

Polyamidoamine grafted cotton with antimicrobial activity

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The widespread of multidrug resistant bacteria, especially in clinical environment, is an important issue. It is necessary to develop new antimicrobial strategies to combine with traditional antibiotics to control the pathogen growth. Cotton fabrics used in a hospital setting can be colonized by pathogens playing an important role in the infection chain of patients, thus the antimicrobial activity of cotton fabrics is a desired add-value. Since linear polyamidoamines (PAAs) showed a certain degree of toxicity against Gram-positive and Gram-negative microorganisms [1], in this study we evaluated the antimicrobial activity of cotton fabrics grafted with antimicrobial PAA chains either directly or through a PEG spacer (Figure 1). The antimicrobial PAA was obtained by polyaddition of N,N'-methylenebisacrylamide (MBA) with N,N'-dimethylethylenediamine (DMEDA). Direct PAA grafting was achieved by first treating cotton with 3 M NaOH for 1 h, then with a 10% (wt/v) MBA aqueous solution for one night at 40 °C. After this time, an equimolar amount of DMEDA compared to MBA was added and the resultant mixture allowed reacting for 72 h. The PEG spacer was introduced by treating MBA-functionalized cotton fabrics with PEG1000- α - ω -bis(1-carboxypiperazine) previously synthesized [2], then equimolar amounts of DMEDA and MBA were added as in the previous case. The grafted cotton was finally retrieved after exhaustive washing with water and drying.

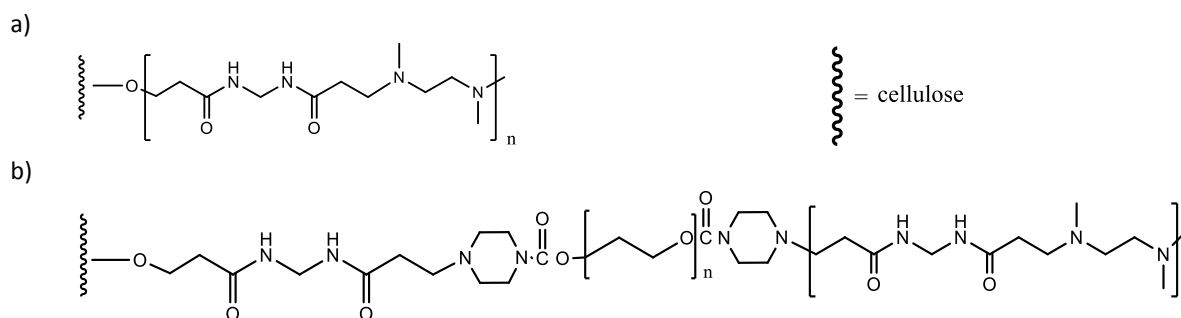


Figure 1. Cotton grafted with MBA-DMEDA directly (a) and through a PEG spacer (b).

Preliminary antimicrobial tests were performed against the model microorganism *Escherichia coli* (*E. coli*) C1a. Samples (1x1 cm) of fabric cotton alone, grafted directly or through PEG spacer with MBA-DMEDA, were inoculated for 2 h with *E. coli* (10^6 cfu/fabric). The fabrics were vigorously shaken in nutrient medium and incubated at 37 °C for 24 h. The bacterial growth associated with cotton grafted directly with PAA was as comparable as the control sample. On the other hand, the fabric grafted through PEG spacer inhibited the bacterial growth of *E. coli*. The positive effect of PEG on the antimicrobial activity displayed by cotton grafted with PAA was confirmed by an “agar patch-test”. Further investigations will be performed to study the mechanism of action.

References

1. E. Caruso, S. Ferrara, P. Ferruti, A. Manfredi, E. Ranucci, V.T. Orlandi, *Lasers Med Sci.*, **2018**, DOI: 10.1007/s10103-017-2345-0.
2. E. Ranucci, P. Ferruti, *Synthetic Commun.* **1990**, *20*, 2951.