NRT Quick Reference Guide:
Burkholderia mallei (Causes the disease Glanders) and Burkholderia pseudomallei (Causes Melioidosis)

For reference, please see "Key References Cited/Used in National Response Team (NRT) Quick Reference Guides (QRGs) for Bacterial 2011 Revision."
QRGs are intended for Federal On-Scene Coordinators (OSCs) and Remedial Program Managers (RPMs).

<table>
<tr><td>Agent Characteristics</td><td colspan="3">Agent Classification: Biological Type: Bacteria (B. mallei and B. pseudomallei)
Description: Glanders is a zoonotic disease (transferable between animals and humans) caused by B. mallei. Most cases occur in horses, mules, or donkeys. Humans rarely become infected after contact with tissue, blood and other body fluids from infected animals. B. mallei enters the body through skin cuts or abrasions, or through eye or nose mucosal surfaces, or may be inhaled via infected dirt. Glanders is manifested in humans in four ways: localized, pulmonary, bloodstream, and chronic. Bloodstream infections can be fatal within 7-10 days. Weaponized B. mallei is a threat because it may easily be aerosolized. Melioidosis, is a zoonotic disease caused by B. pseudomallei. It occurs in humans, sheep, goats, horses, swine, cattle, dogs and cats. Humans may become infected after contact with tissue, blood and other body fluids from infected animals. In addition, melioidosis is caused by inhaling contaminated dirt or water droplets, ingestion or direct contact of abraded or cracked skin with contaminated food, water or soil. Melioidosis is manifested in humans in four ways: LOCALIZED, PULMONARY, BLOODSTREAM, AND CHRONIC. Fatalities have resulted in people with pre-existing conditions. Weaponized B. pseudomallei is a threat because it may easily be aerosolized.
Bio-Safety Level: 3
CDC Class: B
HHS/USDA Select Agent: Yes
Incubation: 1-14 days for B. mallei; 1-21 days for B. pseudomallei, although reactivation of a previously asymptomatic infection can occur after months or many years.
Duration of Illness: Varies; can be acute or chronic.
Person-To-Person Transmission: Glanders & Melioidosis: Although rare, inhalation or contact with tissue, blood or bodily fluids of infected persons.
Other Forms of Transmission: Glanders & Melioidosis: Contact, ingestion or inhalation of tissue, blood or bodily fluids of infected animals.
Treatments: Glanders: Not much is known about the treatments because of its rarity in humans. Melioidosis: Supportive with antibiotics, such as Ceftazidime, has been moderately successful.
Infectivity/Lethality: Animal infectivity is high for glanders & melioidosis; human infectivity is rare for glanders but common for melioidosis. Lethality can be as high as 50%for both, even with treatment.
Persistence/Stability: B. mallei can survive in water up to 30 days; B. pseudomallei can survive in water over 3 years and in moist soils for up to 2 years. B. mallei requires an animal reservoir for sustained transmission to humans. Unlike B. mallei, B. pseudomallei is known to persist in the environment in free-living amoebae, certain plants, and even some free-living worms, which protect it from adverse environmental conditions.</td></tr>
<tr><td>Release Scenarios</td><td colspan="3">Air: If weaponized, B. mallei is an inhalation threat to humans, horses, mules, & donkeys and B. pseudomallei is an inhalation threat to humans, sheep, goats, horses, swine, cattle, dogs and cats.
Soil: While B. mallei is not believed to be persistent in soil, B. pseudomallei is persistent in moist soil (e.g., rice paddies, freshwater wetlands).
Surfaces: B. pseudomallei does not require an animal reservoir. It can persist in a dry environment and remain infectious and culturable for hours to days. In addition, it can remain infectious, viable and non-culturable for up to 1 year.
Water: B. pseudomallei is known to persist in water for over 3 years.</td></tr>
<tr><td rowspan="2">Health Effects</td><td>Onset</td><td colspan="2">1-14 days for B. mallei; 1-21 days for B. pseudomallei, although reactivation of previously asymptomatic infection can occur after months/years.</td></tr>
<tr><td>Signs/ Symptoms</td><td colspan="2">General: Any infection can progress to be systemic. If the eyes, nose and respiratory tract are involved, glanders & melioidosis will cause an increase in the amount of mucous production.
Localized: Local infection with ulceration from a scratch can develop within 1-5 days. Swollen lymph nodes are also common.
Pulmonary: Can lead to pneumonia, pulmonary abscesses, and pleural effusion inside the chest cavity around the lung. Symptoms include chest pain, cough and shortness of breath.
Bloodstream (systemic): Systemic infections usually are fatal within 7-10 days if untreated. Symptoms include high fever, rapid heart rate, and rash.
Chronic (specific to melioidosis): Chronic infections can be asymptomatic for years but when symptoms appear, they can present in any of the forms sited above.</td></tr>
<tr><td>Effect Levels</td><td colspan="3">Infectivity: Human infection is rare for glanders but common for melioidosis. Animal infection is high for glanders & melioidosis.
Infective Dose: There is no infective dose listed currently for either B. mallei or B. pseudomallei but the doses to cause disease is assumed to be low.
Lethality: B. mallei and B. pseudomallei can be 100 % fatal is untreated and as much as 50% fatal, even if treated. This is especially true in individuals with other preexisting conditions (e.g., diabetes, obesity, immunocompromised, etc.).</td></tr>
<tr><td rowspan="4">Personnel Safety</td><td>Concerns</td><td colspan="2">Check with the Health & Safety Officer regarding PPE, Medical Surveillance, & Health & Safety Plan (HASP). Level of PPE may vary depending upon the incident & site specific circumstances. The PPE Levels listed are general suggestions only & are appropriate only for Burkholderia; they may not provide protection for some decon & other chemicals that workers may be exposed to during response/recovery operations. For decon of workers, use warm soapy water, taking care to avoid abrading the skin.</td></tr>
<tr><td>Medical</td><td colspan="2">Baseline: Annual physical & respiratory function exams. THERE IS NO FDA APPROVED HUMAN VACCINE FOR GLANDERS OR MELIOIDOSIS.
Treatments Available: Treatment is supportive. Antibiotics, such as Ceftazidime have been used successfully for treatment of melioidosis. Less is known about glanders because it is rare in humans.</td></tr>
<tr><td>First Aid</td><td colspan="2">During Incident: Conduct medical monitoring; use PPE as designated by the HASP; record the PPE Levels used; monitor for fever & other signs/symptoms as listed under Health Effects &, if necessary, ensure medical attention is obtained as soon as possible.
Post Incident: Monitor for signs/symptoms &, if necessary, ensure medical attention is provided as soon as possible.</td></tr>
<tr><td>PPE</td><td colspan="2">Emergency Response to a Suspected Biological Incident: Possible PPE Levels for emergency responders is based on scenario risks from highest level of protection to least: 1) Pressure-demand Self Contained Breathing Apparatus (SCBA) with Level A protective suit, when: a) Event is uncontrolled, b) The type(s) of airborne agent(s) is unknown, c) The dissemination method is unknown, d) Dissemination via an aerosol-generating device is still occurring, e) Dissemination via an aerosol-generating device has stopped, but there is no information on the duration of dissemination, or what the exposure concentration may be. 2) Pressure-demand SCBA with Level B protective suit, when: a) The suspected biological aerosol is no longer being released, b) Other conditions may present a splash hazard. 3) Full-facepiece respirator with P100 filter or PAPR with HEPA filters, when: An aerosol-generating device was not used to create high airborne concentrations. 4) Disposable hooded coveralls, gloves, & foot coverings, when: Dissemination was by a letter, package, or other material that can be bagged, contained, etc. Other Workers: PPE recommendations for workers other than emergency responders must be developed in the HASP for the specific scenario. PPE recommendations will vary by job type (e.g., cleanup, decon, etc.), type of exposure (e.g., airborne or surface/liquid/soil hazard), & any other site hazards (e.g., chemical, physical, etc.).</td></tr>
<tr><td rowspan="2">Field Detection</td><td colspan="3">Fixed Aerosol Monitoring: Fixed Aerosol Monitoring: An aerosol release of B. mallei and B. pseudomallei may be detected using air samples & PCR. Results may be delayed as much as 2 days from time of release. In the absence of reliable detection, a B. mallei and B. pseudomallei release will only be confirmed once patients present with symptoms and are diagnosed or animal die-off from Glanders/Melioidosis is confirmed. Consult EPA/HQ-EOC at 202-564-3850 for more info.</td></tr>
<tr><td colspan="3">Portable Aerosol Monitoring: Portable aerosol monitoring may use dry or wet sampling methods. Dry sampling (useful only for molecular analyses) includes gelatin, cellulose acetate & Teflon methods. Wet sampling methods include liquid impingers (low flow) & impactors (single or six stage). Refer to the manufacturer's aseptic sampling methods, flow rates, & sampling times. Ensure that the appropriate pump is used for the selected sampling method.</td></tr>
<tr><td>Sampling</td><td colspan="3">Concerns: BEFORE OBTAINING SAMPLES: Identify sample transportation requirements; Contact EPA/HQ-EOC (202-564-3850) for ERLN contract laboratories able to analyze these types of samples; Clearly identify & coordinate with the laboratory to be used since most labs cannot analyze all types of media (e.g., wipes, swabs, and HEPA vacuum samples); Coordinate with the sample disposal facility for acceptance criteria (i.e., sample decon requirements); Coordinate with investigative units (EPA-CID & FBI) to ensure sample chain-of-custody is maintained between the groups. Note: Detection/analytical equipment & sampling techniques will be highly site-specific & depend on: 1) the characteristics of the agent; 2) the type of contaminated surfaces (e.g., porous v. nonporous); 3) the</td></tr>
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	phases/purposes of sampling (initial ID v. post-decon sampling); **4)** the way in which samples are handled so as not to adversely affect viability; **5)** transportation regulations **6)** the acceptance criteria of the analytical laboratory **& 7)** the sample decon requirements for the waste disposal facilities to be used. See LABORATORY ANALYSIS, below.
	CAUTION: ONLY MANUFACTURER CERTIFIED HEPA VACCUUM EQUIPMENT SHOULD BE USED. **A site-specific sampling plan should be reviewed & approved by appropriate Subject Matter Experts &/or through ICS channels.** **Sampling Location Plans:** If release was limited to a small area due to opening a letter or container, start with an area thought to be free of contamination & work in concentric circles towards the initial point of contamination. Be concerned about other contaminated areas due to foot traffic/ventilation systems (e.g., elevator buttons, mail, corners of hallways, baseboards, light switches, door knobs, etc). Based on site characteristics & laboratory capacity, the sampling plan may be judgmental, probabilistic, or a combination thereof.
	Consult EPA/HQ-EOC at 202-564-3850 for Environmental Response Laboratory Network (a.k.a. ERLN laboratory) contact information for personnel who can explain/describe the sampling procedure most compatible with their current analytical procedure. **Types of Samples:** Air, water, soil, surfaces, agriculture and wildlife **Note:** While *B. mallei and B pseudomallei* DNA can be detected long after the bacteria themselves have perished & might be of forensic interest, the presence of the DNA says little about the potential human risk in the days following a release. **Air:** Collect air samples with a gel filter, impinger or impactor. Refer to the manufacturer's aseptic sampling methods, flow rates, & sampling times. Ensure that the appropriate pump is used for the selected sampling method. **Water**: Since *B. mallei and B. pseudomallei c*an persist in water, any potable water source should be sampled. If the potable water is chlorinated, the chlorine needs to be neutralized immediately with a sodium thiosulfate or other neutralizer at the concentration specified by the analytical laboratory prior to shipment. As chlorine levels can vary substantially throughout a drinking water system, it is not always appropriate to assume that a sample is chlorinated based solely on a description of the water treatment processes in use. **Soil:** For the localized areas where soil deposition of the agent is suspected (i.e., aerosol or liquid droplets), a surface soil sample from a depth of less than 1 inch (2.54 cm) should be obtained from a non-vegetated area. **Surfaces: 1)** Wipe & Swab Sampling (for non-porous surfaces): Sterile macrofoam swabs moistened with 1X phosphate-buffered saline supplemented with 0.01% Tween-20 (PBST). If this solution is not available, use sterile de-ionized water (DI). Do NOT use dry wipes or swabs. **2)** HEPA Vacuum Sampling (for both porous & non-porous surfaces): collect samples in a HEPA sock designed to fit into an inlet nozzle of a manufacturer certified HEPA vacuum cleaner. Good for screening & determining the extent & location of contamination in large areas. **Agriculture & Wildlife:** Upon confirmation of an outbreak, ensure these agencies are notified immediately since Glanders & Melioidosis are zoonotic vector borne diseases; USDA at 202-720-5711 & National Center for Emerging and Zoonotic Infectious Diseases at 800-232-4636 (after hours call the Directors Emergency Operations Center at 770-488-7100).
	Samples that test for Re-aerosolization: 1) Wipe sampling of the air duct system (filters, areas of particulate deposition) if exposure occurred indoors. **2)** Air Samplers & Single Stage Impactors with settle plates for capturing airborne particulates of respirable size (1-5 microns) on a series of agar plates. Agar plates are then sent to laboratory for culture analysis.
	Sample Packaging & Shipping: The packaging & shipping of samples are subject to strict regulations established by DOT, CDC, USPS, OSHA, & IATA. Contact the sample-receiving laboratory to determine if they have additional packaging, shipping or labeling requirements (e.g., DO NOT X-RAY). Samples should be packaged in an air-tight container & kept at 40-50°F (4-10°C). Ensure samples are not placed directly on the ice used for cooling the shipping container.
Laboratory Analysis	**CAUTION: Many labs may not be able to perform analysis on all matrices (e.g., wipes & soil).** The goal of laboratory analysis for environmental sampling purposes is to determine if viable *B. mallei or B. pseudomallei* are present in the sample. **Note**: The selected laboratory may use a tiered approach. If a tiered approach is used, the initial analysis may only determine if select/particular components of the bacterium are present in the sample (e.g., presence or absence). It may take additional time (up to weeks depending on the laboratory) to determine if the bacterium are viable & still able to cause adverse effects.
	Laboratory Information: Contact EPA/HQ-EOC at 202-564-3850 for information on ERLN laboratories that specialize in these types of samples.
Decontamination/Cleanup	**CAUTION: ONLY MANUFACTURER CERTIFIED HEPA VACUUM EQUIPMENT SHOULD BE USED.** **Decon Planning:** Site-specific decon/cleanup plan should be developed & approved by all necessary organizations/SMEs via ICS channels. Responders should develop a plan that takes into account: **1)** Nature of contamination including purity, physical properties, how it entered the facility, etc.; **2)** Extent of contamination, including the amount & possible pathways that have spread the agent. It is advisable to isolate the contaminated area; & **3)** Objectives of decon, including decon of critical items for re-use & the treatment, removal, or packaging of other items for disposal. **Note:** Crisis exemptions from EPA's Office of Pesticide Programs might be necessary depending on decontaminating agents used. **CAUTION: DECON SOLUTIONS SHOULD NOT BE DEPLOYED AS A SPRAY WHENEVER POSSIBLE**. **Decon Methods:** Decon decisions will be site & situation specific but due to re-aerosolization concerns, ***under NO circumstances should a non-HEPA vacuum cleaner or a broom be used.*** EPA's National Decon Team (800-329-1841) can provide specific decontamination parameters & requirements for using readily available commercial items such as household bleach. **Methods used on surfaces: 1)** Source reduction steps, including HEPA vacuuming; **2)** Liquid antimicrobial products such as pH-amended bleach (mixture of 1 part household bleach (5.25% to 6.0%) to 1 part white vinegar to 8 parts water, is recommended). This product affects surfaces differently in terms of corrosiveness, staining, & residue. The product will be most efficient **a)** at higher temperatures (i.e., >70°F or 21°C) **b)** when plain bleach (e.g., no added fragrance) is used to make the pH-amended bleach solution, **c)** when pH is ≤ 7, **d)** when presence of other surface contaminants is minimal, & **e)** when surfaces remain wet with amended bleach solution for 60 minutes. **Note:** Store-bought bleach does degrade with time – check the expiration date. Alternate antimicrobial products include: chlorine dioxide, hydrogen peroxide, & peroxyacetic acid. **Fumigation:** Uses gas or vapor to decontaminate facilities in which there is evidence of high levels of contamination, re-aerosolization, or if decontamination of limited access areas is required (e.g. HVAC systems). **Fumigants:** chlorine dioxide, & vaporized hydrogen peroxide. Prior to use, the fumigant's compatibility with materials, penetration capacity, method of removal at the end of fumigation, as well as it's physical, chemical, & toxicological properties should be taken into account. Each chemical has a specified range for process variables (e.g., temperature, relative humidity, concentration & contact time) that must be followed. **Other Decon: 1)** Ethylene oxide sterilization is used to decontaminate items in an off-site sterilization chamber. **2)** Irradiation uses cobalt-60 & electron beam technologies to destroy agents at off-site locations. This procedure may destroy magnetic media. Irradiation & chemical sterilization may be useful in decontaminating items that are intended to be returned to owners. **Verification of Decon:** Site and situation specific. Please contact ERT (732-321-6660) and NDT (800-329-1841) for further assistance.
Waste Disposal	**CAUTION:** Hazardous waste transportation & disposal are regulated federally; however, more stringent regulations may exist under state authority. These regulations differ from state-to-state. Detailed state regulations can be found at: http://www.envcap.org.
	Waste Disposal Planning: Waste generated from assessment & cleanup activities should be autoclaved, chemically disinfected, or fumigated & then tested to be sure the agent(s) were inactivated. Waste disposal for agent-contaminated wastes generated from decontamination & disposal activities will be problematic. Landfills willing to take these wastes may be limited & incineration may be prohibitively expensive or impractical. All waste disposal options should be investigated as early into the response process as possible. Transportation of the agent contaminated wastes from the site to the landfill or incinerator may be problematic as well. Agreements must be reached between the waste generator & acceptor BEFORE transport. Information regarding the agreements may be required to be available to the public. Transportation of hazardous waste may cross several states and localities, which may exceed federal regulations. Requirements for transporting hazardous materials, & procedures for exemption, are specified at: http://www.fmcsa.dot.gov/safety-security/hazmat/complyhmregs.htm. The EPA has developed a web-based Incident Waste Management Planning & Response Tool which contains guidance related to waste transportation and handling, carcass disposal, contact information for potential treatment, disposal facilities, & state regulatory offices, packaging guidance to minimize risk to workers, & guidance to minimize the potential for contaminating the treatment or disposal facility. Access to the EPA's web based disposal tool requires preregistration: http://www2.ergweb.com/bdrtool/login.asp.