



# ***EASAC Report on Gain of Function: Experimental Applications Relating to Potentially Pandemic Pathogens***

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## **Gain of Function (GoF)**

- In the specific context it concerned research on influenza virus, particularly H5N1 variant, to affect its transmission potential so that it could be transmitted between ferrets.
- However, the debate should be wider as GoF research is applied to other viruses and micro-organisms.

Experiments of interest as defined in the  
2004 Fink report:  
*Biotechnology in an age of terrorism*



Box 3: Proposed seven classes of experiments that would require review and discussion by informed members of the scientific and medical community before they are carried out

These classes include experiments that:

- i. Would demonstrate how to render a vaccine ineffective
- ii. Would confer resistance to therapeutically useful antibiotics or antiviral agents
- iii. Would enhance the virulence of a pathogen or render a non-pathogen virulent
- iv. Would increase transmissibility of a pathogen
- v. Would alter the host range of a pathogen
- vi. Would enable the evasion of diagnostic/detection modalities
- vii. Would enable the weaponization of a biological agent or toxin

Background to considering issues  
raised by these GoF studies



- Such studies are already subject to stringent and national regulations in the EU and the USA.
- Concerns for creation of novel pathogens and misuse of published results of such experiments has led to a *de facto* moratorium on GoF studies in the US.
- The EU commission asked EASAC for advice in 2014.

## EASAC GoF recommendations



- Emphasising a layered approach with integration of responsibilities and action at researcher, research institution, research funder, national and international levels.
- Focus on biosafety but biosecurity also recognised as important.
- Academies and learned societies need to continue to promote discussion across scientific community, with other stakeholders and the public.



## EASAC key messages: Self-regulation



- Good practice requires – conforming with regulations/safety conditions/codes of conduct, justifying proposed research.
- Self-regulation means – checks and balances on research within the scientific community, requires raising awareness of researchers and their institutions, with need for education.



## EASAC key messages: Benefit-risk assessment



- Not a “once and for all” calculation but continuing, collective commitment to understand and communicate the issues.
- Benefit can be quantified as potential public health impact or described in terms of generation of scientific knowledge.
- There may be experiments that should not be performed: concerns are legitimate but what is much less clear is how to inform, evaluate, quantify and weigh the concerns.

## A Risk-Benefit matrix



A matrix can be drawn up easily. The difficulties arise from defining the risk and benefit levels as these are value laden. The final problem is that one is weighing incommensurable parameters. There are experiments that should not be done, but we can be guided by what is likely to happen or has happened in nature.

RISK	Final score: Risk/benefit				
5	5.00	2.50	1.67	1.25	1.00
4	4.00	2.00	1.33	1.00	0.80
3	3.00	1.50	1.00	0.75	0.60
2	2.00	1.00	0.67	0.50	0.40
1	1.00	0.50	0.33	0.25	0.20
<b>Benefit level</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>

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## Precautionary versus proportionality principle

In the precautionary approach the burden of proof lies with the proposer to show that the risks are negligible or zero; this can lead to **paralysis**.

In the proportionality approach, the questions are formulated differently.

1. Relevance of the means: the means should bring about or at least help to achieve the goal.
2. Most favourable option: there is no less controversial or risky means to achieve the goal (or reformulated: the least harmful alternative should be used).
3. Non-excessiveness: the means should not be excessive in relation to the intended goal.

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## EASAC key messages



- No new EU-level body is recommended.
- Importance for all researchers and their institutions conforming with EU regulations as implemented nationally.
- Member States should have clear national regulations.

## EASAC key messages: Publication of sensitive information



- Researchers and their institutions all have responsibility to make decisions about publishing sensitive information.
- Journals should obtain appropriate advice, including from security experts.
- European Commission's Export Control Regulation is an inappropriate and ineffective vehicle to block publication

## EASAC key messages: Public engagement



- Trust and openness are crucial for researchers and their institutions.
- Academies and others in the scientific community should actively participate in public dialogue – articulating objectives for research, potential for benefit and risk, and biorisk management practices adopted.

## EASAC key messages: Global context



- Countries worldwide vary in their standards, national guidelines, legal frameworks and in their attitudes to benefit-risk balance.
- Collectively, there is much more to do to understand, share and implement good practice.



Thank You!

Any Questions?

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