# Nanotechnology for Security and Defense. CBRN and Materials Department at INTA-Campus La Marañosa

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Abstract

Biological warfare agents involve a wide range of risks, since they can be deliberately addressed not only at human population but also at livestock or crops [1], causing effects both on human health (mortality/morbidity/incapacity) and on the economy (failed harvest, death of livestock, health and safety investment) [2]. Therefore, much effort has been devoted to the research, design and development of new technologies for their detection and identification. New low-cost sensor devices that allow their detection and early identification are very significant in the effective fight against these agents. The need to carry out analytical determinations with specific devices, easy to use and low cost has led to the development of immunobiosensors [3]. In the OPTONANOSENS project, national project financed by MINECO-FEDER funds, the main objective is the development of analysis devices based on photonic technology for the early and reliable of identification of biological threats as a consequence of a CBN attack.

In the device nanostructured, supports based on nanofibers (manufactured by TECNALIA) will be used. These nanofibers will be used for the immobilization of specific antibodies. In the immobilization assays BSA as used as a surrogate of biological warfare agent, in particular of protein toxin and a specific antibody against BSA will be used.

Three immobilization methods were assayed: passive adsorption, covalent bond and affinity bond by intermediate proteins, as streptavidin-biotin and chimerical protein A/G.

The results show on the one hand, that the more effective system for being used in a biosensor is the antibody immobilization by A/G protein and on the other hand, nanofibers provide a significant increase of the sensitivity due to their high surface/volume relation offering a greater immunocapture capability. Lastly, this immunocapture system was validated with ricin toxin, that can be used as a biological warfare agent.

## References

[1] Thavaselvam D, Vijayaraghavan R. Journal of Pharmacy and Bioallied Sciences, 2(3) (2010) 179-188.
[2] Kaufmann AF, Meltzer MI, Schmid GP. Emerging Infectious Diseases, 3(2) (1997), 83-94.
[3] Petrakova AV, Urusov AE, Gubaydullina MK, Bartosh AV, Zherdev AV, Dzantiev BB. Talanta, 1;175 (2017) 77-81.

## Figures

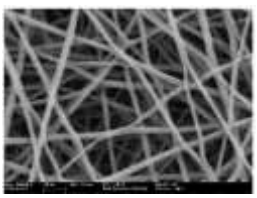

**Figure 1: Nanofibers PA6 5% pyridine**

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