

## E.2 Exposure reduction

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### **Airflows through single hinged and single sliding doors during door operation in isolation rooms**

#### INTRODUCTION

Patients with airborne infectious diseases are usually placed in negative pressure isolation rooms (NPIRs) in hospitals. The negative pressure is assumed to direct the leaking airflow towards the isolation room and hence to prevent the spreading of the airborne infections around the hospital. However, door operation causes transient breakdown of these conditions during which the possibly pathogen laden air can disperse to adjacent spaces. Passage through the doorway increases this spreading as air is dragged out of the NPIR in the trailing wake of a passing person.

#### METHODS

The performance of single hinged and single sliding doors were compared qualitatively and quantitatively. The experiments were carried out in an isolation room model. The airflow patterns across the doorway were visualized with smoke experiments. The airflow through the isolation room doorway was quantified with tracer gas measurements. The effect of ventilation rate (0, 6 and 12 ACH), pressure difference (0 and -20 Pa) and passage (simulated by a moving manikin) for both door types were quantified and examined.

#### RESULTS

Smoke visualizations illustrate that the opening of the hinged door creates more pronounced flow through the doorway than the sliding door. Based on the tracer gas measurements the airflow through the doorway can be over 50 % smaller with sliding door. The effect of ventilation rate is rather small, although there is a small increase in the airflow with 12 ACH in the sliding door case. The pressure difference decreases the airflow slightly, more notably with sliding door set-up. Passage increases the airflow significantly with both door types.

## CONCLUSIONS

Overall, the sliding door comes out better than the hinged door considering the airflow out of the NPIR. Ventilation rate and pressure difference had an effect although smaller than expected. On the other hand the passage contributed notably to the airflow.

## APPLICATION

Typically hinged doors are utilized in hospital isolation room settings. However, this study shows that sliding doors should be considered as the primary door type. These results are also applicable to industrial clean room facilities, where the dispersion of contaminants in and out of the clean rooms should be minimized.