Nanotechnology and Biosecurity

Nanotechnology offers potential benefits and threats for biosecurity and the BTWC convention. States Parties to the convention should be aware of this, because nanotechnology is not commonly included among the life sciences deemed relevant for it [1].

What is nanotechnology?

In this interdisciplinary field biologists, chemists, physicists etc. cooperate in projects on the boundaries between disciplines on materials with novel properties and phenomena at a scale of around 1 to 100 nanometre (10^{-9}m). In nanobiotechnology nanoinstruments are used in biology or biomaterials are used in nanotechnology.

Nanotechnology protects biosecurity

Nanotextiles offer opportunities for personal protective clothing and equipment to protect first responders to a bioterrorist attack[2].

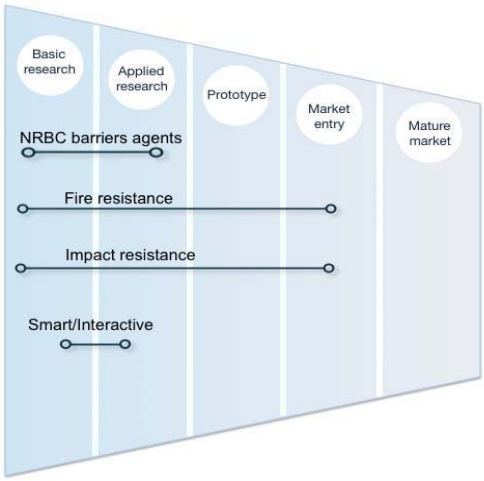

Figure 1: *Technology Readiness Levels (TRL) of protective textiles [2]*

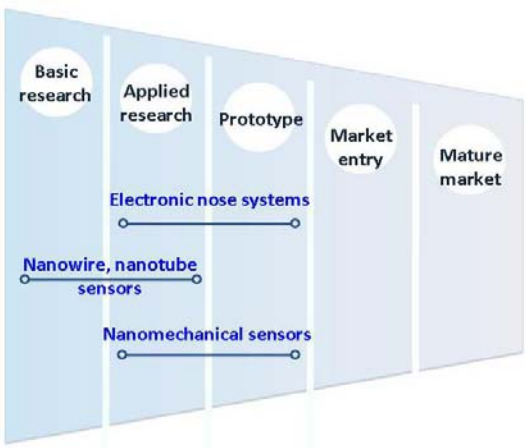

Figure 2: *TRL of nanodetectors[3]*

Also, nanotechnology including nanobiosensors and Nanowires can be applied for detecting chemical and biological substances [3].

Nanotechnology threatens biosecurity

Science and technology relevant for the BTWC include nanotechnologies such as lab-on-a-chip injected in body, artificial viruses, aerosol delivery of nanoparticles, crossing the blood-brain barrier [4,5]. The emergence of "amateur science communities" could eventually undermine the BTWC.

Proposed governance measures

Governments and politicians protect biosecurity through relevant conventions incl. BTWC and law-enforcement. The research community and industry have subsidiary responsibilities, laid down in voluntary codes of conduct;

- respecting the law,
- raising awareness of legal requirements and ethical principles among students and peers,
- informing authorities and starting public dialogue on new emerging threats and protective means. [6]

These governance measures should also cover relevant nano(bio)technology.

References

[1] Malsch, I & Fruelund-Andersen, A-M, "Ethical and Societal Aspects of Nanotechnology Enabled ICT and Security Technologies", ObservatoryNano, 20-04-2011

[2] Mantovani, E, Zapelli, P & Sitjá, R, "Nano-enabled Protective Textiles", ObservatoryNano briefing no.7, 2010

[3] See also Gordeyev, S & Crawley, T, "Nanosensors for explosives detection", ObservatoryNano briefing no. 11, 2011

[4] Nixdorf, K & Dando, M, 2009, Developments in Science and Technology; Relevance for the BWC, in BWPP Biological Weapons Reader 2009, Bioweapons Prevention Project

[5] Blank, D (cited in Malsch & Fruelund-Andersen, 2011)

[6] Discussed in Miller, S, Selgelid, M and Bruggen, K van der, "Report on Biosecurity and Dual Use Research; A report for the Dutch Research Council," 3TU Centre for Ethics, January 2011

ObservatoryNANO is funded by the European Union under FP7. Contract number 218528.