

# IMPACT OF RESPIRATOR USE ON CO<sub>2</sub> LEVELS AND O<sub>2</sub> SATURATION - FY12 (939ZUNF)

## Objective

During a pandemic influenza, healthcare workers (HCW) will be utilizing respirators for protracted periods of time (8–12 hr shifts) that could lead to CO<sub>2</sub> retention, decreases in O<sub>2</sub> saturation, and performance decrements. This study will evaluate transcutaneous CO<sub>2</sub> levels and O<sub>2</sub> saturation associated with respirator use at workrates typical for HCW.



## Project Scope

- Conduct human physiologic testing in the NPPTL physiology lab.
- Determine CO<sub>2</sub> and O<sub>2</sub> concentrations in respirator deadspace and simultaneous transcutaneous CO<sub>2</sub> levels and O<sub>2</sub> saturation while wearing N95FFR, elastomeric, and N95FFR with surgical mask overlay.
- Correlate respirator deadspace CO<sub>2</sub> and O<sub>2</sub> concentrations with transcutaneous CO<sub>2</sub> levels and O<sub>2</sub> saturation.
- Incorporate data from the project into the development of physiologic guidelines for respirator use.

## Milestones FY12

- Q1 submit 4<sup>th</sup> manuscript describing an aspect of the study
- Q2 address reviewer comments
- Q3 finalize 4<sup>th</sup> manuscript for publication

▪ **STUDY COMPLETE, February 2012**

## Applicable Standards

- OSHA standard (29 CFR 1910.134) is 19.5% O<sub>2</sub> concentration to altitude of 8,000 feet.
- No current standard exists for CO<sub>2</sub> levels in filtering facepiece respirators or elastomeric respirators.
- Will apply to ISO/TC94/SC15/WG1/PG5 Human Factors O<sub>2</sub>/CO<sub>2</sub> Guidance document currently being developed (N105).

## Stakeholders

- Healthcare workers (medical, dental, veterinary)
- Emergency Medical Services (paramedics, firefighters, private ambulance crews)
- Industrial workers
- Respirator manufacturers

## Key Partners

- Veterans Administration

## Outputs

- Manuscripts published in peer-reviewed journals (4).
- Presentations at national/international conferences (6).

## Outcomes

- Introduction of physiologic variables (CO<sub>2</sub> levels, O<sub>2</sub> saturation) into NIOSH respirator selection logic.
- Appropriate mitigation strategies for elevated CO<sub>2</sub> and decreased O<sub>2</sub> associated with FFR use incorporated into CDC, NIOSH, WHO, and ISO guidance documents.
- Effects on respiratory gases of combined N95FFR/surgical mask overlay, used to support/modify CDC, NIOSH, WHO, ISO, etc. standards and guidance documents.
- Outputs from the project have been cited 12 times (to date) in the peer-reviewed literature.

Updated: 28 March 2012