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# SYNTHESIS AND FUNCTIONALIZATION OF BACTERIAL CELLULOSE NANOCRYSTALS FROM KOMBUCHA TEA FOR WOUND DRESSING APPLICATIONS

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**Introduction:** Although a lot of wound dressing materials have been developed for the treatment of chronic and acute wounds, there is still urgent need for the improvement of the properties of modern wound dressings in order to accelerate the wound healing process and recovery. Wound dressings that are currently used include films, bandages, foams, patches and hydrogels. Currently, hydrogels are gaining a lot of attention due to their high-water holding capacity. Naturally derived polymers such as polysaccharides have been employed to improve the mechanical properties of hydrogels [1]. Bacterial cellulose from kombucha tea is a biopolymer synthesized by a symbiotic consortium of bacteria and yeast (SCOBY) with many advantages over plant cellulose, such as high degree of purity (unlike plant cellulose, it is free from hemicellulose, lignin and pectin), high crystallinity index and high-water retention capacity [2]. In addition to its biocompatibility and good mechanical properties, it can be functionalized in order to acquire new properties such as antibacterial response and as a non-toxic crosslinking agent with other biopolymers for the synthesis of biocompatible wound dressings, tissue engineering scaffolds and drug delivery systems [3,4].
The main goal of this work was to prepare aldehyde modified nanocrystalline bacterial cellulose from kombucha SCOBY for the preparation of hydrogel wound dressings with improved mechanical and biological properties.

**Main body:** The production of bacterial cellulose was carried out by the fermentation of kombucha tea using SCOBY as the starting material. The fermentation process was allowed in the dark for 21 days at room temperature. The new kombucha pellicles formed at the solution surface were isolated, with hot water at 70 ℃ and then dried in an oven at 70 ℃ for 24 h. The dried bacterial cellulose was crushed and purified with 0.5 M NaOH solution and 1.5 % $H_2O_2$. The preparation of bacterial cellulose nanocrystals was done by sulfuric acid hydrolysis (64 %wt) at 55 ℃ for 55 min, and acid to bacterial cellulose ratio of 18: 1 (ml : mg). Aldehyde functionalization of the obtained bacterial cellulose nanocrystals was performed with sodium periodate at room temperature during 2, 6 and 24 h [5]. Low content of aldehyde groups was found in the samples oxidized for 2 h. The sample soaked in periodate solution for 24 h crosslinked and formed a bacterial cellulose hydrogel which could be attributed to high content of aldehyde groups which subsequently crossed linked with the unreacted hydroxyl groups on the polymer chain.

**Conclusion:** In conclusion, bacterial cellulose nanocrystals were obtained from kombucha tea fermentation, and the aldehyde content of oxidized bacterial cellulose nanocrystals was dependent on the time of periodate oxidation. Therefore, bacterial cellulose can be used as a promising cost-effective material and as a crosslinker for applications in wound dressings and tissue engineering.

## References

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