

Development of a small scale facility to evaluate the efficiency of commercially available masks and respirators against an aerosol of Influenza A virus.

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Only limited data is available measuring the efficiency of filtration of available masks and respirators against airborne viruses in an *in vivo* test. We will describe here the small-scale facility we have developed for this purpose. In this context, we established an infection model by aerosolisation of influenza A/H₁N₁ virus adapted to Balb/c mice and realised a physical characterisation of generated aerosol.

Our institute has a nose-only apparatus for airborne delivery initially designed to measure the protection factor (PF) of gas masks. This apparatus was optimised in order to evaluate viral filtration efficiency of the filter material used in these types of masks and also their factor of protection. Indeed mask-face interface is a key issue when evaluating the level of protection of a mask.

The device was adapted here to comprise two respiratory chains, each one composed of an half-head, an artificial breather and a mice exposition unit. These two units were installed inside the aerosol chamber. In a typical assay, only one unit would be equipped with the mask, the second unit acting as control. PF is the ratio of the number of viral units detected in mice directly exposed to airborne viruses to the number of pulmonary viral units detected in the protected mice. After exposure of masked and unmasked mice against an aerosol of Influenza A virus, weight loss, mortality rate, mortality period and initial viral pulmonary load were monitored and compared between both groups of mice.

Using the aerosol infection procedure with Influenza A H₁N₁ virus, viral infection was 100% lethal in eight days for an initial viral load equivalent to 100 pfu per animal. The size distribution of influenza loaded particles ranged between 0.5 and 15 µm of equivalent aerodynamic diameter with a mean value close to 1 µm. Viral particles were detected in lungs. This airborne delivery system is able to induce the pulmonary infectious process in mice. This retention efficiency in lungs is in accordance with the aerodynamic size of generated particles.

Finally, as a preliminary test, the facility was used to evaluate the efficiency of commercial mask. A PF of 10 was observed.