

Other infectious diseases caused by work in disease prevention, health care, domiciliary assistance and other comparable activities for which a risk of infection has been proven

Definition of causal agent

Almost any communicable infection may occur within the context of the delivery of health care whether this is within a hospital, the home, a laboratory or other related setting. Infections may be acquired as a result of occupational exposure to infectious patients or colleagues or through contact with contaminated equipment or environments.

Causal agents may be classified as:

Biological: micro-organisms, including those which have been genetically modified, cell cultures and human endoparasites, which may be able to provoke any infection, allergy or toxicity

Microbial: any microbiological entity potentially able to reproduce in the human body, or to transfer genetic material into different cells.

From cellular culture: the result of the growth *in vitro* of cells derived from multicellular organisms.

The causal agent, based on its characteristics, can be transferred by:

- ***Direct contact*** through body surface to body surface contact and physical transfer of a micro-organism between a susceptible host and an infected or colonized subject
- ***Indirect contact*** of a susceptible host with a contaminated object.
 - o almost all patient-related healthcare tasks pose a risk of direct or indirect transmission. Agents and diseases that are transmitted in these ways include: *Salmonella* species, *Campylobacter*, hepatitis A virus, hepatitis E virus, *E.coli*, *Clostridium difficile*, scabies, pediculosis and herpes.
- ***Droplet contact*** from conjunctival, nasal or oral mucosal contact with droplets containing microorganisms propelled over short distances and generated by an infected subject through coughing, sneezing, talking or during medical procedures, such as lung function measurement or bronchoscopy. This mode applies to tuberculosis, pertussis, *Meningococcal* meningitis, influenza, rubella, mumps, *Haemophilus influenzae* and *Streptococcus pneumoniae*.
- ***Airborne transmission*** occurs via exposure to

microorganisms contained in droplets that remain suspended in the air over longer distances or to contact with infectious dust particles disseminated by air. Airborne transmission may take place in any indoor space where infectious patients are present, particularly where there is poor ventilation. Measles, tuberculosis, varicella and anthrax may all be transmitted in this way.

- **Bloodborne transmission** requires blood-to-blood transfer of an organism from an infected host to the healthcare worker (HCW). A similar transmission may less commonly arise from blood-mucosal/dermal contact. Bloodborne transmission occurs through accidents involving infected surgical or medical instruments or through contact between infected blood and the skin or mucous membranes of a worker. Tasks that pose a risk of direct contact with patient's blood include surgery, endoscopy, injections and manipulation of venous routes and arteries, paracentesis, dialysis, and oral/dental surgery. Indirect bloodborne transmission is possible while manipulating and transporting biological samples, disposal or cleaning of surgical instruments and the cleaning contaminated surfaces. Hepatitis B and C and HIV are examples of infections transmitted through these routes.

Main occupational uses and sources of exposure:

Virtually all HCW are potentially exposed to various body fluids, medical equipment, environmental surfaces or air which might pose infectious risk. In general, all job tasks entailing direct patient assistance or handling of biological samples may represent a biohazard to the HCW. Health care workers who have frequent contact with patients and their body fluids or environments carry a higher risk of acquiring or transmitting infections through accidental exposures as compared to those HCW who have sporadic and brief contact.

For bloodborne transmission, work that involves "exposure prone procedures" (EPP) is the major determinant of injuries and may influence the transmission of agents such as HBV, HCV and HIV between infected patients and HCW. A current definition of an EPP is:

"Those invasive procedures where there is a risk that injury to the worker may result in exposure of the patient's open tissues to the blood of the worker. These include procedures where the

worker's gloved hands may be in contact with sharp instruments, needle tips or sharp tissues (e.g. spicules of bone or teeth) inside a patient's open body cavity, wound or confined anatomical space where the hands or fingertips may not be completely visible at all times".

Examples of EPPs are sternotomy, arterial cutdown with tissue dissection, many dental procedures, open surgical procedures, assistance to patients with significant risk of biting.

Of the many infectious diseases which can be transmitted to health care workers, some important examples (hepatitis and tuberculosis) are examined separately in other chapters. This chapter describes rubella, SARS, HIV, enteric fevers, scabies and pediculosis.

Airborne pathogens

□ Rubella

1. Definition and causal agent

Rubella is a systemic viral illness caused by the rubella togavirus.

2. Transmission of infection

The main transmission route is through direct droplet contact of the oral or nasal mucous membranes with respiratory secretions from an infected individual; transmission may also occur through direct and indirect contact of oral or nasal mucous membranes with urine from an infant with congenital rubella syndrome.

3. Clinical picture

3.1 Presenting features

Rubella usually presents as a non specific maculopapular rash lasting 3 days or fewer with generalized lymphadenopathy. Asymptomatic infections are common. The rash may be preceded by fever, headache, malaise.

Congenital rubella is a disease contracted during pregnancy. It causes significant disease in the embryo or foetus, characterised by cataract, hearing loss and cardiac malformations. In some cases there are effects on the central nervous, renal, respiratory, hepatic and blood systems. In the most severe cases foetal death is the outcome. Rubella presenting without a rash can pose a risk to pregnant healthcare workers.

3.2 Diagnosis

Typical clinical features with laboratory evidence: rubella IgM antibody positive or four-fold rise in rubella IgG antibody or positive rubella culture of an appropriate specimen.

Exposure criteria:

The incubation period is 14 to 21 days. The period of communicability is from 7 days before to 7 days after the onset of rash. Infants with congenital rubella may be infectious for months after birth.

Minimum intensity of exposure: not applicable.

Minimum induction period: even a single exposure is sufficient to cause the infectious disease.

Maximum latent period: 21 days.

☐ Severe acute respiratory syndrome (SARS)***1. Definition and causal agent***

Pneumonia caused by infection with SARS-associated coronavirus (SARS-coV)

2. Transmission of infection

The main mode of transmission appears to be by close person-to-person contact. The virus is transmitted most readily by respiratory droplets produced when an infected person coughs or sneezes from a short distance and virus is deposited on the mucous membranes of the mouth, nose, or eyes of persons who are nearby. The virus also can spread by direct contact with surfaces or objects contaminated with infectious droplets. In addition, airborne transmission is possible. Transmission may occur from asymptomatic infected persons.

3. Clinical picture***3.1 Presenting features***

Following an incubation period of 2-10 days (median 5), the illness typically begins with fever. After 3-7 days lower respiratory symptoms appear, including a dry, non productive cough or dyspnoea. By day 7 of the illness, most SARS patients demonstrate abnormalities on chest radiographs and the clinical features of an acute pneumonia..

3.2 Diagnostic criteria

Presence of the SARS-coV in patient's sera, secretta or excreta demonstrated by:

- a) Direct immunofluorescence assay addressed at detecting ScoV recombinant antigens
- b) Viral isolation
- c) Detection of virus RNA through RT-PCR assay
- d) Monoclonal antibodies directed against structural components of the virus (nucleocapsid protein)

Chest X-ray signs consistent with pneumonia.

Exposure criteria:

Minimum intensity of exposure: As a general rule, the less serious patients are the less infective, and contagiousity increases with the gravity of the disease. However, in some cases infection has derived from asymptomatic persons.

Minimum induction period: even a single exposure is sufficient to cause the infectious disease.

Maximum latent period: 10 days.

□ Other viral infections/airborne bacterial infections

1. Definitions and causal agents

Other viral infections include: adenovirus, herpesvirus, parvovirus, paramyxovirus morbillae, paramyxovirus, orthomyxovirus influenzae, and any other viruses potentially present in a patient's exhaled air.

Important airborne bacterial infections included: Neisseria meningitidis, Bordetella pertussis; Staphylococcus aureus, Streptococcus group A and Meningococcus.

2. Transmission of infection

The main mode of transmission of these agents is through close person-to-person contact, most readily by respiratory droplets. Transmission may also occur by direct contact with surfaces or objects contaminated with infectious droplets; in addition, airborne transmission is possible. Transmission may occur from asymptomatic infected persons.

3. Clinical picture

Evidence of the specific exanthema and/or clinical manifestations

Presence of specific IgM and IgG immunoglobulins if applicable

Presence or culture of the organisms in host's secreta or excreta

Exposure criteria:

Minimum intensity of exposure: not applicable.

Minimum induction period: even a single exposure is sufficient to cause the infectious disease.

Maximum latent period: depending on the agent.

For tuberculosis, see Annex I entry nr. 405 on '**Tuberculosis**'

Blood borne pathogens

The main determinants of occupational transmission of bloodborne pathogens include:

- a. Risk of exposure to blood or body fluids (taking into account working activities, exposure prone procedures, control measures, personal protective equipment and devices etc.)
- b. Prevalence of infection among patients
- c. Efficiency of transmission, determined by type of injury, biological agent and the viral load in the source

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- d. Effectiveness of post-exposure prophylaxis
 - e. Susceptibility of the injured workers.

For diseases caused by the hepatitis viruses see Annex I entry nr. 404 on '**Viral hepatitis**'.

□ Diseases caused by human immunodeficiency virus

1. Definition and causal agent

Two types of human immunodeficiency virus (HIV) exist: HIV-1 and HIV-2. They result in a similar spectrum of clinical diseases though HIV-2 is thought to be less virulent. HIV-1 is primarily responsible for the HIV/AIDS pandemic while HIV-2 is found mainly in West Africa.

2. Transmission of infection

Occupational acquisition on infection with HIV in a health care setting is almost exclusively through direct contact with infected blood; in most cases through injury. Infection through contact with mucous membranes including conjunctivae is feasible but extremely rare.

3. Clinical picture

3.1 Presenting features:

Infection with HIV is followed by the development of the Acquired Immuno-Deficiency Syndrome (AIDS). AIDS is characterized by HIV infection and clinical evidence of immune deficiency, with an increase of opportunistic such as *Pneumocystis carinii* pneumonia and infection from *Mycobacterial*, *Cryptococcae*, *Cytomegalovirus*, and *Toxoplasma*. In addition there is an increased risk of malignancies such as Kaposi's sarcoma and lymphoma.

3.2 Diagnosis

Presence in the bloodstream of the anti-HIV antibody. Evidence of the effects of the virus on lymphocytes (reduction of T-Helper, reduction of the Helper/suppressor ratio).

Exposure criteria:

Minimum intensity and duration of exposure: not applicable since even a single exposure is sufficient to induce infection. However several factors affect the risk of HIV transmission after an occupational exposure. These include an increased risk after exposure to a substantial quantity of infected blood as indicated by:

- a) Device visibly contaminated with the patient's blood;
- b) Procedure that involved a needle being placed directly in a vein or artery;
- c) A deep injury

NOTE: HIV-infected subjects may transmit virus since early infection

The risk is also increased by exposure to blood from a patient host whose illness is terminal. Although a lower viral load (e.g. <1,500 RNA copies/ml) or one that is below the limits of detection probably indicates a lower intensity of exposure, it does not rule out the possibility of transmission.

Maximum latent period:

- **From contact to seroconversion:** 12 months, taking into account that most subjects who acquire infection after percutaneous exposure develop HIV antibody within 6 months.
- **From seroconversion to AIDS:** dependent on type and timing of therapy after seroconversion.

Other routes of infection

☐ Enteric fever

1. Definition and causal agent

Gastrointestinal disease caused by infection with *Salmonella typhi*; *Salmonella paratyphi A* and *B* or *Salmonella typhimurium*.

2. Transmission of infection

Ingestion of water or food that has been contaminated by a human carrier; occasionally through direct contact with a carrier host.

3. Clinical picture

3.1 Presenting features

Constipation, diarrhoea, abdominal tenderness, fever, headache.

3.2 Diagnosis

Determination of agglutinating antibodies to O or H antigens (Widal test for *S. Typhimurium*).

Leucopenia and neutropenia (25% of patients).

Isolation of the organism in faecal culture.

Exposure criteria:

Minimum intensity and duration of exposure: not applicable

Maximum latent period: 60 days from infection.

☐ Enteric viral infections

1. Definition and causal agents

Gastroenteritis caused by human single-stranded RNA enteroviruses including rotaviruses, Norwalk virus, poliovirus and others.

2. *Transmission of infection*

Ingestion of contaminated food or water. More rarely infection can arise from contact of contaminated fingers with the eyes; airborne transmission can also take place.

3. *Clinical picture*

3.1 *Presenting features*

More than 50% of non-polio and more than 90% of polio virus infections are subclinical, asymptomatic or associated only with mild symptoms. In most cases, the clinical picture is non-specific; diarrhoea, abdominal pain and vomiting in conjunction with fever, headache and sometimes upper respiratory tract symptoms. In a minority of cases of polio infection there is involvement of motor neurones and paralysis.

3.2 *Diagnostic criteria*

Isolation of the viruses in stool or cell cultures.

Exposure criteria

Minimum intensity and duration of exposure: not applicable.

Maximum latent period: 35 days (but usually less than a week.)

□ **Scabies**

1. *Definition and causal agent*

Dermal infestation by the mite *Sarcoptes scabiei*.

2. *Transmission*

Direct contact with infested host, clothing or bedding

3. *Clinical picture*

3.1 *Presenting features*

Localised, itchy rash induced by sensitization to the excreta of the mite.

3.2 *Diagnosis*

Microscopic examination of material obtained from a mite burrow collected with a needle or scalpel blade.

Biopsy showing the mite or its products.

Exposure criteria:

Minimum intensity and duration of exposure: a single contact may result in infestation

Maximum latent period: from contact to initial manifestation of symptoms: 6 weeks. In cases of reinfestation (sensitised): no latency period.

□ Pediculosis

1. Definition and causal agent

Dermal infestation with *Pediculus humanus* var. *capitis/corporis/pubis*.

2. Transmission

Direct contact with infested host, clothing or bedding. The incubation period is 6 to 10 days. The period of communicability continues until 24 hours after effective treatment of lice and ova.

3. Clinical picture

3.1 Presenting features

Localised, intensely itchy maculopapular rash in sensitized persons.

3.2 Diagnosis

Finding of nits or adult lice in hair or clothing.

Exposure criteria:

Minimum intensity and duration of exposure: a single contact may result in infestation

Maximum latent period: from contact to disease: 10 days