NBIC/Enhancement-Medicine, Emerging technologies (Nano, Bio, Info, Cogno) and the Concept of Health: A New Challenge for HTA, Health Research, and Health Policy

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Agenda

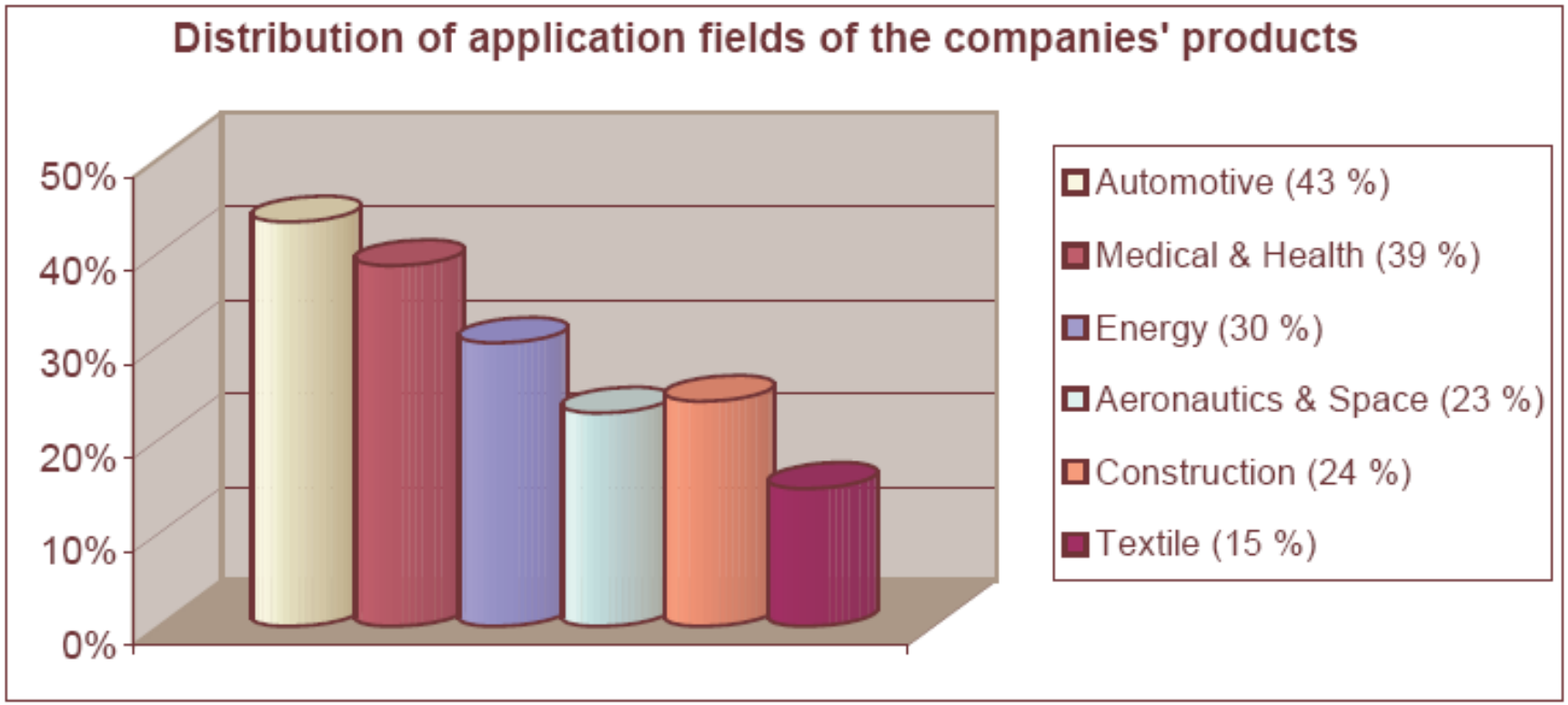
Introduce the status of NBIC-medicine and its relationship with the concept of

- **health, disease, wellbeing, disability/ impairment**
- **Medicalization**
- **Enhancement medicine**
- **HTA, health research and policy**

NBIC" (nano-bio-info-cogno)

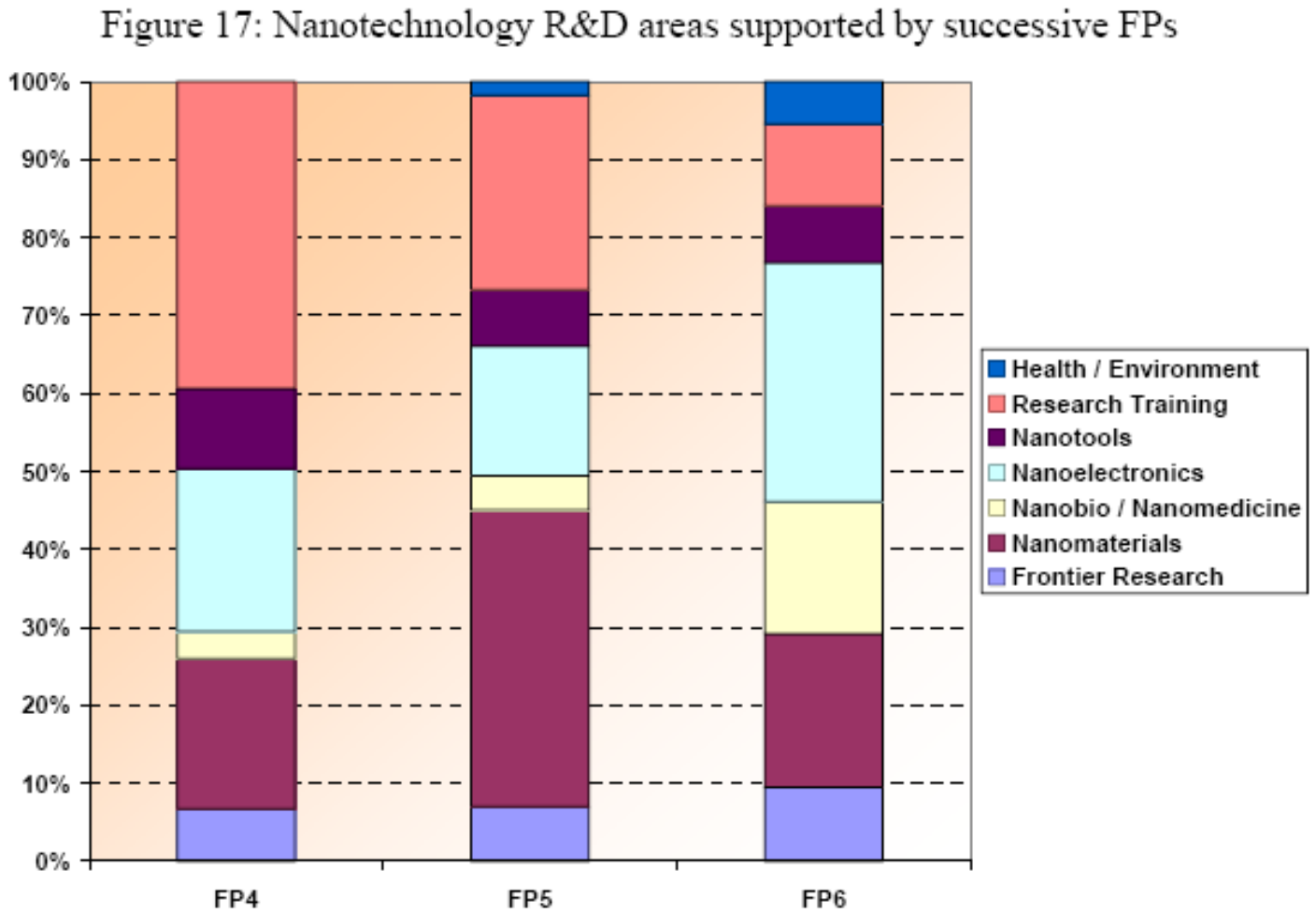
- Nanotechnology allows for the manipulation of materials on an atomic or molecular scale enabling the converging of NBIC at the nanoscale
- (a) nanoscience and nanotechnology;
- (b) biotechnology and biomedicine, including genetic engineering;
- (c) information technology, including advanced computing and communications;
- (d) cognitive science (neuro engineering)

NBIC-Medicine



http://www.nanoroad.net/download/is_as.pdf; http://www.nanoroad.net/download/is_mh.pdf;
http://www.nanoroad.net/index.php?topic=download

NBIC-Medicine



Some Figures about Nanotechnology R&D in EuropeCompiled by Unit G4 Nanosciences and Nanotechnologies European Commission, Research DG Version: 8 December 2005 http://cordis.europa.eu.int/nanotechnology and Beyondhttp://www.innovationsgesellschaft.ch/images/fremde_publikationen/nano_funding_data_08122005.pdf

NBIC-Medicine definition

- **the science and technology of diagnosing, treating, and preventing disease and traumatic injury, of relieving pain, and of preserving and improving human health, using molecular tools and molecular knowledge of the human body**
- **the employment of molecular machine systems to address medical problems, using molecular knowledge to maintain and improve human health at the molecular scale."**
- **Nanotech NOW http://www.nanotech-now.com/nanotechnology-medicine-glossary.htm**

NBIC-medicine Taxonomy (Canada)

Nanomedicine Taxonomy

Biopharmaceutics

Drug Delivery

- Drug Encapsulation
- Functional Drug Carriers

Drug Discovery

Implantable Materials

Tissue Repair and Replacement

- Implant Coatings
- Tissue Regeneration Scaffolds

Structural Implant Materials

- Bone Repair
- Bioresorbable Materials
- Smart Materials

Implantable Devices

Assessment and Treatment Devices

- Implantable Sensors
- Implantable Medical Devices

Sensory Aids

- Retina Implants
- Cochlear Implants

Surgical Aids

Operating Tools

- Smart Instruments
- Surgical Robots

Diagnostic Tools

Genetic Testing

- Ultra-sensitive Labeling and Detection Technologies
- High Throughput Arrays and Multiple Analyses

Imaging

- Nanoparticle Labels
- Imaging Devices

Understanding Basic Life Processes

Nanomedicine Taxonomy Briefing Paper, by Neil Gordon and Uri Sagman
http://www.regenerativemedicine.ca/nanomed/Nanomedicine%20Taxonomy%20(Feb%202003).PDF

NBIC-Medicine Taxonomy

Table 1
A partial nanomedicine technologies taxonomy

Raw nanomaterials	**Cell simulations and cell diagnostics**	**Biological research**
Nanoparticle coatings	Cell chips	Nanobiology
Nanocrystalline materials	Cell simulators	Nanoscience in life sciences
Nanostructured materials	**DNA manipulation, sequencing, diagnostics**	**Drug delivery**
Cyclic peptides	Genetic testing	Drug discovery
Dendrimers	DNA microarrays	Biopharmaceutics
Detoxification agents	Ultrafast DNA sequencing	Drug delivery
Fullerenes	DNA manipulation and control	Drug encapsulation
Functional drug carriers		Smart drugs
MRI scanning (nanoparticles)	**Tools and diagnostics**	
Nanobarcodes	Bacterial detection systems	**Molecular medicine**
Nanoemulsions	Biochips	Genetic therapy
Nanofibers	Biomolecular imaging	Pharmacogenomics
Nanoparticles	Biosensors and biodetection	
Nanoshells	Diagnostic and defense applications	**Artificial enzymes and enzyme control**
Carbon nanotubes	Endoscopic robots and microscopes	Enzyme manipulation and control
Noncarbon nanotubes	Fullerene-based sensors	
Quantum dots	Imaging (cellular, etc.)	**Nanotherapeutics**
	Lab on a chip	Antibacterial and antiviral nanoparticles
Artificial binding sites	Monitoring	Fullerene-based pharmaceuticals
Artificial antibodies	Nanosensors	Photodynamic therapy
Artificial ezymes	Point of care diagnostics	Radiopharmaceuticals
Artificial receptors	Protein microarrays	
Molecularly imprinted polymers	Scanning probe microscopy	**Synthetic biology and early nanodevices**
		Dynamic nanoplatform “nanosome”
Control of surfaces	**Intracellular devices**	Tecto-dendrimers
Artificial surfaces—adhesive	Intracellular assay	Artificial cells and liposomes
Artificial surfaces—nonadhesive	Intracellular biocomputers	Polymeric micelles and polymersomes
Artificial surfaces—regulated	Intracellular sensors/reporters	
Biocompatible surfaces	Implants inside cells	**Biotechnology and biorobotics**
Biofilm suppression		Biologic viral therapy
Engineered surfaces	**BioMEMS**	Virus-based hybrids
Pattern surfaces (contact guidance)	Implantable materials and devices	Stem cells and cloning
Thin-film coatings	Implanted bioMEMS, chips, and electrodes	Tissue engineering
	MEMS/Nanomaterials-based prosthetics	Artificial organs
	Sensory aids (artificial retina, etc.)	Nanobiotechnology
Nanopores	Microarrays	Biorobotics and biobots
Immunoisolation	Microcantilever-based sensors	
Molecular sieves and channels	Microfluidics	**Nanorobotics**
Nanofiltration membranes	Microneedles	DNA-based devices and nanorobots
Nanopores	Medical MEMS	Diamond-based nanorobots
Separations	MEMS surgical devices	Cell repair devices

NBIC medicine

US NANOTECHNOLOGY HEALTH CARE PRODUCTS DEMAND(million dollars)					
Item	2004	2009	2014		
Nanotech Health Care Product Demand	906	6500	27700		
Pharmaceuticals	406	3000	16600		
Diagnostics	465	1100	2200		
Medical Supplies & Devices	35	2400	8900		

US NANOTECHNOLOGY HEALTH CARE PRODUCT DEMAND TO REACH $6.5 BILLION IN 2009;
http://www.the-infoshop.com/press/fd29054_en.shtml

NBIC-Medicine

Table 6: Market Drivers and Relevant Nanotechnology Impacts in Pharmaceuticals, Biotechnology & Medical Devices

Drivers	Nanotechnology Impacts
Detection	❑ Lab-on-a-chip Drug discovery ❑ Micro/Nanofluidic systems Highly specific detection and analysis capabilities ❑ Nanowires Cancer detection ❑ Nanopores DNA sequencing
Targeted Drug delivery systems	❑ Nanoparticulates Nano delivery systems that can be readily adsorbed into the bloodstream; nanospheres; nanocapsules; nanocrystals; inhalation technology ❑ Dendrimers High drug-carrying capacity ❑ Nanoporous membranes Turnstiles for releasing drugs
Biocompatible implants	❑ Nanocoatings Coronary stents; cell friendly environment ❑ Nanocomposites High resistance to damage and biocompatible
Bone and tissue regeneration	❑ Nanostructured materials As templates for growth ❑ Nanoparticles In bone cement

Source: Institute of Nanotechnology

Research, Applications and Markets in Nanotechnology in Europe The Institute of Nanotechnology Section 1http://www.researchandmarkets.com/reportinfo.asp?report_id=302091&t=t&cat_id=4

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Appendix V

Nanomedicines in Routine Clinical Use or Clinical Development

Liposomal formulations in clinical use and clinical development

Product	Status	Payload	Indication
Daunoxome®	Market	daunorubicin	cancer
Doxil®/Caelyx®	Market	doxorubicin	cancer
Myocet®	Market	doxorubicin	cancer
Ambisome®	Market	amphotericin B	fungal infections
Amphotech®	Market	amphotericin B	fungal infections

Monoclonal antibody-based products in the market

Antibody	Target	Payload	Use
Therapeutic antibodies			
Rituxan®	CD20	inherent activity	CD20+ve Non-Hodgkin's Lymphoma
Herceptin®	HER2	inherent activity	HER2 +ve breast cancer
Antibody-drug conjugates			
Mylotarg®	CD33	calicheamicin	Acute Myeloid Leukaemia
Radioimmunotherapeutics			
Tositumomab®	CD20	$[^{131}I]$iodide	Non-Hodgkin's Lymphoma-targeted radiotherapy
Zevalin®	CD20	^{90}Yttrium	Non-Hodgkin's Lymphoma-targeted radiotherapy
Immunotoxins			
Anti-B4-blocked ricin	CD19	blocked ricin	Non-Hodgkin's lymphoma targeted immunotoxin
Anti-Tac(Fv)-PE38 (LMB2)	CD25	*Pseudomonas* exotoxin fusion protein	Haematological malignancies
PEG-antiTNF Fab CDP870	TNFα	Phase III	Rheumatoid arthritis and Crohn's disease

ESF Forward Look on Nanomedicine 2005
http://www.esf.org/publication/214/Nanomedicine.pdf

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Nanoparticles as imaging agents and drug carriers

Product	Compound	Status	Use
Imaging Agents			
Endorem®	superparamagnetic iron oxide nanoparticle	Market	MRI agent
Gadomer®	Dendrimer-based MRI agent	Phase III	MRI agent-cardiovascular
Drug delivery			
Abraxane®	Albumin nanoparticle containing paclitaxel	Market	Breast cancer

Polymer Therapeutics in the market or transferred into clinical development

Compound	Name	Status	Indication
Polymeric drugs			
Poly(alanine, lysine, glutamic acid, tyrosine)	Copaxone®	Market	Multiple sclerosis
Poly(allylamine)	Renagel®	Market	End stage renal failure
Dextrin-2-sulphate	Emmelle® gel	Market	Phase III HIV/AIDS - a vaginal virucide formulated as a gel
Dextrin-2-sulphate		Phase III	HIV/AIDS - polymer administered intraperitoneally
Poly(I):Poly(C)	Ampligen®	Phase III	Chronic fatigue immune dysfunction (myalgic encephalomyelitis; ME)
Polyvalent, polylysine dendrimer containing SPL7013	VivaGel™	Phase I/II	Viral sexually transmitted diseases, formulated as a vaginal gel
Polymer-oligonucleotide conjugates			
PEG-aptamer	Macugen™	NDA filed	Age-related macular degeneration
Polymer-protein conjugates			
PEG-adenosine deaminase	Adagen®	Market	Severe combined immuno-deficiency syndrome
SMANCS	Zinostatin Stimalmer®	Market	Cancer - hepatocellular carcinoma
PEG-L-asparaginase	Oncaspar®	Market	Acute lymphoblastic leukamia
PEG-a-interferon 2b	PEG-intron™	Market	Hepatitis C, also in clinical development in cancer, multiple sclerosis, HIV/AIDS
PEG-a-interferon 2a	PEG-Asys®	Market	Hepatitis C
PEG-human growth hormone	Pegvisomant®	Market	Acromegaly
PEG-GCSF	Neulasta™	Market	Prevention of neutropenia associated with cancer chemotherapy
PEG-antiTNF Fab	CDP870	Phase III	Rheumatoid arthritis and Crohn's disease
Polymer-drug conjugates			
Polyglutamate-paclitaxel	CT-2103, XYOTAX™	Phase II/III	Cancer -particularly lung cancer, ovarian and oesophageal
HPMA copolymer-doxorubicin	PK1; FCE28068	Phase II	Cancer -particularly lung and breast cancer
HPMA copolymer-doxorubicin-galactosamine	PK2; FCE28069	Phase I/II	Cancer -particularly hepatocellular carcinoma
HPMA copolymer-paclitaxel	PNU166945	Phase I	Cancer
HPMA copolymer camptothecin	MAG-CPT / PNU166148	Phase I	Cancer
HPMA copolymer platinate	AP5280	Phase II	Cancer
HPMA copolymer platinate	AP5346	Phase I/II	Cancer
Polyglutamate-camptothecin	CT-2106	Phase I/II	Cancer
PEG-camptothecin	PROTHECAN™	Phase II	Cancer
Polymeric micelles			
PEG-aspartic acid-doxorubicin micelle	NK911	Phase I	Cancer

ESF Forward Look on Nanomedicine
2005 http://www.esf.org/publication/214/Nanomedicine.pdf

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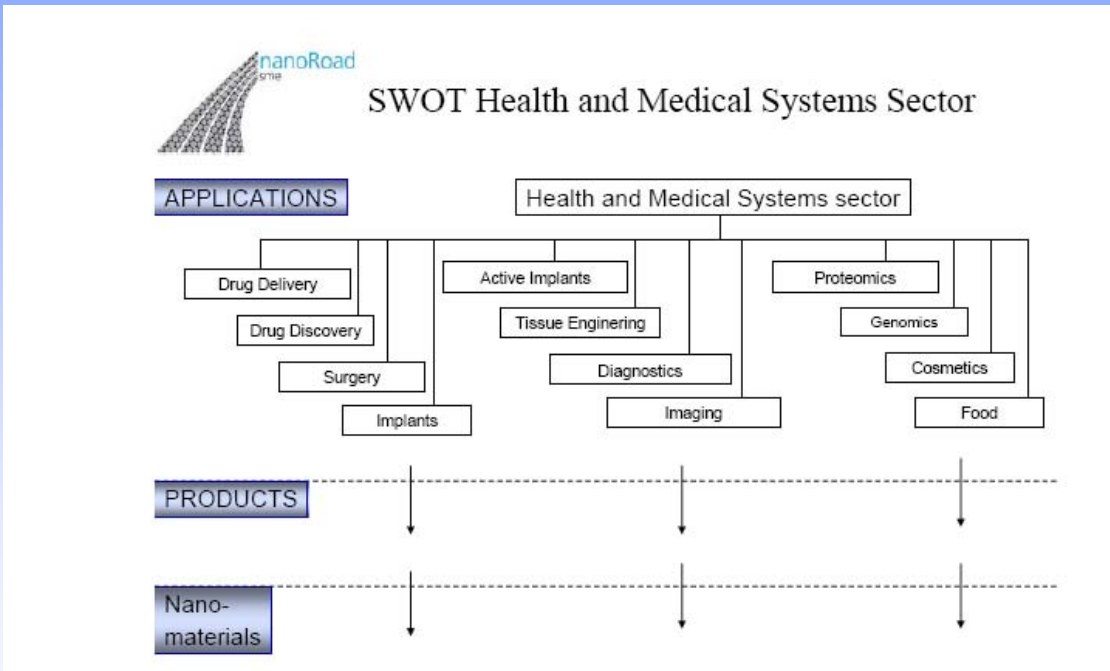

http://www.nanoroad.net/index.php?topic=download; http://www.nanoroad.net/download/roadmap_mh.pdf

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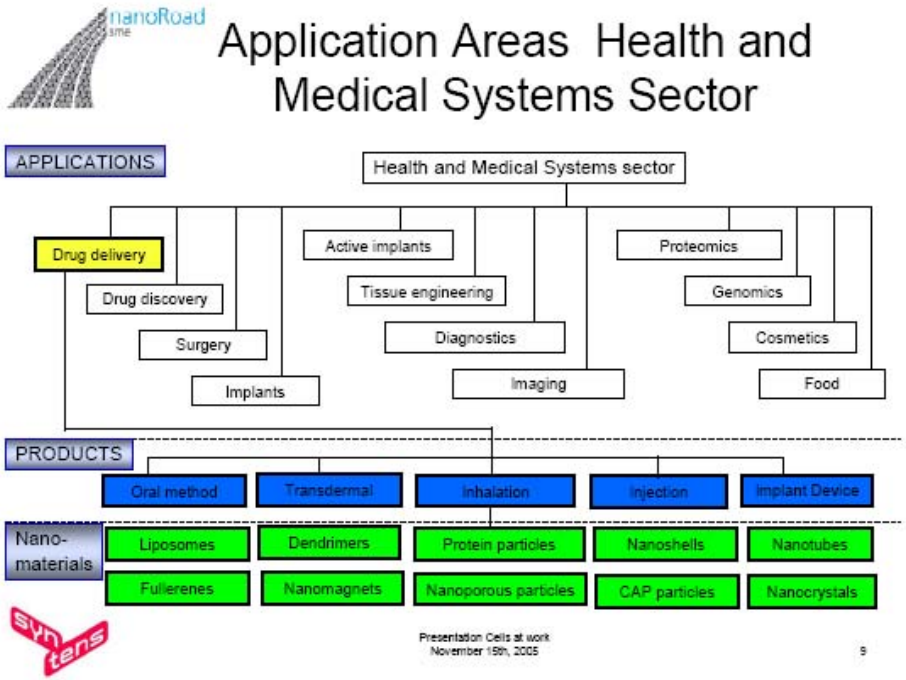

Figure 9: Breakdown structure Drug Delivery

http://www.nanoroad.net/index.php?topic=download; http://www.nanoroad.net/download/roadmap_mh.pdf

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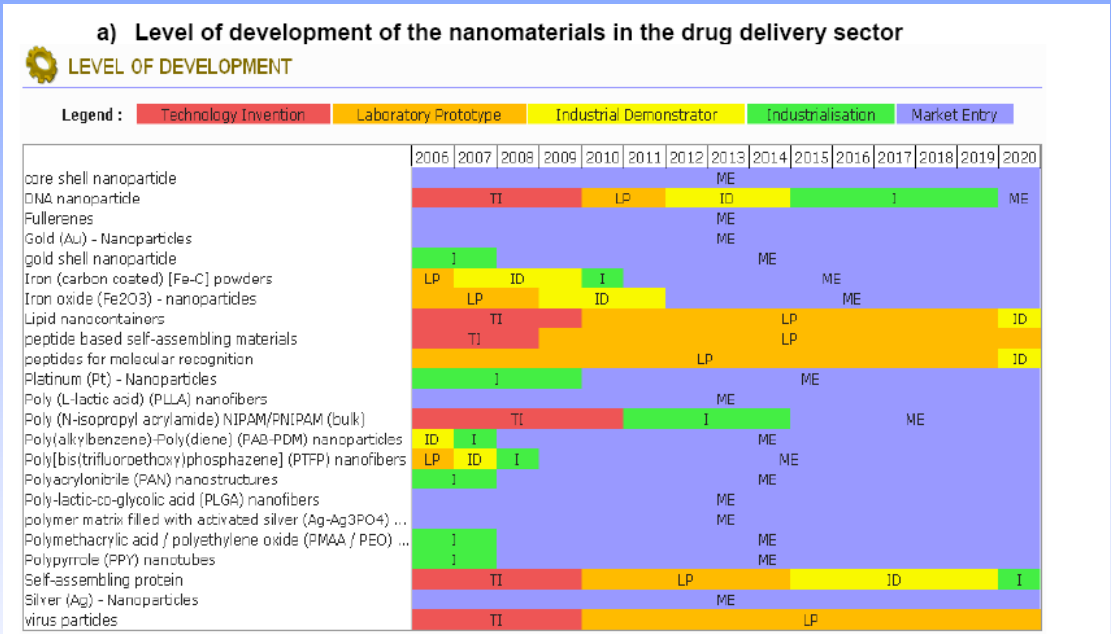

Figure 6: Level of development of nanomaterials for drug delivery - Nanoparticles, bio-nanomaterials and polymers are the important nanomaterial groups. According to experts the bio-nanomaterials will take the longest time to enter the market.

http://www.nanoroad.net/index.php?topic=download; http://www.nanoroad.net/download/roadmap_mh.pdf

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b) Time frame of possible industrial applications of the nanomaterials for the drug delivery sector

APPLICATIONS

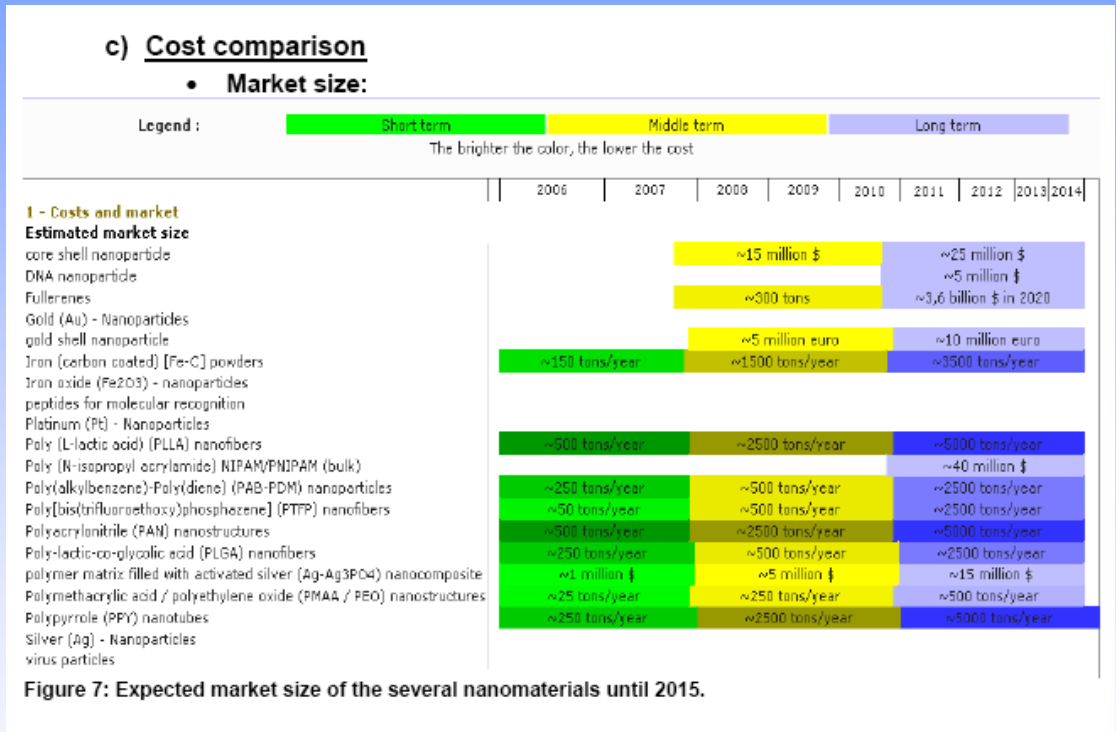
List of specific applications corresponding to search criteria

	Unspecified	0 - 2 years	3 - 5 years	6 - 10 years
core shell nanoparticle				- drug delivery - radiation therapy
DNA nanoparticle				- gene therapy
Fullerenes	- Drugdelivery			
Gold (Au) - Nanoparticles				- Therapeutic treatments
gold shell nanoparticle				- drug delivery implants
Iron (carbon coated) [Fe-C] powders			- Local drug delivery	
Iron oxide (Fe2O3) - nanoparticles		- paints and coatings		
Lipid nanocontainers		- drug delivery		
peptide based self-assembling materials				- responsive peptide nanostructures
peptides for molecular recognition			- Targeting by peptides	
Platinum (Pt) - Nanoparticles				- therapeutic treatments
Poly (L-lactic acid) (PLLA) nanofibers		- Drug delivery		
Poly (N-isopropyl acrylamide) N[PAM/PN]PAM (bulk)				- drug delivery
Poly(alkylbenzene)-Poly(diene) (PAB-PDM) nanoparticles		- Drug delivery and blood applications		
Poly[bis(trifluoroethoxy)phosphazene] (PTFP) nanofibers			- Drug delivery	
Polyacrylonitrile (PAN) nanostructures		- Filtering nanomembranes		
Poly-lactic-co-glycolic acid (PLGA) nanofibers		- Drug delivery nanocapsules and nanospheres		
polymer matrix filled with activated silver (Ag-Ag3PO4) nanocomposite		- antimicrobial, antibacterial and antifungal materials		
Polymethacrylic acid / polyethylene oxide (PMAA / PEO) nanostructures			- Carrier degradable capsules	
Polypyrrole (PPY) nanotubes		- Controlled release of drugs and pigment		
Self-assembling protein			- chaperon - hydrophobin - s-layer protein	
Silver (Ag) - Nanoparticles		- Antimicrobial, antibacterial and antifungal materials		
virus particles				- virus material

Table 2: Possible applications of the nanomaterials in the drug delivery sector in dependence of a short (0-2 years), mid (3-5 years) and long term (5-10 years) view.

http://www.nanoroad.net/index.php?topic=download; http://www.nanoroad.net/download/roadmap_mh.pdf

NBIC-Medicine



c) **Cost comparison**

- **Market size:**

Legend : Short term | Middle term | Long term

The brighter the color, the lower the cost

1 - Costs and market	2006	2007	2008	2009	2010	2011	2012	2013	2014
Estimated market size									
core shell nanoparticle				~15 million $		~25 million $			
DNA nanoparticle						~5 million $			
Fullerenes				~300 tons		~3,6 billion $ in 2020			
Gold (Au) - Nanoparticles									
gold shell nanoparticle				~5 million euro		~10 million euro			
Iron (carbon coated) [Fe-C] powders			~150 tons/year	~1500 tons/year		~3500 tons/year			
Iron oxide (Fe2O3) - nanoparticles									
peptides for molecular recognition									
Platinum (Pt) - Nanoparticles									
Poly (L-lactic acid) (PLLA) nanofibers			~500 tons/year	~2500 tons/year		~5000 tons/year			
Poly (N-isopropyl acrylamide) NIPAM/PNIPAM (bulk)						~40 million $			
Poly(alkylbenzene)-Poly(diene) (PAB-PDM) nanoparticles			~250 tons/year	~500 tons/year		~2500 tons/year			
Poly[bis(trifluoroethoxy)phosphazene] (PTFP) nanofibers			~50 tons/year	~500 tons/year		~2500 tons/year			
Polyacrylonitrile (PAN) nanostructures			~500 tons/year	~2500 tons/year		~5000 tons/year			
Poly-lactic-co-glycolic acid (PLGA) nanofibers			~250 tons/year	~500 tons/year		~2500 tons/year			
polymer matrix filled with activated silver (Ag-Ag3PO4) nanocomposite			~1 million $	~5 million $		~15 million $			
Polymethacrylic acid / polyethylene oxide (PMAA / PEO) nanostructures			~25 tons/year	~250 tons/year		~500 tons/year			
Polypyrrole (PPY) nanotubes			~250 tons/year	~2500 tons/year		~5000 tons/year			
Silver (Ag) - Nanoparticles									
virus particles									

Figure 7: Expected market size of the several nanomaterials until 2015.

http://www.nanoroad.net/index.php?topic=download; http://www.nanoroad.net/download/roadmap_mh.pdf

NBIC-Medicine

- **Material costs:**

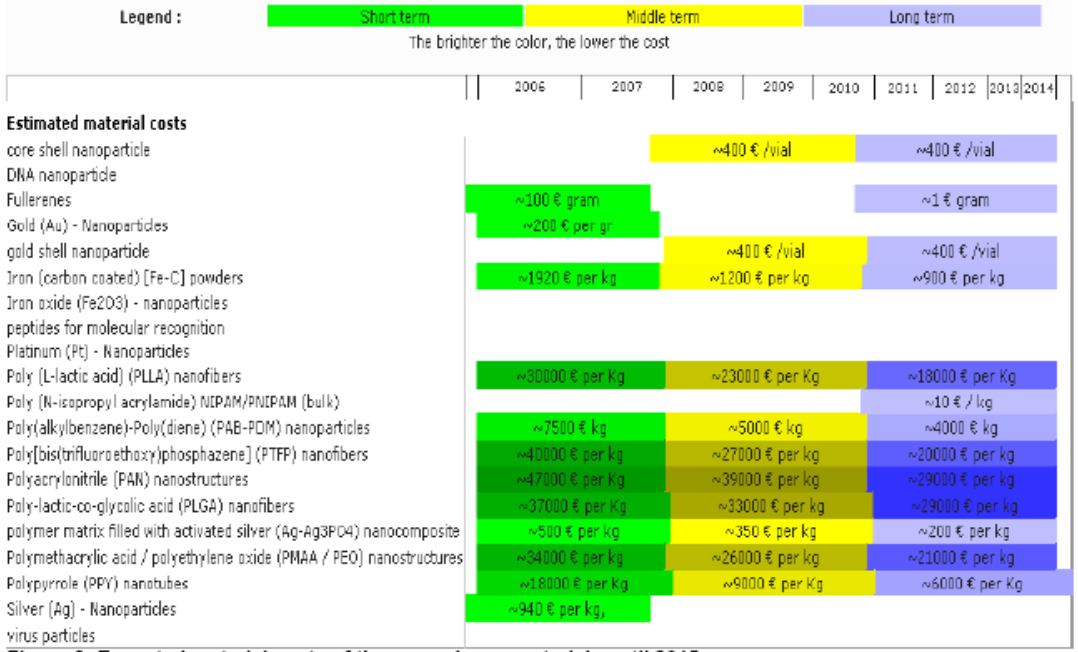


Figure 8: Expected material costs of the several nanomaterials until 2015.

http://www.nanoroad.net/index.php?topic=download; http://www.nanoroad.net/download/roadmap_mh.pdf

Products just arriving or anticipated

- Brain–machine interfaces;
- chips replacing the memory part of the brain
- bionic implants: bionic ears, eyes, legs and arms, knees, joints, kidney, liver, lungs, discs, muscles, artificial nose and tongue functions;
- neural and spinal cord prostheses;
- artificial womb;
- newly designed life-forms (synthetic biology);
- enhanced animals,
- Stem cell technology (embryonic, umbilicord, placenta and adult derived) used for numerous purposes
- Nano-formulated drugs, drug delivery systems, herbs,….
- longevity immortality products,
- Star trek style food replicator (molecular manufacturing)

Paradigm changes

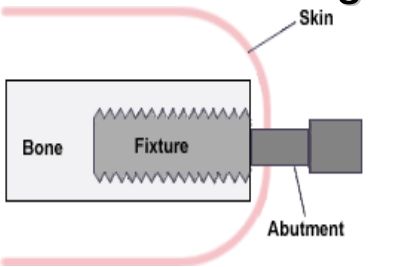
- **Moving from Species-typical functioning to Beyond species-typical functioning**
- **Moving from curative to enhancement medicine**
- **Moving from human rights to sentient rights**
- **Moving from the ‘subnormative’’disabled’ towards the techno poor disabled**
- **Moving from Disability Studies to Vari-Abilities Studies**
- **Moving from nature based commodities (i.e. cooper, rubber) towards nanoformulated commodities towards atomic commodities (molecular manufacturing)**

NBIC-Medicine/NBIC-enhancement

http://www.3sat.de/3sat.php?http://www.3sat.de/nano/bstuecke/64605

NBIC-Medicine/NBIC-enhancement

http://www.amputee-coalition.org/communicator/vol2no3pg4.html



The process termed "osseoperception" refers to the adjustment of the mind to an osseointegrated prosthesis. The implication is that bone-integrated prosthetic fixtures "communicate" with the mind, via numerous neural pathways, to promote near-normal function of the prosthetic limb and improved psychological acceptance. Beethoven, who held a pencil between his teeth and touched the pencil to the piano keys to help him "hear" the music, illustrates a primitive form of this concept. Similarly, patients can perceive their environment through their osseointegrated prosthetic device. A self-reported incident even describes a patient sensing, through his artificial leg, what type of subfloor was beneath a carpet.

The Road to Enhancement Medicine

The concept of health/Relationship between health and wellbeing:

- **WHO model considers different domains of well-being as determinants of the umbrella term “health” combining the areas of “medical health” and “social health” under the term “health”.**
- **Non-WHO models of health and wellbeing set**
- **a) "wellbeing" as the umbrella term, and define health as "the absence of disease and illness“ limits the term “health” to mean “medical health”/”medical illness”. “Health” is used to cover the domain of "medical" determinant of "wellbeing."**
- **or b) health beside wellbeing**

The Road to Enhancement Medicine

Model of health and disease

- The old models
- M**edical model of health and disease** with medical and social determinants
- Social model of health and disease which looks at the social wellbeing
- **Medical model of disability/impairment with medical and social determinants**
- **Social model of disability/impairment which looks at the social wellbeing**

The Road to Enhancement Medicine

The new kid on the block: the transhumanist/enhancement model of health

–the concept of health no longer had the endpoint that someone is "healthy" if the biological systems function within species-typical, normative frameworks. Within the transhumanist/enhancement model all Homo sapiens bodies – no matter how conventionally "medically healthy" – are defined as limited and defective in need of constant improvement made possible by new technologies appearing on the horizon (a little bit like the constant software upgrades we do on our computers). Health in this model is the concept of having obtained maximum (at any given time) enhancement (improvement) of one's abilities, functioning and body structure.. Disease, in this case, is identified in accordance with a negative self-perception (confined to the 'normal' human body) of ones non-enhanced body. Medical and technological interventions on the level of the individual that add new abilities to the human body or improve on existing abilities are seen as necessary remedies. Enhancement medicine is the new field providing the remedy through surgery, pharmaceuticals, implants and other means.

The Road to Enhancement Medicine

The new kid on the block: the transhumanist/enhancement model of health

Health/healthy not = species-typical, normative functioning.

Homo sapiens bodies = limited and defective till obtained maximum (at any given time) enhancement (improvement) of one's abilities, functioning and body structure..

Disease = negative self-perception

Enhancement medicine is the new field adding new abilities to the human body or improves on existing abilities through surgery, pharmaceuticals, implants and other means

The Road to Enhancement Medicine

Transhumanist/enhancement of "disability/impairment"

The transhumanist/enhancement model of health, disease, disability, and well-being perceives the human body in general as defective or as a work in progress. This sentiment is the ultimate endpoint of the existing medicalization of the "healthy", where perfectly healthy persons are made to feel badly about their appearances or functioning. The transhumanist/enhancement model of health and disease elevates the **medicalization** dynamic to its ultimate endpoint, namely, to see the enhancement beyond species-typical body structures and functioning as a therapeutic intervention (**transhumanization of medicalization**).

The Road to Enhancement Medicine

Transhumanist/enhancement of "disability/impairment"

Human body

=defective

= work in progress

=endpoint of the existing medicalization of the "healthy",

= elevates the **medicalization** dynamic by adding enhancement beyond species-typical body structures and functioning as a therapeutic intervention (**transhumanization of medicalization**).

Where do we go from here?

Characteristics of the three models of health

	Medical Model Medical/Social Determinants	Social Model WHO/Canadian Index on Well-being	Transhumanist/ enhancement Model
Individualistic approach/ health	+++/0	+---/+++	+++++
Deficiency/problem within the person or person to be	+++/0	0/+++	+++
Based on a norm/standard	+++/++	+++	0 or constantly shifting toward enhancing the norm
Body modification (appearance and functionality)	+/0	0/0 or +	+++
Acceptance of human performance enhancement	0 or+/0	0/0 or +	+++++
Enhancement part of medicalization	0 or+/0	0/0 or +	+++++
Life extension/ immortality/cryonics through bodily interventions	0 or +/0	0/0 or +	+++++
Model of health enticing to disabled people	+++ Switching over to transhumanist/+	++ But frustrating because of lack of acceptance of social model of disability; people might also move to transhumanist/enhancement model//0 switching over to transhumanist	+++
Subject is a patient	+++/0 or +	---/+++	+++
Subject is a “health” product consumer	+++/0	0/+++	++++++

+ means impacted by, 0 means not much impacted by, – means negatively impacted by, N/A means

Where do we go from here?

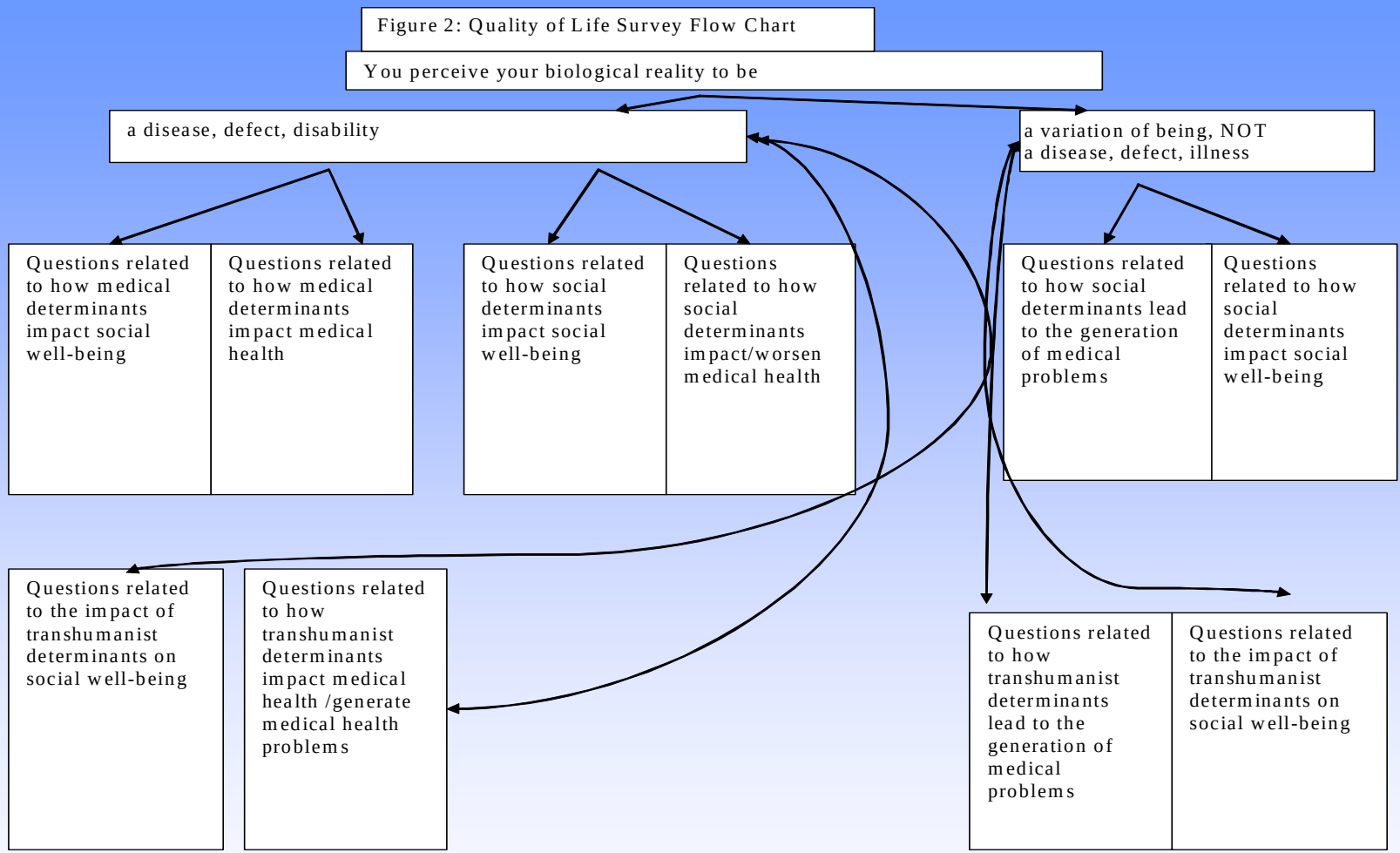
Table 3: Implication of NBIC advances/transhumanist/enhancement model and determinants

	Provincial Government Funding	Health Authority Delivery	Healthcare Delivery	Providers	Global Health	For Disabled People	Dealing with Disabled People	Public Health
Mandate change	+++	++	+++	++	++	N/A	+++	+++
Scope change	+++	++	+++	++++	+++	++++	+++	+++
Money needed	+++++	++++	++++	++++	++++	++++	++++	++++
Human resources needed	++++	++++	++++	++++	++++	++++	++++	++++
Access to service	++++	++	+++++	+++	+++	+++	N/A	+++
Medically necessary	+++++	+++++	+++++	+++++	++ or 0	+++++		++++
Enhanced medical good	++++	++	++	++	0	++++	++++	++++
Enhanced medical good becoming “normal medical goods”	+++++	++++	++++	+++	0	++++	++++	++++
Quality of care	++++	Dept on funding – or 0 or ++	Dept on funding – or 9 or ++	Dept on funding – or 0 or ++	0	Dept on funding – or 0 – or ++	N/A	Dept on funding – or 0 or ++

Where do we go from here?

	Provincial Government Funding	Health Authority Delivery	Healthcare Delivery	Providers	Global Health	For Disabled People	Dealing with Disabled People	Public Health
Reduction of risk	N/A	) or --	0 or --	N/A	N/A	0 or --	0 or --	0 or --
Provision of alternative in the beginning	+++	+++	+++	+++	0	+++	+++	++++
Provision of alternative can become the new norm	+++	+++	+++	+++	9	+++	+++	++++
Credentialing	++++	++++	++++	++++	0	N/A	+++	N/A or +++
Efficacy	0 or --	0 or --	0 or --	0 or --	---	N/A	N/A	0 or --
Safety	Needs more funding	Impacted	Impacted	Impacted	Impacted	N/A	Impacted	Impacted
Effectiveness	0 or --	0 or --	0 or --	0 or --	0 or --	N/A	++ or 0	0 or --
Cost-effectiveness	0 or --	0 or --	0 or --	0 or --	0 or --	N/A	N/A	---
Control of diffusion	--- Decrease in control	--- Decrease in control	--- Decrease in control	--- Decrease in control	--- Decrease in control	N/A	N/A	--- Decrease in control
Dealing with disabled	++ or 0 or --	++ or 0 or --	++ or 0 or --	++ or 0 or --	++ or 0 or --	N/A	N/A	+++

Figure 2: Quality of Life Survey Flow Chart



Policy implications

- Inevitability of enhancement
- +
- Increased popularity of the transhumanist model
- +
- The dynamic of medicalization,
- +
- Transhumanization of medicalization,
- =
- Enhancement medicine to become a growing, flourishing field of medicine providing the remedy through surgery, pharmaceuticals, implants and other means.

Policy implications

GETTING ON WITH BETTER HEALTH CARE Message from Honourable Iris Evans Minister of Health and Wellness Action 8: Make changes to legislation and regulations September 2005

- Provide choice in enhanced medical goods and services People will be able to choose enhanced medical goods and services beyond what doctors decide is medically necessary – for example, a special kind of hip replacement. Regional health authorities will be able to charge reasonable fees for enhanced goods and services over and above basic services.

http://www.health.gov.ab.ca/Key/reform/AHW_WebFinal_REV.pdf

Policy implications

“Enhancement medicine" favoured over "curative medicine“?

Murray the designer of the Disability Adjusted life years
“In fact, as shown above the results are quite consistent across groups that individuals prefer, after appropriate deliberation, to extend the life of healthy individuals rather than those in a health state worse than perfect health” (p.726).”
Murray C, Acharaya AK. Understanding DALYs. J Health Econ 1997;16:703-730.

It might lead to the reality that basic ‘medical good’ with no performance productivity upsite will be deinsured/ seen as futile care and enhanced medical goods with a performance productivity upsite will become insured.

Policy implications

Chaoulli decision is interpreted

- **as supporting right to health/health care**
- **as supporting a two-tiered healthcare system.**
- **as linked to article 15(1), “equal benefit in front of the law”.**

Policy implications for HTA

Problem 1: Impact of the models of health and wellbeing on the scope, process, direction, and outcome of HTA.

CCOHTA/CADTH definition of HTA

Health technology assessment (HTA) is the process of systematically reviewing existing evidence and providing an evaluation of the effectiveness, cost effectiveness and impact, both on patient health and on the health care system, of medical technology and its use.

2005 https://www.ccohta.ca/entry_e.html.

- On one side of the spectrum, every intervention applied to the human body could be classified as a medical intervention and therefore seen as a medical technology if one follows the transhumanist/enhancement model of health disease, disability, and well-being.

Policy implications for HTA

- **On the other side of the spectrum, if one follows the WHO scenario of health and the social model of health, disease, disability, and well-being, health technology is much more than medical, clinical technology and the above HTA definition might be too narrow**

- **Increase in HTA-eligible technologies increases the need For Money and human resources in order to be able to fulfill The HTA mandate.**

- **Other assessment methods such as HIA, HNA, STA, SIA, and social well being needs assessment might be needed if HTA does that cover social well-being to give policy makers and others a complete picture regarding the impact of any given "health" technology.**

Policy implications for HTA

Problem 2: Who is a patient and why? The increase in the number of patients/health /healthcare consumer (techno poor disabled)

Transhumanist model
=
Every human being a patient and therefore a client for HTA
=

increase the need for money and human resources

Policy implications for HTA

Problem 3: Biased languages within HTA assessment
A useful tool is the BIAS FREE Framework
Building an Integrative Analytical System For Recognizing and Eliminating InEquities,
a tool which development I was involved with and which was designed to provide a unified approach to detect biases that derive from any and all social hierarchies.

The BIAS FREE Framework: A New Analytical Tool for Global Health Research Margrit Eichler; Mary Anne Burke Canadian Journal of Public Health; Jan/Feb 2006; 97, 1; CBCA Complete pg. 63-68

Policy implications for HTA

TABLE Ia
Maintaining an Existing Hierarchy, THE *BIAS FREE* FRAMEWORK

Type of Bias	Diagnostic Questions	Solutions	Research Component	Types of Hierarchy
H—Maintaining an Existing Hierarchy *Is dominance of one group over the other in any way justified or maintained?*	**H1 Denying hierarchy:** Is the existence of a hierarchy denied in spite of widespread evidence to the contrary?	*Acknowledge the existence of a hierarchy; question and reject its validation.*	Title Abstract Executive summary Literature review Research proposal/call for proposal Research question and design Research methods Data analysis and interpretation Concepts Language Policy recommendations	Gender Disability Race/Ethnicity Class Caste Age Religion Sexual orientation Geographic location Income Health status (among others)
	H2 Maintaining hierarchy: Are practices or views that are based on a hierarchy presented as normal or unproblematic?	*Question and problematize expressions of hierarchies.*		
	H3 Dominant perspective: Is the perspective or standpoint of the dominant group adopted?	*Respect and accept the perspectives of non-dominant and dominant groups.*		
	H4 Normalization: Are norms derived from the dominant group and then applied to the nondominant group without questioning their relevance?	*Acknowledge diversity; exclude norms derived from a social hierarchy.*		
	H5 Pathologization: Is the non-dominant group defined as deficient when it differs from the norms derived from the dominant group?	*Challenge the norm and address the reasons given for defining the group as deficient.*		
	H6 Objectification: Is stripping people of their intrinsic dignity and personhood presented as normal or unproblematic?	*Recognize that every human is a person with intrinsic dignity and human rights that are inviolable and must be protected.*		
	H7 Victim blaming: Are victims of personal or societal/systemic violence blamed and held accountable?	*Do not blame victims; identify individual, societal and systemic violence; and hold accountable those responsible.*		
	H8 Appropriation: Is ownership claimed by the dominant group for entities that originate(d) in or belong to the nondominant group?	*Acknowledge and respect original ownership.*		

Margrit Eichler; Mary Anne Burke Canadian Journal of Public Health; Jan/Feb 2006; 97, 1; CBCA Complete pg. 63-68

Policy implications for HTA

TABLE Ib

Failing to Examine Differences, THE *BIAS FREE* FRAMEWORK

Type of Bias	Diagnostic Questions	Solutions	Research Component	Types of Hierarchy
F—Failing to Examine Differences *Is membership in a non-dominant/ dominant group examined as socially relevant and accommodated?*	**F1 Insensitivity to difference:** Has the relevance of membership in dominant/ non-dominant group been ignored?	*Always determine the relevancy of dominant/non-dominant group membership; include group membership as an analytical variable throughout the activity so that its relevancy can be assessed.*	Title Abstract Executive summary Literature review Research proposal/Call for proposal Research question and design Research methods Data analysis and interpretation Concepts Language Policy recommendations	Gender Disability Race/Ethnicity Class Caste Age Religion Sexual orientation Geographic location Income Health status (among others)
	F2 Decontextualization: Has the different social reality of dominant and non-dominant groups explicitly been considered?	*Explicitly examine the context with respect to dominant/non-dominant group membership and identify and analyze differences following from this.*		
	F3 Over-generalization or universalization: Is information derived from dominant groups generalized to non-dominant groups without examining if it is applicable to the non-dominant groups?	*Acknowledge information about the dominant group, and make efforts to obtain information about the non-dominant group.*		
	F4 Assumed homogeneity: Is the dominant or non-dominant group treated as a uniform group?	*Acknowledge and take into account differences within dominant and non-dominant groups.*		

Margrit Eichler; Mary Anne Burke Canadian Journal of Public Health; Jan/Feb 2006; 97, 1; CBCA Complete pg. 63-68

Policy implications for HTA

TABLE Ic

Using Double Standards, THE *BIAS FREE* FRAMEWORK

Type of Bias	Diagnostic Questions	Solutions	Research Component	Types of Hierarchy
D—Using Double Standards *Are nondominant/ dominant groups dealt with differently?*	**D1 Overt double standard:** Are nondominant and dominant groups treated unequally?	*Provide equal treatment to members of dominant and non-dominant groups to increase equity.*	Title Abstract Executive summary Literature review Research proposal/Call for proposal Research question and design Research methods Data analysis and interpretation Concepts Language Policy recommendations	Gender Disability Race/Ethnicity Class Caste Age Religion Sexual Orientation Geographic Location Income Health Status (among others)
	D2 Underrepresentation or exclusion: Are non-dominant groups under-represented or excluded?	*Include non-dominant groups to verify their relevancy.*		
	D3 Exceptional under-representation or exclusion: In contexts normally associated with non-dominant groups, but pertinent to all groups, is the dominant group underrepresented or excluded?	*Appropriately represent and/or include dominante groups in issues of relevance to them that have been stereotyped as being important only for a non-dominant group.*		
	D4 Denying agency: Is there a failure to consider nondominant/dominant groups as both actors and acted upon?	*Examine ways in which dominant and non-dominant groups are both acting as well as acted upon.*		
	D5 Treating dominant opinions as facts: Are opinions expressed by a dominant group about a nondominant group treated as opinion or fact?	*Treat opinions expressed by dominant groups about non-dominant groups as opinions, not fact.*		
	D6 Stereotyping: Are stereotypes of non-dominant/ dominant groups treated as essential aspects of group membership?	*Treat stereotypes as stereotypes, not as truths, and work towards abolishing them or ensure they are excluded.*		
	D7 Exaggerating differences: Are overlapping traits treated as if they were characteristic of only non-dominant / dominant groups?	*Document both the differences and the similarities between members of non-dominant and dominant groups.*		
	D8 Hidden double standard: Are different criteria used to define comparable facts with the effect of hiding their comparability?	*Ask whether there might be a hidden double standard by looking for non-obvious parallels. One way of achieving this is by asking what form the phenomenon identified within one group might take within another group.*		

Margrit Eichler; Mary Anne Burke Canadian Journal of Public Health; Jan/Feb 2006; 97, 1; CBCA Complete pg. 63-68

Policy implications for HTA

Problem 4: Who is part of the HTA team?
Problem 5: Horizon timeline too short
Problem 6: Lack of coverage of social implications and lack of inclusion of the voices on marginalized groups
Problem 7: Missing ethical framework
Problem 8: HTA and disabled people

Policy implications for HTA

Problem 9 Evaluation, measuring, analysis, and outcome tools and EBDM are not value free.

- **The landscape of what kind of competing or complementing values one can expect is changing due to the emerging transhumanist model and the changing perception of disabled people**
- **They do not take into account the increased ability to improve body structures and functionality beyond species-typical boundaries**
- **Most outcome measures and analysis tools are used to look at medical determinants of health**
- **They are not set up to compare medical determinant with social determinants and medical health with social health**

The Triangle of Enhancement Medicine, Disabled People, and the Concept of Health: A New Challenge for HTA, Health Research, and Health Policy

Gregor Wolbring

To be published by the HTA unit of the AHFMR 2006

If you have any questions e-mail me

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