

## Appendix A:

**Preamble** The mode(s) and risk of transmission for each specific disease agent included in Appendix A were reviewed. Principle sources consulted for the development of disease-specific recommendations for Appendix A included infectious disease manuals and textbooks<sup>833, 1043, 1044</sup>. The published literature was searched for evidence of person-to-person transmission in healthcare and non-healthcare settings with a focus on reported outbreaks that would assist in developing recommendations for all settings where healthcare is delivered. Criteria used to assign Transmission-Based Precautions categories follow:

- A Transmission-Based Precautions category was assigned if there was strong evidence for person-to-person transmission via droplet, contact, or airborne routes in healthcare or non-healthcare settings and/or if patient factors (e.g., diapered infants, diarrhea, draining wounds) increased the risk of transmission
- Transmission-Based Precautions category assignments reflect the predominant mode(s) of transmission
- If there was no evidence for person-to-person transmission by droplet, contact or airborne routes, Standard Precautions were assigned
- If there was a low risk for person-to-person transmission and no evidence of healthcare-associated transmission, Standard Precautions were assigned
- Standard Precautions were assigned for bloodborne pathogens (e.g., hepatitis B and C viruses, human immunodeficiency virus) as per CDC recommendations for Universal Precautions issued in 1988<sup>780</sup>. Subsequent experience has confirmed the efficacy of Standard Precautions to prevent exposure to infected blood and body fluid<sup>778, 779, 866</sup>.

Additional information relevant to use of precautions was added in the comments column to assist the caregiver in decision-making. Citations were added as needed to support a change in or provide additional evidence for recommendations for a specific disease and for new infectious agents (e.g., SARS-CoV, avian influenza) that have been added to Appendix A. The reader may refer to more detailed discussion concerning modes of transmission and emerging pathogens in the background text and for MDRO control in Appendix B.

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### TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS

Infection/Condition	Precautions		
	Type <sup>*</sup>	Duration <sup>†</sup>	Comments
Abscess			
Draining, major	C	DI	No dressing or containment of drainage; until drainage stops or can be contained by dressing
Draining, minor or limited	S		Dressing covers and contains drainage
Acquired human immunodeficiency syndrome (HIV)	S		Post-exposure chemoprophylaxis for some blood exposures <sup>866</sup> .
Actinomycosis	S		Not transmitted from person to person
Adenovirus infection ( see agent-specific guidance under gastroenteritis, conjunctivitis, pneumonia)			
Amebiasis	S		Person to person transmission is rare. Transmission in settings for the mentally challenged and in a family group has been reported <sup>1045</sup> . Use care when handling diapered infants and mentally challenged persons <sup>1046</sup> .
Anthrax	S		Infected patients do not generally pose a transmission risk.
Cutaneous	S		Transmission through non-intact skin contact with draining lesions possible, therefore use Contact Precautions if large amount of uncontained drainage. Handwashing with soap and water preferable to use of waterless alcohol based antiseptics since alcohol does not

<sup>1</sup> Type of Precautions: A, Airborne Precautions; C, Contact; D, Droplet; S, Standard; when A, C, and D are specified, also use S.

<sup>†</sup> Duration of precautions: CN, until off antimicrobial treatment and culture-negative; DI, duration of illness (with wound lesions, DI means until wounds stop draining); DE, until environment completely decontaminated; U, until time specified in hours (hrs) after initiation of effective therapy; Unknown: criteria for establishing eradication of pathogen has not been determined

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			have sporicidal activity <sup>983</sup> .
Pulmonary	S		Not transmitted from person to person
Environmental: aerosolizable spore-containing powder or other substance		DE	Until decontamination of environment complete <sup>203</sup> . Wear respirator (N95 mask or PAPRs), protective clothing; decontaminate persons with powder on them ( <a href="http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5135a3.htm">http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5135a3.htm</a> ) <b>Hand hygiene:</b> Handwashing for 30-60 seconds with soap and water or 2% chlorhexidine gluconate after spore contact (alcohol handrubs inactive against spores <sup>983</sup> ). <b>Post-exposure prophylaxis following environmental exposure:</b> 60 days of antimicrobials (either doxycycline, ciprofloxacin, or levofloxacin) and post-exposure vaccine under IND
Antibiotic-associated colitis (see <i>Clostridium difficile</i> )			
Arthropod-borne viral encephalitides (eastern, western, Venezuelan equine encephalomyelitis; St Louis, California encephalitis; West Nile Virus) and viral fevers (dengue, yellow fever, Colorado tick fever)	S		Not transmitted from person to person except rarely by transfusion, and for West Nile virus by organ transplant, breastmilk or transplacentally <sup>530, 1047</sup> . Install screens in windows and doors in endemic areas Use DEET-containing mosquito repellants and clothing to cover extremities
Ascariasis	S		Not transmitted from person to person
Aspergillosis	S		Contact Precautions and Airborne Precautions if massive soft tissue infection with copious drainage and repeated irrigations required <sup>154</sup> .
Avian influenza (see influenza, avian below)			
Babesiosis	S		Not transmitted from person to person except rarely by transfusion,
Blastomycosis, North American, cutaneous or pulmonary	S		Not transmitted from person to person
Botulism	S		Not transmitted from person to person
Bronchiolitis (see respiratory infections in infants and young children)	C	DI	Use mask according to Standard Precautions.

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Brucellosis (undulant, Malta, Mediterranean fever)	S		Not transmitted from person to person except rarely via banked spermatozoa and sexual contact <sup>1048, 1049</sup> . Provide antimicrobial prophylaxis following laboratory exposure <sup>1050</sup> .
<i>Campylobacter</i> gastroenteritis (see gastroenteritis)			
Candidiasis, all forms including mucocutaneous	S		
Cat-scratch fever (benign inoculation lymphoreticulosis)	S		Not transmitted from person to person
Cellulitis	S		
Chancroid (soft chancre) ( <i>H. ducreyi</i> )	S		Transmitted sexually from person to person
Chickenpox (see varicella)			
<i>Chlamydia trachomatis</i>			
Conjunctivitis	S		
Genital (lymphogranuloma venereum)	S		
Pneumonia (infants $\leq$ 3 mos. of age)	S		
<i>Chlamydia pneumoniae</i>	S		Outbreaks in institutionalized populations reported, rarely <sup>1051, 1052</sup>
Cholera (see gastroenteritis)			
Closed-cavity infection			
Open drain in place; limited or minor drainage	S		Contact Precautions if there is copious uncontained drainage
No drain or closed drainage system in place	S		
<i>Clostridium</i>			
<i>C. botulinum</i>	S		Not transmitted from person to person
<i>C. difficile</i> (see Gastroenteritis, <i>C. difficile</i> )	C	DI	
<i>C. perfringens</i>			
Food poisoning	S		Not transmitted from person to person
Gas gangrene	S		Transmission from person to person rare; one outbreak in a surgical setting reported <sup>1053</sup> . Use Contact Precautions if wound drainage is

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	Type <sup>*</sup>	Duration <sup>†</sup>	Comments
			extensive.
Coccidioidomycosis (valley fever)			
Draining lesions	S		Not transmitted from person to person except under extraordinary circumstances because the infectious arthroconidial form of <i>Coccidioides immitis</i> is not produced in humans <sup>1054</sup> .
Pneumonia	S		Not transmitted from person to person except under extraordinary circumstances, (e.g., inhalation of aerosolized tissue phase endospores during necropsy, transplantation of infected lung) because the infectious arthroconidial form of <i>Coccidioides immitis</i> is not produced in humans <sup>1054, 1055</sup> .
Colorado tick fever	S		Not transmitted from person to person
Congenital rubella	C	Until 1 yr of age	Standard Precautions if nasopharyngeal and urine cultures repeatedly neg. after 3 mos. of age
Conjunctivitis			
Acute bacterial	S		
<i>Chlamydia</i>	S		
Gonococcal	S		
Acute viral (acute hemorrhagic)	C	DI	Adenovirus most common; enterovirus 70 <sup>1056</sup> , Coxsackie virus A24 <sup>1057</sup> ) also associated with community outbreaks. Highly contagious; outbreaks in eye clinics, pediatric and neonatal settings, institutional settings reported. Eye clinics should follow Standard Precautions when handling patients with conjunctivitis. Routine use of infection control measures in the handling of instruments and equipment will prevent the occurrence of outbreaks in this and other settings. <sup>460, 814, 1058, 1059 461, 1060</sup> .
Corona virus associated with SARS (SARS-CoV) (see severe acute respiratory syndrome)			

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Coxsackie virus disease (see enteroviral infection)			
Creutzfeldt-Jakob disease CJD, vCJD	S		Use disposable instruments or special sterilization/disinfection for surfaces, objects contaminated with neural tissue if CJD or vCJD suspected and has not been R/O; No special burial procedures <sup>1061</sup>
Croup (see respiratory infections in infants and young children)			
Crimean-Congo Fever (see Viral Hemorrhagic Fever)	S		
Cryptococcosis	S		Not transmitted from person to person, except rarely via tissue and corneal transplant <sup>1062, 1063</sup>
Cryptosporidiosis (see gastroenteritis)			
Cysticercosis	S		Not transmitted from person to person
Cytomegalovirus infection, including in neonates and immunosuppressed patients	S		No additional precautions for pregnant HCWs
Decubitus ulcer (see Pressure ulcer)			
Dengue fever	S		Not transmitted from person to person
Diarrhea, acute-infective etiology suspected (see gastroenteritis)			
Diphtheria			
Cutaneous	C	CN	Until 2 cultures taken 24 hrs. apart negative
Pharyngeal	D	CN	Until 2 cultures taken 24 hrs. apart negative
Ebola virus (see viral hemorrhagic fevers)			
Echinococcosis (hydatidosis)	S		Not transmitted from person to person
Echovirus (see enteroviral infection)			
Encephalitis or encephalomyelitis (see specific etiologic agents)			
Endometritis (endomyometritis)	S		
Enterobiasis (pinworm disease, oxyuriasis)	S		
<i>Enterococcus</i> species (see multidrug-resistant organisms if			

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epidemiologically significant or vancomycin resistant)			
Enterocolitis, <i>C. difficile</i> (see <i>C. difficile</i> , gastroenteritis)			
Enteroviral infections (i.e., Group A and B Coxsackie viruses and Echo viruses) (excludes polio virus)	S		Use Contact Precautions for diapered or incontinent children for duration of illness and to control institutional outbreaks
Epiglottitis, due to <i>Haemophilus influenzae</i> type b	D	U 24 hrs	See specific disease agents for epiglottitis due to other etiologies)
Epstein-Barr virus infection, including infectious mononucleosis	S		
Erythema infectiosum (also see Parvovirus B19)			
<i>Escherichia coli</i> gastroenteritis (see gastroenteritis)			
Food poisoning			
Botulism	S		Not transmitted from person to person
<i>C. perfringens</i> or <i>welchii</i>	S		Not transmitted from person to person
Staphylococcal	S		Not transmitted from person to person
Furunculosis, staphylococcal	S		Contact if drainage not controlled. Follow institutional policies if MRSA
Infants and young children	C	DI	
Gangrene (gas gangrene)	S		Not transmitted from person to person
Gastroenteritis	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks for gastroenteritis caused by all of the agents below
Adenovirus	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
<i>Campylobacter</i> species	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
Cholera ( <i>Vibrio cholerae</i> )	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
<i>C. difficile</i>	C	DI	Discontinue antibiotics if appropriate. Do not share electronic thermometers <sup>853, 854</sup> ; ensure consistent environmental cleaning and

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			disinfection. Hypochlorite solutions may be required for cleaning if transmission continues <sup>847</sup> . Handwashing with soap and water preferred because of the absence of sporicidal activity of alcohol in waterless antiseptic handrubs <sup>983</sup> .
<i>Cryptosporidium species</i>	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
<i>E. coli</i>			
Enteropathogenic O157:H7 and other shiga toxin-producing Strains	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
Other species	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
<i>Giardia lamblia</i>	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
Noroviruses	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks. Persons who clean areas heavily contaminated with feces or vomitus may benefit from wearing masks since virus can be aerosolized from these body substances <sup>142, 147 148</sup> ; ensure consistent environmental cleaning and disinfection with focus on restrooms even when apparently unsoiled <sup>273, 1064</sup> ). Hypochlorite solutions may be required when there is continued transmission <sup>290-292</sup> . Alcohol is less active, but there is no evidence that alcohol antiseptic handrubs are not effective for hand decontamination <sup>294</sup> . Cohorting of affected patients to separate airspaces and toilet facilities may help interrupt transmission during outbreaks.
Rotavirus	C	DI	Ensure consistent environmental cleaning and disinfection and frequent removal of soiled diapers. Prolonged shedding may occur in

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			both immunocompetent and immunocompromised children and the elderly <sup>932, 933</sup>
<i>Salmonella</i> species (including <i>S. typhi</i> )	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
<i>Shigella</i> species (Bacillary dysentery)	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
<i>Vibrio parahaemolyticus</i>	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
Viral (if not covered elsewhere)	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
<i>Yersinia enterocolitica</i>	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
German measles (see rubella; see congenital rubella)			
Giardiasis (see gastroenteritis)			
Gonococcal ophthalmia neonatorum (gonorrheal ophthalmia, acute conjunctivitis of newborn)	S		
Gonorrhea	S		
Granuloma inguinale (Donovanosis, granuloma venereum)	S		
Guillain-Barré' syndrome	S		Not an infectious condition
<i>Haemophilus influenzae</i> (see disease-specific recommendations)			
Hand, foot, and mouth disease (see enteroviral infection)			
Hansen's Disease (see Leprosy)			
Hantavirus pulmonary syndrome	S		Not transmitted from person to person
<i>Helicobacter pylori</i>	S		
Hepatitis, viral			
Type A	S		Provide hepatitis A vaccine post-exposure as recommended <sup>1065</sup>
Diapered or incontinent patients	C		Maintain Contact Precautions in infants and children <3 years of age

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Infection/Condition	Precautions		
	Type *	Duration †	Comments
			for duration of hospitalization; for children 3-14 yrs. of age for 2 weeks after onset of symptoms; >14 yrs. of age for 1 week after onset of symptoms <sup>833, 1066, 1067</sup>
Type B-HBsAg positive; acute or chronic	S		See specific recommendations for care of patients in hemodialysis centers <sup>778</sup>
Type C and other unspecified non-A, non-B	S		See specific recommendations for care of patients in hemodialysis centers <sup>778</sup>
Type D (seen only with hepatitis B)	S		
Type E	S		Use Contact Precautions for diapered or incontinent individuals for the duration of illness <sup>1068</sup>
Type G	S		
Herpangina (see enteroviral infection)			
Hookworm	S		
Herpes simplex ( <i>Herpesvirus hominis</i> )			
Encephalitis	S		
Mucocutaneous, disseminated or primary, severe	C	Until lesions dry and crusted	
Mucocutaneous, recurrent (skin, oral, genital)	S		
Neonatal	C	Until lesions dry and crusted	Also, for asymptomatic, exposed infants delivered vaginally or by C-section and if mother has active infection and membranes have been ruptured for more than 4 to 6 hrs until infant surface cultures obtained at 24-36 hrs. of age negative after 48 hrs incubation <sup>1069, 1070</sup>
Herpes zoster (varicella-zoster) (shingles)			
Disseminated disease in any patient Localized disease in immunocompromised patient until disseminated infection ruled out	A,C	DI	Susceptible HCWs should not enter room if immune caregivers are available; no recommendation for protection of immune HCWs; no recommendation for type of protection, i.e. surgical mask or respirator; for susceptible HCWs.

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Infection/Condition	Precautions		
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Localized in patient with intact immune system with lesions that can be contained/covered	S	DI	Susceptible HCWs should not provide direct patient care when other immune caregivers are available.
Histoplasmosis	S		Not transmitted from person to person
Human immunodeficiency virus (HIV)	S		Post-exposure chemoprophylaxis for some blood exposures <sup>866</sup> .
Human metapneumovirus	C	DI	HAI reported <sup>1071</sup> , but route of transmission not established <sup>823</sup> . Assumed to be Contact transmission as for RSV since the viruses are closely related and have similar clinical manifestations and epidemiology. Wear masks according to Standard Precautions..
Impetigo	C	U 24 hrs	
Infectious mononucleosis	S		
Influenza			
Human (seasonal influenza)	D	5 days except DI in immuno compromised persons	Single patient room when available or cohort; avoid placement with high-risk patients; mask patient when transported out of room; chemoprophylaxis/vaccine to control/prevent outbreaks <sup>611</sup> . Use gown and gloves according to Standard Precautions may be especially important in pediatric settings. Duration of precautions for immunocompromised patients cannot be defined; prolonged duration of viral shedding (i.e. for several weeks) has been observed; implications for transmission are unknown <sup>930</sup> .
Avian (e.g., H5N1, H7, H9 strains))			See <a href="http://www.cdc.gov/flu/avian/professional/infect-control.htm">www.cdc.gov/flu/avian/professional/infect-control.htm</a> for current avian influenza guidance.
Pandemic influenza (also a human influenza virus)	D	5 days from onset of symptoms	See <a href="http://www.pandemicflu.gov">http://www.pandemicflu.gov</a> for current pandemic influenza guidance.
Kawasaki syndrome	S		Not an infectious condition
Lassa fever (see viral hemorrhagic fevers)			

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Legionnaires' disease	S		Not transmitted from person to person
Leprosy	S		
Leptospirosis	S		Not transmitted from person to person
Lice			<a href="http://www.cdc.gov/ncidod/dpd/parasites/lice/default.htm">http://www.cdc.gov/ncidod/dpd/parasites/lice/default.htm</a>
Head (pediculosis)	C	U 4 hrs	
Body	S		Transmitted person to person through infested clothing. Wear gown and gloves when removing clothing; bag and wash clothes according to CDC guidance above
Pubic	S		Transmitted person to person through sexual contact
Listeriosis ( <i>listeria monocytogenes</i> )	S		Person-to-person transmission rare; cross-transmission in neonatal settings reported <sup>1072, 1073 1074, 1075</sup>
Lyme disease	S		Not transmitted from person to person
Lymphocytic choriomeningitis	S		Not transmitted from person to person
Lymphogranuloma venereum	S		
Malaria	S		Not transmitted from person to person except through transfusion rarely and through a failure to follow Standard Precautions during patient care <sup>1076-1079</sup> . Install screens in windows and doors in endemic areas. Use DEET-containing mosquito repellants and clothing to cover extremities
Marburg virus disease (see viral hemorrhagic fevers)			
Measles (rubeola)	A	4 days after onset of rash; DI in immune compromised	Susceptible HCWs should not enter room if immune care providers are available; no recommendation for face protection for immune HCW; no recommendation for type of face protection for susceptible HCWs, i.e., mask or respirator <sup>1027, 1028</sup> . For exposed susceptibles, post-exposure vaccine within 72 hrs. or immune globulin within 6 days when available <sup>17, 1032, 1034</sup> . Place exposed susceptible patients on Airborne Precautions and exclude susceptible healthcare personnel

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			from duty from day 5 after first exposure to day 21 after last exposure, regardless of post-exposure vaccine <sup>17</sup> .
Melioidosis, all forms	S		Not transmitted from person to person
Meningitis			
Aseptic (nonbacterial or viral; also see enteroviral infections)	S		Contact for infants and young children
Bacterial, gram-negative enteric, in neonates	S		
Fungal	S		
<i>Haemophilus influenzae</i> , type b known or suspected	D	U 24 hrs	
<i>Listeria monocytogenes</i> (See Listeriosis)	S		
<i>Neisseria meningitidis</i> (meningococcal) known or suspected	D	U 24 hrs	See meningococcal disease below
<i>Streptococcus pneumoniae</i>	S		
<i>M. tuberculosis</i>	S		Concurrent, active pulmonary disease or draining cutaneous lesions may necessitate addition of Contact and/or Airborne Precautions; For children, airborne precautions until active tuberculosis ruled out in visiting family members (see tuberculosis below) <sup>42</sup>
Other diagnosed bacterial	S		
Meningococcal disease: sepsis, pneumonia, meningitis	D	U 24 hrs	Postexposure chemoprophylaxis for household contacts, HCWs exposed to respiratory secretions; postexposure vaccine only to control outbreaks <sup>15, 17</sup> .
<i>Molluscum contagiosum</i>	S		
Monkeypox	A,C	A-Until monkeypox confirmed and smallpox excluded C-Until lesions crusted	Use See <a href="http://www.cdc.gov/ncidod/monkeypox">www.cdc.gov/ncidod/monkeypox</a> for most current recommendations. Transmission in hospital settings unlikely <sup>269</sup> . Pre- and post-exposure smallpox vaccine recommended for exposed HCWs

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Mucormycosis	S		
Multidrug-resistant organisms (MDROs), infection or colonization (e.g., MRSA, VRE, VISA/VRSA, ESBLs, resistant <i>S. pneumoniae</i> )	S/C		MDROs judged by the infection control program, based on local, state, regional, or national recommendations, to be of clinical and epidemiologic significance. Contact Precautions recommended in settings with evidence of ongoing transmission, acute care settings with increased risk for transmission or wounds that cannot be contained by dressings. See recommendations for management options in Management of Multidrug-Resistant Organisms In Healthcare Settings, 2006 <sup>870</sup> . Contact state health department for guidance regarding new or emerging MDRO.
Mumps (infectious parotitis)	D	U 9 days	After onset of swelling; susceptible HCWs should not provide care if immune caregivers are available. Note: (Recent assessment of outbreaks in healthy 18-24 year olds has indicated that salivary viral shedding occurred early in the course of illness and that 5 days of isolation after onset of parotitis may be appropriate in community settings; however the implications for healthcare personnel and high-risk patient populations remain to be clarified.)
Mycobacteria, nontuberculosis (atypical)			Not transmitted person-to-person
Pulmonary	S		
Wound	S		
<i>Mycoplasma pneumoniae</i>	D	DI	
Necrotizing enterocolitis	S		Contact Precautions when cases clustered temporally <sup>1080-1083</sup> .
Nocardiosis, draining lesions, or other presentations	S		Not transmitted person-to-person
Norovirus (see gastroenteritis)			
Norwalk agent gastroenteritis (see gastroenteritis)			
Orf	S		

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	Type *	Duration †	Comments
Parainfluenza virus infection, respiratory in infants and young children	C	DI	Viral shedding may be prolonged in immunosuppressed patients <sup>1009, 1010</sup> . Reliability of antigen testing to determine when to remove patients with prolonged hospitalizations from Contact Precautions uncertain.
Parvovirus B19 (Erythema infectiosum)	D		Maintain precautions for duration of hospitalization when chronic disease occurs in an immunocompromised patient. For patients with transient aplastic crisis or red-cell crisis, maintain precautions for 7 days. Duration of precautions for immunosuppressed patients with persistently positive PCR not defined, but transmission has occurred <sup>929</sup> .
Pediculosis (lice)	C	U 24 hrs after treatment	
Pertussis (whooping cough)	D	U 5 days	Single patient room preferred. Cohorting an option. Post-exposure chemoprophylaxis for household contacts and HCWs with prolonged exposure to respiratory secretions <sup>863</sup> . Recommendations for Tdap vaccine in adults under development.
Pinworm infection (Enterobiasis)	S		
Plague ( <i>Yersinia pestis</i> )			
Bubonic	S		
Pneumonic	D	U 48 hrs	Antimicrobial prophylaxis for exposed HCW <sup>207</sup> .
Pneumonia			
Adenovirus	D, C	DI	Outbreaks in pediatric and institutional settings reported <sup>376, 1084-1086</sup> . In immunocompromised hosts, extend duration of Droplet and Contact Precautions due to prolonged shedding of virus <sup>931</sup> .
Bacterial not listed elsewhere (including gram-negative bacterial)	S		
<i>B. cepacia</i> in patients with CF, including respiratory tract colonization	C	Unknown	Avoid exposure to other persons with CF; private room preferred. Criteria for D/C precautions not established. See CF Foundation guideline <sup>20</sup> .

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<i>B. cepacia</i> in patients without CF(see Multidrug-resistant organisms)			
<i>Chlamydia</i>	S		
Fungal	S		
<i>Haemophilus influenzae</i> , type b			
Adults	S		
Infants and children	D	U 24 hrs	
<i>Legionella spp.</i>	S		
Meningococcal	D	U 24 hrs	See meningococcal disease above
Multidrug-resistant bacterial (see multidrug-resistant organisms)			
<i>Mycoplasma</i> (primary atypical pneumonia)	D	DI	
Pneumococcal pneumonia	S		Use Droplet Precautions if evidence of transmission within a patient care unit or facility <sup>196-198, 1087</sup>
<i>Pneumocystis jiroveci</i> ( <i>Pneumocystis carinii</i> )	S		Avoid placement in the same room with an immunocompromised patient.
<i>Staphylococcus aureus</i>	S		For MRSA, see MDROs
<i>Streptococcus</i> , group A			
Adults	D	U 24 hrs	See streptococcal disease (group A streptococcus) below
Infants and young children	D	U 24 hrs	Contact precautions if skin lesions present
Varicella-zoster (See Varicella-Zoster)			Contact Precautions if skin lesions present
Viral			
Adults	S		
Infants and young children (see respiratory infectious disease, acute, or specific viral agent)			
Poliomyelitis	C	DI	
Pressure ulcer (decubitus ulcer, pressure sore) infected			

## APPENDIX A<sup>1</sup>

### TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS

Infection/Condition	Precautions		
	Type <sup>*</sup>	Duration <sup>†</sup>	Comments
Major	C	DI	If no dressing or containment of drainage; until drainage stops or can be contained by dressing
Minor or limited	S		If dressing covers and contains drainage
Prion disease (See Creutzfeld-Jacob Disease)			
Psittacosis (ornithosis) ( <i>Chlamydia psittaci</i> )	S		Not transmitted from person to person
Q fever	S		
Rabies	S		Person to person transmission rare; transmission via corneal, tissue and organ transplants has been reported <sup>539, 1088</sup> . If patient has bitten another individual or saliva has contaminated an open wound or mucous membrane, wash exposed area thoroughly and administer postexposure prophylaxis. <sup>1089</sup>
Rat-bite fever ( <i>Streptobacillus moniliformis</i> disease, <i>Spirillum minus</i> disease)	S		Not transmitted from person to person
Relapsing fever	S		Not transmitted from person to person
Resistant bacterial infection or colonization (see multidrug-resistant organisms)			
Respiratory infectious disease, acute (if not covered elsewhere)			
Adults	S		
Infants and young children	C	DI	Also see syndromes or conditions listed in Table 2
Respiratory syncytial virus infection, in infants, young children and immunocompromised adults	C	DI	Wear mask according to Standard Precautions <sup>24</sup> CB <sup>116, 117</sup> . In immunocompromised patients, extend the duration of Contact Precautions due to prolonged shedding <sup>928</sup> ). Reliability of antigen testing to determine when to remove patients with prolonged hospitalizations from Contact Precautions uncertain.
Reye's syndrome	S		Not an infectious condition
Rheumatic fever	S		Not an infectious condition
Rhinovirus	D	DI	Droplet most important route of transmission <sup>104 1090</sup> . Outbreaks have

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### TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS

Infection/Condition	Precautions		
	Type *	Duration †	Comments
			occurred in NICUs and LTCFs <sup>413, 1091, 1092</sup> . Add Contact Precautions if copious moist secretions and close contact likely to occur (e.g., young infants) <sup>111, 833</sup> .
Rickettsial fevers, tickborne (Rocky Mountain spotted fever, tickborne typhus fever)	S		Not transmitted from person to person except through transfusion, rarely
Rickettsialpox (vesicular rickettsiosis)	S		Not transmitted from person to person
Ringworm (dermatophytosis, dermatomycosis, tinea)	S		Rarely, outbreaks have occurred in healthcare settings, (e.g., NICU <sup>1093</sup> , rehabilitation hospital <sup>1094</sup> ). Use Contact Precautions for outbreak.
Ritter's disease (staphylococcal scalded skin syndrome)	C	DI	See staphylococcal disease, scalded skin syndrome below
Rocky Mountain spotted fever	S		Not transmitted from person to person except through transfusion, rarely
Roseola infantum (exanthem subitum; caused by HHV-6)	S		
Rotavirus infection (see gastroenteritis)			
Rubella (German measles) ( also see congenital rubella)	D	U 7 days after onset of rash	Susceptible HCWs should not enter room if immune caregivers are available. No recommendation for wearing face protection (e.g., a surgical mask) if immune. Pregnant women who are not immune should not care for these patients <sup>17, 33</sup> . Administer vaccine within three days of exposure to non-pregnant susceptible individuals. Place exposed susceptible patients on Droplet Precautions; exclude susceptible healthcare personnel from duty from day 5 after first exposure to day 21 after last exposure, regardless of post-exposure vaccine.
Rubeola (see measles)			
Salmonellosis (see gastroenteritis)			
Scabies	C	U 24	
Scalded skin syndrome, staphylococcal	C	DI	See staphylococcal disease, scalded skin syndrome below)
Schistosomiasis (bilharziasis)	S		

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### TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS

Infection/Condition	Precautions		
	Type *	Duration †	Comments
Severe acute respiratory syndrome (SARS)	A, D,C	DI plus 10 days after resolution of fever, provided respiratory symptoms are absent or improving	Airborne Precautions preferred; D if AIIR unavailable. N95 or higher respiratory protection; surgical mask if N95 unavailable; eye protection (goggles, face shield); aerosol-generating procedures and “supershedders” highest risk for transmission via small droplet nuclei and large droplets <sup>93, 94, 96</sup> . Vigilant environmental disinfection (see www.cdc.gov/ncidod/sars)
Shigellosis (see gastroenteritis)			
Smallpox (variola; see vaccinia for management of vaccinated persons)	A,C	DI	Until all scabs have crusted and separated (3-4 weeks). Non-vaccinated HCWs should not provide care when immune HCWs are available; N95 or higher respiratory protection for susceptible and successfully vaccinated individuals; postexposure vaccine within 4 days of exposure protective <sup>108, 129, 1038-1040</sup> .
Sporotrichosis	S		
<i>Spirillum minor</i> disease (rat-bite fever)	S		Not transmitted from person to person
Staphylococcal disease ( <i>S aureus</i> )			
Skin, wound, or burn			
Major	C	DI	No dressing or dressing does not contain drainage adequately
Minor or limited	S		Dressing covers and contains drainage adequately
Enterocolitis	S		Use Contact Precautions for diapered or incontinent children for duration of illness
Multidrug-resistant (see multidrug-resistant organisms)			
Pneumonia	S		
Scalded skin syndrome	C	DI	Consider healthcare personnel as potential source of nursery, NICU outbreak <sup>1095</sup> .
Toxic shock syndrome	S		
<i>Streptobacillus moniliformis</i> disease (rat-bite fever)	S		Not transmitted from person to person

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### TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS

Infection/Condition	Precautions		
	Type *	Duration †	Comments
Streptococcal disease (group A streptococcus)			
Skin, wound, or burn			
Major	C,D	U 24 hrs	No dressing or dressing does not contain drainage adequately
Minor or limited	S		Dressing covers and contains drainage adequately
Endometritis (puerperal sepsis)	S		
Pharyngitis in infants and young children	D	U 24 hrs	
Pneumonia	D	U 24 hrs	
Scarlet fever in infants and young children	D	U 24 hrs	
Serious invasive disease	D	U24 hrs	Outbreaks of serious invasive disease have occurred secondary to transmission among patients and healthcare personnel <sup>162, 972, 1096-1098</sup> Contact Precautions for draining wound as above; follow rec. for antimicrobial prophylaxis in selected conditions <sup>160</sup> .
Streptococcal disease (group B streptococcus), neonatal	S		
Streptococcal disease (not group A or B) unless covered elsewhere	S		
Multidrug-resistant (see multidrug-resistant organisms)			
Strongyloidiasis	S		
Syphilis			
Latent (tertiary) and seropositivity without lesions	S		
Skin and mucous membrane, including congenital, primary, Secondary	S		
Tapeworm disease			
<i>Hymenolepis nana</i>	S		Not transmitted from person to person
<i>Taenia solium</i> (pork)	S		
Other	S		
Tetanus	S		Not transmitted from person to person
Tinea (e.g., dermatophytosis, dermatomycosis, ringworm)	S		Rare episodes of person-to-person transmission

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### TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS

Infection/Condition	Precautions		
	Type *	Duration †	Comments
Toxoplasmosis	S		Transmission from person to person is rare; vertical transmission from mother to child, transmission through organs and blood transfusion rare
Toxic shock syndrome (staphylococcal disease, streptococcal disease)	S		Droplet Precautions for the first 24 hours after implementation of antibiotic therapy if Group A streptococcus is a likely etiology
Trachoma, acute	S		
Transmissible spongiform encephalopathy (see Creutzfeld-Jacob disease, CJD, vCJD)			
Trench mouth (Vincent's angina)	S		
Trichinosis	S		
Trichomoniasis	S		
Trichuriasis (whipworm disease)	S		
Tuberculosis ( <i>M. tuberculosis</i> )			
Extrapulmonary, draining lesion)	A,C		Discontinue precautions only when patient is improving clinically, and drainage has ceased or there are three consecutive negative cultures of continued drainage <sup>1025, 1026</sup> . Examine for evidence of active pulmonary tuberculosis.
Extrapulmonary, no draining lesion, meningitis	S		Examine for evidence of pulmonary tuberculosis. For infants and children, use Airborne Precautions until active pulmonary tuberculosis in visiting family members ruled out <sup>42</sup>
Pulmonary or laryngeal disease, confirmed	A		Discontinue precautions only when patient on effective therapy is improving clinically and has three consecutive sputum smears negative for acid-fast bacilli collected on separate days(MMWR 2005; 54: RR-17 <a href="http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5417a1.htm?s_cid=rr5417a1_e">http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5417a1.htm?s_cid=rr5417a1_e</a> ) <sup>12</sup> .
Pulmonary or laryngeal disease, suspected	A		Discontinue precautions only when the likelihood of infectious TB

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### TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS

Infection/Condition	Precautions		
	Type *	Duration †	Comments
			disease is deemed negligible, and either 1) there is another diagnosis that explains the clinical syndrome or 2) the results of three sputum smears for AFB are negative. Each of the three sputum specimens should be collected 8-24 hours apart, and at least one should be an early morning specimen
Skin-test positive with no evidence of current active disease	S		
Tularemia			
Draining lesion	S		Not transmitted from person to person
Pulmonary	S		Not transmitted from person to person
Typhoid ( <i>Salmonella typhi</i> ) fever (see gastroenteritis)			
Typhus			
<i>Rickettsia prowazekii</i> (Epidemic or Louse-borne typhus)	S		Transmitted from person to person through close personal or clothing contact
<i>Rickettsia typhi</i>	S		Not transmitted from person to person
Urinary tract infection (including pyelonephritis), with or without urinary catheter	S		
Vaccinia (vaccination site, adverse events following vaccination) *			Only vaccinated HCWs have contact with active vaccination sites and care for persons with adverse vaccinia events; if unvaccinated, only HCWs without contraindications to vaccine may provide care.
Vaccination site care (including autoinoculated areas)	S		Vaccination recommended for vaccinators; for newly vaccinated HCWs: semi-permeable dressing over gauze until scab separates, with dressing change as fluid accumulates, ~3-5 days; gloves, hand hygiene for dressing change; vaccinated HCW or HCW without contraindication to vaccine for dressing changes <sup>205, 221, 225</sup> .
Eczema vaccinatum	C	Until lesions dry and crusted, scabs separated	For contact with virus-containing lesions and exudative material
Fetal vaccinia	C		
Generalized vaccinia	C		

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### TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS

Infection/Condition	Precautions		
	Type *	Duration †	Comments
Progressive vaccinia	C		
Postvaccinia encephalitis	S		
Blepharitis or conjunctivitis	S/C		Use Contact Precautions if there is copious drainage
Iritis or keratitis	S		
Vaccinia-associated erythema multiforme (Stevens Johnson Syndrome)	S		Not an infectious condition
Secondary bacterial infection (e.g., <i>S. aureus</i> , group A beta hemolytic streptococcus)	S/C		Follow organism-specific (strep, staph most frequent) recommendations and consider magnitude of drainage
Varicella Zoster	A,C	Until lesions dry and crusted	Susceptible HCWs should not enter room if immune caregivers are available; no recommendation for face protection of immune HCWs; no recommendation for type of protection, i.e. surgical mask or respirator for susceptible HCWs. In immunocompromised host with varicella pneumonia, prolong duration of precautions for duration of illness. Post-exposure prophylaxis: provide post-exposure vaccine ASAP but within 120 hours; for susceptible exposed persons for whom vaccine is contraindicated (immunocompromised persons, pregnant women, newborns whose mother's varicella onset is ≤5days before delivery or within 48 hrs after delivery) provide VZIG, when available, within 96 hours; if unavailable, use IVIG, Use Airborne Precautions for exposed susceptible persons and exclude exposed susceptible healthcare workers beginning 8 days after first exposure until 21 days after last exposure or 28 if received VZIG, regardless of postexposure vaccination. <sup>1036</sup>
Variola (see smallpox)			
<i>Vibrio parahaemolyticus</i> (see gastroenteritis)			
Vincent's angina (trench mouth)	S		
Viral hemorrhagic fevers	S, D, C	DI	Single-patient room preferred. Emphasize: 1) use of sharps safety

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### TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS

Infection/Condition	Precautions		
	Type <sup>*</sup>	Duration <sup>†</sup>	Comments
due to Lassa, Ebola, Marburg, Crimean-Congo fever viruses			devices and safe work practices, 2) hand hygiene; 3) barrier protection against blood and body fluids upon entry into room (single gloves and fluid-resistant or impermeable gown, face/eye protection with masks, goggles or face shields); and 4) appropriate waste handling. Use N95 or higher respirators when performing aerosol-generating procedures. Largest viral load in final stages of illness when hemorrhage may occur; additional PPE, including double gloves, leg and shoe coverings may be used, especially in resource-limited settings where options for cleaning and laundry are limited. Notify public health officials immediately if Ebola is suspected <sup>212, 314, 740, 772</sup> Also see Table 3 for Ebola as a bioterrorism agent
Viral respiratory diseases (not covered elsewhere)			
Adults	S		
Infants and young children (see respiratory infectious disease, acute)			
Whooping cough (see pertussis)			
Wound infections			
Major	C	DI	No dressing or dressing does not contain drainage adequately
Minor or limited	S		Dressing covers and contains drainage adequately
<i>Yersinia enterocolitica</i> gastroenteritis (see gastroenteritis)			
Zoster (varicella-zoster) (see herpes zoster)			
Zygomycosis (phycomycosis, mucormycosis)	S		Not transmitted person-to-person

**TABLE 1. HISTORY OF GUIDELINES FOR ISOLATION PRECAUTIONS IN HOSPITALS\***

<b>YEAR (Ref)</b>	<b>DOCUMENT ISSUED</b>	<b>COMMENT</b>
1970 1099	Isolation Techniques for Use in Hospitals, 1 <sup>st</sup> ed.	<ul style="list-style-type: none"> <li>- Introduced seven isolation precaution categories with color-coded cards: Strict, Respiratory, Protective, Enteric, Wound and Skin, Discharge, and Blood</li> <li>- No user decision-making required</li> <li>- Simplicity a strength; over isolation prescribed for some infections</li> </ul>
1975 1100	Isolation Techniques for Use in Hospitals, 2 <sup>nd</sup> ed.	<ul style="list-style-type: none"> <li>- Same conceptual framework as 1<sup>st</sup> edition</li> </ul>
1983 1101	CDC Guideline for Isolation Precautions in Hospitals	<ul style="list-style-type: none"> <li>- Provided two systems for isolation: category-specific and disease-specific</li> <li>- Protective Isolation eliminated; Blood Precautions expanded to include Body Fluids</li> <li>- Categories included Strict, Contact, Respiratory, AFB, Enteric, Drainage/Secretion, Blood and Body Fluids</li> <li>- Emphasized decision-making by users</li> </ul>
1985-88 780, 896	Universal Precautions	<ul style="list-style-type: none"> <li>- Developed in response to HIV/AIDS epidemic</li> <li>- Dictated application of Blood and Body Fluid precautions to all patients, regardless of infection status</li> <li>- Did not apply to feces, nasal secretions, sputum, sweat, tears, urine, or vomitus unless contaminated by visible blood</li> <li>- Added personal protective equipment to protect HCWs from mucous membrane exposures</li> <li>- Handwashing recommended immediately after glove removal</li> <li>- Added specific recommendations for handling needles and other sharp devices; concept became integral to OSHA's 1991 rule on occupational exposure to blood-borne pathogens in healthcare settings</li> </ul>

<p>1987 1102</p>	<p>Body Substance Isolation</p>	<ul style="list-style-type: none"> <li>- Emphasized avoiding contact with all moist and potentially infectious body substances except sweat even if blood not present</li> <li>- Shared some features with Universal Precautions</li> <li>- Weak on infections transmitted by large droplets or by contact with dry surfaces</li> <li>- Did not emphasize need for special ventilation to contain airborne infections</li> <li>- Handwashing after glove removal not specified in the absence of visible soiling</li> </ul>
<p>1996 1</p>	<p>Guideline for Isolation Precautions in Hospitals</p>	<ul style="list-style-type: none"> <li>- Prepared by the Healthcare Infection Control Practices Advisory Committee (HICPAC)</li> <li>- Melded major features of Universal Precautions and Body Substance Isolation into Standard Precautions to be used with all patients at all times</li> <li>- Included three transmission-based precaution categories: airborne, droplet, and contact</li> <li>- Listed clinical syndromes that should dictate use of empiric isolation until an etiological diagnosis is established</li> </ul>

\* Derived from Garner ICHE 1996

**TABLE 2. CLINICAL SYNDROMES OR CONDITIONS WARRANTING EMPIRIC TRANSMISSION-BASED PRECAUTIONS IN ADDITION TO STANDARD PRECAUTIONS PENDING CONFIRMATION OF DIAGNOSIS\***

Clinical Syndrome or Condition†	Potential Pathogen‡	Empiric Precautions (Always includes Standard Precautions)
<b>DIARRHEA</b>		
Acute diarrhea with a likely infectious cause in an incontinent or diapered patient	Enteric pathogens§	Contact Precautions (pediatrics and adult)
<b>MENINGITIS</b>		
	<i>Neisseria meningitidis</i>	Droplet Precautions for first 24 hrs of antimicrobial therapy; mask and face protection for intubation
	Enteroviruses	Contact Precautions for infants and children
	<i>M. tuberculosis</i>	Airborne Precautions if pulmonary infiltrate Airborne Precautions plus Contact Precautions if potentially infectious draining body fluid present
<b>RASH OR EXANTHEMS, GENERALIZED, ETIOLOGY UNKNOWN</b>		
Petechial/ecchymotic with fever (general)  - If positive history of travel to an area with an ongoing outbreak of VHF in the 10 days before onset of fever	<i>Neisseria meningitides</i>	Droplet Precautions for first 24 hrs of antimicrobial therapy
	Ebola, Lassa, Marburg viruses	Droplet Precautions plus Contact Precautions, with face/eye protection, emphasizing safety sharps and barrier precautions when blood exposure likely. Use N95 or higher respiratory protection when aerosol-generating procedure performed

Vesicular	Varicella-zoster, <i>herpes simplex</i> , variola (smallpox), vaccinia viruses  Vaccinia virus	Airborne plus Contact Precautions;  Contact Precautions only if <i>herpes simplex</i> , localized zoster in an immunocompetent host or vaccinia viruses most likely
Maculopapular with cough, coryza and fever	Rubeola (measles) virus	Airborne Precautions

Clinical Syndrome or Condition†	Potential Pathogens‡	Empiric Precautions (Always includes Standard Precautions)
<b>RESPIRATORY INFECTIONS</b>		
Cough/fever/upper lobe pulmonary infiltrate in an HIV-negative patient or a patient at low risk for human immunodeficiency virus (HIV) infection	<i>M. tuberculosis</i> , Respiratory viruses, <i>S. pneumoniae</i> , <i>S. aureus</i> (MSSA or MRSA)	Airborne Precautions plus Contact precautions
Cough/fever/pulmonary infiltrate in any lung location in an HIV-infected patient or a patient at high risk for HIV infection	<i>M. tuberculosis</i> , Respiratory viruses, <i>S. pneumoniae</i> , <i>S. aureus</i> (MSSA or MRSA)	Airborne Precautions plus Contact Precautions Use eye/face protection if aerosol-generating procedure performed or contact with respiratory secretions anticipated. If tuberculosis is unlikely and there are no AIIRs and/or respirators available, use Droplet Precautions instead of Airborne Precautions Tuberculosis more likely in HIV-infected individual than in HIV negative individual
Cough/fever/pulmonary infiltrate in any lung location in a patient with a history of recent travel (10-21 days) to countries with active outbreaks of SARS, avian influenza	<i>M. tuberculosis</i> , severe acute respiratory syndrome virus (SARS-CoV), avian influenza	Airborne plus Contact Precautions plus eye protection. If SARS and tuberculosis unlikely, use Droplet Precautions instead of Airborne Precautions.
Respiratory infections, particularly bronchiolitis and pneumonia, in infants and young children	Respiratory syncytial virus, parainfluenza virus, adenovirus, influenza virus, Human metapneumovirus	Contact plus Droplet Precautions; Droplet Precautions may be discontinued when adenovirus and influenza have been ruled out

**Skin or Wound Infection**

Abscess or draining wound that cannot be covered	<i>Staphylococcus aureus</i> (MSSA or MRSA), group A streptococcus	Contact Precautions Add Droplet Precautions for the first 24 hours of appropriate antimicrobial therapy if invasive Group A streptococcal disease is suspected
<p>* Infection control professionals should modify or adapt this table according to local conditions. To ensure that appropriate empiric precautions are implemented always, hospitals must have systems in place to evaluate patients routinely according to these criteria as part of their preadmission and admission care.</p> <p>† Patients with the syndromes or conditions listed below may present with atypical signs or symptoms (e.g. neonates and adults with pertussis may not have paroxysmal or severe cough). The clinician's index of suspicion should be guided by the prevalence of specific conditions in the community, as well as clinical judgment.</p> <p>‡ The organisms listed under the column "Potential Pathogens" are not intended to represent the complete, or even most likely, diagnoses, but rather possible etiologic agents that require additional precautions beyond Standard Precautions until they can be ruled out.</p> <p>§ These pathogens include enterohemorrhagic <i>Escherichia coli</i> O157:H7, <i>Shigella spp</i>, hepatitis A virus, noroviruses, rotavirus, <i>C. difficile</i>.</p>		

**TABLE 3.**  
**INFECTION CONTROL CONSIDERATIONS FOR HIGH-PRIORITY (CDC CATEGORY A) DISEASES THAT MAY RESULT FROM BIOTERRORIST ATTACKS OR ARE CONSIDERED TO BE BIOTERRORIST THREATS**

(www.bt.cdc.gov)<sup>a</sup>

<sup>a</sup> Abbreviations used in this table: RT = respiratory tract; GIT = gastrointestinal tract; CXR = chest x-ray; CT = computerized axial tomography; CSF = cerebrospinal fluid; and LD<sub>50</sub> – lethal dose for 50% of experimental animals; HCWs = healthcare worker; BSL = biosafety level; PAPR = powered air purifying respirator; PCR = polymerase chain reaction; IHC = immunohistochemistry

Disease	Anthrax
<b>Site(s) of Infection; Transmission Mode</b> Cutaneous and inhalation disease have occurred in past bioterrorist incidents	<b>Cutaneous</b> (contact with spores); <b>RT</b> (inhalation of spores); <b>GIT</b> (ingestion of spores - rare) <b>Comment:</b> Spores can be inhaled into the lower respiratory tract. The infectious dose of <i>B. anthracis</i> in humans by any route is not precisely known. In primates, the LD <sub>50</sub> (i.e., the dose required to kill 50% of animals) for an aerosol challenge with <i>B. anthracis</i> is estimated to be 8,000–50,000 spores; the infectious dose may be as low as 1-3 spores
<b>Incubation Period</b>	<b>Cutaneous:</b> 1 to 12 days; <b>RT:</b> Usually 1 to 7 days but up to 43 days reported; <b>GIT:</b> 15-72 hours
<b>Clinical Features</b>	<b>Cutaneous:</b> Painless, reddish papule, which develops a central vesicle or bulla in 1-2 days; over next 3-7 days lesion becomes pustular, and then necrotic, with black eschar; extensive surrounding edema. <b>RT:</b> initial flu-like illness for 1-3 days with headache, fever, malaise, cough; by day 4 severe dyspnea and shock, and is usually fatal (85%-90% if untreated; meningitis in 50% of RT cases). <b>GIT:</b> ; if intestinal form, necrotic, ulcerated edematous lesions develop in intestines with fever, nausea and vomiting, progression to hematemesis and bloody diarrhea; 25-60% fatal
<b>Diagnosis</b>	<b>Cutaneous:</b> Swabs of lesion (under eschar) for IHC, PCR and culture; punch biopsy for IHC, PCR and culture; vesicular fluid aspirate for Gram stain and culture; blood culture if systemic symptoms; acute and

	<p>convalescent sera for ELISA serology</p> <p><b>RT:</b> CXR or CT demonstrating wide mediastinal widening and/or pleural effusion, hilar abnormalities; blood for culture and PCR; pleural effusion for culture, PCR and IHC; CSF if meningeal signs present for IHC, PCR and culture; acute and convalescent sera for ELISA serology; pleural and/or bronchial biopsies IHC.</p> <p><b>GIT:</b> blood and ascites fluid, stool samples, rectal swabs, and swabs of oropharyngeal lesions if present for culture, PCR and IHC</p>
<b>Infectivity</b>	<p><b>Cutaneous:</b> Person-to-person transmission from contact with lesion of untreated patient possible, but extremely rare.</p> <p><b>RT and GIT:</b> Person-to-person transmission does not occur.</p> <p><b>Aerosolized powder, environmental exposures:</b> Highly infectious if aerosolized</p>
<b>Recommended Precautions</b>	<p><b>Cutaneous:</b> Standard Precautions; Contact Precautions if uncontained copious drainage.</p> <p><b>RT and GIT:</b> Standard Precautions.</p> <p><b>Aerosolized powder, environmental exposures:</b> Respirator (N95 mask or PAPRs), protective clothing; decontamination of persons with powder on them (<a href="http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5135a3.htm">http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5135a3.htm</a>)</p> <p><b>Hand hygiene:</b> Handwashing for 30-60 seconds with soap and water or 2% chlorhexidine gluconate after spore contact (alcohol handrubs inactive against spores [Weber DJ JAMA 2003; 289:1274]).</p> <p><b>Post-exposure prophylaxis following environmental exposure:</b> 60 days of antimicrobials (either doxycycline, ciprofloxacin, or levofloxacin) and post-exposure vaccine under IND</p>

Disease	Botulism
<b>Site(s) of Infection; Transmission Mode</b>	<p><b>GIT:</b> Ingestion of toxin-containing food, <b>RT:</b> Inhalation of toxin containing aerosol cause disease.</p> <p><b>Comment:</b> Toxin ingested or potentially delivered by aerosol in bioterrorist incidents. LD<sub>50</sub> for type A is 0.001 µg/ml/kg.</p>
<b>Incubation Period</b>	1-5 days.
<b>Clinical Features</b>	Ptosis, generalized weakness, dizziness, dry mouth and throat, blurred vision, diplopia, dysarthria, dysphonia, and dysphagia followed by symmetrical descending paralysis and respiratory failure.

<b>Diagnosis</b>	Clinical diagnosis; identification of toxin in stool, serology unless toxin-containing material available for toxin neutralization bioassays.
<b>Infectivity</b>	Not transmitted from person to person. Exposure to toxin necessary for disease.
<b>Recommended Precautions</b>	Standard Precautions.
<b>Disease</b>	<b>Ebola Hemorrhagic Fever</b>
<b>Site(s) of Infection; Transmission Mode</b>	As a rule infection develops after exposure of mucous membranes or RT, or through broken skin or percutaneous injury.
<b>Incubation Period</b>	2-19 days, usually 5-10 days
<b>Clinical Features</b>	Febrile illnesses with malaise, myalgias, headache, vomiting and diarrhea that are rapidly complicated by hypotension, shock, and hemorrhagic features. Massive hemorrhage in < 50% pts.
<b>Diagnosis</b>	Etiologic diagnosis can be made using RT-PCR, serologic detection of antibody and antigen, pathologic assessment with immunohistochemistry and viral culture with EM confirmation of morphology,
<b>Infectivity</b>	Person-to-person transmission primarily occurs through unprotected contact with blood and body fluids; percutaneous injuries (e.g., needlestick) associated with a high rate of transmission; transmission in healthcare settings has been reported but is prevented by use of barrier precautions.
<b>Recommended Precautions</b>	<b>Hemorrhagic fever specific barrier precautions:</b> If disease is believed to be related to intentional release of a bioweapon, epidemiology of transmission is unpredictable pending observation of disease transmission. Until the nature of the pathogen is understood and its transmission pattern confirmed, Standard, Contact and Airborne Precautions should be used. Once the pathogen is characterized, if the epidemiology of transmission is consistent with natural disease, Droplet Precautions can be substituted for Airborne Precautions. Emphasize: 1) use of sharps safety devices and safe work practices, 2) hand hygiene; 3) barrier protection against blood and body fluids upon entry into room (single gloves and fluid-resistant or impermeable gown, face/eye protection with masks, goggles or face shields); and 4) appropriate waste handling. Use N95 or higher respirators when performing aerosol-generating procedures. In settings where AIIRs are unavailable or the large numbers of patients cannot be accommodated by existing AIIRs, observe Droplet Precautions (plus Standard Precautions and Contact Precautions) and segregate patients from those not suspected of VHF infection. Limit blood draws to those essential to care. See text for discussion and Appendix A for recommendations for naturally

	occurring VHF.
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Disease	Plague <sup>2</sup>
<b>Site(s) of Infection; Transmission Mode</b>	<b>RT:</b> Inhalation of respiratory droplets. <b>Comment:</b> Pneumonic plague most likely to occur if used as a biological weapon, but some cases of bubonic and primary septicemia may also occur. Infective dose 100 to 500 bacteria
<b>Incubation Period</b>	1 to 6, usually 2 to 3 days.
<b>Clinical Features</b>	Pneumonic: fever, chills, headache, cough, dyspnea, rapid progression of weakness, and in a later stage hemoptysis, circulatory collapse, and bleeding diathesis
<b>Diagnosis</b>	Presumptive diagnosis from Gram stain or Wayson stain of sputum, blood, or lymph node aspirate; definitive diagnosis from cultures of same material, or paired acute/convalescent serology.
<b>Infectivity</b>	Person-to-person transmission occurs via respiratory droplets risk of transmission is low during first 20-24 hours of illness and requires close contact. Respiratory secretions probably are not infectious within a few hours after initiation of appropriate therapy.
<b>Recommended Precautions</b>	Standard Precautions, Droplet Precautions until patients have received 48 hours of appropriate therapy. <b>Chemoprophylaxis:</b> Consider antibiotic prophylaxis for HCWs with close contact exposure.

<sup>2</sup> Pneumonic plague is not as contagious as is often thought. Historical accounts and contemporary evidence indicate that persons with plague usually only transmit the infection when the disease is in the end stage. These persons cough copious amounts of bloody sputum that contains many plague bacteria. Patients in the early stage of primary pneumonic plague (approximately the first 20–24 h) apparently pose little risk [1, 2]. Antibiotic medication rapidly clears the sputum of plague bacilli, so that a patient generally is not infective within hours after initiation of effective antibiotic treatment [3]. This means that in modern times many patients will never reach a stage where they pose a significant risk to others. Even in the end stage of disease, transmission only occurs after close contact. Simple protective measures, such as wearing masks, good hygiene, and avoiding close contact, have been effective to interrupt transmission during many pneumonic plague outbreaks [2]. In the United States, the last known cases of person to person transmission of pneumonic plague occurred in 1925 [2].

1. Wu L-T. A treatise on pneumonic plague. Geneva: League of Nations, 1926. III. Health.
2. Kool JL. Risk of person to person transmission of pneumonic plague. *Clinical Infectious Diseases*, 2005; 40 (8): 1166-1172
3. Butler TC. Plague and other Yersinia infections. In: Greenough WB, ed. *Current topics in infectious disease*. New York: Plenum Medical Book Company, 1983.

Disease	Smallpox
<b>Site(s) of Infection; Transmission Mode</b>	RT Inhalation of droplet or, rarely, aerosols; and skin lesions (contact with virus). <b>Comment:</b> If used as a biological weapon, natural disease, which has not occurred since 1977, will likely result.
<b>Incubation Period</b>	7 to 19 days (mean 12 days)
<b>Clinical Features</b>	Fever, malaise, backache, headache, and often vomiting for 2-3 days; then generalized papular or maculopapular rash (more on face and extremities), which becomes vesicular (on day 4 or 5) and then pustular; lesions all in same stage.
<b>Diagnosis</b>	Electron microscopy of vesicular fluid or culture of vesicular fluid by WHO approved laboratory (CDC); detection by PCR available only in select LRN labs, CDC and USAMRID
<b>Infectivity</b>	Secondary attack rates up to 50% in unvaccinated persons; infected persons may transmit disease from time rash appears until all lesions have crusted over (about 3 weeks); greatest infectivity during first 10 days of rash.
<b>Recommended Precautions</b>	Combined use of Standard, Contact, and Airborne Precautions <sup>b</sup> until all scabs have separated (3-4 weeks). Only immune HCWs to care for pts; post-exposure vaccine within 4 days. <b>Vaccinia:</b> HCWs cover vaccination site with gauze and semi-permeable dressing until scab separates ( $\geq 21$ days). Observe hand hygiene. <b>Adverse events with virus-containing lesions:</b> Standard plus Contact Precautions until all lesions crusted

<sup>b</sup> Transmission by the airborne route is a rare event; Airborne Precautions is recommended when possible, but in the event of mass exposures, barrier precautions and containment within a designated area are most important <sup>204, 212</sup>.

<sup>c</sup> Vaccinia adverse events with lesions containing infectious virus include inadvertent autoinoculation, ocular lesions (blepharitis, conjunctivitis), generalized vaccinia, progressive vaccinia, eczema vaccinatum; bacterial superinfection also requires addition of contact precautions if exudates cannot be contained <sup>216, 217</sup>.

Disease	Tularemia
<b>Site(s) of Infection; Transmission Mode</b>	<b>RT:</b> Inhalation of aerosolized bacteria. <b>GIT:</b> Ingestion of food or drink contaminated with aerosolized bacteria. <b>Comment:</b> Pneumonic or typhoidal disease likely to occur after bioterrorist event using aerosol delivery. Infective dose 10-50 bacteria
<b>Incubation Period</b>	2 to 10 days, usually 3 to 5 days
<b>Clinical Features</b>	Pneumonic: malaise, cough, sputum production, dyspnea; Typhoidal: fever, prostration, weight loss and frequently an associated pneumonia.
<b>Diagnosis</b>	Diagnosis usually made with serology on acute and convalescent serum specimens; bacterium can be detected by PCR (LRN) or isolated from blood and other body fluids on cysteine-enriched media or mouse inoculation.
<b>Infectivity</b>	Person-to-person spread is rare. Laboratory workers who encounter/handle cultures of this organism are at high risk for disease if exposed.
<b>Recommended Precautions</b>	Standard Precautions

**TABLE 4.**  
**RECOMMENDATIONS FOR APPLICATION OF STANDARD PRECAUTIONS FOR THE CARE OF ALL PATIENTS IN ALL HEALTHCARE SETTINGS**  
 (See Sections II.D.-II.J. and III.A.1)

<b>COMPONENT</b>	<b>RECOMMENDATIONS</b>
Hand hygiene	After touching blood, body fluids, secretions, excretions, contaminated items; immediately after removing gloves; between patient contacts.
Personal protective equipment (PPE)	
Gloves	For touching blood, body fluids, secretions, excretions, contaminated items; for touching mucous membranes and nonintact skin
Gown	During procedures and patient-care activities when contact of clothing/exposed skin with blood/body fluids, secretions, and excretions is anticipated..
Mask, eye protection (goggles), face shield*	During procedures and patient-care activities likely to generate splashes or sprays of blood, body fluids, secretions, especially suctioning, endotracheal intubation
Soiled patient-care equipment	Handle in a manner that prevents transfer of microorganisms to others and to the environment; wear gloves if visibly contaminated; perform hand hygiene.
Environmental control	Develop procedures for routine care, cleaning, and disinfection of environmental surfaces, especially frequently touched surfaces in patient-care areas.
Textiles and laundry	Handle in a manner that prevents transfer of microorganisms to others and to the environment
Needles and other sharps	Do not recap, bend, break, or hand-manipulate used needles; if recapping is required, use a one-handed scoop technique only; use safety features when available; place used sharps in puncture-resistant container
Patient resuscitation	Use mouthpiece, resuscitation bag, other ventilation devices to prevent contact with mouth and oral secretions

Patient placement	Prioritize for single-patient room if patient is at increased risk of transmission, is likely to contaminate the environment, does not maintain appropriate hygiene, or is at increased risk of acquiring infection or developing adverse outcome following infection.
Respiratory hygiene/cough etiquette (source containment of infectious respiratory secretions in symptomatic patients, beginning at initial point of encounter e.g., triage and reception areas in emergency departments and physician offices)	Instruct symptomatic persons to cover mouth/nose when sneezing/coughing; use tissues and dispose in no-touch receptacle; observe hand hygiene after soiling of hands with respiratory secretions; wear surgical mask if tolerated or maintain spatial separation, >3 feet if possible.

\* \* During aerosol-generating procedures on patients with suspected or proven infections transmitted by respiratory aerosols (e.g., SARS), wear a fit-tested N95 or higher respirator in addition to gloves, gown, and face/eye protection.



**TABLE 5. COMPONENTS OF A PROTECTIVE ENVIRONMENT**

(Adapted from MMWR 2003; 52 [RR-10])

**I. Patients: allogeneic hematopoietic stem cell transplant (HSCT) only**

- Maintain in PE room except for required diagnostic or therapeutic procedures that cannot be performed in the room, e.g. radiology, operating room
- Respiratory protection e.g., N95 respirator, for the patient when leaving PE during periods of construction

**II. Standard and Expanded Precautions**

- Hand hygiene observed before and after patient contact
- Gown, gloves, mask NOT required for HCWs or visitors for routine entry into the room
- Use of gown, gloves, mask by HCWs and visitors according to Standard Precautions and as indicated for suspected or proven infections for which Transmission-Based Precautions are recommended

**III. Engineering**

- Central or point-of-use HEPA (99.97% efficiency) filters capable of removing particles 0.3  $\mu\text{m}$  in diameter for supply (incoming) air
- Well-sealed rooms
  - Proper construction of windows, doors, and intake and exhaust ports
  - Ceilings: smooth, free of fissures, open joints, crevices
  - Walls sealed above and below the ceiling
  - If leakage detected, locate source and make necessary repairs
- Ventilation to maintain  $\geq 12$  ACH
- Directed air flow: air supply and exhaust grills located so that clean, filtered air enters from one side of the room, flows across the patient's bed, exits on opposite side of the room
- Positive room air pressure in relation to the corridor
  - Pressure differential of  $>2.5$  Pa [0.01" water gauge]
- Monitor and document results of air flow patterns daily using visual methods (e.g., flutter strips, smoke tubes) or a hand held pressure gauge
- Self-closing door on all room exits
- Maintain back-up ventilation equipment (e.g., portable units for fans or filters) for emergency provision of ventilation requirements for PE areas and take immediate steps to restore the fixed ventilation system
- For patients who require both a PE and Airborne Infection Isolation, use an anteroom to ensure proper air balance relationships and provide independent exhaust of contaminated air to the outside or place a HEPA filter in the exhaust duct. If an anteroom is not available, place patient in an AIIR and use portable ventilation units, industrial-grade HEPA filters to enhance filtration of spores.

#### ***IV. Surfaces***

- Daily wet-dusting of horizontal surfaces using cloths moistened with EPA-registered hospital disinfectant/detergent
- Avoid dusting methods that disperse dust
- No carpeting in patient rooms or hallways
- No upholstered furniture and furnishings

#### ***V. Other***

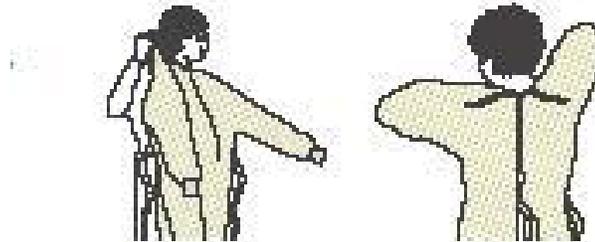
- No flowers (fresh or dried) or potted plants in PE rooms or areas
- Use vacuum cleaner equipped with HEPA filters when vacuum cleaning is necessary

Figure.  
Example of Safe Donning and Removal of Personal  
Protective Equipment (PPE)

## DONNING PPE

### **GOWN**

- Fully cover torso from neck to knees, arms to end of wrist, and wrap around the back
- Fasten in back at neck and waist



### **MASK OR RESPIRATOR**

- Secure ties or elastic band at middle of head and neck
- Fit flexible band to nose bridge
- Fit snug to face and below chin
- Fit-check respirator



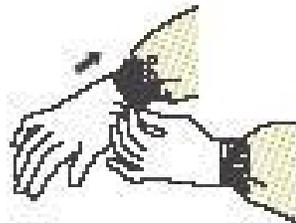
### **GOGGLES/FACE SHIELD**

- Put on face and adjust to fit



### **GLOVES**

- Use non-sterile for isolation
- Select according to hand size
- Extend to cover wrist of isolation gown



## SAFE WORK PRACTICES

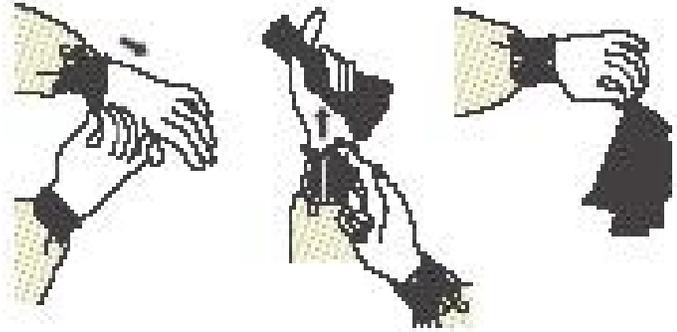
- Keep hands away from face
- Work from clean to dirty
- Limit surfaces touched
- Change when torn or heavily contaminated
- Perform hand hygiene

## **REMOVING PPE**

Remove PPE at doorway before leaving patient room or in anteroom

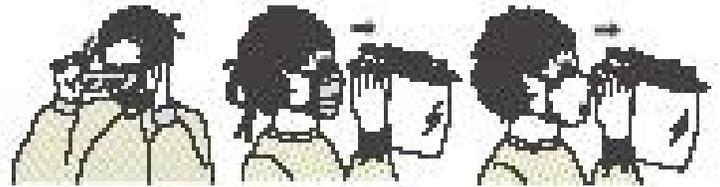
### **GLOVES**

- Outside of gloves are contaminated!
- Grasp outside of glove with opposite gloved hand; peel off
- Hold removed glove in gloved hand
- Slide fingers of ungloved hand under remaining glove at wrist



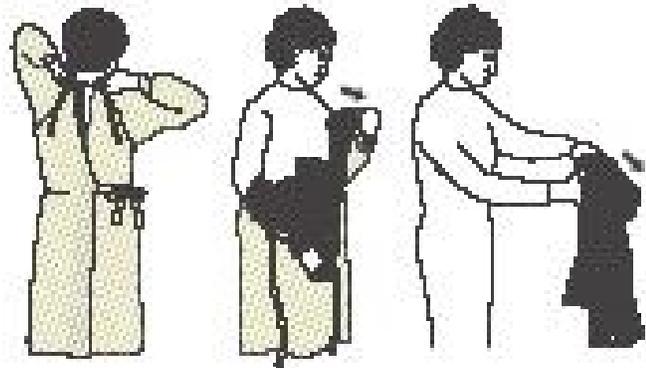
### **GOGGLES/FACE SHIELD**

- Outside of goggles or face shield are contaminated!
- To remove, handle by “clean” head band or ear pieces
- Place in designated receptacle for reprocessing or in waste container



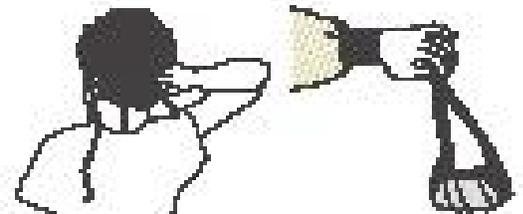
### **GOWN**

- Gown front and sleeves are contaminated!
- Unfasten neck, then waist ties
- Remove gown using a peeling motion; pull gown from each shoulder toward the same hand
- Gown will turn inside out
- Hold removed gown away from body, roll into a bundle and discard into waste or linen receptacle



### **MASK OR RESPIRATOR**

- Front of mask/respirator is contaminated – DO NOT TOUCH!
- Grasp ONLY bottom then top ties/elastics and remove
- Discard in waste container



## **HAND HYGIENE**

Perform hand hygiene immediately after removing all PPE!

