A Novel Strapless Adhesion Face-sealed Mask with Highly Efficient Filter Material

Sergey A. Grinshpun and Takeshi Honda

University of Cincinnati
Environmental Health, Center for Health-related Aerosol
3223 Eden Ave, POB 670056
Cincinnati, OH 45267-0056
Email: Grinshs@ucmail.uc.edu

Worldwide concern continues growing about the protection of health-care workers and the general populous in the event of a major disease outbreak or a pandemic caused by an airborne infectious agent. Simple surgical masks may not provide adequate protection; the use of more efficient N95 respirators requires a face fit testing and proper training while may still allow 5% or more virus-size particles to penetrate (even with ideal face-fitting characteristics). In this study, we tested a newly-developed self-adhesive facepiece that represents an alternative approach to respiratory protection. The prototype of recently developed Viramask (Wein Products, Inc., Los Angeles, CA, USA) utilizing triboelectric charged polypropylene/acrylic filter media was tested in a 25 m3 indoor aerosol chamber following the manikin-based protocol. The concentration and size distribution of NaCl aerosol particles were measured in real time outside and inside the prototype respirator, and the penetration was determined as a function of the particle size. Specific focus was given to the range of 10 to 500 nm, which includes viral particles that cause avian influenza, SARS and other emerging diseases with possible airborne transmission. During the "nose+mouth" inhalation, the penetration of 100-nm particles was <0.5% at 85 Lpm and <0.05% at 30 Lpm (much lower than was determined for the face-sealed N95 respirators), while the pressure drop was 21 and 8 mm H2O, respectively. The penetration dependence on the particle size was less pronounced than that obtained for N95 respirators.