

# TENCEL<sup>®</sup> with a Microbial Barrier for Medical Bras<sup>★</sup>

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## Abstract

The goal of the research was to determine the properties of the microbial barrier TENCEL<sup>®</sup> knitted fabrics intended for medical bras. The samples were tested according to a new method developed in the earlier research by the same authors. The most resistant forms of microorganisms of a pathogenic bacterial endospore of the *Bacillus* genus were used to investigate microbial barrier permeability. Based on the samples tested and their characteristics, medical bra construction was developed with the aim of reducing irritation for the body part that underwent surgery. The data on the forms and measures were obtained using a 3D body scanner.

*Keywords:* TENCEL<sup>®</sup>; Microbial Barrier; Medical Bra; 3D Scanning; Clothing Construction

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## 1 Introduction

Textile materials often present a problem when dealing with microorganism control, not only in health care, but also in food-processing industry, in nursing homes, hotels, restaurants, etc. Textiles are often exposed to microorganism attack at such places because microorganisms use textiles to survive, since humidity and easily accessible foodstuffs are often inadvertently present in textiles, making it a highly probable source of contamination [1, 2].

A precondition for the development of an infection is that the agent (bacteria, virus, fungus, protozoa) is present in the environment. Single microorganism can in no way cause an infection. A source of infection is necessary to start an infection. The infectious agents breed there. The transfer can be direct, through touch or drops, or indirect, by dirty hands, clothing, air, etc [3].

Each wound represents a hazard of developing new infections. Apart from patients, the source of infection can also be the personnel of the surgery department, visitors and other people. Preventing the development of hospital infections is the best approach in protecting the patients and medical staff. Exposure to pathogenic bacteria can be a result of the contact with an infected person, with an infected object, or can simply be due to inadequate care [4].

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TENCEL<sup>®</sup> is a man-made cellulosic fibre of the lyocell generic fibre type. The material is characterised by the ability of the fibres to absorb water and humidity into its nanostructure, making it less prone to the development of microorganism. While cotton, which is most often used for underwear, keeps most of the water at fibre surface, and is thus more susceptible to develop microorganisms, TENCEL<sup>®</sup> is different and is being increasingly used in medicine and postoperative situations on the expense of cotton and other materials. TENCEL<sup>®</sup> does not let off particles (textile dust) as opposed to cotton, which is prone to such shedding and is for this reason being removed from medical applications [5].

A study by Thomas L. Diepgen showed a positive impact of TENCEL<sup>®</sup> on the care of patients with sensitive skin, even for the patients with atopic dermatitis or psoriasis [6]. This proves TENCEL<sup>®</sup> to be an acceptable fabric to be used in health care and medical environments, postoperative ladies underwear included [7].

The medical bra takes care of the physical comfort and the concern of physical appearance of the woman's altered body. A medical or post-surgical bra is designed to accommodate for a woman's special post surgical medical needs. Depending on the purpose and style of the bra, medical bras and postoperative bras may be made of soft, comfortable materials, or firm materials that provide compression during the healing process. The product also encompasses prosthesis bras, which typically contain pockets inside the bra to hold the breast prosthesis after a surgery. Bra discomfort presents a unique challenge to women treated for breast cancer due to the significant physical changes to the breast and the surrounding tissue. Despite this, literature offers only a single study investigating the impact of bra discomfort on exercise levels among breast cancer survivors [8-10].

Medical bras are mostly made of knitted fabrics, as knitted structures can adapt to body shapes and sizes quite easily, much better than woven ones. Fibre content is most often 100% cotton. It is well known that cotton is avoided in medicine, and in surgery especially, as it is prone to release particles, or create textile dust, which can cause infections with open wounds. As the underwear includes articles of clothing that come into direct contact with the body, it should offer protection from infections and irritations that could significantly slow down recovery after surgical treatment. Underwear is exposed to the influence of microorganisms from the environment and from the patient himself. It is thus necessary to select materials with adequate microbial barrier to be used in the manufacture of the underwear for the above purposes. It is also important to design the underwear in such a way as to follow the shape and contours of the body to the maximum, so as to be able, apart from offering protection from infection, to minimise negative impacts on patient's recovery with its shape, by eliminating or reducing to an acceptable level the irritation of the part of the body that was subjected to a surgical procedure.

Most hospitals give some advice and recommendations to their patients after surgeries. They usually suggest postoperative wearing of a bra that would contribute to reducing swellings and pressures at the place of surgery. Medical bras are recommended to be worn for 3 months after the surgical procedure. The bra should be comfortable and soft, so as to avoid irritations and scars, and should have no wires in its construction [11, 12].

## **2 Experimental**

A medical or surgical bra is designed to accommodate a woman's special post-surgical medical