

**Transmission Based Precautions Literature Review:
Definitions of Transmission Based Precautions**

Version: 2.0
Owner/Author: Infection Control Team
Review Date: Financial year 2020/21

DOCUMENT CONTROL SHEET

Key Information:		
Title:	Transmission Based Precautions (TBPs) Literature Review: Definitions of Transmission Based Precautions	
Date Published/Issued:	October 2017	
Date Effective From:	October 2017	
Version/Issue Number:	2.0	
Document Type:	Literature Review	
Document status:	Final	
Author:	Name:	Craig Ritchie Allan
	Role:	Healthcare Scientist
	Division:	HPS
Owner:	Infection Control	
Approver:		
Approved by and Date:		
Contact	Name:	Infection Control Team
	Tel:	0141 300 1175
	Email:	nss.hpsinfectioncontrol@nhs.net
File Location:		

Version History:			
This literature review will be updated in real time if any significant changes are found in the professional literature or from national guidance/policy.			
Version	Date	Summary of changes	Changes marked
2.0	October 2017	'Airborne transmission from the environment' added to the 'Which infectious agents are transmissible by the airborne route?' box. Airborne dissemination/Environmental transmission, in regard to construction/renovation added. AGP section moved to RPE (link added). Definitions for TBPs: 'airborne dissemination' added.	

Approvals – this document requires the following approvals (in cases where signatures are required add an additional 'Signatures' column to this table)::				
Version	Date Approved	Name	Job Title	Division

HPS ICT Document Information Grid	
Title:	Transmission Based Precautions Literature Review: Definitions of Transmission Based Precautions
Purpose:	To inform the Transmission Based Precautions section of the National Infection Prevention and control manual in order to facilitate the prevention and control of HAIs in NHS Scotland hospital settings.
Target audience:	All NHS Scotland staff involved in the prevention and control of infection in the hospital setting.
Circulation list:	Infection Control Managers, Infection Prevention and Control Teams, Public Health Teams
Description:	This literature review examines the available professional literature on the definitions of Transmission Based Precautions.
Update/review schedule:	Updated as new evidence emerges, with changes made to recommendations as required.
Cross reference:	NIPCM: Chapter 1 - Standard Infection Control Precautions (SICPs) http://www.nipcm.hps.scot.nhs.uk/chapter-1-standard-infection-control-precautions-sicps/ NIPCM: Chapter 2 – Transmission Based Precautions (TBPS) http://www.nipcm.hps.scot.nhs.uk/chapter-2-transmission-based-precautions-tbps/
Update level:	Practice – <i>No significant change to practice</i> Research – <i>No significant change</i>

Contents:

1. Objectives	5
2. Definitions	6
References.....	11

1. Objectives

The aim is to review the extant scientific literature to produce standard definitions for Transmission Based Precautions.

The specific objectives of the review are to determine:

- What are Transmission Based Precautions (TBPs)?
- When should TBPs be applied?
- What is airborne transmission?
- Which activities result in airborne transmission?
- Which infectious agents are transmissible by the airborne route?
- What is droplet transmission?
- Which activities result in droplet transmission?
- Which infectious agents are transmissible by the droplet route?
- What is contact transmission?
- Which activities result in contact transmission?
- Which infectious agents are transmissible by the contact route?
- Are there any other definitions for cross transmission of infectious agents referred to in the care setting literature?

N.B. Transmission Based Precautions (TBPs) are measures that may be required **in addition to Standard Infection Control Precautions (SICPs)**. It is assumed, for the purpose of this literature review, that all SICPs are adhered to, and therefore are not the focus of this literature review and the associated recommendations.

2. Definitions

What are Transmission Based Precautions?

Transmission Based Precautions (TBPs) are a set of infection prevention and control measures that should be implemented when patients are known or suspected to be infected with an infectious agent. These should be implemented, as required, in addition to Standard Infection Control Precautions (SICPs) in all care settings.

TBPs are categorised according to the route of transmission of the infectious agent i.e. airborne, droplet or contact transmission.

(AGREE rating: Recommend)

When should TBPs be applied?

TBPs should be applied when caring for:

- Patients with active (known) infection(s);
- Asymptomatic patients who are suspected to be infectious or incubating an infection; and
- Patients colonised with a pathogenic microorganism.

(AGREE rating: Recommend)

What is airborne transmission?

Airborne transmission is the transmission of infectious airborne particles (aerosols) of small size (<5µm diameter).^{1;2} Particles of this size can remain suspended in the air for long periods of time and may be dispersed over large distances by air currents.^{1;2}

“Droplet nuclei” are aerosols formed from the evaporation of larger droplet particles (see Droplet Transmission).^{1-3;7} Aerosols formed from droplet particles in this way behave as other aerosols, such as those generated from environmental sources or aerosol generating procedures (AGPs).^{1;2;6;9}

Aerosols can penetrate the respiratory system to the alveolar level.¹

(AGREE rating: Recommend)

Which activities result in airborne transmission?

Airborne particles can be generated from:

- The respiratory tract through breathing, coughing, sneezing, talking and laughing.¹ In addition, certain healthcare activities and procedures termed ‘aerosol generating procedures’ (AGPs) can generate aerosols, and create the potential for airborne transmission of infections that may otherwise only be transmissible by the droplet route.^{1;7} For a list of AGPs see: <http://www.nipcm.hps.scot.nhs.uk/documents/tbp-respiratory-protective-equipment-rpe/>
- During construction/renovation. These activities have been associated with outbreaks of *Aspergillus* spp. within healthcare settings, with severely immunocompromised patients more at risk of developing aspergillosis.^{2;3;9;10} Aerosolised water which is contaminated with infectious agents, such as *Legionella*, have been implicated in outbreaks. Equipment identified as producing aerosols include: showers, cooling towers, water-cooled air conditioning systems and humidifiers.^{3-5;7;8;11;12}

(AGREE rating: Recommend)

Which infectious agents are transmissible by the airborne route?

Airborne transmission from the patient

Only a small number of infectious agents are known to be transmissible primarily by the airborne route. These are *Mycobacterium tuberculosis*, measles virus and varicella-zoster virus (chicken pox).^{3;6} There are, however, a number of other pathogens that are believed to be transmissible by the airborne (aerosol) route under certain circumstances. These include norovirus, influenza virus and coronavirus.^{3;8}

Airborne transmission from the environment

Some infectious agents do not usually involve person-to person transmission but are derived from environmental sources, these include spores of environmental fungi such as *Aspergillus* spp. and anthrax spores. Legionella is transmitted to humans through a common aerosolised contaminated water source.³

(AGREE rating: Recommend)

What is droplet transmission?

Droplet transmission is the transmission of droplets (5µm to approximately 200 µm diameter) from the respiratory tract of an infectious individual to susceptible mucosal surface or conjunctiva (eyes, nose, mouth) of another individual.¹ Droplets of less than 20 µm can remain suspended in the air for many minutes, while droplets of greater than 20 µm fall out of suspension in seconds. Droplets do not readily penetrate the lower (alveolar) respiratory system.^{1;2;7} The maximum distance for cross transmission from droplets has not been definitively determined, although a distance of approximately 1 metre (3 feet) around the infected individual has frequently been reported in the medical literature as the area of risk.¹⁻³ Droplets can become aerosols through evaporation (see **Airborne Transmission**).

(AGREE rating: Recommend)

Which activities result in droplet transmission?

Droplets are produced from the respiratory tract through talking, coughing or sneezing, and can be generated from healthcare procedures that may cause splashing or spraying of body fluids e.g. open suctioning, endotracheal intubation and cough induction by chest physiotherapy.^{1;3}

(AGREE rating: Recommend)

Which infectious agents are transmissible by the droplet route?

Examples of infectious agents transmissible by the droplet route include *Bordetella pertussis* (whooping cough), influenza virus, adenovirus, rhinovirus, *Mycoplasma pneumoniae*, coronavirus and *Neisseria meningitidis*.³

(AGREE rating: Recommend)

What is contact transmission?

Contact transmission is the most common route of transmission, and consists of two distinct types: direct contact and indirect contact.³ Direct transmission occurs when microorganisms are transmitted directly from an infectious individual to another individual without the involvement of another contaminated person or object (fomite).³ Indirect transmission occurs when microorganisms are transmitted from an infectious individual to another individual through a contaminated object or person (fomite) or person.^{3;6;6}

(AGREE rating: Recommend)

Which activities result in contact transmission?

Examples of ways in which direct contact transmission can occur include: blood or other body fluids from an infected individual directly enter another individual's body through contact with a mucous membrane or via cuts and abrasions to the skin; and scabies mites transmitted from an infected individual to another individual by direct skin-to-skin contact.³ Examples of ways in which indirect contact transmission can occur in care settings include: via healthcare worker hands if hand hygiene is not performed between touching an infected or colonised body site or a contaminated object and then touching another individual; via shared patient care equipment contaminated with blood and/or body fluids that are not adequately cleaned or disinfected between use; and via surgical instruments or equipment that have not been adequately sterilised or disinfected between use.³

(AGREE rating: Recommend)

Which infectious agents are transmissible by the contact route?

Microorganisms transmitted primarily by the contact route (both direct and indirect) include *Staphylococcus aureus* and herpes simplex virus (HSV).³

(AGREE rating: Recommend)

Are there any other definitions for cross transmission of infectious agents in the healthcare setting?

The literature also uses the term 'airborne dissemination' when referring to airborne transmission of infectious organisms via environmental sources rather than patient to patient transmission.^{4;5}

References

- (1) Coia JE, Ritchie L, Adisesh A, Makison Booth C, Bradley C, Bunyan D, et al. Guidance on the use of respiratory and facial protection equipment. *J HOSP INFECT* 2013 Nov;85(3):170-82.
- (2) Fernstrom A, Goldblatt M. Aerobiology and Its role in the transmission of infectious diseases. *Journal of Pathogens* 2013(no pagination):493960.
- (3) Siegel JD, Rhinehart E, Jackson M, Chiarello L. Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings 2007. Centres for Disease Control and Prevention 2007 [cited 2011 Sep 19]; Available from: URL: <http://www.cdc.gov/hicpac/2007IP/2007isolationPrecautions.html>
- (4) Panagea S, Winstanley C, Walshaw M, Ledson M, Hart C. Environmental contamination with an epidemic strain of *Pseudomonas aeruginosa* in a Liverpool cystic fibrosis centre, and study of its survival on dry surfaces. *Journal of Hospital Infection* 2005;59:102-7.
- (5) Jones A, Govan J, Docherty C, Dodd M, Isalska B, Stanbridge T. Identification of airborne dissemination of epidemic multiresistant strains of *Pseudomonas aeruginosa* at a CF centre during a cross infection outbreak. *Thorax* 2003;58:525-7.
- (6) Jones RM, Brosseau LM. Aerosol transmission of infectious disease. *Journal of Occupational and Environmental Medicine* 2015 May 1;57(5):01.
- (7) Ijaz KMD, Zargar BBEMEP, Wright KEMMP, Rubino JRB, Sattar SAM. Generic aspects of the airborne spread of human pathogens indoors and emerging air decontamination technologies. [Review]. *AJIC: American Journal of Infection Control* 2016 Sep;44(9):S109-S120.
- (8) Public Health England. NERVTAG Sub-committee on the pandemic influenza Facemasks and Respirators: Formal recommendations to Department of Health. 2016
- (9) Nevalainen A, Taubel M, Hyvarinen A. Indoor fungi: companions and contaminants. [Review]. *Indoor Air* 2015 Apr;25(2):125-56.
- (10) Health Protection Scotland. Information for staff on *Aspergillus* spp. 12-10-2016 <http://www.hps.scot.nhs.uk/haic/ic/resourcedetail.aspx?id=1591>
- (11) Public Health England. Legionnaires' disease: guidance, data and analysis. 20-1-2017 <https://www.gov.uk/government/collections/legionnaires-disease-guidance-data-and-analysis>
- (12) Roberts K, Smith C, Snelling A, Kerr K, Banfield KR, Sleigh A, et al. Aerial Dissemination of *Clostridium difficile* spores. *BMC Infectious Diseases* 2008;2008(8:7).