Social implications of biomedical research in Europe

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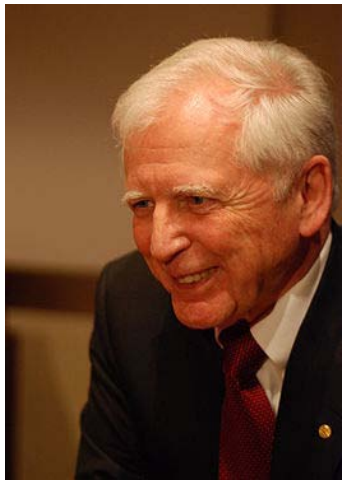

Example 1

Harald Zur Hausen

The Nobel Prize in Physiology or Medicine 2008

“*for his discovery of human papilloma viruses causing cervical cancer“*

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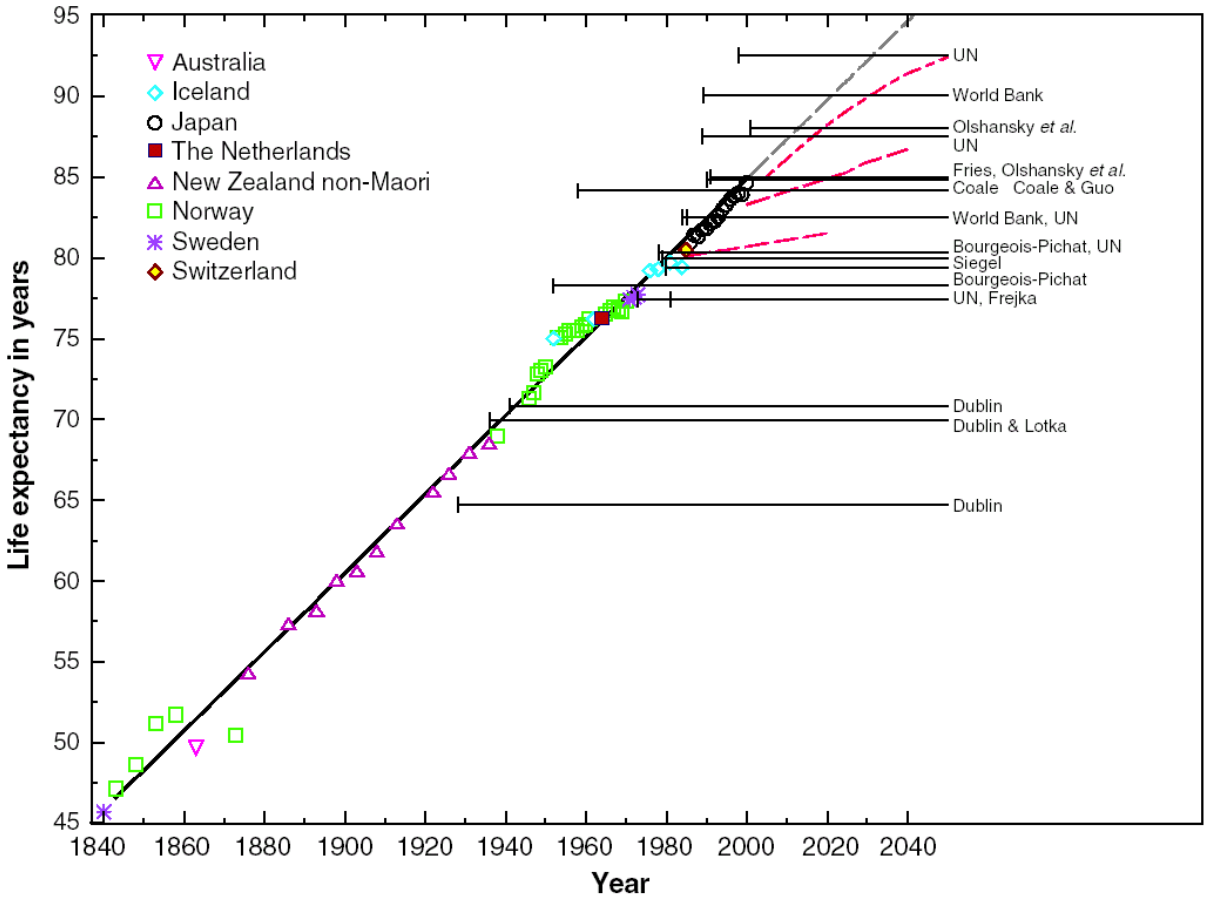
Example 2

Longitivity

Thanks to Professor Steven Lamberts,
emeritus rector magnificus of the Erasmus univerity of Rotterdam for providing the following slides

Female Life Expectancy from 1840 to the present, with the extrapolated trend



Horizontal lines represent asserted ceilings

Oeppen et al., Science, 2002

100 yo proband and his 70 yo offspring

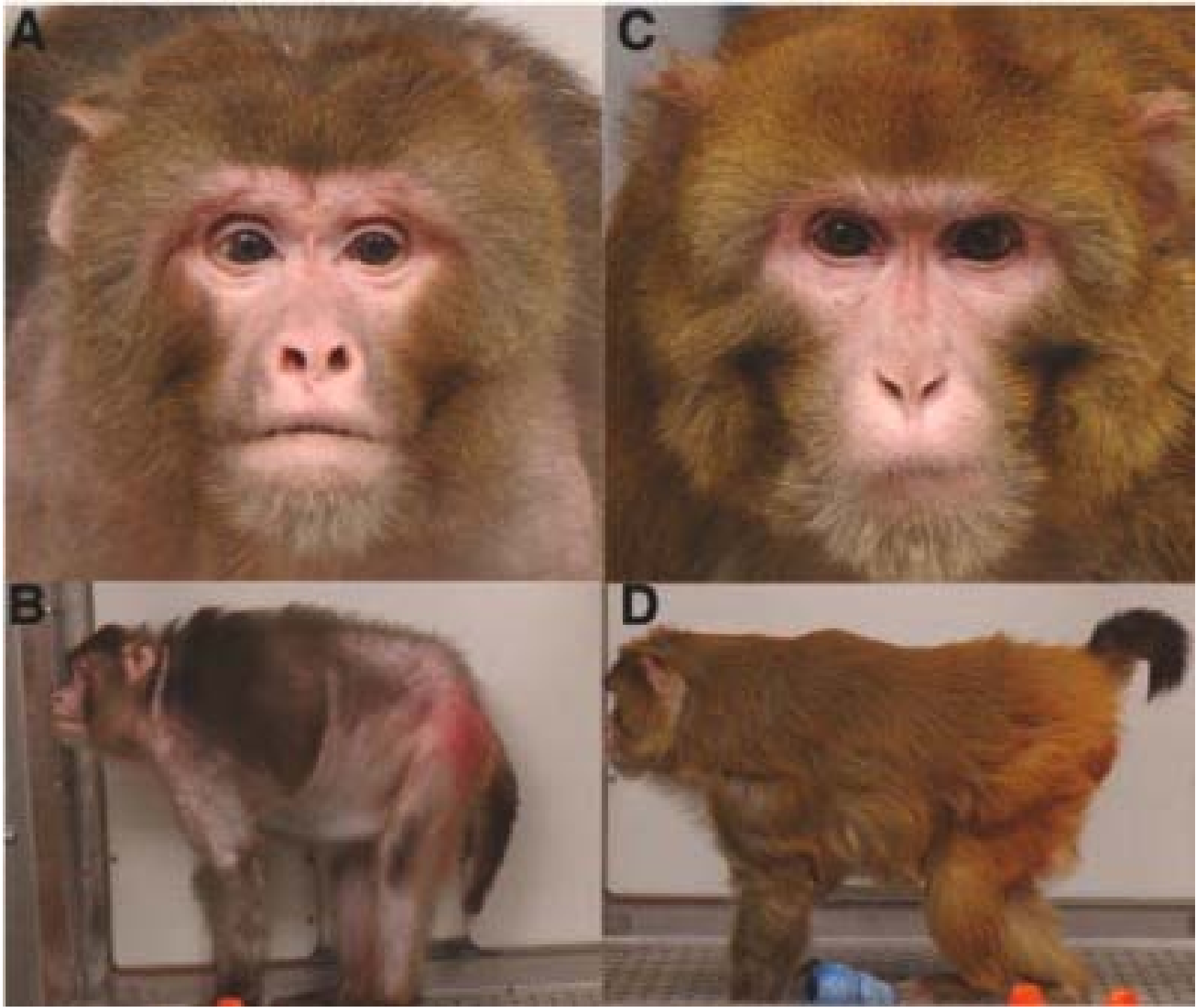
Theories on Aging or Longitivity

1 Telomeres

2 DNA repair

3 Caloric restriction

4 Hormones:
    1 Sirtuins
    2 Insulin sensitivity


A
C
B
D

Theories on Aging or Longitivity

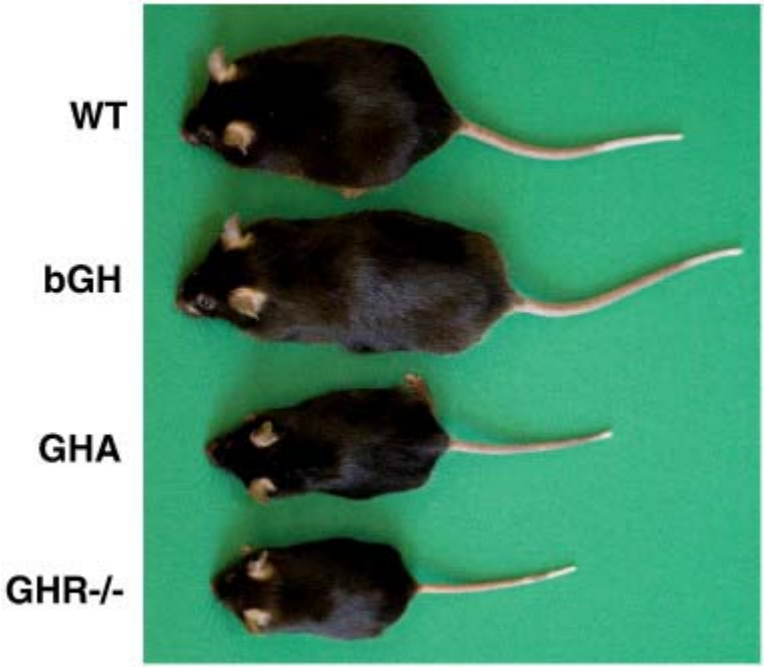
1 Telomeres

2 DNA repair

3 Caloric restriction

4 Hormones:
    1 Sirtuins
    2 Insulin sensitivity
        e.g. Deletion of the growth hormone receptor

METHUSALEM MOUSE



wild-type mice, giant bGH transgenic, dwarf GHA transgenic and dwarf GHR −/− gene disrupted mice in the same genetic background (C57BL/6 J). These mice represent normal, elevated, decreased and absent levels of GH action, respectively.

Kopchick et al., 2011 Growth Hormone & IGF research

METHUSALEM MOUSE PRIZE

- **The Methuselah Mouse Prize (Prize M)** is a competition prize for researchers who attempt to artificially lengthen the life of mice. The name of the prize is derived from the biblical figure Methuselah, who is storied to be the longest living men ever (969 years).

- The price has been conceived and founded in 2003 by Aubrey de Grey.

Current longevity record

- **Currently (December 2011) the record is set at 1819 days (about five years) for genetically manipulated mice. The normal life expectancy for the (control) mouse strain used is around three years.**

METHUSALEM MOUSE

The prospects of a long and healthy life are excellent

if you are a mouse in a good laboratory

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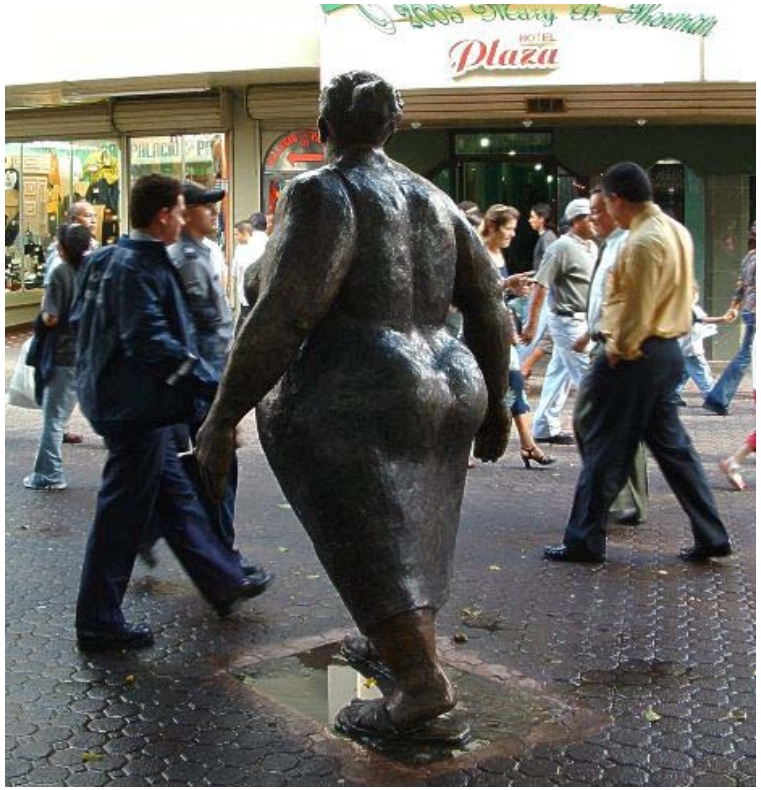
Example 3

a WESTERN DIET and the Metabolic Syndrome:

SERENDIPITY FOR THE PREPARED MIND



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Example 3

TISSUE SPECIFIC KO OF INSULIN RECEPTOR (and full insulin resistance) in

SKELETAL MUSCLE: NO METABOLIC SYNDROME

FAT: NO METABOLIC SYNDROME

BONE:OSTEOCYTES/OBL: **FULL** METABOLIC SYNDROME

BECAUSE BONE CELLS SECRETE HORMONE(S) THAT STIMULATE(S)

- INSULIN SECRETION OF BETA CELLS
- ADIPONECTIN SECRETION BY FAT CELLS, THEREBY IMPROVING INSULIN SENSITIVITY WITH EVEN RISK OF SEVERE POSTNATAL HYPOGLYCEMIA (OR VICE VERSA)

(BASED ON WORK FROM G. KARSENTY'S AND T. CLEMENTS' LABS)

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Example 4

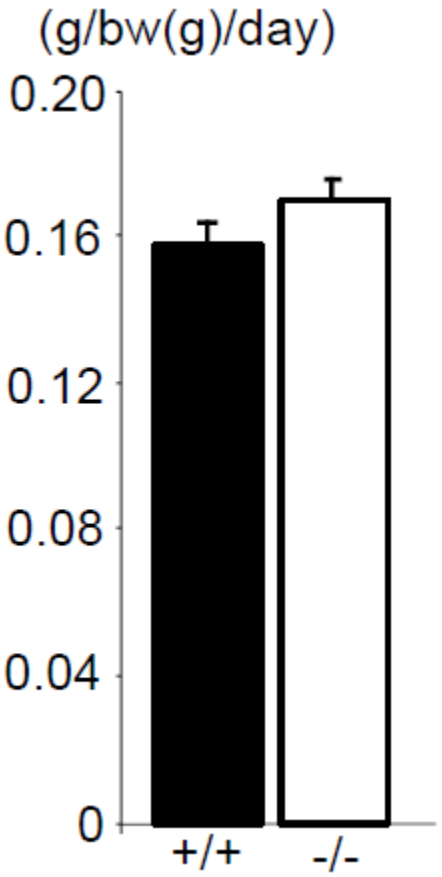
NORMAL BODY MASS DESPITE WESTERN DIET:

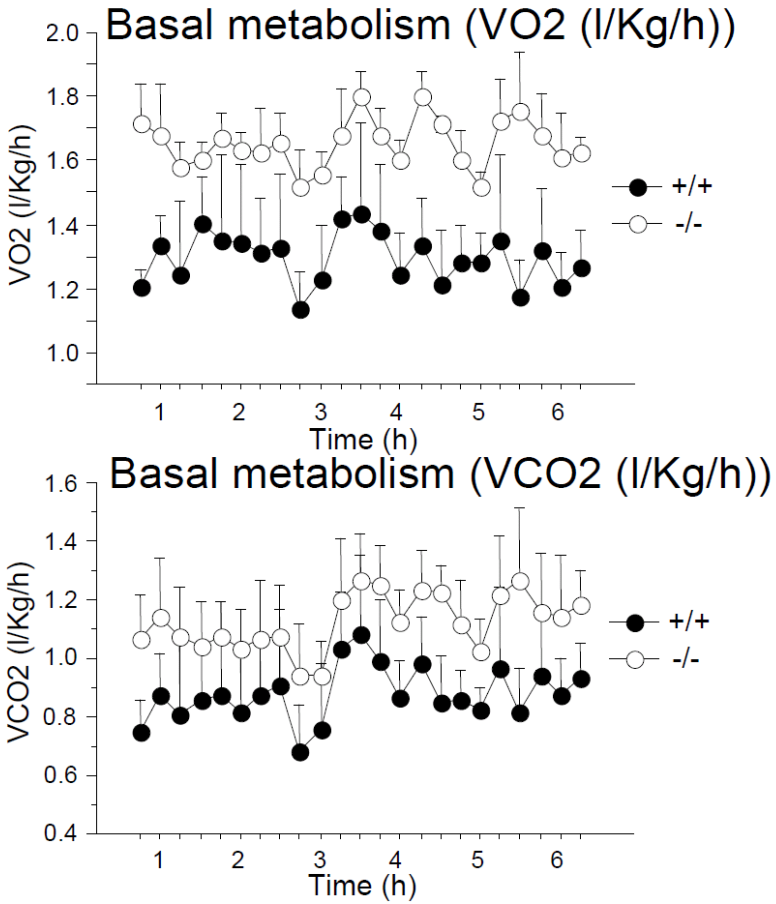
SERENDIPITY FOR THE PREPARED MIND

VDR KO mice develop rickets as in children

But show strange metabolic consequences

Food intake of vdr ko MICE





VDR KO mice have a metabolic/energy phenotype (see figures)**

Transgenic expression of VDR in fat cells only generate OBESE mice

**** unpublished J Auwerx, K Schoonjans, R Bouillon**

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Example 111111111111

THERE ARE MANY EXAMPLES
OF MAJOR DISCOVERIES
BY BLUE SKIES RESEARCH
THAT HAVE A MAJOR
SOCIETAL IMPACT

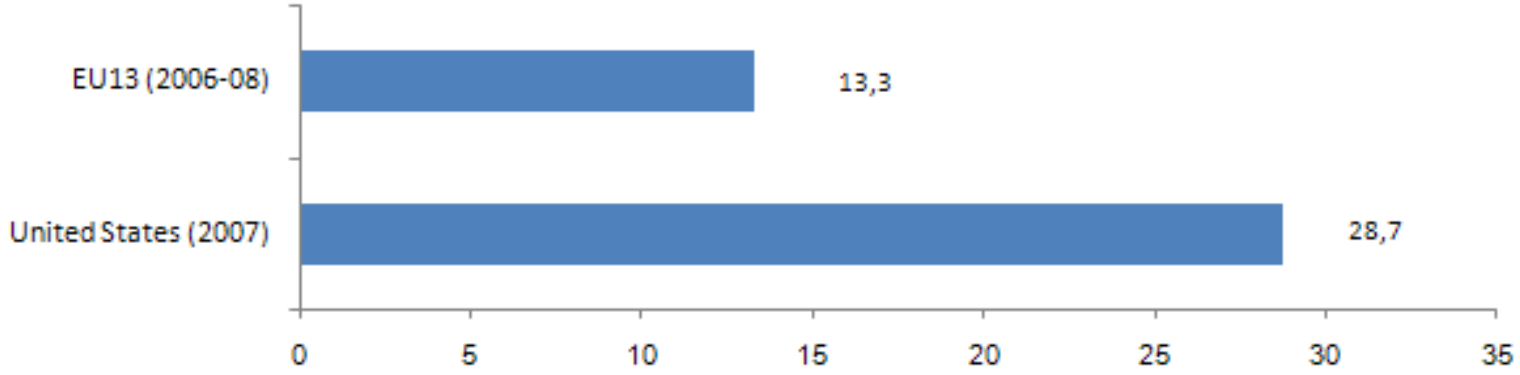
Ernst H. Starling to the British Research Council in 1924:

”Find the best of men, give them what equipment you can afford, and leave them alone”

(Discovery of the hormone together with Bayliss, the capillary diffusion & Starling’s heart law)

Figure 2 White Paper II EMRC 2011

Public funding of health R&D in 13 EU countries and the US



In billion euros at 2007 PPP

Per capita: 25 € pp EU

82 € pp USA

Notes: EU13 includes Austria, the Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, the Netherlands, Slovenia, Spain and the United Kingdom, using the latest annual OECD data available for the years 2006-2008. Before aggregation for the EU13, we use annual purchasing power parities (PPPs) to convert national expenditures of all EU countries into euros and the 2007 PPP to convert this aggregate into US-$, the currency used as the standard unit for international comparisons by the OECD. PPPs are conversion rates that both convert to a common currency and equalise the purchasing power of different currencies, thus eliminating differences in price levels between countries in the process of conversion. Given that price behaviour is different in different sectors, the OECD publishes specific PPPs for a number of different types of goods and services, but PPPs for the goods and services used in health-related R&D is not available. We therefore use PPPs for GDP, as they can be considered the most generic PPPs.

Social implications of biomedical research in Europe

We all consider health and thus also health care as top priority for our family, our friends and ourself

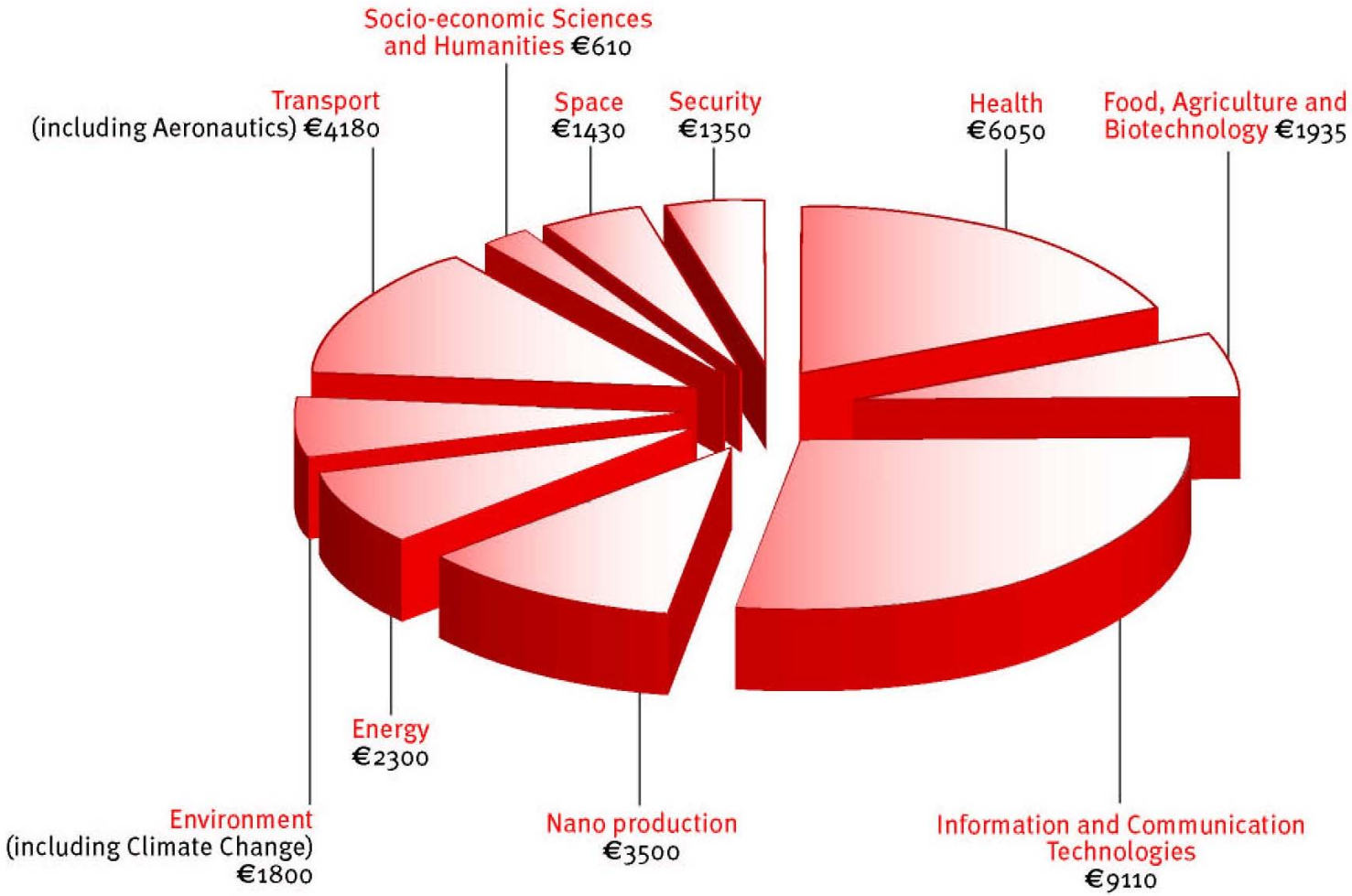
And we are obliged or willing to pay for this aim (social security)

Health care expenditure = 10 % GDP and rapidly growing ~~ 2500 € pp in EU!

EU FP7

(about 32 bn €)

ESF EMRC



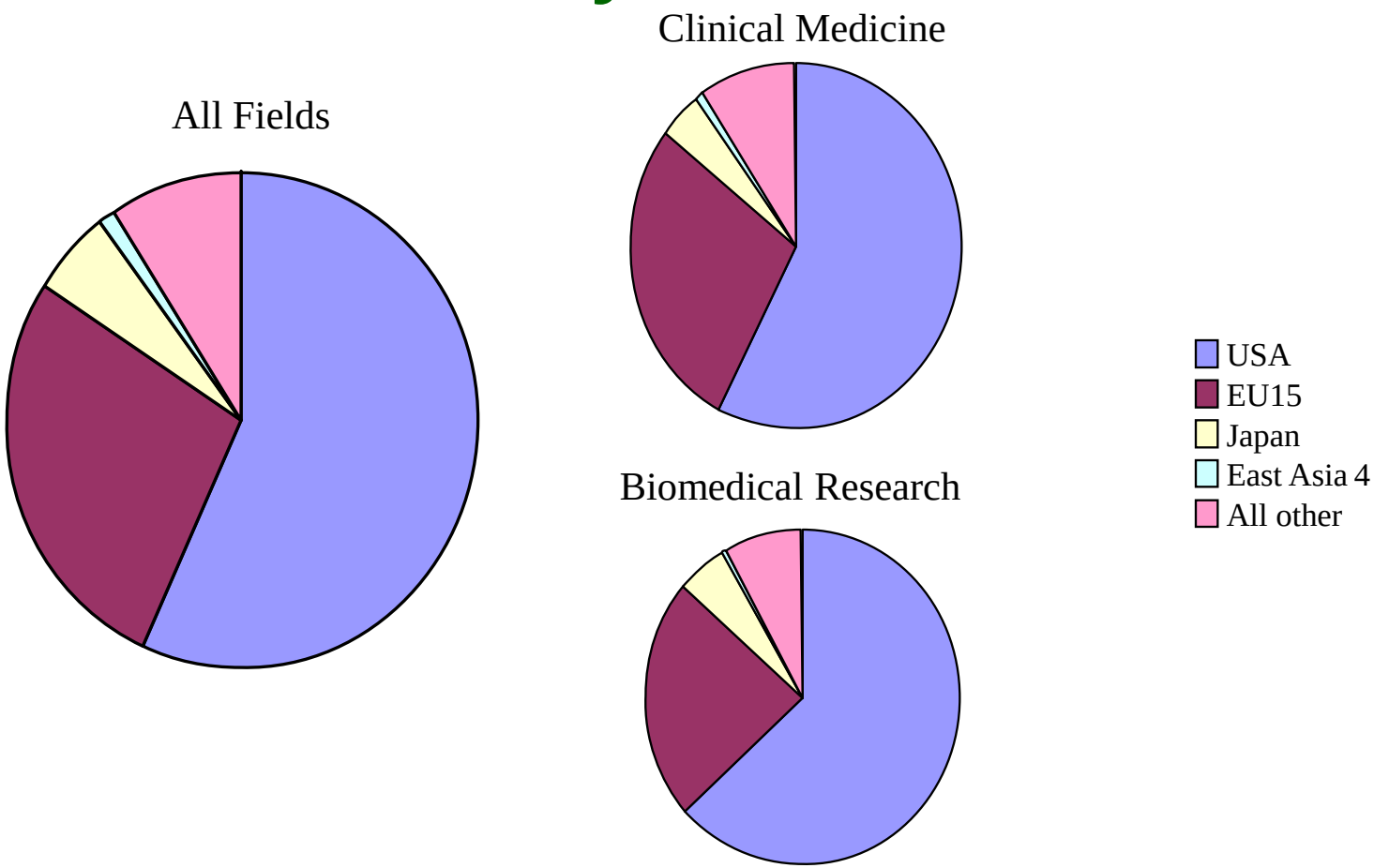
European Framework Program: ~15 % is spend on biomedical research :

Shame on us, the biomedical scientists/clinical scientists ,

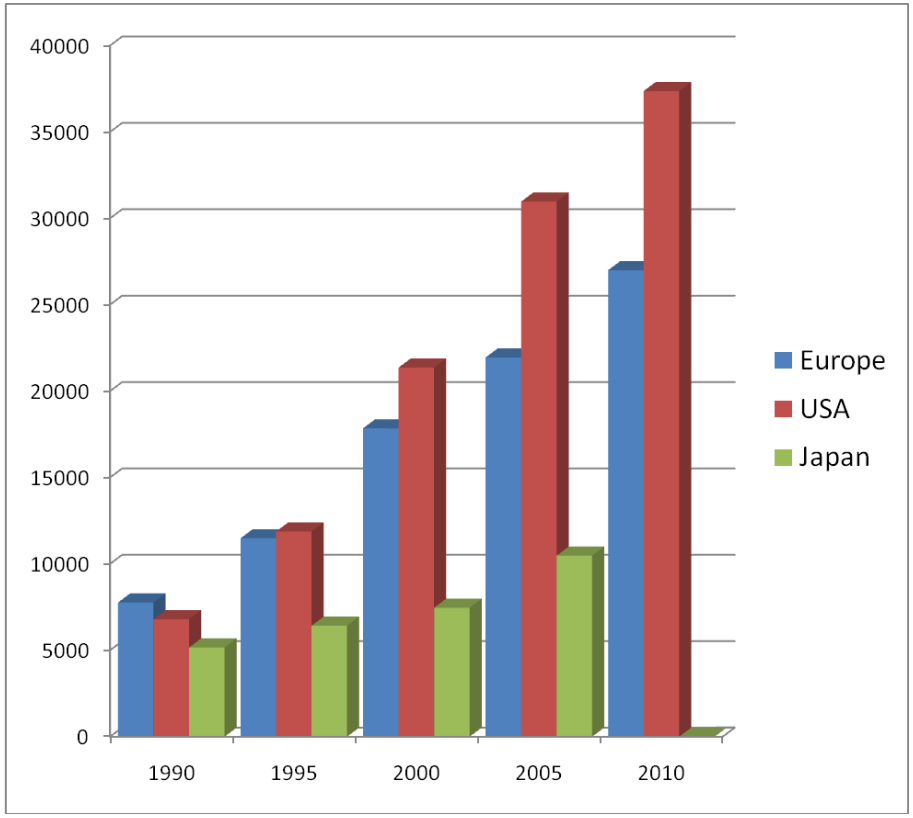
that we tolerated that for so long

BUT SHOULD THAT NOT CHANGE AFTER TODAY???!!!

World share of top 1% cited articles, by field 2003



* fractional counts of major S&E publishing centers
* Hill D, Rapoport AI, Lehming RFBRK. Changing U.S. Output of Scientific Articles: 1988-2003. 2007. National Science Foundation, Division of Science Resources Statistics, Directorate for Social, Behavorial, and Economic Sciences.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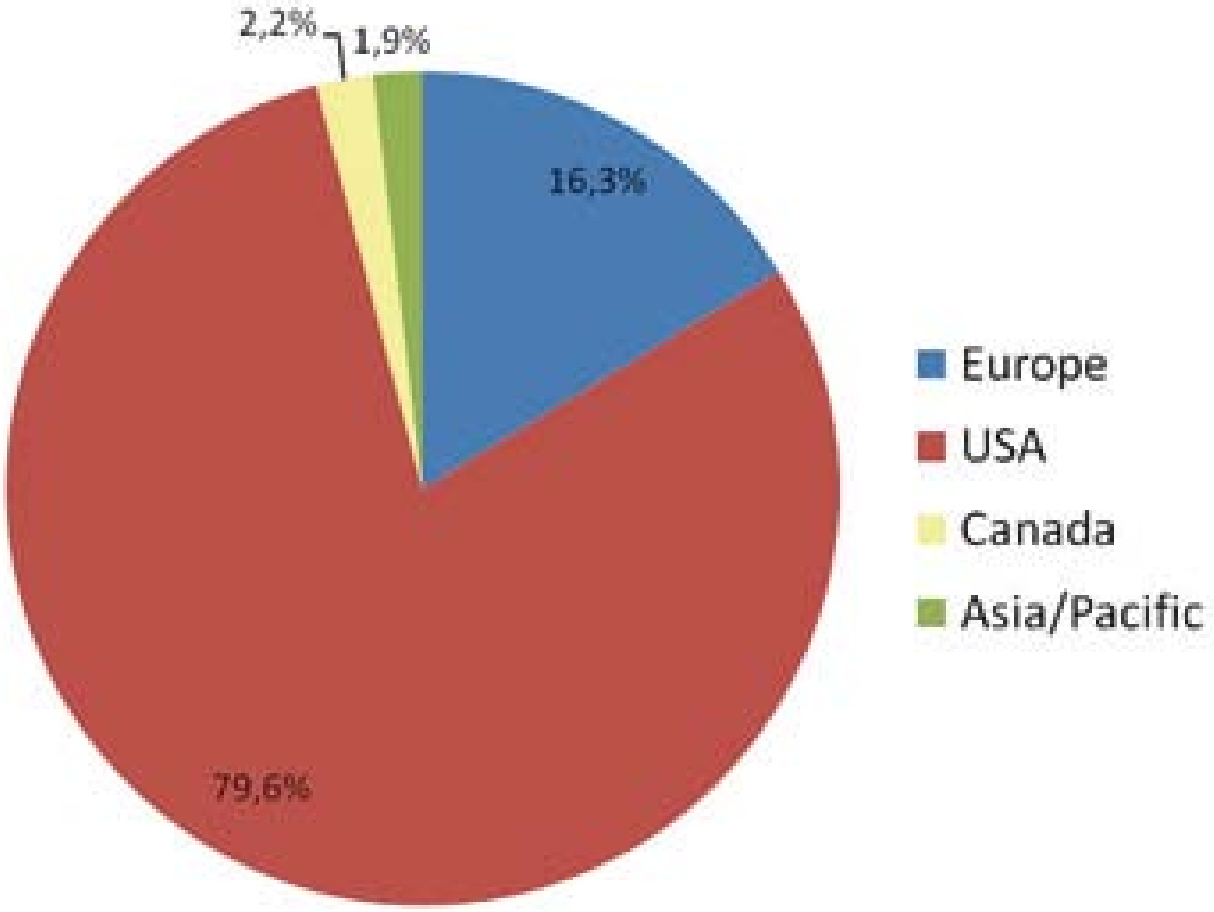

EMRC WP II 2011
GLOBAL BIOTECHNOLOGY R&D 2010

”Best Practice” missing gaps

Basic research

Translational research

Clinical research

This is a true bottleneck in many EU countries and certainly in EU perspective of need for international Clinical Trials which generate the greatest societal impact

Implementation research

Largely missing:
e.g. lack of compliance for good therapies
mysterious belief in “alternative therapies”

Interdisciplinary Research with SciTech and human sciences

Social implications of biomedical research in Europe: Conclusions (1)

- **biomedical / medical research had, has and will have major societal effects**
- **societal decisions will have a major impact on biomedical / medical research**
- **the present meeting and its decisions should have a long lasting impact in biomedical / medical / health care research**

Social implications of biomedical research in Europe: Conclusions (2)

Biomedical/medical research in Europa shows signs of disease or frailty

and

needs a good diagnosis and adequate treatment plan

Social implications of biomedical research in Europe

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Conclusions (3)

Action plan?

TASK force for 10-20 year plan to

- **diagnose, and find remedies AND implement the remedies for the biomedical/medical research gaps in Europe**

Social implications of biomedical research in Europe

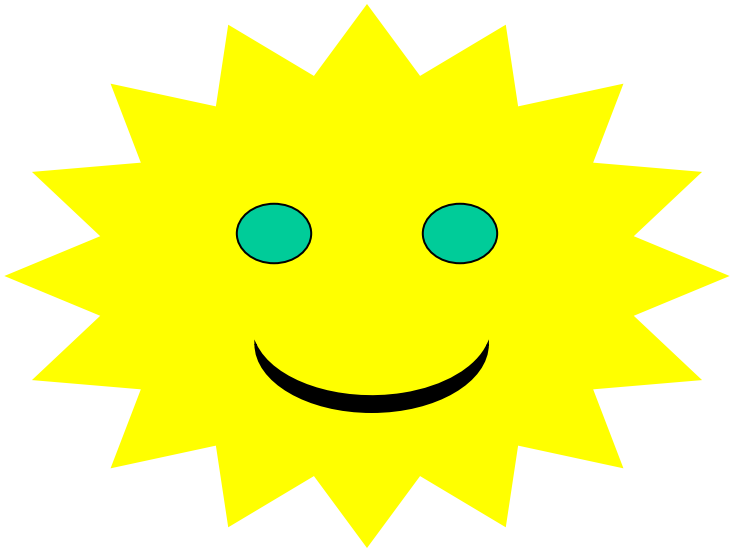
Conclusions (4)

Potential winners:

- **Scientist**
- **Patients in EU and all over the world**
- **Industry would have a better and essential partner**
- **Tax payer: more efficient use of his €€€€€**

= win-win-win-win situation

Bright sunny future for biomedical research In Europa



Thank you!!!

Health (Care)

= top priority for most people

= expensive (≈ 10% GDP in EU and close to 20 % in USA)

= growth of costs >> growth GDP

= research = driving factor for

- further improvement of care
- optimal use of health care €/$

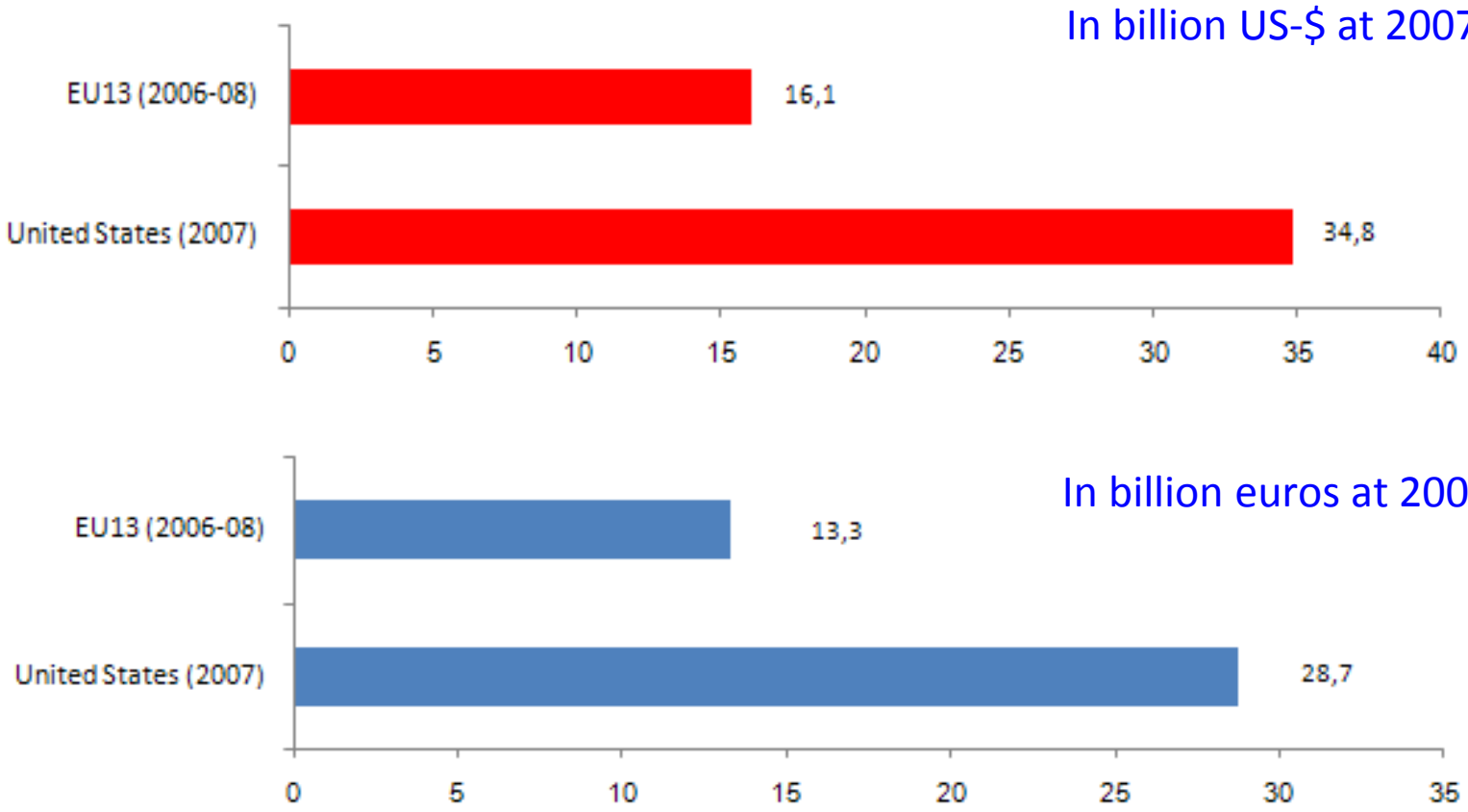
Social implications of biomedical research in Europe

A critical analysis revealed that about 25 % of the present expenditure for health care is useless or worse in Belgium

= example of incorrect implementation of what clinical scientist know best

Figure 2

Public funding of health R&D in 13 EU countries and the US



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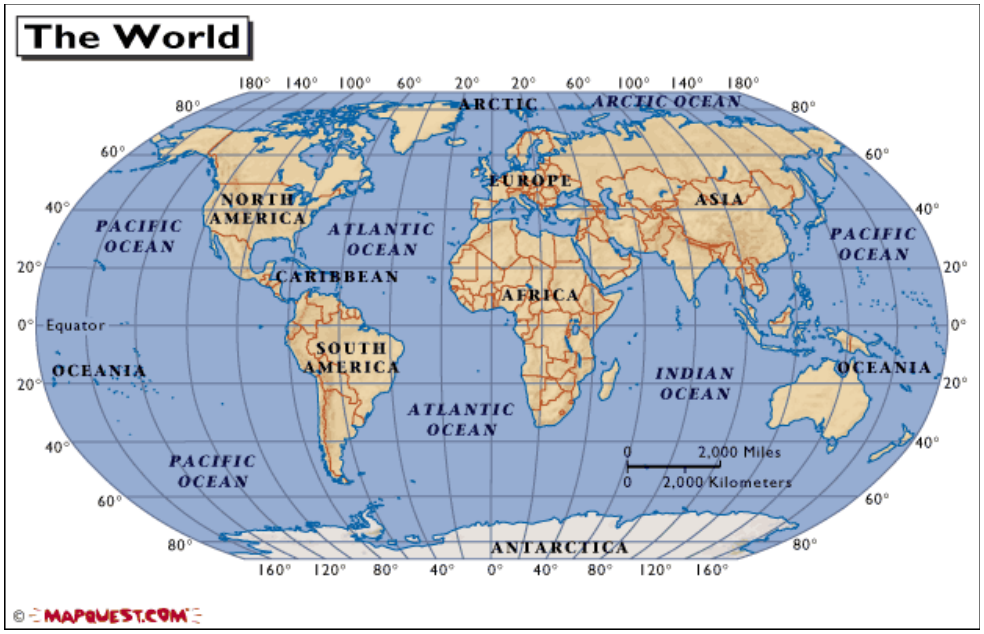


A concerted and collaborative effort to streghten and improve European medical research will have a positive impact for health and welfare in Europe and the rest of the world

Recommandations for strenghtening medical research in Europe

1. Best practice for funding and performing research
2. Collaboration
3. Revision of EC Directives
4. Equal opportunities for performing research
5. Doubling of public funding to 0.25 % of GDP

Solutions:

Adequate Research Funding &

Use of “Best Practice” in R&D

Medical research essential to cope with the future

In Europe and the rest of the world we are facing rapid changes in society with globalisation, new emerging and rapidly spreading infectious diseases, bioterrorism, changed disease patterns with treatment resistant tuberculosis, rapid and dramatic climate changes and -- in Europe – a changed demography with an Ageing population.

Social implications of biomedical research in Europe

Health care cost as percent of GDP

In most EU countries: ~~ 10% and growing more rapidly than growth of GDP

(versus close to 20% in US)

What can biomedical research do to improve Health and health care while keeping health care cost in control??

Social implications of biomedical research in Europe

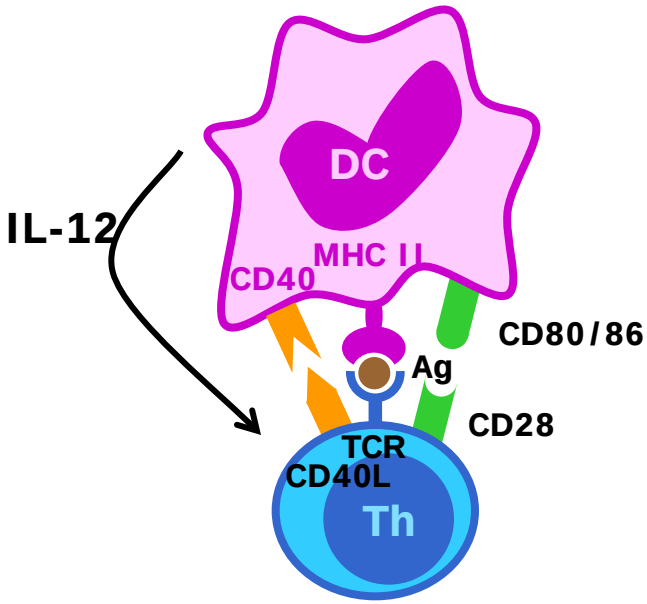
Who wins from better biomedical research in Europe?

Scientists

Patients (= eventually all of us)

Health care industry

Tax payer with better and more efficient use of his health care €€€€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MHC II
CD40
CD80/86
Ag
CD28
TCR
CD40L
Th