



Antibacterial nanocellulose for the production of new anti-biofilm materials

E. Bianchi,^a F. Mancusi,^a D. Squitieri,^b G. Biagiotti,^a M. Cacaci,^b C. Montis,^a F. Bugli,^b B. Richichi,^a S. Cicchi,^a

^aDepartment of Chemistry "Ugo Schiff", University of Florence, Via della Lastruccia 3-13, 50019, Sesto Fiorentino (FI), Italy

^bDepartment of Basic Biotechnological Sciences, Intensive and Perioperative Clinics, Università Cattolica del Sacro Cuore, Largo A. Gemelli, 00168, Rome, Italy
elisa.bianchi1@unifi.it

Cellulosic nanomaterials have stimulated interest in the scientific community thanks to their properties that make them particularly promising among nanostructured materials. Nanocellulose-based materials are naturally available, from waste materials, at low price and are, generally, characterized by a high biocompatibility.¹ Moreover, nanocellulose can be easily functionalized to produce materials with new properties and applications. In this work we focused on materials with antimicrobial properties. Actually, the antibiotic resistance in the treatment of chronic infections related to the surgical introduction of medical devices, generates in Europe almost 25.000 thousand deaths per year.² The develop of medical devices, such as catheters, coated with nanocellulosic materials with antibacterial properties, may prevent the formation of biofilms, a kind of aggregation of bacteria that makes them insensitive to antibiotic treatments.

Our project aims to the production of a multilayered material composed by differently functionalised nanocellulose to obtain an efficient antibiofilm device. Finally, we developed a catheter prototype made with a base in polydimethylsiloxane (PDMS) covered by a plastic polymeric layer made of Evatane[®] 40-55 and two nanocellulosic layers kept together by electrostatic interactions.

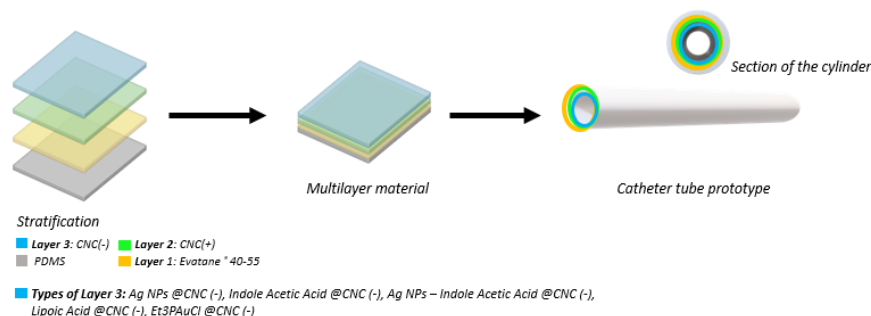


Figure 1: Stratification and formation of the catheter prototype.³

References:

- [1] B. Thomas, M.C. Raj, J. Joy, A. Moores, G.L. Drisko, C. Sanchez, 2018, Chemical Reviews, 118.24, 11575-11625.
- [2] A. Macgowan, E. Macnaughton, 2017, Medicine 45.10, 622– 628.
- [3] Created with Biorender.com

Funder: Project funded under the National Recovery and Resilience Plan (NRRP), Mission 4 Component 2 Investment 1.4 - Call for tender No. 3277 of 30 December 2021 of Italian Ministry of University and Research funded by the European Union – NextGenerationEU. **Award Number:** Project code ECS_00000017, Concession Decree No. 1055 of 23 June 2022 adopted by the Italian Ministry of University and Research, CUP: B83C22003920001, project title "Tuscany Health Ecosystem – THE" - SPOKE4_Nanotechnologies for diagnosis and therapy.