

# Das *Dual Use*-Problem: Missbrauchspotenziale in der biowissenschaftlichen Forschung

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Workshop

*Dual Use*-Technologien - gute Forschung, böse Forschung?

25. November 2014, 16.00 – 17.15 Uhr, Maritim Hotel Magdeburg



## Begriff *Biologische Sicherheit*

deutsche Begriff „*Biologische Sicherheit*“ gliedert sich im internationalen Sprachgebrauch in **zwei Felder**:

1. **Biosecurity**
2. **Biosafety**

Regelungsbedarf dieser beiden Felder ist ganz unterschiedlich.

# Governance of dual-use research: an ethical dilemma

Michael J. Selgelid

Centre for Applied Philosophy and Public Ethics (CAPPE), The Australian National University, Canberra, Australia

«There has been growing debate about the dual-use nature of life science research with implications for making biological weapons.»

«The paper reviews several controversial publications that have been the focus of debates about dual-use life science research.»

*Synthetic virology* (first known example: Picorna-Viruses)

*Gain of function research* (first known example: Pox-Viruses)

*Journal of the World Health Organization*  
June 2009

## Chemical Synthesis of Poliovirus cDNA: Generation of Infectious Virus in the Absence of Natural Template

Ulrich Cello, Aniko V. Paul, Eckard Wimmer

Department of Molecular Genetics and Microbiology, School of Medicine, State University of New York at Stony Brook

... synthetic poliovirus cDNA was transcribed by RNA polymerase into viral RNA, which translated and replicated in a cell-free extract, resulting in the de novo synthesis of infectious poliovirus.»

Our results show that it is possible to synthesize an infectious agent by in vitro chemical-biochemical means solely by following instructions from a written sequence.»

*Science* **297**, 1016-1018 (2002)

# Scenes of Terror: The Science; Scientists Create a Live Polio Virus

Andrew Pollack

«The work, conducted by scientists at the State University of New York at Stony Brook, was financed by the Pentagon as part of a program to develop biowarfare countermeasures.»

«Dr. Eckard Wimmer, professor of molecular genetics and microbiology at Stony Brook and leader of the project, said they made the virus to send a warning that terrorists might be able to make biological weapons without obtaining a natural virus.»

«But Dr. Wimmer said polio, as it has done in the past, could spread panic and that vaccines would have to be stockpiled if not routinely administered. "In 20 or 25 years," he said, "if a good percentage of the world is not immunized against polio virus, then the virus would be a terrible terrorist agent."»

## Expression of Mouse Interleukin-4 by a Recombinant Ectromelia Virus Suppresses Cytolytic Lymphocyte Responses and Overcomes Genetic Resistance to Mousepox

D. J. JACKSON,<sup>1,2</sup> ALISTAIR J. RAMSAY,<sup>2</sup> CARINA D. CHRISTENSEN,<sup>2</sup> SANDRA BEATON,<sup>1</sup> DIANA ...<sup>1</sup> AND IAN A. RAMSHAW<sup>2</sup>

Animal Control Cooperative Research Centre, CSIRO Sustainable Ecosystems,<sup>1</sup> and Division of ...  
Immunology and Cell Biology, John Curtin School of Medical Research, Australian National University,<sup>2</sup> ...  
Canberra, Australia

We have investigated the influence of virus-expressed mouse interleukin-4 (IL-4) on ...  
the cell-mediated response during infection.»

Genetically resistant mice infected with the IL-4-expressing virus developed ...  
symptoms of acute mousepox accompanied by high mortality..»

Strikingly, infection of recently immunized genetically resistant mice with the virus ...  
expressing IL-4 also resulted in significant mortality...»

These data therefore suggest that virus-encoded IL-4 not only suppresses primary ...  
antiviral cell-mediated immune responses, but also can inhibit the expression of ...  
immune memory responses.»

# Orthomyxoviren als Gegenstand von *Animal Use Research*

Negativ-Strang-RNA in 8 Segmenten

Familie: Orthomyxo-Viridae

Größe:  
100 – 200 nm Durchmesser

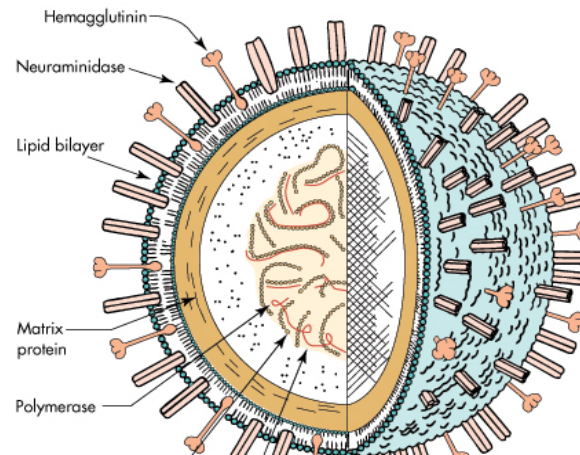
Drei Typen  
**A, B, C**

Stückproteine

H (Hämagglutinin) (1-16)

N (Neuraminidase) (1-9)

Wasservögel sind natürlicher Wirt



# Epidemiologie der Grippe

**Epidemien:** Auftreten etwa alle 1-3 Jahre irgendwo auf der Welt während der letzten 400 Jahre

**Pandemien:** Auftreten in Intervallen von etwa 10 - 40 Jahren

1918/19 etwa **21 Mio. Todesfälle weltweit** (Spanische Grippe)

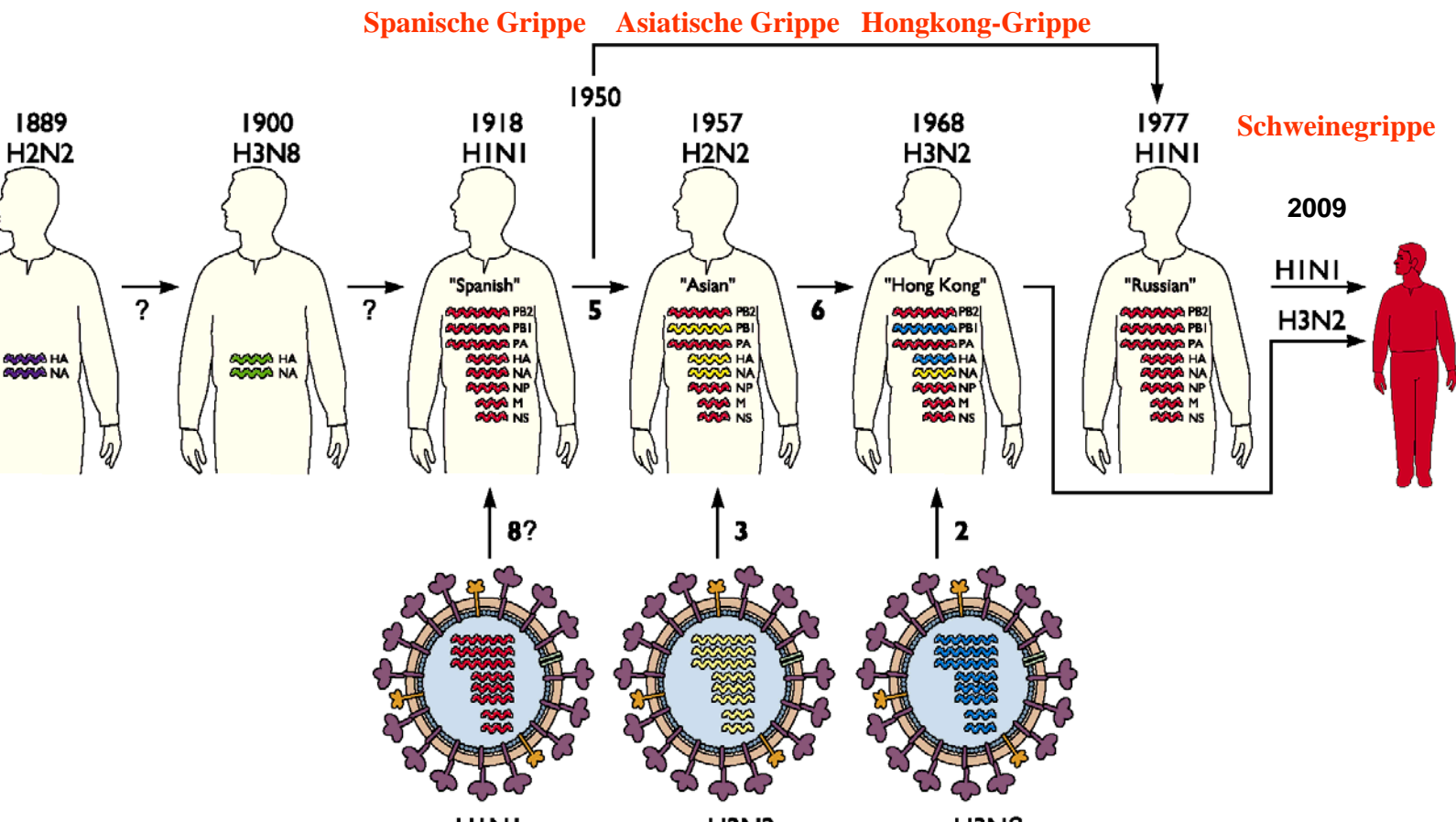
Erster beschriebener Ausbruch einer Pandemie etwa 1580

1918/19





# Fluenza A-Subtypen



## Die Aviäre Influenzavirus- Subtypen an Menschen („Vogelgrippe“)



**H5N1** Hong Kong 1997 (18 Infizierte, 6 Todesfälle)

> Keulen des Geflügels

**H7N7** England seit 1996, später Niederlande bis 2003 (89 Infizierte, 1 Todesfall)

**H9N2** Hong Kong 1999 (Krankheitsfälle, keine Todesfälle)

**H1N2** England 2002 (keine erhöhte Pathogenität)

**H5N1** Vietnam 2003, dann Thailand, China, Türkei usw.

(sporadische Übertragung mit hoher Sterblichkeit; überwiegend junge Menschen)

**H5N1** seit 2005 in Europa (Feb. 2006 in Deutschland)

**H5N1** von 2003 – 2013 633 Fälle an WHO gemeldet; 59,6% Letalität

**H7N9**-Ausbruch in China ab April 2013, 23% Letalität

## Drei Jahre der Kontroversen um die Gefahren Myxovirus-Forschung

- 9.2011 *New Scientist* berichtet über einen Vortrag von **Ron Fouchier** in Malta „*Five easy mutations to make bird flu a lethal pandemic*“
- 1.2011 NSABB fordert *Science* dazu auf, Details aus **Ron Fouchiers** Publikation zu verschweigen
- 2.2011 **Bruce Alberts**, *Editor in Chief* von *Science*, widerspricht der NSABB in einem offenem Brief
- 1.2012 **Ron Fouchier** und **Albert Osterhaus** fechten die Zensurversuche an (*Nature* 481, 257)
- 1.2012 Moratorium zur Transmission von Vogelgrippe-Virus wird von der Wissenschaft verkündet (*Science* 335, 400)
- 5.2012 **Kawaoka und Kollegen** publizieren ihre Daten zu Vogelgrippe-Virus H5N1 (Imai et al., *Nature* 486, 420)
- 6.2012 **Fouchier und Kollegen** beschreiben Aerosol-Übertragung des Vogelgrippe-Virus H5N1 zwischen Frettchen (Herfst et al., *Science* 336, 1534)

## Drei Jahre der Kontroversen um die Gefahren Myxovirus-Forschung

- 2.2013 Das Moratorium zur Transmissionsstudie mit H5N1 wird für beendet erklärt (Science 339, 520)
- 2013 Die **Gesellschaft für Virologie (GfV)** begrüßt in ihrer Stellungnahme die restriktiven Vorgaben (BSL-4) in Deutschland
- Sept. 2013 Ein Distriktgericht in Holland entscheidet, dass internationale Publikationen den nationalen Exportregeln unterliegen
- 0.2013 Prof. **Giorgio Palù**, Präsident der **European Society for Virology (ESV)**, wendet sich in einem Schreiben an den Kommissionspräsidenten **José M. Barroso**
- 1.2013 Generalsekretär **Robert Jan Smits** antwortet im Namen von Herrn **Barroso**
- 2.2013 Die Royal Society organisiert ein Meeting unter Leitung von **Sir John Skehel** in London
- 2.2013 **Simon Wain-Hobson**, Pasteur-Institut, schreibt eine Erwiderung zum Brief der ESV und bezichtigt diese der

## rei Jahre der Kontroversen um die Gefahren Myxovirus-Forschung

- 1.2014 **Giorgio Palù** erwidert den Brief von Wain-Hobson mit einer Stellungnahme in *Science* (343, 368)
- 5.2014 **Deutscher Ethikrat** formuliert einen langen Forderungskatalog zu *Dual Use Research of Concern*
- 5.2014 **Deutsche Forschungsgemeinschaft** und die **Nationale Akademie der Wissenschaften Leopoldina** geben Empfehlungen zum Umgang mit sicherheitsrelevanter Forschung
- 6.2014 Die **Königlich-Niederländische Akademie der Wissenschaften** organisiert in Amsterdam eine Konferenz mit Giorgio Palù und Simon Wain-Hobson als Hauptredner
- 8.2014 **ESV** ruft eine Diskussionsrunde mit Giorgio Palù und Simon Wain-Hobson auf der Insel Brissago in Lago Maggiore zusammen

ere Symposia zum Thema *Gain of Function Research* unter Federführung der  
wagen-Stiftung, der Leopoldina und der European Association of Scientific

# Discussion on Gain of Function in Virology

2014



St. Gallen

## Discussion on Gain of Function in Virology

Discussion with **Simon Wain-Hobson** and **Giorgio Palù**; Discussion leader: **Bernhard Fleckenstein**  
Wednesday, August 27, 2014

### Summary

The discussion on the risks of GOF research should differentiate between biosafety and biosecurity issues

It can be legitimate trying to suppress the publication of inappropriate research

The spread of information can, at large, not be suppressed by administrative measures

It is expressed that the judgement on biosafety situations must remain in the responsibility of scientists

Executive boards and advisory committees should essentially consist of scientists, but they should also encompass members with a background in ethical sciences and representatives of the society at large

So far, there are no established structures that can give recommendations or formulate the necessary guidelines on biosafety issues at the European level

# Discussion on Gain of Function in Virology

2014



Brissago Island

## Discussion on Gain of Function in Virology

Discussion with **Simon Wain-Hobson** and **Giorgio Palù**; Discussion leader: **Bernhard Fleckenstein**  
Tuesday, August 27, 2014

### Summary- continued

ECDC, an institution associated with the European Commission, seems not yet prepared to provide the administrative basis to coordinate the political advice

It is reported that administrative bodies in Germany have acted so far. The Central Committee for Biological Safety (ZKBS) has ruled that GOF myxovirus research will only be allowed under BSL4 conditions

It has been proposed that there should be a hierarchical structure in Europe. Accordingly, general rules should be formulated under the auspices of an advisory council at the European level; the legal execution should be done under the responsibility of the individual member states

The Brissago meeting has given the impression that there are no irresponsible supporters or opponents of GOF research. Nevertheless, there remained recognizably different views on how to judge the right balance between GOF research and necessary restrictions.