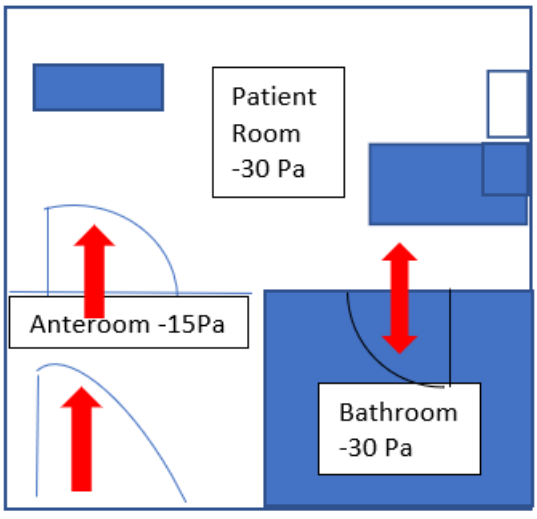
Transmission of Aerosols - Rebecca

In order to understand how aerosols are transmitted, firstly we need to understand the mechanics involved. When a person sings, sneezes and/or coughs, they produce droplets of varying size. Droplets which are larger than 5 µm fall to the ground and deposit on surfaces. Most respiratory viruses are usually transported in large particle droplets and travel short distances of less than 2 metres. Transmission of infection therefore occurs either when contact is made with contaminated surfaces and a person then touches his/her mouth, nose and/or eyes or else there is direct inhalation of droplets via the nose and/or mouth (WHO, 2021). Such examples include; adenoviruses, influenza, rhinovirus, SARS COV-2 and respiratory syncytial virus (CDC, 2021). Therefore these viruses can be transmitted through both direct and indirect contact.

Droplets which may range in size from 1 µm -5 µm (also known as droplet nuclei) may travel with air currents, thereby becoming aerosolised, after having remained suspended in the air. Droplet nuclei contain potentially viable microorganisms protected by a dry secretion coating. They can travel for long distances, remaining suspended in the air possibly indefinitely (CDC, 2021). In order to survive, such microorganisms require a cool and dry environment with poor or no source/s of radiation such as sunlight. Known microorganisms that are spread via droplet nuclei include Mycobacterium Tuberculosis (causing TB), Varicella Zoster virus (causing chickenpox), Rubeola virus (causing measles). Airborne transmission therefore occurs when a person inhales viruses or bacteria suspended in such droplets.

Airborne Precautions

Knowing the method of transmission of airborne disease helps one to understand which precautions need to be taken and how these precautions are effective. Patients who have an airborne transmissible infection should be placed in a single airborne infection isolation room (AIIR). Such isolation rooms usually are equipped with an anteroom, in which items of personal protective equipment can be stored whilst also providing an area in which healthcare personnel can don and doff safely. The anteroom also serves the purpose of creating a barrier between the isolation room and the rest of the ward area as well as preventing potential loss of pressurisation. Isolation room are usually also equipped with an ensuite bathroom as can be seen in the figure below.



unilateral direction of airflow

bilateral direction of airflow

Adapted from: www.healthfacilityguidelines.com/ViewPDF/ViewIndexPDF/iHFG_part_d_isolation_rooms

The airflow within the room should produce negative pressure, that is, the exhaust system removes a quantity of air greater than the supply of air (iHFG, 2017). The air exchanges (ACH) for such rooms is that of 12 per hour and air can be removed via an external outlet or can be recirculated after being filtered through a HEPA filter. Such filters may be built into the room filtration system or may be portable and must be regulated according to the room volume.

Those entering a room, in which a patient with a confirmed or suspected airborne disease is admitted, must ensure that they implement transmission-based precautions by donning all personal protective equipment for airborne transmission. This includes protecting airways with an FFP2/3 mask as well as protecting the eyes with a visor or goggles. Gowns/aprons and gloves should also be worn.

References

CDC. Available at: https://www.cdc.gov/infectioncontrol/guidelines/environmental/background/air.html1. Accessed on the 27th of May 2021.

iHFG. International Health Facility Guidelines. 2017. Available at: https://www.healthfacility guidelines.com/ViewPDF/ViewIndexPDF/iHFG_part_d_isolation_rooms. Accessed on the 20th of May 2021.

WHO. Available at: https://www.who.int/news-room/commentaries/detail/transmission-of-sars-cov-2-implications-for-infection-prevention-precautions. Accessed on the 27th of May 2021.