Exercise 27 Nov 2009 SA Nanoschool:

Application of nanogovernance model on the possible use of aptamers for drug delivery

The topics to address are:

1) What problems are supposed to be solved by using this type of nanotechnology?
2) By whom are the addressed problems recognised as problems?
3) What understanding of the problems does a solution based on nanotechnology demand?
4) Describe a scenario or a script for the proposed solution, including the future roles, which the technology, the users, the surrounding infrastructures etc. are supposed to have

Be sure to apply a *system's perspective* to the description of the scenario / script.
This implies that focus is not only on single properties or features, for example the tiny dimensions of a nanotechnology or material on nanoscale, but the whole system, which the nanotechnology-based product is part of. This should include the need for supporting infrastructures like quality standards, waste management systems, the roles expected to be taken by the future actors in these systems etc.

5) Make a screening of environmental and work environmental assessment in a life cycle perspective of a nanotechnology system applying aptamers for drug delivery. Fill out a MECO-matrix for environmental impacts and work environmental impacts

Get inspiration for the MECO-matrix by considering the scenario / script and the "meetings" herein between the nanotechnology system, different persons (actors) and different infrastructures (like supply of water, energy, materials and chemicals, equipment etc., waste handling etc.) during production, use, waste handling etc.

MECO-matrices

- M: Materials, including the use of scarce and non-renewable materials
- E: Energy, including whether the energy sources are fossil or renewable
- C: Chemicals, including aspects of human toxicology (e.g. risks of carcinogen, reproductive, allergic and neuro-toxic impact) and eco-toxicology (e.g. risks related to persistence and bio-accumulation)
- O: Other aspects, like use of space, biodiversity, work environment etc.

If you miss knowledge about some of the spaces in the matrices describe in that space what information you would like to have.

6) How are these impacts compared to the present ways of solving the problem in focus?

Different life cycle phases *Different possible environmental impacts*	**Raw materials**	**Production**	**Use**	**Disposal**
Materials				
Energy				
Chemicals				
Other aspects, including work environment (occupational health and safety)				

Table: Presentation of the Materials, Energy, Chemicals and Others matrix for the different life cycle stages of a nanotechnology

EXAMPLE FOR INSPIRATION:

Oil lubricant	**Raw materials**	**Production**	**Use**	**Disposal**
Materials	Fossil fuels Graphite	Motor oil		
Energy	Electricity	Electricity	Improved lubrication => less fuel consumption?	
Chemicals		Fullerenes	Release of nanoparticles in exhaust gasses?	Nanoparticles released from waste?
Other aspects, including occupational health and safety	Occupational handling of soot with fullerenes	Occupational handling of fullerene nanoparticles		Occupational handling of the used motor oil

Table: Presentation of the Materials, Energy, Chemicals and Others matrix for the different life cycle stages of a motor oil with nanoparticles