

# Nanomedisin hos GE Healthcare – Fra forskning til kommersialisering

12.12-07  
Per A Foss



imagination at work

# Introduction

GE and GE Healthcare

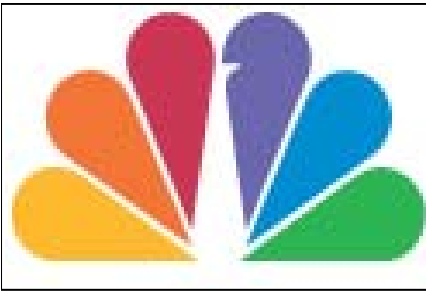
Early health / personalized medicine

Molecular imaging

Nanoparticles

Idea to market

# GE



- 6 diverse global businesses
- \$163.5 B in 2006 revenues
- \$20.7B in 2006 net earnings
- One of only six AAA rated US companies
- Publicly traded since 1896
- *Financial Times*' "world's most respected company" from 1998-2006
- *Fortune's* "America's most admired company" 1998-2006

# GE Healthcare

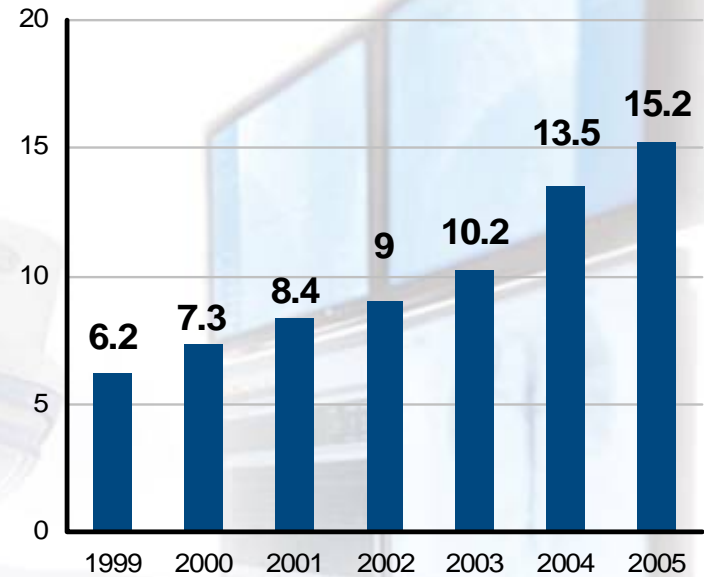
## A GE Growth Engine

\$15.2B global business unit of GE

\$1B in R&D

42,500 employees worldwide

Headquartered in Chalfont St. Giles,  
United Kingdom



GE Healthcare Revenues (\$B)

# Medical Diagnostics R&D

Approx. 700 employees at four (six) sites.



# Driver GE med Nanomedisin ??

”nye teknikker for **syntese** og bearbeiding, herunder flytting av og **bygging** med naturens **byggesteiner** (atomer, molekyler eller makromolekyler), for **intelligent design av funksjonelle** materialer, komponenter og **systemer** med attraktive egenskaper og funksjoner og hvor dimensjoner og toleranser i området **0,1 til 100 nanometer (nm)** spiller en avgjørende rolle”

# Early Health

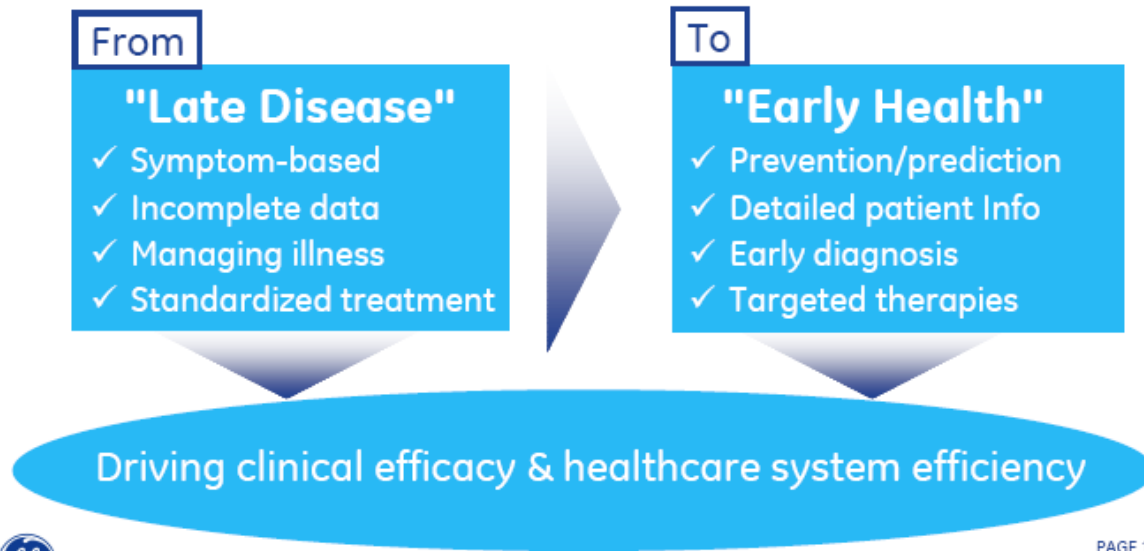


# Early Health

## Our Vision: Healthcare Re-imagined

We are striving to transform the delivery of healthcare.

Our Purpose is to help **predict**, **diagnose**, **treat** and **monitor** disease earlier so people can live life to the fullest





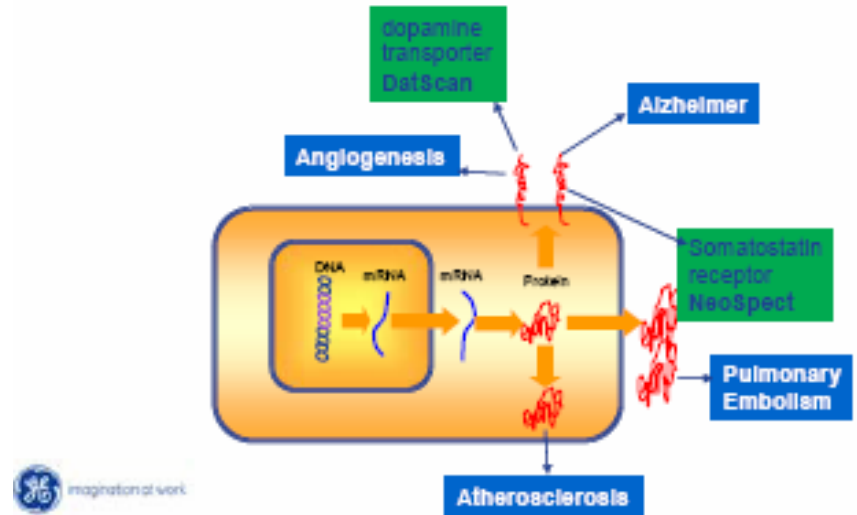
# Molecular imaging

Targeting

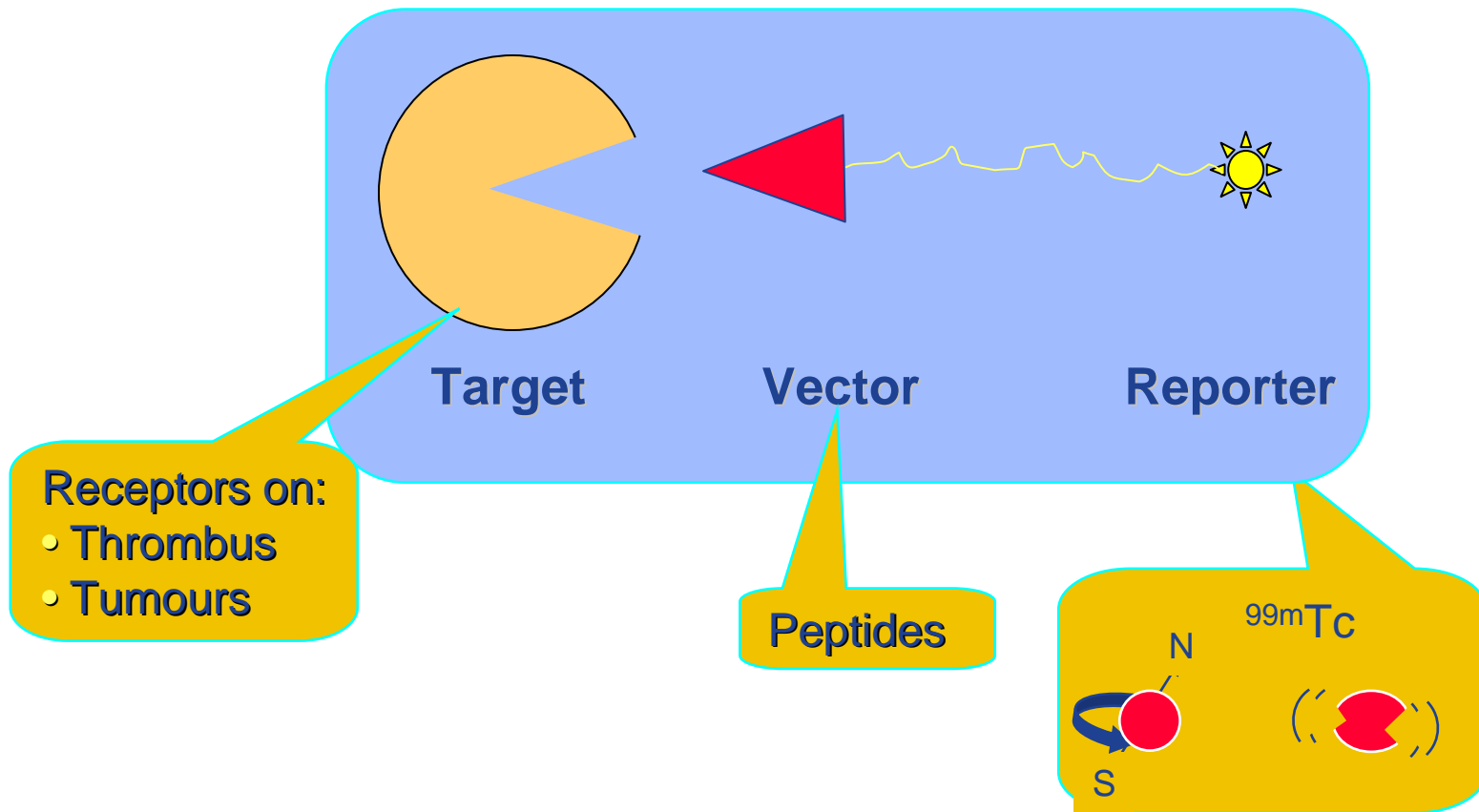
Vector- reporter

Examples: PET,  
SPECT, Optical

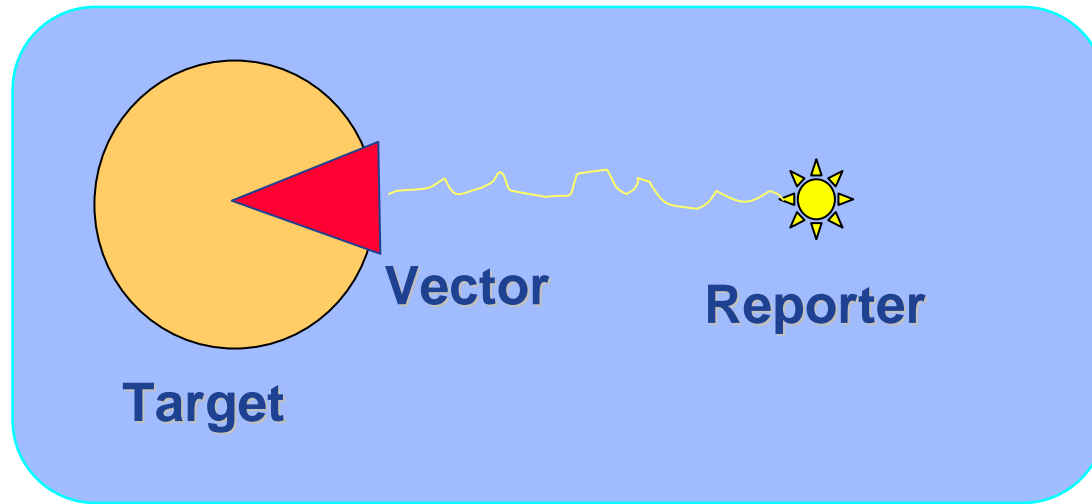
## Molecular Imaging TARGETS and VECTORS ...an understanding of disease at the molecular level



# Molecular imaging

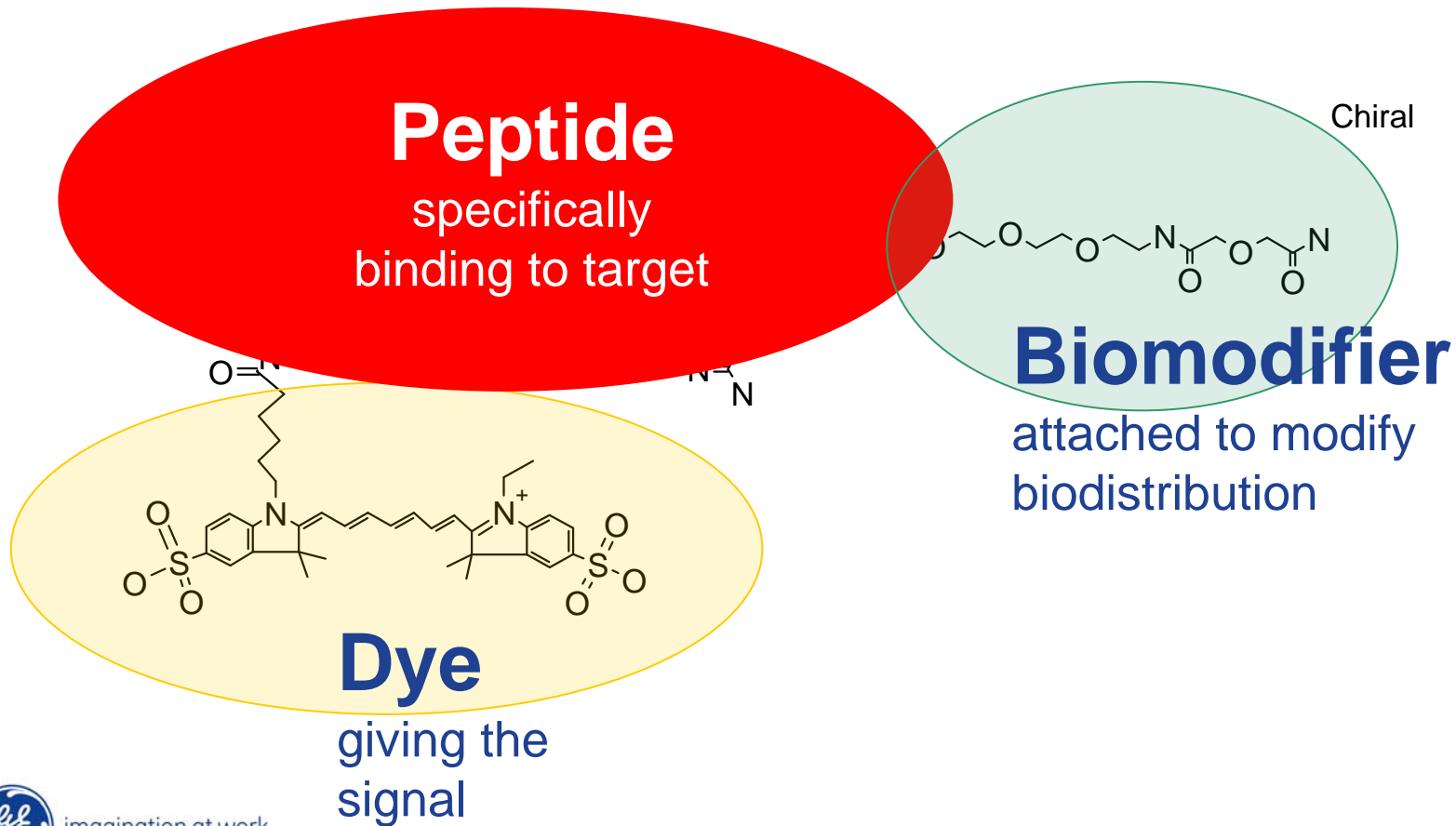


# Molecular imaging



# An targeted optical agent:

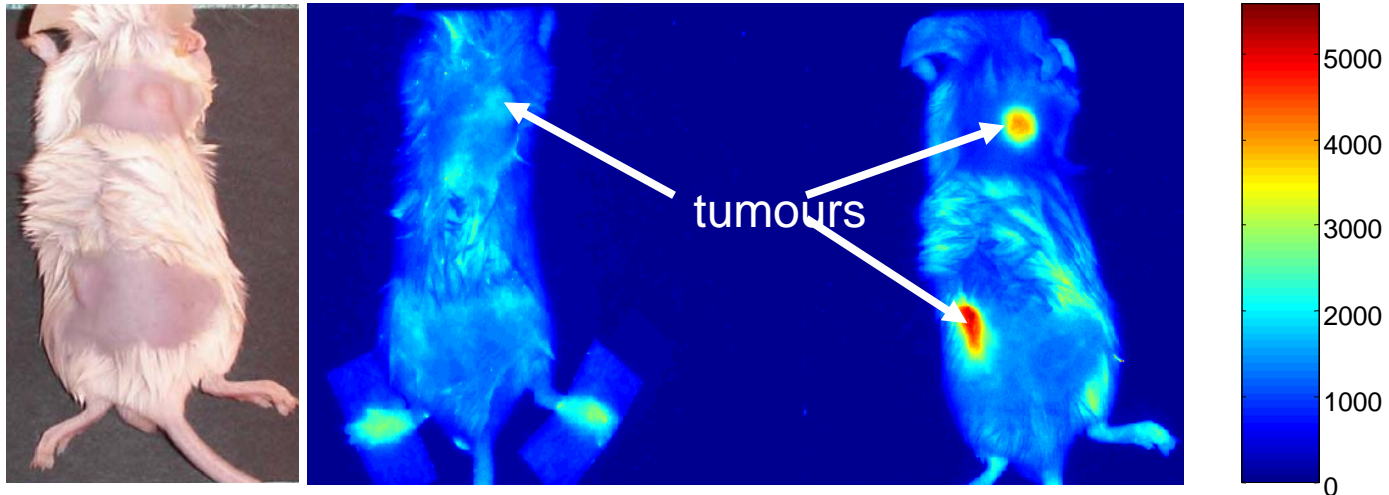
A peptide binder conjugated to an optical dye represents a complicated chemical structure



# Molecular Imaging

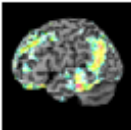
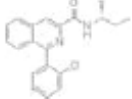


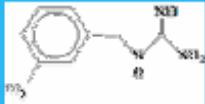


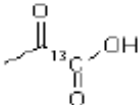

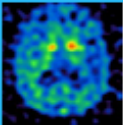
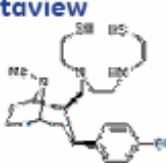
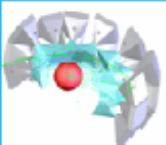
Negative control SN2148  
50 nmoles/kg bw *i.v.*

Active substance SN2112  
50 nmoles/kg bw *i.v.*



# Molecular imaging

## Driving Molecular Imaging

Disease	Target	GE MDX agents	GE DI Technologies	Applications
Alzheimer's \$500MM		PiB 	 PET/CT	Diagnose Alzheimer's track therapy
Congestive heart failure \$300MM		Adreview 	 Cardiac Nuclear	Image cardio vascular neurotransmission network
Prostate cancer \$350MM		<sup>13</sup> C 	 <sup>13</sup> C MR	Image cancer cell metabolis
Parkinson's dementia \$250MM		Striataview 	 Nuclear Head	Increase diagnosis sensitivity

Only GE: agents + hardware + software

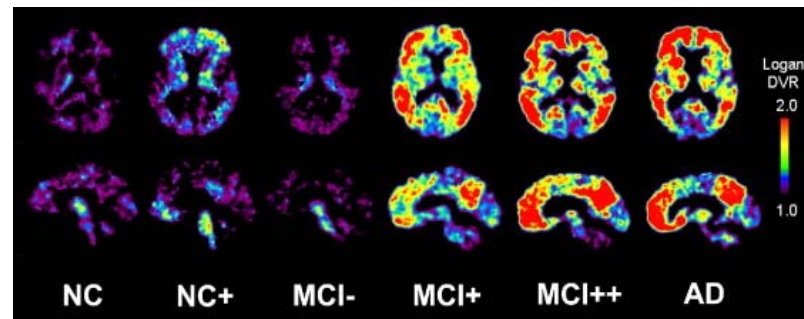
# PIB

29 November 2006

Research Collaboration between the University of Pittsburgh and GE Healthcare Reaches Significant Milestone in Development of F-18 PiB for Brain Amyloid Imaging

CHICAGO--(BUSINESS WIRE)--A key milestone in the imaging of Alzheimer's Disease (AD) has been reached through a close collaboration between radiochemists from the University of Pittsburgh and GE Healthcare. The University of Pittsburgh has started a study aimed at obtaining preliminary information on the performance of fluorine-18 labelled Pittsburgh Compound B (F-18 PiB) to identify amyloid deposits in subjects with a diagnosis of AD. Chet Mathis, Professor Of Radiology, University of Pittsburgh School of Medicine and director of the PET Facility at UPMC reports, "early results are encouraging and we look forward to the larger multi-site trials that GE Healthcare will perform with F-18 PiB in early 2007."

## Neuro-Psychiatric Disorders



Adapted from Mathis et al.,  
Nuclear Medicine and Biology 2007

### Neurodegenerative disease

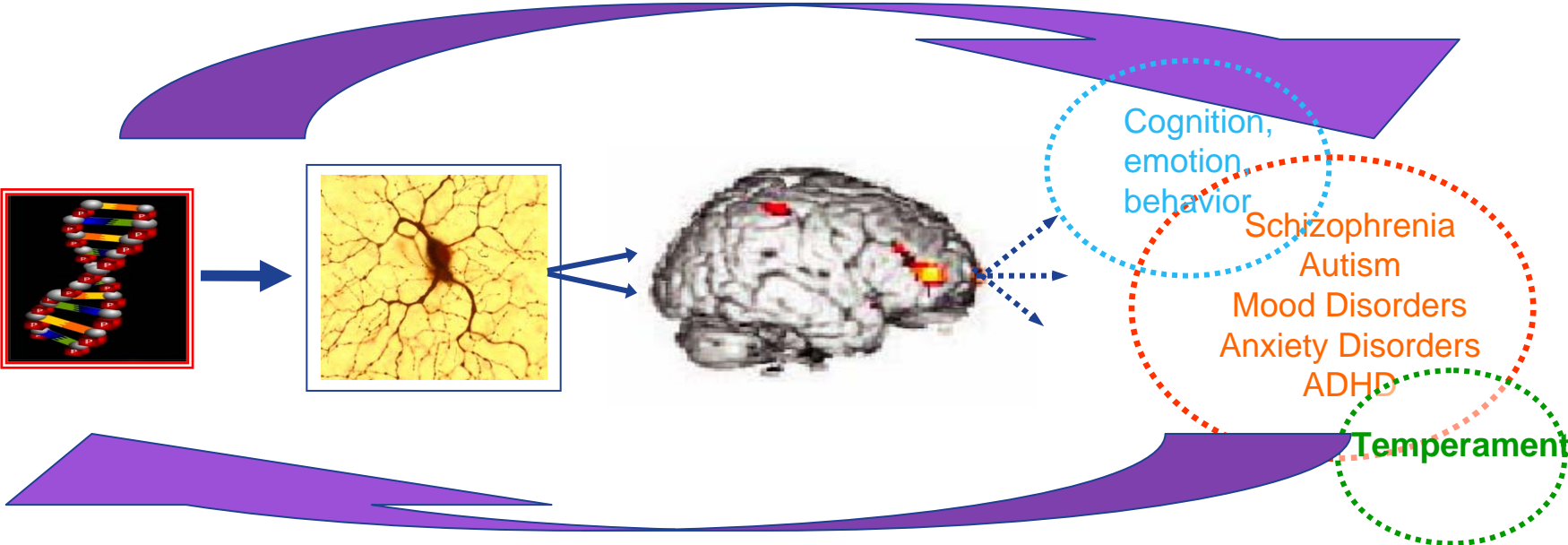
Currently program in development of amyloid binding agent for diagnosis of Alzheimer's disease

Agent measures protein deposition



4/  
GE Healthcare MDx - AHM/  
NeuroNor October 2007

# Mental Health Care in the Genomic Era



**Genes:**  
multiple  
susceptibility  
alleles each of  
small effect

**Cells:**  
subtle  
molecular  
abnormalities

**Systems:**  
abnormal  
information  
processing

**Behavior:**  
complex  
functional  
interactions

**Genomic  
Toolbox**

**Diagnostic Imaging Toolbox**

**Executive Function  
Toolbox**



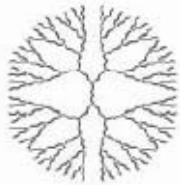
# Nanoparticles

Microbubbles, Optison and Sonazoid

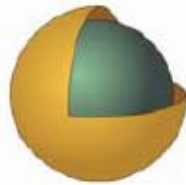
SPIO ( Super paramagnetic iron oxides)



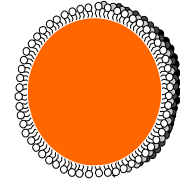
Liposome



Dendrimer



Gold Nanoshell



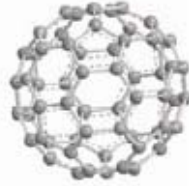
Microbubble



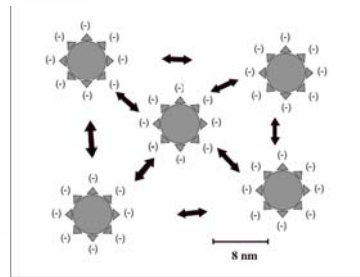
Nanotubes



Quantum Dot



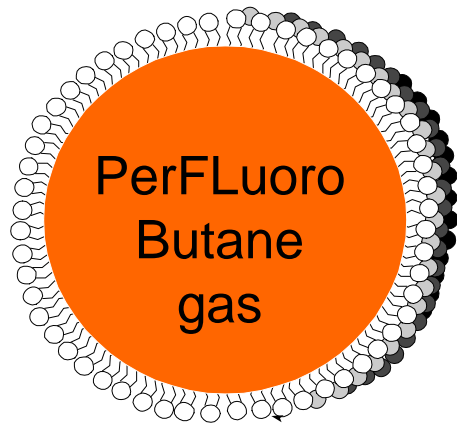
Fullerene



SPIO

# Nanoparticles Sonazoid

~2.6  $\mu\text{m}$



Phosphatidylserine monolayer



Lung cancer metastasises

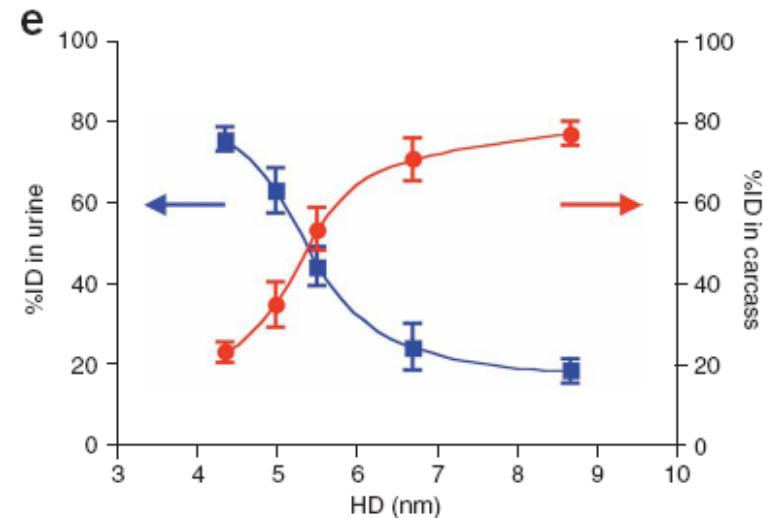
Volume of microbubbles: 8 ml/ml  
Number of bubbles:  $1,15 \cdot 10^9/\text{ml}$   
Membrane thickness: 2-3 nm  
Liver imaging dose: 0.15 mL MB/kg  
Typical injected dose: 1ml

# Biodistribution

PK, ADME

Nanoparticle challenges (large surface, renal clearance, toxicity...)

Nanotechnology  
Characterization Lab  
<http://ncic.nih.gov>



Urine excretion (blue curve) and carcass retention (red curve) of  $^{99m}\text{Tc}$ -QuantumDots of various hydrodynamic diameters 4 h after intravenous injection into CD-1 mice.

Choi et al NATURE BIOTECHNOLOGY OCT 2007

FDA nanoparticle report  
<http://www.fda.gov/nanotechnology/taskforce/report2007.html>

# Idea to market

**Figure 6: Working in Three Dimensions on the Critical Path**

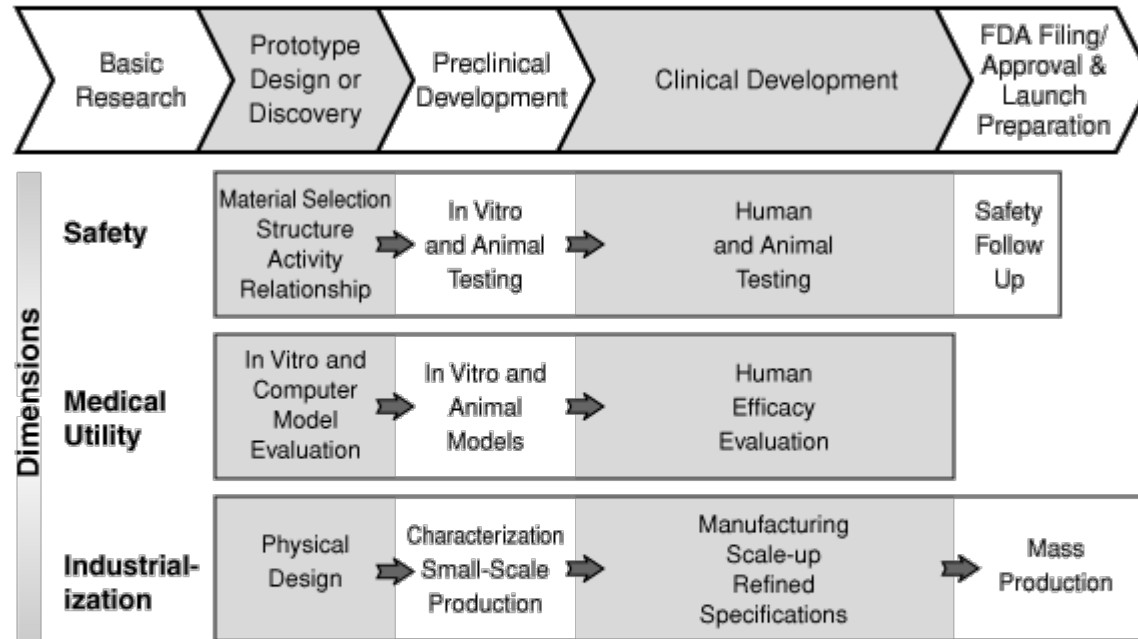


Figure 6 is a highly generalized description of activities that must be successfully completed at different points and in different dimensions along the critical path. Many of these activities are highly complex — whole industries are devoted to supporting them. Not all the described activities are performed for every product, and many activities have been omitted for the sake of simplicity.