Australian Government
Cotton Research and Development Corporation

Executive Summary 2017

Part 1 - Summary Details

Please use your TAB key to complete Parts 1 & 2.

CRDC Project Number: **DU**1501

Project Title: Novel Anti-Wetting and Self-Sterilising Cotton Fabric

Project Commencement Date: 01/07/2014 **Project Completion Date:** 17/12/2017

CRDC Research Program: 3 Customers

Part 2 – Contact Details

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Date Submitted: **02/12/2017**

Part 4 – Final Report Executive Summary

Provide a one page Summary of your research that is not commercial in confidence, and that can be published on the World Wide Web. Explain the main outcomes of the research and provide contact details for more information. It is important that the Executive Summary highlights concisely the key outputs from the project and, when they are adopted, what this will mean to the cotton industry.

Healthcare associated infections (HAIs) are common in hospitals around the world, where patients get infected for reasons entirely unrelated to the purpose of their admission. Healthcare textiles have a ubiquitous presence in the form of healthcare workers and patients' uniforms, bed linens and curtains. Numerous clinical reports have confirmed that the contamination of healthcare textiles with HAI-causing pathogens may result in transmission of disease to healthy patients, through health-care worker's uniform, scrubs and hospital linen.

Incorporation of antimicrobial agents into textiles is increasingly looked upon as a solution to prevent the pathogen colonization. However, if the fabric is hydrophilic then the absorption of organic fluids (in the form of a sneeze, vomit) can jeopardize the antimicrobial activity. Therefore, there is a growing interest to incorporate dual functionalities, antimicrobial property and superhydrophobicity, into healthcare textiles; as a superhydrophobic surface can repel pathogen-rich fluids encountered in a hospital environment while antimicrobial functionality destroys the attached microbes. Obtaining durable functionality of both properties seems to be an elusive proposition for the researchers in this field. Therefore, developing durable dual functional coatings on cotton fabrics is the prime objective of this work. The work investigates the incorporation of a cationic antimicrobial compound into cotton textiles. The compound has no adverse effect on human health, unlike some of the existing metal-based antimicrobial agents (e.g. nanosilver). This study also aims to achieve the superhydrophobic effect by using non-fluoro hydrophobic compounds, owing to the toxicity and persistent nature of fluorine compounds.

This work reports novel methods of immobilization of antimicrobial agent and hydrophobic compound to cotton fibres. One-Pot coating method is relevant to textile industry as it can be adopted as a pad-dry finishing technique. The method is simple, rapid and suitable for bulk-scale manufacturing. The process consists of deposition of antimicrobial agent and a hydrophobic compound through the use of cross-linker. The experimental design revealed the optimum synthesis conditions and the inter-relation between the three constituents of the coatings. The incorporation of cross-linker has fulfilled three purposes: anchoring of antimicrobial compound to cotton, inter-linking of antimicrobial compound chains in the coating and bonding of hydrophobic compound to the antimicrobial network. The fabrics possessed the durable activity of both antimicrobial property and superhydrophobicity. Such a fabric would enhance cotton's competitive advantage over made-made fibres in a range of markets including: health care textiles, sportswear, outdoor furnishings, and hospitality and defence services.

To summarize, the development of dual functional cotton fabrics is a promising solution in the fight against the transmission of HAIs.