



Health Protective Textiles: Bridging the Disposable/Reusable Divide
A National Science Foundation – Materials Use: Science, Engineering, and Society Study

In Collaboration with



Spreading of drug-resistant infectious diseases in hospitals, skyrocketing medical costs and an increasing medical waste stream are great challenges to the health care industry. University of California, Davis researchers and their collaborators are teaming together to perform a comprehensive assessment of protective textiles in the medical arena. This interdisciplinary research team consists of academic researchers, manufacturers, end-users and trade associations. They will look at factors that include the protective performance, costs, and environmental impact of the textiles used. A major focus will be on assessing the physical, sociological, economic, life cycle, health risk, and environmental impact of disposable versus reusable protective textiles in health care facilities, as well as in other applications.

The specific objectives of the research are:

- To determine the most effective, multi-functional (biocidal and water-repellent) materials for medical applications,
- To quantitatively assess the economic, environmental, and health risks of using these textiles in the health care industry,
- To determine the social and psychological factors affecting the acceptance of new materials by health care workers, and
- To educate health care workers, patients, and the public regarding the role of medical textiles in infection control and waste management.



The fire fighter HAZMAT suit is another application ready for biocidal protection

Biocidal Materials

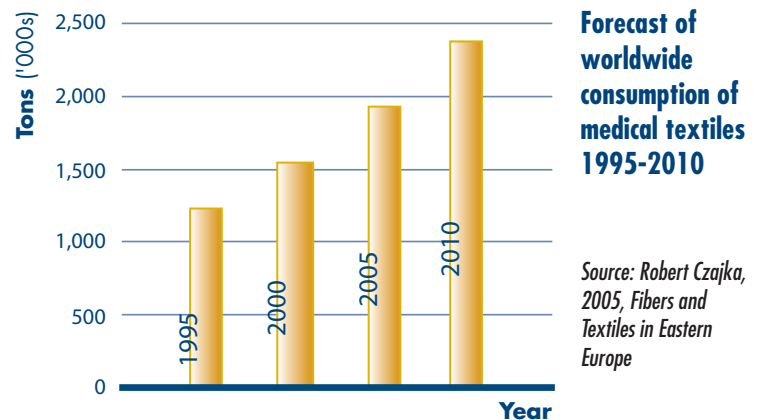
These are functional materials with antimicrobial properties that inactivate a broad spectrum of microorganisms upon contact. This research focuses on the medical applications of biocidal materials to reduce or completely inactivate any pathogens on hospital textiles to protect health care workers and the public. Applications of this protective technology extend to a wide variety of uses including:

- First response personnel,
- Military personnel,
- Hotel and food industry personnel,
- Mail processing and delivery personnel,
- Researchers.

Relevance

Medical textiles are one of the most dynamically expanding sectors in the technical textile market. Above average growth rates are a result of increases in consumption in developing countries in the Asian and Western markets. A forecast suggests that the world market for medical textiles will increase at a rate of 4.5% per annum in volume from 2005 to 2010 to reach 2.4 million tons with a value of \$8.2 billion by 2010, shown below. Additionally, technical textiles will grow at 3.8% per annum to reach 23.8 million tons with a value of \$126 billion dollars in the same time frame.

Medical textiles make up 19% of technical textiles. This research also has protective applications for other technical textiles used by personnel in defense, first response, hotel and food service, mail processing and delivery, and other industries.



The Reusable-Disposable Quandary

Disposable and reusable textile products are two popular but competing materials employed in health care and other fields requiring personal protection against biological and chemical hazards. Factors that drive selection include

Cost	Environment
Advertising	Regulations
Protection	Comfort
Standards	Other

The spread of infectious diseases within the health care system is significant due to the 675 thousand tons of infectious medical waste generated by U.S. hospitals each year.

A Collaborative Effort

This research is being performed with a number of academic, federal, state and private entities from the United States and across the globe. The project partners include:

- American Association of Textile Chemists and Colorists (AATCC),
- American Society for Testing and Materials (ASTM),
- Association of the Nonwoven Fabrics Industry (INDA),
- American Reusable Textile Association (ARTA),
- American Hospital Association (AHA),
- California Environmental Protection Agency (Cal EPA),
- China Nonwovens and Industrial Textiles Association (CNITA),
- Donghua University, China,
- European Textile Service Association (ETSA),
- National Textile Center (NTC),
- National Personal Protective Technology Laboratory (NPPTL),
- National Institute for Occupational Safety and Health (NIOSH),
- North Carolina State University (NCSU),
- U. S. Environmental Protection Agency (USEPA),
- University of California, Berkeley, and
- Manufacturers of Woven and Nonwoven Textiles.

Biocidal Medical Textile Requirements

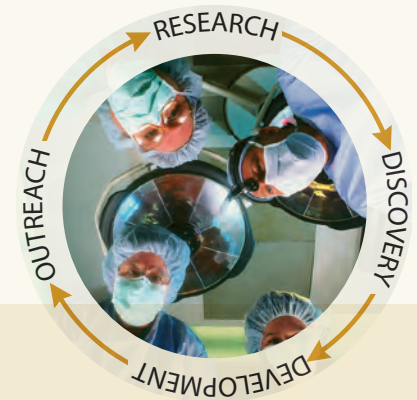
- Provide protection against pathogens: Fluid repellent and antimicrobial, reduce the level of infection rate in hospitals, health effects,
- Comfortable to wear,
- Environmentally friendly, non-toxic, materials that minimize use of raw materials, and lower waste disposal costs.

Health Care Environment Analysis

- Evaluate the extent and effectiveness of biocidal material use in hospitals,
- Determine the relationship between infection rate in the hospitals and usage of biocidal materials.

Data Collection and Analysis

- Survey and interview health care managers, infection control professionals, health care decision makers and industry stakeholders,
- Exploratory research on multifunctional fabrics,
- Compare government regulations, international standards, political and economic standards.



Textile and Process Development

- Develop reusable biocidal fibers/fabrics for hospital linens and uniforms,
- Develop environmentally benign fibers for both nonwoven and woven fabrics, laundering, and waste-disposal methods.

Outreach

- Academic and industry publications,
- Incorporate research into education programs
- Interface with related worldwide associations,
- Organize an international workshop/conference,
- Technology transfer to industry.

	Disposable	Reusable
<i>Appearance</i>	Fresh and clean	Used and washed
<i>Protection Mechanism</i>	Water Resistant	Water repellent
<i>Cost per unit</i>	Low	High
<i>Overall cost</i>	High	Low
Production		
<i>Process</i>	Easy	Complex
<i>Energy Use</i>	Low	High
<i>Raw Materials</i>	Petroleum and wood pulp	Cotton and petroleum
<i>Water Use</i>	Low	High
Disposal		
<i>Method</i>	Incineration	Biodegradable
<i>Environmental Impact</i>	Single use, high waste	Repeat use, low waste



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