



Maurice WHELAN



The Joint Research Centre (JRC)

As the science and knowledge service of the Commission our mission is to support EU policies with independent evidence throughout the whole policy cycle.

~ 3000 staff

Almost 75% are scientists.

Headquarters in Brussels.

Research facilities located in 5 Member States.



The European Union Reference Laboratory for alternatives to animal testing

- Research
- Validation
- Dissemination
- Promotion

EURL ECVAM



EURL ECVAM Annual Status Report



Replacing animals used in science

Impossible or Inevitable?

Maurice Whelan



Francqui Chair 2017-18, Inaugural Lecture

Vrije Universiteit Brussel, 27th February 2018



Animals used for scientific purposes in EU

11.5 million in 2011

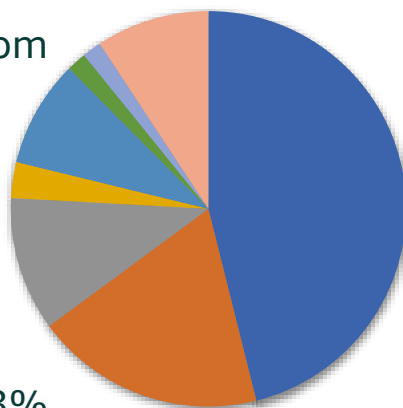
Seventh Report from
the Commission
COM(2013)859/final

Birds ~ 6%

Rabbits ~ 3%

Rodents ~ 80%

Cold-blooded ~ 13%



- Basic Research
- Research & Development
- Production & QC (human)
- Production & QC (vet)
- Toxicology & safety
- Disease diagnostics
- Education & Training
- Other



Directive 2010/63/EU on the protection of animals used for scientific purposes



"... an important step towards achieving the **final goal of full replacement** of procedures on live animals for scientific and educational purposes **as soon as it is scientifically possible** to do so."



Directive 2010/63/EU on the protection of animals used for scientific purposes



ANIMAL WELFARE BODIES AND NATIONAL COMMITTEES

PROJECT EVALUATION AND RETROSPECTIVE ASSESSMENT

EDUCATION AND TRAINING FRAMEWORK

SEVERITY ASSESSMENT FRAMEWORK



Directive 2010/63/EU

REVIEW

REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

in accordance with Article 58 of Directive 2010/63/EU on the protection of animals used for scientific purposes

Accompanied by Commission Staff Working Document



Scientific Conference:

NON-ANIMAL APPROACHES THE WAY FORWARD

Brussels, 6 > 7 December 2016

Action 4 of European Commission's response to,
"Stop Vivisection" European Citizens' Initiative
June 2015

Understanding animal use in science

WHITE PAPER

Tierversuche in der Max-Planck-Gesellschaft

Animal Research in the Max Planck Society

Dec 2016



Laboratory Mouse

Education

Caltech, Oxford, Stanford, Harvard, MIT, Princeton, Cambridge, Imperial, Berkeley, Chicago, Yale, ETH Zurich, Columbia, UPenn, John Hopkins, ICL, Cornell, Northwestern, UMichigan, Toronto, Carnegie Mellon, Duke, UWashington, UTexas at Austin, GA Tech, Tokyo, Melbourne, Singapore, UNC, Wisconsin-Madison, Edinburgh, McGill, Hong Kong, Santa Barbara, Karolinska Institute, UMinnesota, Manchester — and just about every other major university, medical school & research institution in the world.

Nobel Prizes

1905 - Transmission and treatment of TB
 1906 - Structure of Nervous System
 1907 - Role of protozoa in disease
 1908 - Immunity to infectious diseases
 1928 - Investigations on typhus
 1929 - Importance of dietary vitamins
 1939 - Discovery of antibacterial agent, Penicillin
 1945 - Discovery of penicillin
 1951 - Yellow fever vaccine
 1952 - Discovery of streptomycin
 1954 - Culture of the polio virus
 1960 - Understanding of immunity
 1970 - Understanding of neurotransmitters
 1974 - Structural & functional organisation of cells
 1975 - Tumour-viruses and genetics of cells
 1977 - Hypothalamic hormones
 1984 - Techniques of monoclonal antibody formation
 1986 - Nerve growth factor and epidermal growth factor
 1990 - Organ transplantation techniques
 1992 - Regulatory mechanisms in cells
 1996 - Immune-system detection of virus-infected cells
 1997 - Discovery and characterisations of prions
 1999 - Discovery of signal peptides
 2000 - Signal transduction in the nervous system
 2004 - Odour receptors and organisation of olfactory systems
 2008 - Role of HPV and HIV in causing disease
 2010 - Development of in vitro fertilization
 2011 - Discoveries around innate and adaptive immunity
 2012 - Reprogramming mature cells to pluripotent ones

Overview

- Involved in around 75% of research
- Short life-span and fast reproductive rate means mice are suitable for studying disease across whole life cycle
- 98% of genes have comparable genes in humans
- Similar reproductive and nervous systems and suffer many of the same diseases as humans including cancer, diabetes and anxiety
- Can be genetically modified to include human genes to enhance biological relevance
- Can act as an aviator for a human cancer to allow drug therapies to be trialled safely

Research Areas

Alzheimer's disease, anaesthetics, AIDS & HIV, anticoagulants, antidepressants, asthma, blindness, bone and joint disease, brain injury, breast cancer, cardiac arrest, cystic fibrosis, deafness/hearing loss, Down's syndrome, drugs for high blood pressure, transplant rejection, Hepatitis B, C & E, Huntington's disease, influenza, leukaemia, malaria, motor neurone disease, multiple sclerosis, muscular dystrophy, Parkinson's disease, prostate cancer, schistosomiasis, spinal cord injury, stroke, testicular cancer, tuberculosis,

Contact

www.understandinganimalresearch.org.uk
www.animalresearch.info
www.amprogress.org
www.speakingofresearch.com

CV of a
Lifesaver



A failing research paradigm?

Animal Models of Alzheimer Disease: Historical Pitfalls and a Path Forward

Sarah E. Cavanaugh¹, John J. Pippin¹ and Neal D. Barnard^{1,2}

¹Physicians Committee for Responsible Medicine, Washington, D.C., USA; ²Department of Medicine, George Washington University School of Medicine and Health Sciences, Washington, D.C., USA

(ALTEX. 2014;31(3):279-302.)



www.impactjournals.com/oncotarget/

Oncotarget, Vol. 7, No. 26

Research Paper: Gerotarget (Focus on Aging)

Alzheimer disease research in the 21st century: past and current failures, new perspectives and funding priorities

Francesca Pistollato¹, Elan L. Ohayon², Ann Lam^{1,2}, Gillian R. Langley³, Thomas J. Novak⁴, David Pamies¹, George Perry⁵, Eugenia Trushina⁷, Robin S.B. Williams⁶, Alex E. Roher^{8,9}, Thomas Hartung⁵, Stevan Harnad¹¹, Neal Barnard¹, Martha Clare Morris¹², Mei-Chun Lai¹, Ryan Merkley¹ and P. Charukeshi Chandrasekera¹



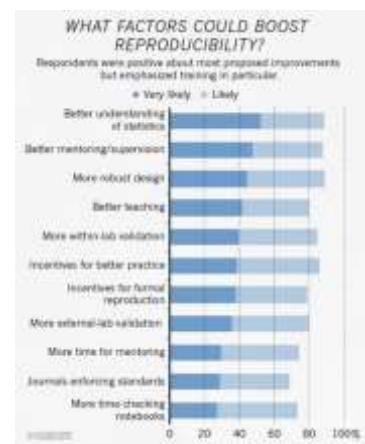
Reliability of animal studies

- More than 70% of researchers have failed to reproduce another scientist's experiments
- More than half have failed to reproduce their own experiments



Is there a reproducibility crisis in science?

Nature 533, 452–454 (2016)



We need better animal research, better reported

Fiona Godlee *editor in chief*

"New drug development is underpinned by animal research, but ... the **preclinical foundations of clinical research are shaky and in urgent need of reform.**"

"This story is about the **urgent need to improve the integrity of animal research** - its reliability, reproducibility, analysis, reporting, and interpretation - to increase the chances that it **translates into real improvements to human health**"



Clinical Development

Likelihood of Approval from Phase I





ehp ENVIRONMENTAL
HEALTH
PERSPECTIVES



PERSPECTIVES | BRIEF COMMUNICATIONS

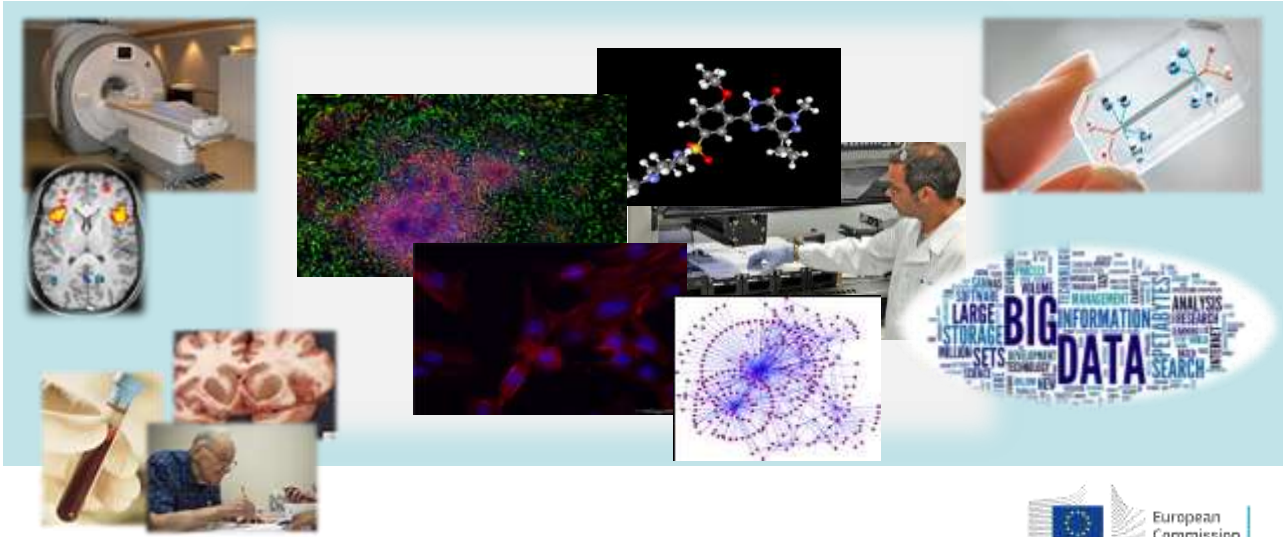
NOVEMBER 2015 | VOLUME 123 | ISSUE 11

Lessons from Toxicology: Developing a 21st-Century Paradigm for Medical Research

Gill Langley,¹ Christopher P. Austin,² Anil K. Balapure,³ Linda S. Birnbaum,⁴ John R. Bucher,⁵ Julia Fentem,⁶ Suzanne C. Fitzpatrick,⁷ John R. Fowle III,⁸ Robert J. Kavlock,⁹ Hiroaki Kitano,¹⁰ Brett A. Lidbury,¹¹ Alysson R. Muotri,¹² Shuang-Qing Peng,¹³ Dmitry Sakharov,¹⁴ Troy Seidle,¹⁵ Thales Trez,¹⁶ Alexander Tonevitsky,¹⁷ Anja van de Stolpe,¹⁸ Maurice Whelan,¹⁹ and Catherine Willett²⁰



New technologies and tools



Knowledge and understanding

"... unprecedented ability to collect data about nature but **there is now a crisis developing in biology**, ... we can't talk to each other ... unstructured information does not enhance understanding ..."

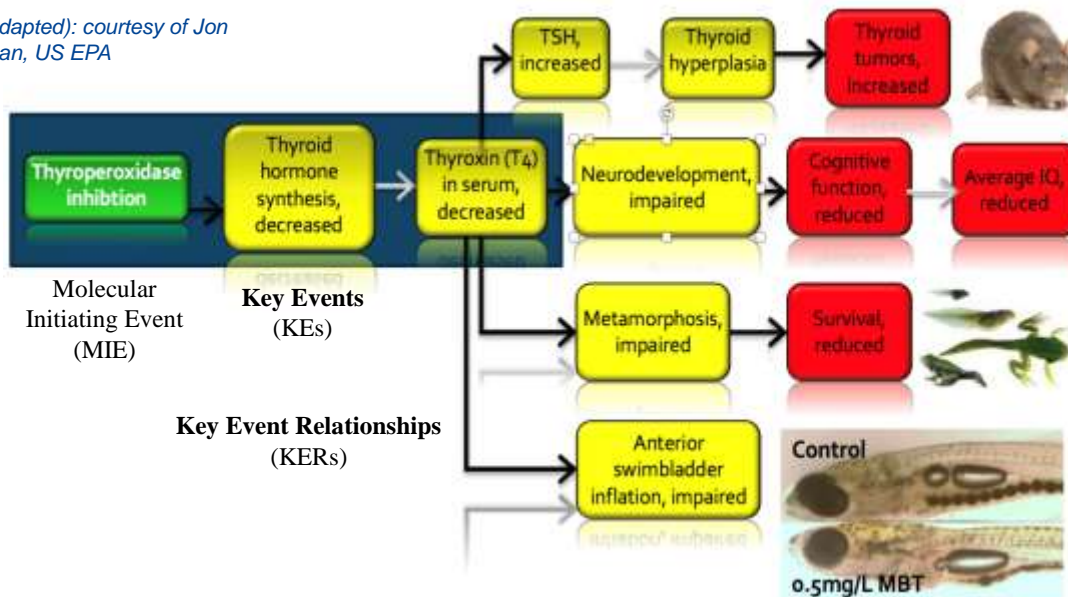
"We need a framework to put all of this knowledge and data into ... **driving toward that framework** is really the big challenge."



Sydney Brenner. Molecular Biologist and Nobel Laureate



Slide (adapted): courtesy of Jon Haselman, US EPA



Adverse Outcome Pathways (AOP)

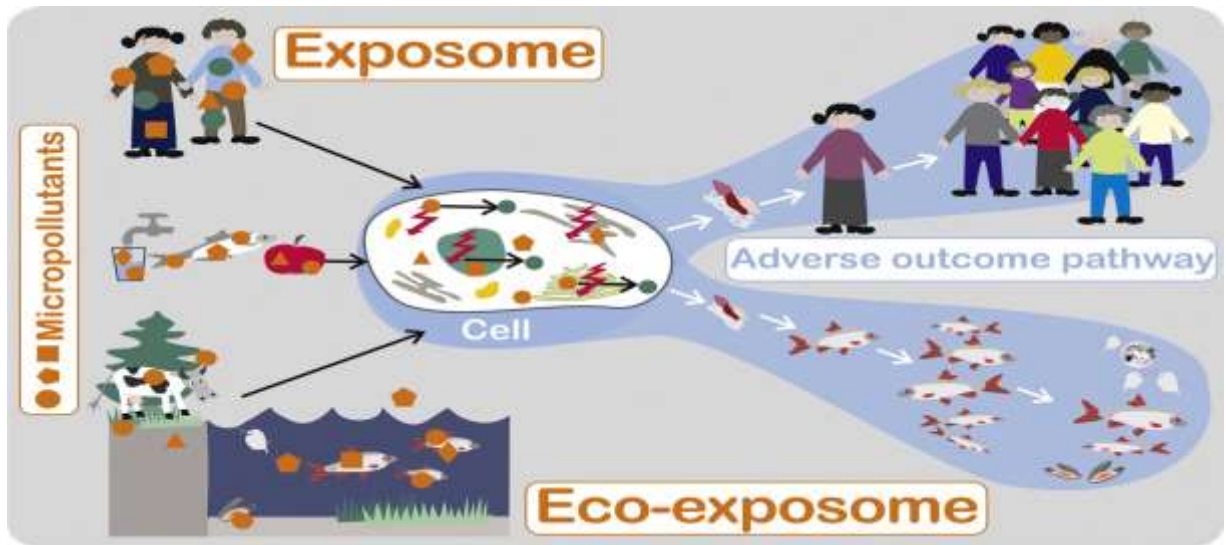


AOP Knowledge Base www.aopkb.org



Holistic thinking

Escher et. al. Environ Int. (2017)



Scientists and their science



*... discovery, challenge, responsibility, application,
 Facilitate them to take a new approach!
 publication, funding, career, fame, fortune, ...*

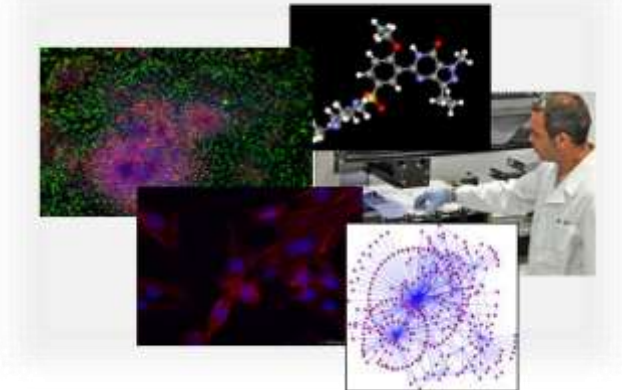




JRC Summer School on Alternative Approaches for Risk Assessment (May 2017)



Replacement through displacement



Thank you



Any questions?

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Directorate for Health, Consumers and Reference Materials,
European Commission, Joint Research Centre (JRC).

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