

## NanoMed Round Table Communication Working Group

### Annex 2 – Case Study: Visions of Nanomedicine

#### Overview

The abundance of existing visions in the context of nanomedicine is in stark contrast to the number of nanomedical applications currently on the market. These visions cover a wide range of potential applications and predicted times to market. Due to these factors and the associated communication issues and challenges, the subject 'Visions of Nanomedicine' was adopted as a case study by the Communication Working Group.

Whilst investigating this case study the experts were asked to consider the following aspects of the various visions that were reviewed:

- How realistic are these visions?
- Are different visions combined?
- What benefits / dangers are implied?
- What message is communicated?
- To whom?
- For what purpose?
- How should stakeholders (us/legislators/industry) try to influence this?

The deliberation of these points raised further questions:

- Are these visions technically and economically feasible?
- Why are visions of present developments far different to visions of the future?
- Does public perception (influenced by visions) differ from current developments?

In addition, the Communication Working Group commented on the discrepancy between the artistic impressions of such visions and the actual or expected implementation. If possible future nanomedical applications are strongly exaggerated or presentation of the method is unclear or misleading, false hopes and therefore disappointments can arise among the general public. Also, most visions give either an extremely optimistic time frame or none at all, which can also lead to misunderstandings. In many cases the medical background is not or insufficiently explained, which can be potentially harmful (e.g. use of nanorespirocites to increase oxygen transport in body shown as positive, however too much oxygen in the body is poisonous).

Further questions resulted:

- Why do visionaries create such 'exaggerated' visions?
- Are such visions the result of promising developments or are they seen as potential drivers for future development?

It was suggested that these questions are strongly tied to cultural differences, with the motivation of visionaries from the US possibly differing strongly from that of visionaries from Europe.

# Nanomed Round Table

## Investigated Visions

The investigated visions ranged from near-realistic nanoparticle cancer therapies and nerve regeneration treatments, often in various stages of experimental development, to far-fetched active "nanobots" capable of monitoring the whole organism. Yet even in the case of the former approach, the visions depicting the various methods are generally exaggerated or extremely humanised, e.g. with nano-sized doctors firing slingshots at tumour cells. This exaggerated visualisation is even more present in the visions which are more distanced from reality. Additionally, these visions combine various different effects to create a whole which is greater than the sum of the parts. These often cross the border to human improvement, blurring the boundaries of nanomedicine towards transhumanism. This not only poses questions regarding medical aspects, but also opens up a completely new spectrum of ethical, social and legal debate.

## Selected Examples of Nanomedical Visions

### Treating tumours - Golden slingshot

"Journalists sometimes joke that the ideal headline for a science story would be something like *"Black holes cure cancer"*. Sadly, it will never happen. *"Nanotechnology cures cancer"*, though, is a pretty good runner-up, and that might just turn out to be true."

*(The Economist, 8 Nov 2008)*



The next generation of cancer treatments may be delivered by nanoparticles

"The ability to regenerate nerve cells in the body could reduce the effects of trauma and disease in a dramatic way. In two presentations at the NSTI Nanotech 2007 Conference, researchers describe the use of nanotechnology to enhance the regeneration of nerve cells. In the first method, developed at the University of Miami, researchers show how magnetic nanoparticles (MNPs) may be used to create mechanical tension that stimulates the growth and elongation of axons of the central nervous system neurons. The second method from the University of California, Berkeley uses aligned nanofibres containing one or more growth factors to provide a bioactive matrix where nerve cells can regrow.

*(ScienceDaily, 21 May 2007)*



*It is known that injured neurons in the central nervous system (CNS) do not regenerate, but it is not clear why. Adult CNS neurons may lack an intrinsic capacity for rapid regeneration, and CNS glia create an inhibitory environment for growth after injury.*

# Nanomed Round Table

## Sperm Powered Nanobots? I Offer My Services As A Fuel Tank

What would you say if we told you that scientists believe that future nanobots might be powered by the energetic little baby makers which live in the darkness of your scrotum? [...] A research project revealed that a solution for fueling the multitudes of nanobots that are sure to be used in the future, could be one of the most wasted products in the world. Sperm, of course.



(Andrew Dobrow, [www.gearfuse.com](http://www.gearfuse.com), 2 Jan 2008)

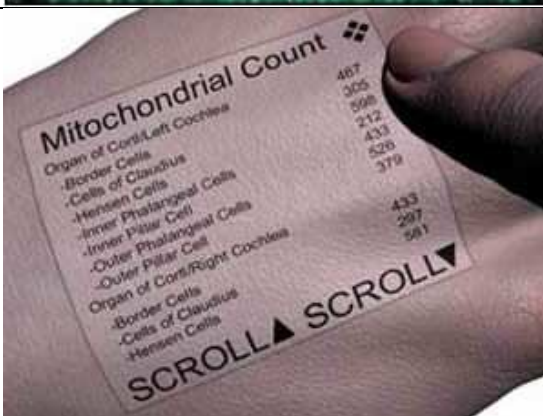
## Chemical brain controls nanobots

A tiny chemical "brain" which could one day act as a remote control for swarms of nano-machines has been invented. The molecular device - just two billionths of a metre across - was able to control eight of the microscopic machines simultaneously in a test.



(Jonathan Fildes, [www.bbc.co.uk](http://www.bbc.co.uk), 11 Mar 2008)

In his book *Nanomedicine, Volume I: Basic Capabilities*, Robert A. Freitas Jr. describes a "programmable dermal display" in which a population of about 3 billion display pixel robots would be permanently implanted a fraction of a mm under the surface of the skin, covering a rectangle 6 cm x 5 cm on the back of the hand. Photons emitted by these pixel bots would produce an image on the surface of the skin. This pixelbot array could be programmed to form any of many thousands of displays. Each display would be capable of two functions: (1) presenting to the user data received from the large population of medical bots that roam the user's body; (2) conveying instructions from the user to that same large population of bots. The display could be activated or deactivated by finger tapping on the skin.



(Gina Miller, [www.nanogirl.com](http://www.nanogirl.com), 22 Sep

# Nanomed Round Table

2005)

[Natasha Vita-More's] theory suggests that human nature is built on the premise of problem solving through innovative methods of design. Such theory employs Conceptual Art at its core [...]. Arguing for instinctive need and desire to overcome odds such as disease, the original future human body/brain design "Primo Posthuman" is both a media design and a theoretical concept.

(Natasha Vita-More, [www.wikipedia.org](http://www.wikipedia.org))

