RAPID ASSESSMENT OF CLOTHING AND EQUIPMENT USING ADVANCED THERMAL SIMULATION TO LIGHTEN THE THERMAL LOAD

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Overview

- Background
- Current Practices
- Bridging the Gap
- Next Steps
Background

Thermal Load

Clothing

Activity Level

Environment

Equipment/PPE
Background

Rapid Response Challenge: Ebola

“-PROBLEM
On the front lines of the Ebola epidemic, health care workers face many obstacles in providing the timely care to patients that is required to prevent the virus from spreading—from heat stress caused by the personal protective equipment (PPE) they wear, to lengthy infection control measures that leave no room for error, to communities reluctant to seek care.

-CHALLENGE
Develop new practical and cost-effective solutions to improve infection treatment and control that can be rapidly deployed (1) to help health care workers provide better care and (2) transform our ability to combat Ebola.” USAID Fighting Ebola BAA

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Current Practice: Thermal Design

PRODUCT DESIGN

HOTPLATE

THERMAL MANIKIN

HUMAN SUBJECT TESTS

FIELD TRIALS / SALE / ISSUE
Current Practice

Cost vs. Fidelity for one test

- No Testing
- Hot Plate
- Thermal Manikin
- Human Subject

Bridging The Gap

Cost
Fidelity
Bridging the Gap

Two ways to evaluate human thermal effects with simulation:
1. Simulation of human in various virtual thermal environments
2. Direct simulation with physiologically controlled manikin
Bridging the Gap: Human Thermal Simulation

- Thermal Manikin/Hotplate
- Human Parameters
- Environmental Conditions

HUMAN RESULTS
Bridging the Gap: Human Thermal Simulation
Bridging the Gap: Physiologically Controlled Manikin

- Manikin is placed in chamber controlled at desired environmental conditions in desired clothing and equipment.
- Human inputs are supplied to control program.
- Manikin changes skin temperature and sweat rate to simulate human.
- Provides human response characteristics to experimenter.
Next Steps: Thermal Area

- Develop metrics for warfighter performance vs. thermal load
- Employ in series or parallel with existing task simulation programs
Next Steps: Our Research

- Further the understanding of the relationships between
  - simulation
  - manikin measurement
  - human subject results
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