Fabrication and characterization of PVA-electrospun tips for bacteriological swabs

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In this study, an innovative swab tip was produced using poly(vinyl-alcohol) (PVA) as bulk material and electrospinning for the processing method. PVA was selected as a possible material for sample collection as bacteriological swab tip because of its revealed efficiency in recovery and detection of exhaled bacteria. PVA mats were successfully obtained through electrospinning, a processing technique which can be easily scalable for intensive manufacturing. Since PVA has a hydrophilic nature and is soluble in water, a physical reaction by thermal crosslinking was chosen to increase its crystallinity, resulting in an improved stability of the material. PVA mats were then stable in aqueous solutions until 28 days, with suitable mechanical properties.

To obtain a prototype swab, in these preliminary *in vitro* tests, PVA mats were simply wrapped around PS sticks, to simulate a swab assembly, thus evaluating material performance in this panorama. In particular, PVA electrospun tip uptake and release capacities were investigated for different kinds of samples. Firstly, it was assessed its absorption capacities using water and 0.01 M PBS solution, then it was simulated a more realistic context with the detection of proteins, using BSA as a model protein, and the detection of bacteria, using *P. aeruginosa* PA01 and *S. aureus* SA-1 as Gram-negative and Gram-positive bacteria. In each test, the prototype showed great potential, with performances comparable to foam swabs currently commercially available and used worldwide.

These results represent a promising starting point for future investigations.