Peptide-cotton bond: methods for biocompatible and antimicrobial fabrics

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The need to develop new biocompatible materials for a variety of applications is greatly promoting academic and industrial research. We present chemical and chemoselective methods for the preparation of a cotton-based, antibacterial textiles. Short peptides are chosen as antimicrobial agents, while naturally occurring cellulose fibers are used as textile support.

Covalent grafting of molecules on cotton surface is approached in different ways. All the methods exploit the natural occurring hydroxyl groups of cellulose matrix, opportunely modified. In the most classical approach, we transform the hydroxyl group into easy functionalizable amine for the reaction with amino acids and peptides. In search of green mild reactions, we exploit chemoselective ligations to achieve an oxime bond or a thioazolidine ring in aqueous solution. With this last approach we were able to link an ottapeptide derived from the N-terminal domain of a dermaseptin 1S mutant known for its antimicrobial properties. In this example, we use the chemo-enzymatic TEMPO-mediated oxidation that converts hydroxyl groups into aldehyde moieties by means of *laccase* in mild acidic aqueous conditions. The reaction between the aldehyde and a β-aminothiol of a Cys-peptide gave a stable covalent bond.

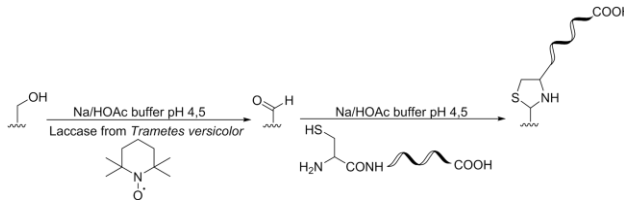

Figure 1. Laccase mediated cotton oxidation and chemoselective reaction with a Cy-peptide

We characterized cotton-peptide samples by means of FT-IR, UV-Vis and XPS and determined their antimicrobial activity against *Staphylococcus aureus* and *Escherichia coli*. Interestingly, some of the materials gave promising results against the Gram positive strain, responsible for most hospital-acquired infections.

References

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