cases to the public health agency, which conducts data management and analysis once the data are received.

12.2.2 Active surveillance

Requires public health staff to engage actively in the system and take action in order to receive reports of disease cases. This may involve calling or visiting health facilities to encourage follow-up or having staff review medical records to identify cases meeting prescribed case definitions.

- Active surveillance to detect every case. Although active surveillance is more comprehensive, it requires significant human and financial resources, so passive surveillance is often implemented.

- Active surveillance can have many approaches, including countrywide (e.g., for polio, measles, and rubella) or restricted to sentinel sites that capture cases within a demined catchment population.

Surveillance for some diseases can be a mixture of passive and active surveillance wherein passive surveillance is complemented by active surveillance to investigate outbreak signals detected through passive surveillance. For example, surveillance for biothreat pathogens is ongoing throughout the year as it is a notifiable disease for many countries and globally.

12.2.3 Hospital- based surveillance

Hospitalized cases can be enrolled prospectively or retrospectively when a case report form is filled out based on their medical chart and responsibility of public health unit in the hospital. Identifying cases in hospitals can be easier than identifying cases in the community, but the cases may only represent a small proportion of cases and miss cases that do not seek health care. An example of hospital-based surveillance is severe acute respiratory illness (sari) surveillance for influenza.

12.2.4 A sentinel surveillance site

A sentinel surveillance site is a single or small number of health facilities that are responsible for collecting data on cases enrolled with the case definition under surveillance including global networks surveying for diarrhea or pneumonia.

12.2.5 Aggregated surveillance

Aggregate surveillance data can exist in a variety of forms, but the main feature is that it lacks detailed information on specific cases. Aggregate data typically include the number of cases (for example, number of suspect and confirmed neonatal tetanus cases, or by age group) for a specific region and time period. Diseases.

12.2.6 Case-based surveillance

Case-based surveillance refers to surveillance systems that collect information about each case at the individual level. This type of surveillance system has a case investigation form where information can be gathered from the patient or their family members, their medical records, and their laboratory records.

12.2.7 Syndromic surveillance

Involves monitoring cases that meet a clinical case definition for the disease under surveillance, typically without laboratory confirmation. This allows for rapid identification of a cluster of cases that might warrant further investigation. An example of syndromic surveillance includes acute fever/rash surveillance in many countries, which is used to monitor measles and rubella.

12.2.8 Sero-surveillance

Serosurveillance involves the use of blood specimens to determine the burden of disease or immunity gaps in a population. Serosurveillance is frequently done as a periodic survey for multiple diseases of interest simultaneously.

12.2.9 Adverse events following immunization surveillance

Adverse events following immunization (AEFI) surveillance is a critical component of ensuring vaccine safety in the populations where the vaccines are being used. Surveillance often begins at the health facility level, where health workers are trained to recognize adverse events from immunizations and is reported to national regulatory agencies and who.

12.3 Innovative technology strategies for surveillance

Technology is increasing the availability of data on health that can be used for infectious disease surveillance, including sources that go beyond that of traditional passive or active surveillance systems. New sources of data include mobile data, electronic health records, and social media. These aggregate sources and the speed at which they can be compiled are referred to as 'big data. These sources of data can provide more real-time information to help mitigate outbreaks or improve the health of a population

12.4 Specific objectives of surveillance

Some of the specific objectives of a public health surveillance program can be summarized as follows:

- Identify the characteristics of the disease in the affected populations.
- Formulate prevention and control programs for the human health and veterinary sectors.
- Evaluate prevention and control activities through the monitoring of subsequent
- Incidence of the disease and carry out an evaluation of the cost effectiveness of the
- Programme.
- Detect outbreaks and monitor changes in the epidemiological patterns of the disease, modifying control activities appropriately.
- Ensure regular feedback of information to all groups involved.
- Suggested case definition & clinical classification
- The suggested case definition & **clinical classification** should be adapted to local needs and laboratory capabilities available for confirmation of diagnosis (CDC-MOH guidelines)

12.5 Surveillance activity (see Annex 1 anthrax example)

During the outbreak and post-outbreak phase the main objectives of the surveillance during the outbreak phase are to assess the success of the control measures being implemented and also to prevent further spillover of the infection into the susceptible population.

Surveillance during the preventive phase: The objective of the surveillance during the preventive phase is for early case detection and prevention of outbreaks. The process comprises of routine clinical and laboratory surveillance. However, in the high-risk areas/groups/population, targeted and ecological surveillance should be undertaken

12.6 Reporting and information flow

The *local level* (public health care centers, private clinics and physicians, and other health personnel) is the first point of official contact with the infected patient and the point at which surveillance data should first be collected. Suspected rather than confirmed cases may be reported from this level to higher levels. The tasks at this level are diagnosis and case

management, including treatment and health education plus, resources permitting, case and outbreak investigation with sample taking before starting the treatment.

The *intermediate level* (health districts, public health directorate in province, health directorate) collates and analyses data from local levels. The tasks of the intermediate level are: case management which cannot be done at the local level; analysis of data from local levels; epidemiological investigations, tracing sources of infection; monitoring of prevention activities; provision of laboratory support; feedback of information to the local level; and reporting to the central level(public health directorate/MoH).

The *central level* Formulates national policies and allocates resources. It provides technical support (e.g., Laboratory or epidemiological) to the intermediate and local levels as appropriate, and reports to who through International Health Regulation (IHR) focal person/MoH.

***data and indicators can be displayed for easy interpretation in graphs (e.g., Number of suspected/probable/confirmed cases by age, sex, month and place), tables (e.g., Number of suspected / probable /confirmed cases by age, sex, month and place) and maps (e.g., Number of suspected/probable/confirmed cases by place). The use of mapping or other geographical information tools for surveillance of suspected endemic/epidemic and free areas is recommended**.

12.7 Roles and responsibility of stakeholders before during and after outbreaks

***(please see annex 1 anthrax outbreak example)**

12.8 One health

One health emphasizes the link of human health to the surrounding environment and animals. One of the mission statements of one health is to improve the lives of all species by harmonizing both animal and human disease surveillance and control efforts. International organizations participating in one health include who, the un food and agricultural organization, and the world organization for animal health.

12.9 Reference

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Annex: Roles and responsibility of stakeholders before during and after outbreaks as shown in below table

Stakeholder	Responsibility		
	Before outbreak	**During outbreak**	**After outbreak**

Gov. Health department	1. Develop an outbreak preparedness plan and ensure all the resources (money, man, material and management with regular pre seasonal review) are arranged from community to national level, 2. Ensure routine surveillance system is efficiently functional (train, implement and regularly M&E the process of notification, analysis, alert investigation and outbreak control activities) 3. Ensure adequate prepositioning of necessary emergency supplies according to the expected incidence 4. Ensure existence and functional standard laboratory investigation net working 5. Train all the clinicians on standard case management and technical support	1. Efficiently manage the resources allocate and mobilize according to the priorities 2. Ensure fully functional enhanced surveillance is in place in all affected areas and relevant areas under risk 3. Ensure necessary supplies and buffer stocks are reached to the affected sites in time 4. Ensure quick access to sample transport and feedback from laboratory are reached the field in time 5. Review the case management issues and rectify accordingly and enhance the referral system as well	1. Reorganize the resources and withdraw excess from the affected site or utilize them for long term sustainable solutions 2. Continue enhanced surveillance until complete control is observed 3. Keep an emergency stock at risk locations and withdrew back the balance to the provincial stores 4. Maintain a laboratory investigation data base for future reference 5. Identify the practical issues faced by the clinical staff on case management and plan to rectify them in future 6. Appreciate all the work forces and prepare them for future emergencies as well 7. Evaluate the outbreak response and identify the gaps and utilize the findings to plan and prepare for future
Gov. Education (health promotion and media departments)	1. Participate and contribute to outbreak preparedness 2. Spread the knowledge of Biothreat Pathogen preventive measures through regular education system and special campaigns	1. Organize campaigns in the school and surrounding community regarding prevention of spread of Biothreat Pathogen 2. Volunteer service provision to the health facilities to manage the cases and blood donation	1. Continue to campaign on regular vector control and personal protective measures 2. Participate and contribute to emergency/outbreak review and planning
Gov. Agriculture and livelihood development department+ CDC-MOH/ vector control section	1. Ensure regular vector control measures are taken in the outbreak prone areas through community-based vector control programs. 2. Well maintain the logistics and supplies for the communities under risk 3. Prevent the hazards due to the use of chemicals 4. Introduce suitable biological and physical control measures 5. Enforce all available legislatives to control the malpractices and strengthen the legislations	1. Quickly identify the sources in the outbreak area and isolate the animals those could have had active Biothreat Pathogen infection 2. Arrange for a special vector control campaign and fill the gaps of safe handling practices of animals and their products in outbreak areas with immediate and long-term measures 3. Maintain and train the local authorities to ensure	1. Maintain the vector control and preventive activities until complete control of the outbreak 2. Properly train the local authority or community and ensure a sustainable mechanism to maintain the activities 3. Closely monitor and evaluate the project 4. Capitalize the outbreak and get funds to fill the gap and make necessary improvements to the

		and follow the practices in the area 4. Launch additional tick control activities 5. Provide personal protective kits and supplies (gloves, aprons, boots, and chemicals etc.)	preventive measures in the area
Private business community, funding agents and financial supporters	1. Support the communities in outbreak prone areas with micro financing/revolving funds to maintain their farms 2. Support the small-scale farmers, butchers and cooks to maintain minimum standard procedures of handling animals and their products 3. Support community-based vector control activities and trainings	1. Support vector control activities, safe handling of animals and their products through established community organizations	1. Identify the gaps in the activities and develop appropriate plans to rectify them

13.0 Infection Prevention and Control

Preventing infections in healthcare facilities is crucial, especially in the era of air-borne infections, TB, COVID-SARS, HIV/AIDS, hepatitis, among others. Healthcare workers have a responsibility to practice effective infection prevention measures to protect themselves and their clients from acquiring an infection. Universal precautions have become the international standard of practice, which means taking precautions to prevent spread of infection regardless of the perceived risk. Providing education and training to healthcare staff is an important strategy in implementing an infection prevention program. However, equally important is organizing a means of setting and measuring compliance to standards, identifying problems and finding ways to improve infection prevention practices. These are the functions of an infection prevention committee. This manual provides the information needed to begin improving infection prevention practices in health facilities and home-based care.

13.1 Overview of infection prevention and control

Nosocomial infections or Hospital Acquired Infections [HAI] are defined as: “An infection acquired in a hospital by a patient who was admitted for a reason other than that infection.”

“An infection occurring in a patient in a hospital or other health facility in whom the infection was not present or incubating at the time of admission. This includes infections acquired in the hospital but appearing after discharge, and also occupational infections among staff of the facility.”

Among hospitalized patients, nosocomial infections are the leading cause of morbidity and mortality. The most dangerous nosocomial infections are caused by resistant strains of bacteria that have developed through their natural adaptation and the overuse of antibiotics. Evidence-based guidelines for prevention and control of nosocomial infections have been developed by the U.S. Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO). Proper hand washing is the most important preventive measure and therefore increased awareness and adherence to this guideline are necessary.

Healthy human body uses several defense mechanisms against disease. The skin is a barrier that effectively protects against pathogens unless it is disrupted by lesions, or invasive procedures causing injury to the skin. Bacteria and fungi cannot enter through intact skin; however, there are exceptions e.g., human papilloma virus can enter through intact skin. Mucosal surfaces of the body are also entry points for pathogens. These surfaces include respiratory, gastrointestinal and genitourinary tracts. The membranes of these tracts are natural barriers to infections and their secretions have antimicrobial properties.

- Respiratory tract filters inhaled pathogens. The mucociliary epithelium of the trachea and bronchi move the pathogens out of the lung.
- Gastrointestinal tract gastric acid, bile, pancreatic enzymes and intestinal secretions destroy pathogens. In the gastrointestinal tract, there are nonpathogenic bacteria called commensal bacteria which also protect against pathogens. With the overuse or misuse of antibiotics, these commensal bacteria become a source of infection. Another way in which they become harmful is when they are transmitted to another part of the body where they do not exist normally.

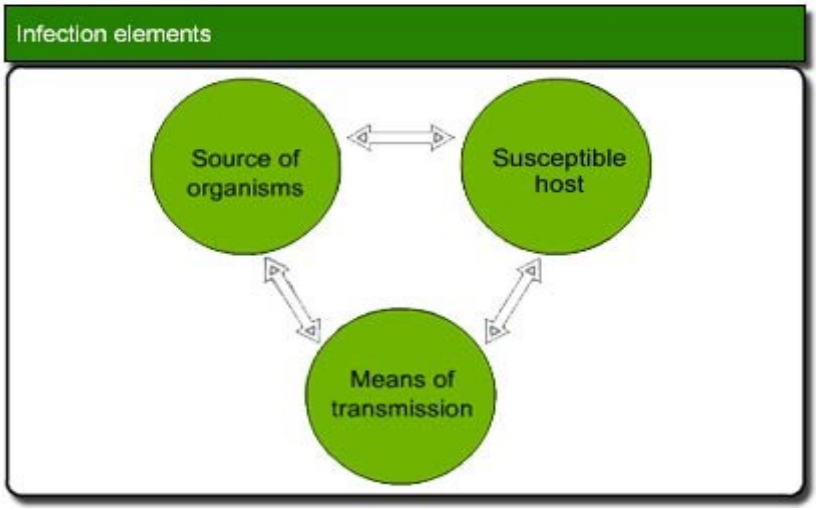
Bacterial pathogens are the most common cause of nosocomial infections. Viruses, fungi and parasites less frequently cause infection. Children tend to have more viral infections and are associated with risk of epidemic. Fungal infections occur more frequently in immune-compromised patients and among those patients with prolonged antibiotic therapy.

13.2 Factors for Disease Transmission:

A pathogen needs a host in which to survive. It also needs an environment which will support its survival [reservoir]. A mode of transmission is also required for infection to occur. The primary modes of transmission are:

- air
- blood or body fluid
- contact [direct or indirect]
- fecal-oral
- food
- animal
- insects

Pathogens have certain properties that allow them to survive. Inside the host, gram-negative bacteria use fimbriae, and pili [hair-like projections] to attach to cell surface. Bacteria [both gram-positive and gram-negative] also use certain proteins or adhesins to bind to receptor molecules in the body. Once this binding process is complete, bacteria are able to form colonies within the body. When the pathogen is not virulent, there is no infection, no damage to tissues and no immune reaction occurs. These individuals become vectors of transmission.



However, if the pathogen is very virulent, infection may develop, causing damage to tissues and development of an immune response. Bacteria derive their nutrition from the host and avoid phagocytosis within the body. In the health facility, there are two reasons that infection will result:

- sterile body sites are exposed, allowing pathogens to come into contact with mucous membranes, non-intact skin and internal body sites
- Host is more susceptible because of existing health status

Transmission of disease can occur from patient–to-patient or staff to patient. Staff members can become vectors of transmission when there is contamination in the health care environment.

13.3 Prevention of Infection

The spread of infection can be interrupted by eliminating the necessary conditions for transmission from reservoir to host.

- Destroying the pathogen e.g., use of aseptic technique and use of antibiotics
- Blocking the transmission e.g., hand hygiene
- Protecting individuals from becoming vectors of transmission e.g., contact precautions
- Decreasing the susceptibility of host e.g., immunization

13.4 Guidelines for infection prevention

Standard precautions	1. Treat all blood and body fluids [cerebrospinal, pleural, pericardial, peritoneal, amniotic, synovial] as if they are infectious
Engineering Controls *[for procedures that involve exposure to contaminated equipment including plumbing procedures]*	1. Hand washing facilities are accessible to all employees 2. Containers for disposal are puncture resistant, color-coded, labeled with biohazard warning, and leak proof
Work Practice Controls	1. Employees wash their hands immediately after removal of gloves and PPE 2. Employees wash their hands and rinse mucous membranes with water after contact with blood and body fluids, which are potentially infectious 3. Contaminated needles and sharps are not recapped and are placed in puncture proof containers immediately after use 4. Equipment is decontaminated as necessary
Use of PPE *[vascular access procedures e.g., i.v. lines, phlebotomy] [handling contaminated objects*	1. ALL PPE is inspected regularly and repaired or replaced as needed 2. Reusable PPE is decontaminated as needed. 3. Single-use PPE is disposed of in accordance with hospital waste management program 4. PPE is removed before leaving work area 5. Gloves are worn when: employees anticipate contact with potentially infectious materials, when performing vascular access, and when handling contaminated objects or surfaces 6. Disposable gloves are not used if they are torn or discolored

Housekeeping Procedures *[handling of waste]*	1. All equipment and surfaces are decontaminated after contact with blood 2. Waste is discarded in closeable, leak proof, puncture resistant containers with biohazard warning label 3. All infectious waste is covered during transport 4. Containers are located throughout the facility within access of staff and close to the source of waste

Core infection prevention and control interventions for health facilities			
Intervention	**Target group**	**Equipment and Supplies**	**Indicators for monitoring**
Hand hygiene	All healthcare workers † Visitors Patients	Clean running water, Soap (mounted preferable), sinks or basins, towels, alcohol-based solutions	Proportion of staff observed performing hand hygiene before attending patients
Personal protective equipment	All healthcare workers †	Gloves, Gowns	Proportion of staff observed wearing gloves when exposure to blood or body fluids is anticipated
Isolation precautions	Nurses Physicians Nursing assistants Other	Gloves, Gowns, Masks, Eye protection	Average time between admission and isolation for tuberculosis patients
Aseptic technique	Nurses, Physicians Laboratory Technicians, Dental surgeons	Antiseptics Sterile gloves Sterile devices and instruments Sterile barrier devices	Proportion of intravenous lines inserted using aseptic technique
Cleaning and disinfection	Nurses Nursing aids Housekeeping staff Laboratory staff	Cleaning fluids Cleaning equipment Disinfectant	Proportion of rooms appropriately disinfected after patients' discharge

Sterilization	Sterilization staff, Nurses, Laboratory Technicians, Dental surgeons	Autoclaves and steam sterilizers Test strips Chemicals	Proportion of sterilized devices whose sterility is documented with test strips
Waste management	Health-care workers Waste handlers Logisticians	Sharps boxes and other collection containers Storage space and container for interim storage Final disposal options Personal protection equipment for waste handlers	Presence of healthcare waste in the surroundings of the health-care facility
Antibiotic use protocol	Physicians	Essential list of antibiotics	Proportion of prescriptions including an antibiotic
Immunization and exposure management	All healthcare workers †	Hepatitis B vaccine and other appropriate vaccines	Three-dose hepatitis B vaccine coverage among nurses, physicians and laboratory technicians

** Key indicator: Proportion of essential supplies stocked out.*
† Include nursing staff, physicians, dental staff, laboratory staff, housekeeping staff, waste management staff and morgue staff.

Source: Department of Essential Health Technologies (EHT), World Health Organization
www.who.int/injection_safety

13.5 IPC for biothreat pathogens

Direct contact with an animal with Biothreat Pathogen infection or human with active infection, can cause infection. Also, exposure to Biothreat Pathogen agents in laboratory and healthcare settings can also lead to infection among those who get exposed to these pathogens. In a household setting, young children are at high risk of infection. Use of objects such as razors, toothbrushes and towels may also cause infection. Common household disinfectants can be used to kill the infectious agents e.g., bleach diluted 1:10 with water.

13.6 Standard Precautions

The purpose of standard precautions is:

- To provide health care workers with knowledge of the process of protecting themselves and their clients/patients/facility visitors against communicable disease transmission
- To provide health care workers with knowledge of Universal Precautions [to reduce the risk of transmission of blood borne pathogens], using masks and social distancing to reduce risk of air-borne infections, and Body Substance Isolation [to reduce the risk of infection from moist body substances]
- To provide health care workers with the knowledge that standard precautions are based on the major features of Universal Precautions and Body Substance Isolation [BSI]

Standard Precautions apply to ALL patients who are hospitalized as well as those receiving home-based care, regardless of their diagnosis or infection status. This means that health care workers must use protection measures routinely to reduce the risk of occupational exposure to blood or air-borne pathogens as well as nosocomial infections, which can result from transmission between patients, patient to health worker and health worker to patient. Standard precautions apply to blood, all body fluids, secretions, excretions, [except sweat] regardless or not they have visible blood on them, non-intact skin and mucous membranes.

HAND HYGIENE

- This is the most important procedure for preventing the spread of infection
- Hands must be washed after touching blood, body fluids, secretions, excretions and contaminated items, whether or not gloves are worn
- Hand washing should be done immediately after gloves are removed, between examining patients, in order to avoid spread of pathogens to other patients
- It may be necessary sometimes to wash hands between procedures done with the same patient to avoid cross contamination of body parts

GLOVES

- Clean gloves must be worn when touching blood, body fluids, secretions, excretions and contaminated items
- Clean gloves must be worn before touching mucous membranes and non-intact skin

- Clean, *sterile* gloves must be worn for procedures involving contact with sterile body parts
- Gloves must be changed between procedures on the same patient after contact with potentially infectious materials
- Gloves must be removed immediately after use, before touching uncontaminated objects and surfaces and before touching another patient. Failure to do so is an infection control hazard
- After removing gloves, hands must be washed immediately. There are 2 main reasons for this namely: 1) gloves may tear while in use, or have hidden defects and 2) hands may get contaminated while gloves are being removed
- Only utility gloves maybe sterilized for re-use. Housekeeping or sterilization staff use these gloves etc. If they are torn or discolored, they must be discarded.

MASKS, PROTECTIVE EYE WEAR

- These are used for protecting mucous membranes of eyes, nose and mouth during procedures that may result in splashes of blood, body fluids, secretions, and excretions

GOWNS

- Clean gowns are used to protect skin and prevent soiling where splashes of blood, body fluids, secretions, and excretions may occur on clothing
- Soiled gowns must be removed and followed by immediate hand washing

PATIENT CARE EQUIPMENT

- Soiled, used patient care equipment must be handled with care to avoid transmission of pathogens to other patients
- Single use items must be discarded, and reusable equipment must be sterilized before re-use.

LAUNDRY

- Contaminated items must be collected in leak-proof bags and transported to decontamination site where it must be sorted and rinsed.
- Staff handling linen must wear gloves to reduce the risk of contact with moist body substances.

SPECIMENS

- **ALL** specimens are considered biohazardous. Gloves must be worn at all times
- Specimens are placed in air-tight bags before transporting to laboratory

TRASH

- Staff handling trash must wear protective items and heavy-duty gloves
- Trash must be transported in leak-proof bags

ENVIRONMENTAL CONTROL

- Hospital procedures for disinfection must be followed. Spills should be cleaned up immediately with 0.5% chlorine solution and then disinfected with hospital disinfectant solution.

- Waste includes sharps, expired pharmaceuticals, lab reagents, old batteries, broken Blood Pressure gauges [mercury], infectious waste from lab cultures, tissue swabs and pathology [blood, body fluids, human tissue]

PREVENTION OF BLOOD BORNE PATHOGENS

- Care must be taken when handling needles and sharps to avoid injuries; after procedures; while cleaning instruments; and while disposing used needles and sharps
- Avoid two-handed recapping of needles
- Do not remove used needles from disposable syringes. Discard them in appropriate disposal containers, located within access to the area where they are used
- For reusable syringes, the correct procedure is to place them in puncture-resistant containers and transport them to the reprocessing facility
- All needle stick injuries, mucosal splashes and contamination of open wounds must be reported and evaluated
- Use mouthpieces and barriers for mouth-to-mouth resuscitation

13.7 Transmission-Based Precautions for Hospitalized Patients*

Airborne Precautions

In addition to standard precautions, use airborne precautions for patients known or suspected to have serious illnesses transmitted by airborne droplet nuclei. Examples of such illnesses include:

- Measles
- Varicella (including disseminated zoster)†
- Tuberculosis‡

Droplet Precautions

In addition to standard precautions, use droplet precautions for patients known or suspected to have serious illnesses transmitted by large particle droplets. Examples of such illnesses include:

- Invasive *Hemophilus influenzae* type b disease, including meningitis, pneumonia, epiglottitis, and sepsis
- Invasive *Neisseria meningitidis* disease, including meningitis, pneumonia, and sepsis

Other serious bacterial respiratory infections spread by droplet transmission, including:

- Diphtheria (pharyngeal)

- *Mycoplasma* pneumonia
- Pertussis
- Pneumonic plague
- Streptococcal pharyngitis, pneumonia, or scarlet fever in infants and young children

Serious viral infections spread by droplet transmission, including those caused by:

- Adenovirus*
- Influenza
- Mumps
- Parvovirus B19
- Rubella

Contact Precautions

In addition to standard precautions, use contact precautions for patients known or suspected to have serious illnesses easily transmitted by direct patient contact or by contact with items in the patient's environment. Examples of such illnesses include:

Gastrointestinal, respiratory, skin, or wound infections or colonization with multidrug-resistant bacteria judged by the infection control program, based on current state, regional, or national recommendations, to be of special clinical and epidemiologic significance

Enteric infections with a low infectious dose or prolonged environmental survival, including those caused by:

- *Clostridium difficile*

For diapered or incontinent patients: enterohemorrhagic *Escherichia coli* 0157:H7, *Shigella*, hepatitis A, or rotavirus

Respiratory syncytial virus, parainfluenza virus, or enteroviral infections in infants and young children

Skin infections that are highly contagious or that may occur on dry skin, including:

- Diphtheria (cutaneous)
- Herpes simplex virus (neonatal or mucocutaneous)

- Impetigo
- Major abscesses, cellulitis, or decubiti
- Pediculosis
- Scabies
- Staphylococcal furunculosis in infants and young children
- Zoster (disseminated or in the immunocompromised host)*
- Viral/hemorrhagic conjunctivitis
- Viral hemorrhagic infections (Ebola, Lassa, or Marburg)

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* Reprinted from Garner JS and the Hospital Infection Control Practices Advisory Committee. †
Garner JS, and the Hospital Infection Control Practices Advisory Committee Guideline for isolation precautions in hospitals. Infect Control Hosp Epidemiol. 1996; 17:53-80

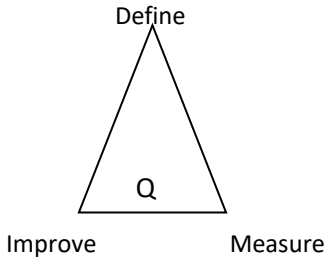
Certain infections require more than one type of precaution.

‡ See Centers for Disease Control and Prevention.
Centers for Disease Control and Prevention Guidelines for preventing the transmission of Mycobacterium tuberculosis in health-care facilities, 1994. MMWR. 1994; 43:1-132

13.8 Organizing infection prevention and control in a heath facility

It is important that a health facility has an active infection prevention committee as well as a staff assigned to manage the IPC program in the facility. The committee should establish a structure for IPC as well as a monitoring plan to track if the IPC is working well at the facility.

Effective implementation of infection control in health care settings involves teamwork and establishment of a Committee. Team members are chosen to represent each aspect of the infection prevention program. For example, infection prevention involves physicians, nurses, laundry staff, equipment management, and cleaning staff. Criteria for selection should include the willingness to participate in the team along with the knowledge, experience, and time available to contribute to the effort. An effective team consists of six to eight members. When the members have been selected, a meeting needs to be held with the group to inform them of the purpose of the committee, the roles and responsibilities of the coordinator and the committee.

Purpose	▪ "Hospital standards have been developed by the Ministry of Health. Infection prevention has been identified as a priority. Infection prevention committees are being developed in each hospital. We are here today to talk about your participation on the committee."
Role and responsibilities of the Coordinator	▪ "The coordinator will chair the committee. He/she will be responsible for organizing the meetings and agenda, coordinating monitoring activities, orientation and training of committee members, and communications between the committee, facility management, and the MOH. ▪ The coordinator will promote quality improvement and provide guidance to the committee to use quality methods to improve infection prevention practices and ultimately reduce nosocomial infection rates."
Quality principles	"The infection prevention program is a part of the overall quality program initiated by the MOH. There are four key principles of quality that I would like to review. 1. The first is that quality is focused on the client/customer. In the case of infection prevention, who is the customer?" (Patient, family, staff.) What is our responsibility to these customers? (To prevent infections.) 2. The second principle in quality is teamwork. Each staff member brings different knowledge and skills to the team about the infection control process. 3. The third principle is that Quality is focused on systems and processes/procedures. The Committee will be looking at the various procedures that are needed to prevent infections. What are some of the procedures involved in infection prevention? (Hand washing, sterilization of equipment, cleaning, laundry, aseptic technique.) 4. Lastly, quality is based on data. In order to make good decisions regarding improving infection control practices, the Committee will need information regarding infection rates and current clinical practices."
Role and responsibilities of the Committee  	"The Infection Prevention Committee is responsible for defining, measuring and improving infection prevention practices in order to reduce the rates of nosocomial infections." 1. "The committee will help **define** the structure for providing infection control, such as determining how often the committee will meet to accomplish the objectives. Defining quality will also involve developing and implementing infection control standards." 2. "The committee will develop ways to communicate the standards to staff and **measure** how effectively the standards have been implemented. This will involve making observations of practice, reviewing charts and working with staff to monitor their own practice. Sometimes, monitoring tools will be pre-made and other times the committee will develop their own tools. 3. "The committee will use the information obtained from these measurements to make **improvements** in infection prevention." "It will be important that the committee establish a routine meeting schedule and that each member is committed to participating."
Next steps	"How do you feel about what we have discussed thus far?" "What are your questions or concerns about working on this committee? We will plan an

	orientation for the committee to learn how to use quality methods to improve infection prevention." (Set a date.)

13.9 Roles and responsibilities of team members

The infection control team is responsible for the daily functions of infection control and for preparing the annual work plan for review by the Committee. The team also develops an Infection Control Manual for review by the Committee. This manual is updated on a timely basis and made available to the staff. The following entities are central to the implementation of the infection control plan. Their roles and responsibilities are outlined below.

Infection Control Coordinator	**Department Manager**	**Education Department**	**Employees**
Overall responsibility for implementation of Infection Control for the health facility	Responsible for training and continuing education of employees	Responsible for maintaining list of staff requiring training	Responsible for awareness of tasks that increase risk of exposure
Works with administrators and employees to develop policies	Responsible for ensuring routine use of precautions for all patients	Responsible for developing training programs	Responsible for attending training sessions and for following the recommended practices
Revises and updates the plan when necessary	Responsible for ensuring availability of recommended equipment to minimize risk of infection	Responsible for scheduling training seminars for staff	Responsible for avoiding reuse of needles and recapping needles
Maintains reference library related to safety and health information	Responsible for monitoring adherence to Standard Precautions	Responsible for record keeping; maintaining quizzes and /or sign-up sheets for attendance	Responsible for using safety devices

Has knowledge about legal requirements	Responsible for assisting remedial training for those employees who fail to comply with standards	Responsible for updating training programs to include new information	Responsible for safe handling and disposal of needles and sharps
Acts as facility liaison during inspection. Supervises facility audits			Responsible for reporting injuries from needles and sharps

Ref: Tietjen L, Bossemeyer D, McIntosh N. *Infection Prevention. Guidelines for Health care Facilities with Limited Resources.* Baltimore, MD. JHPIEGO. 2003

13.10 Key indicators and Checklists

Numerator: Number of ventilated patients who develop pneumonia.

Denominator: Number of ventilator days.

Numerator: Number of patients who develop infections in clean surgical wounds while hospitalized in the prior calendar month.

Denominator: Total number of patients who underwent clean surgeries in the operating room in the prior calendar month.

Infection Prevention Self-Assessment Tool

Hospital: Date:

Person conducting assessment:

Observations	Yes	No	Comments
Ward:			
Indicator: General Housekeeping			
Is the ward generally clean (floors clean, linens clean & neat, no trash lying around, things orderly)?			
Are floors mopped with detergent daily? (Ask cleaner or other staff member.)			
Are beds, bedside tables & cabinets cleaned with disinfectant after discharge? (Ask staff.)			
Are patient/visitor bathrooms clean, with functioning toilets & sinks?			
Are staff bathrooms clean, with functioning toilets & sinks?			
Are clean and soiled linens and supplies stored separately?			
Are medication and storage areas clean and neat?			
Level of Indicator Achievement			
Indicator: Universal Precautions			
Are sinks or running water conveniently located for staff to wash hands? (Covered container with spigot is acceptable.)			
Is soap available?			
Is hand washing done when appropriate (between procedures, after use of toilet, before & after applying gloves)? If not observed, ask staff members when hand washing should be done.)			

Do staff dry hands appropriately? (e.g., clean towel, air dry.)			
Are gloves worn when appropriate (performing procedures, contact with contaminated materials, waste)? (If not observed, ask staff members when gloves should be worn.)			
Level of Indicator Achievement			
Indicator: Sharps Disposal			
Are used needles placed in puncture-resistant containers?			
Are sharps well contained within container (no more than 3/4 full)?			
Are sharps containers burned appropriately?			
Level of Indicator Achievement			
Indicator: Clinical Practice			
Are I.V. sites properly dressed (clean, well-secured, no obvious signs of infection)?			
Are urinary drainage bags maintained off the floor, yet below the level of the patient's bladder?			
Reusable items are NOT reused (needles, syringes, IV bottles)?			
Level of Indicator Achievement			
Indicator: Decontamination			
Is equipment (e.g., forceps) properly decontaminated, e.g., soaked 10 minutes in disinfectant solution, cleaned, dried, placed in container to await sterilization? (If not observed, ask staff to describe the process.)			
Is chlorine routinely available?			
Level of Indicator Achievement			
Indicator: Waste Management			

Is waste well-contained in containers with lids?			
Are waste containers labeled appropriately?			
Is soiled linen placed in separate containers?			
Are on-site waste dumps well contained (e.g., refuse not lying around)?			
Level of Indicator Achievement			
Overall Results:			

Handling and Disposal of Medical Waste Monitoring Tool

Facility:

Instructions: Make observations for each of the following

Questions	A	S	N	Comments
1. Waste is sorted at the point that it is generated.				
2. Separate containers are placed in convenient locations and labeled.				
3. Medical waste containers are covered (have lids).				
4. Waste is disposed within a few hours but not more than 2 days.				
5. If waste is stored on-site, it is placed in a closed area with minimal accessibility to others.				
6. Heavy utility gloves and shoes are worn when handling/transporting medical waste.				
Solid Medical Waste				
If waste is burned, answer the following:				
1. Burning site is downwind from the facility.				
2. Incinerator is on hardened earth or a concrete base.				
3. Kerosene is placed on the waste prior to starting the fire.				
If waste is buried, answer the following:				
1. Site is 50 meters away from a water source.				
2. Site is located downhill from any wells.				
3. Pit is 1-2 meters wide and 2-5 meters deep.				
4. A fence or wall surrounds the pit.				
5. When waste is added to the pit, 10-30 cm of soil is added.				
6. When the level of waste reaches to within 30-50 cm of the surface, the pit is filled with dirt and sealed with concrete.				
Liquid Medical Waste				

1. Solutions and disinfectants are poured down a sink, drain, flushable toilet or latrine.				
2. The sink/drain/toilet is rinsed thoroughly with water.				
3. Areas are cleaned with a disinfectant cleaning solution at the end of the day.				
4. The container that held the liquid waste is decontaminated by filling it will 0.5% chlorine solution for 10 minutes.				
5. Gloved hands are washed before removing gloves.				
6. Hands are washed after removing gloves.				
Sharps Disposal				
1. Sharps are burned in an industrial incinerator.				
2. If no industrial incinerator is available, are the sharps placed in a metal container, covered with fuel, ignited and then buried?				

Routine Hand washing Procedure Monitoring Tool

Date: _____

Observer: _____

Facility: _____ **Ward:** _____

Total Number of Staff Observed = _____

Directions: Observe individual staff members wash their hands. For each activity of the procedure, make a mark in the column (based on the level of staff being observed) indicating whether the activity was completed as described (yes) or not (no). Note "N/A" if the activity is not applicable, for instance, the staff member was not wearing jewelry.

*If the staff member should have washed their hands, but did not, they are still to be included in the survey. In this case, indicate which level of staff and the reason for hand washing. All of the activities would be marked "no" because they did not wash their hands.

Activity	Doctor		Nurse		Health Assistant		Cleaning Staff	
	yes	**no**	**yes**	**no**	**yes**	**no**	**yes**	**no**
Removes jewelry								
Wet hands under running water								
Apply soap to hands								
Rub hands together, lathering and using friction								
Wash between fingers and around nails								
Wash for 10-15 seconds								
Rinse hands thoroughly under running water								
Dry hands-on clean towel or air dry.								

Part 2: Hand washing monitoring tool

Directions: For each ward/area visited to make handwashing observations, complete the form by answering the questions by making a checkmark in one of the columns.

Observation	Yes	No
Was soap available?		
Was the soap in a well-drained dispenser (e.g., has holes to drain the excess water)?		
Was clean running water available (spigot or someone that pours the water)?		
Are sinks conveniently located?		
Are sinks clean?		
Do sinks have good drainage?		
Is antimicrobial soap available in the O.R., delivery room?		

Additional Comments:

_____

_____