Human Correlation Fit Testing of a Static Advanced Headform

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ABSTRACT

New respirator test headforms are needed to evaluate N95 filtering facepiece respirator (FFR) fit against biological aerosols. The objective was to compare N95 FFR fit between a medium size Static (i.e., non-moving) Advanced Headform (StAH) and 10 similarly sized human test subjects. The StAH was developed based on the anthropometric dimensions of new digital headforms developed by the National Institute for Occupational Safety and Health and also incorporates a silicone polymer skin. Quantitative fit tests were performed on 10 test subjects wearing eight different FFR models resulting in "Overall" test fit factors (FFs). Additionally, subject breathing patterns were recorded. Following a fit test, the FFR was donned on the StAH and a fit test was performed utilizing a breathing simulator which replicated the test subject's breathing pattern.

Similar fit test passing rates (% FFs ≥ 100) for the StAH and human subjects were observed for 6 of the 8 FFR models. Statistical differences in geometric mean (GM) FFs were observed in 4 of the 8 models for actual fit test values. A linear regression on GM FFs for the eight FFR models showed a good correlation ($R^2 = 0.95$) for the test platforms. Preliminary fit test research using a StAH shows that the headform has utility as a tool for assessing a range of different levels of respirator fit. Further research is needed to better understand FF differences between humans and Advanced Headforms.