IDENTIFICATION AND CHARACTERIZATION OF MATERIALS USED BY DIABETIC FOOT PATIENTS

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Diabetes is a problem that affects millions of people around the world. One of the most serious problems for diabetic patients is called diabetic foot, that when neglected, can become dramatic, because in extreme cases, amputation of the foot may occur. In this research we studied several socks, made with new materials and diversified knitted structures, focusing on socks commercially available and specially designed for diabetic patients, in order to understand what would be the most adequate combination of structure and fibres that would give the adequate results in thermal and mechanical properties for this specific problem.

The identification and characterization of materials and knitted structures of the commercially available socks worldwide were done and to guarantee a better characterization of the socks, they were divided in three different areas: foot, ankle and leg. An objective analysis of the seven selected socks was then conducted in order to determine which materials and structures were the most important for a patient with diabetic foot, using univariate and multivariate statistical tools. The main findings of this study was that the 100% cotton jersey sock, referred throughout this study as the standard sock, didn’t performed as expected for the studied properties. This finding is rather important, because this sock is referred as the most recommended sock for a diabetic patient with diabetic foot syndrome. However, it should be noted that the performance is satisfactory in the foot area. Another factor of relevance is its low price, thus becoming a strong competitor to all the other socks studied, including the socks with advanced or high performance fibres. Therefore, the socks that had the best performance in terms of the studied properties were the ones made with acrylic fiber, Polyester Coolmax® and Polypropylene. These findings reinforce the idea that actually there are other alternatives in terms of new fibres with high performance for this type of product. Also the knitted structures with which the socks were knitted revealed a major contribution, since the socks in jersey and plush presented the best results in terms of properties, particularly the friction coefficient, water vapour permeability, air permeability, thermal conductivity and thermal resistance.

Beyond the observations and conclusions obtained during this research, an interesting suggestion resulted and that is the need for a classification of diabetic socks in two types: Socks recommended for the spring-summer; and socks recommended for the autumn-winter. The former should be knitted in jersey structure and the yarn should present a low linear density; the latter should be knitted in plush structure and the yarns should have high mass per unit length. This kind of classification should be included on the diabetic sock labels in order to elucidate "consumers" - diabetic patients and prevent improper use of these socks.

Therefore, the textile sector can and should contribute to a better quality of life of diabetic patients, particularly with diabetic foot, applying their knowledge in terms of raw materials and level of variation and combination of different knitted structures.

Keywords: Diabetic foot; Advanced materials; Thermal properties; Mechanical properties.