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Communication

The "H5N1 publication case" and its conclusions

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The request of the National Science Advisory Board for Biosecurity (NSABB) to the editors of the scientific journals *SCIENCE* and *NATURE* not to publish details on the modified H5N1-virus has surprisingly not caused a discussion on censorship within the scientific community (NSABB, 2012a, P.1). This may show that science generally acknowledges the necessity to cut out *sensitive data from research results* in publications that may serve as a manual for weapons of mass destruction. In this article the policy of the NSABB and the reaction of the scientific community is discussed, as well as the meaning of censorship in dual use research and how an appropriate organisation of future surveillance in sensitive science fields could be organised: To guarantee future undisturbed work in sensitive science fields, the establishment of an internationally organised frame for scientists dealing with dual-use-research is suggested.

Keywords: H5N1, dual use research, NSABB, ethics, science

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INTRODUCTION

For years, the approach of science dealing with publications on dual-use-research and the necessity to skip sensitive details in publications has been the object of discussions — often for but originating outside science (Pauwels, 2007, P.29). Science itself seems to be incapable of dealing with the problem of a possible use of research results for terroristic acts with biological and chemical weapons. There are several ethics declarations from scientific associations, e.g. The Code of Ethics against Misuse of Scientific Knowledge, Research and Resources by The International Union of Microbiological Societies (IUMS, 2006). This declaration as many other ethics-declarations has not had any impact or organisational consequences for the practice of science; the question to be asked is whether "awareness creation" is a sufficient final goal for ethical announcements or if a concrete management of ethical problems must be established in Science. As publishing is the main part of science, the possibility to cut out respective details from publications or even to abandon publications with the potential to deliver unintentionally information for building a weapon or weapons of mass destruction, this kind of self-restriction in science touches the core of scientific self-understanding. However, as science has missed the right point in time to create alternatives to the idea of censored or abandoned publications, restrictions on delivering possibly sensitive information to the public seem to be an appropriate and necessary measure.

CASE REPORT

The following essay deals with the case of the publications on gene-modifications of the H5N1-virus by Ron Fouchier and others, and the attempt to censor the respective papers that finally were published in *Nature* and *Science* (Fouchier *et al*., 2012; Herfst *et al*., 2012; Masaki *et al*., 2012) . It also deals with the connected problems referring to possible misuse of the research results and possible conclusions to be drawn for future dealings with dual-use-research.

The leading question of the H5N1-gene-modification research was to find out which and how many modifications would be needed to make the virus even more harmful. In autumn 2011 the authors finally decided to publish their results in *Nature* and *Science*.

By the end of 2011 the U.S American National Science Advisory Board for Biosecurity (NSABB) sent a recommendation to the scientific journals Science and Nature remove crucial details of two papers for publication on research on the modified H5N1 virus before publishing them (NSABB, 2012a, P.1).

As a State organ, the NSABB was established after the terror-attacks of 09/11, and within the American counter-terrorist organisations it represents the board of specialists responsible for consulting the government on possible dangers connected with biomedical research and possible acts of bioterrorism (NSABB, 2012b, P.1f).

At the current point in time it is not clear how the NSABB gained knowledge on, or if the NSABB even received full access to the suggested papers on the H5N1-gene-modifications at such an early point in time before publication (On: NSABB, 2012a, P1 it is reported that the NSABB reviewed Fouchier´s paper in autumn 2011, but it is not explained how the NSABB gained access to a paper sent under usual confidentiality to publishers of scientific journals)

The argumentation of the NSABB to *Science* and *Nature* was clear and as plausible as the message on dual-use-research: complete publication on this H5N1 project may be helpful for terrorists developing weapons of mass destruction and must be prevented (l.c.).

The entire case of the publication on the "Armageddon Super-Virus" (This term originates from REUTERS, 2012) has been far more complex, and actually raises many questions connected with science, its organisation and publication processes, but also concerning its mechanism of dealing with sensational news presented by scientists in lurid ways.

One of the main authors, Ron Fouchier, launched contradictory and disconcerting information on the re-

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Abbreviations: H5N1, influenza A virus subtype H5N1; NSABB, National Science Advisory Board for Biosecurity

search results before publication. Presenting research results before publication at scientific conferences, Fouchier announced the modified virus first as absolutely lethal in the animal model, airborne and easily spread, but weakened his argumentation later, strangely based on the same research results. Sandman (2012) reports that Fouchier gave such statements at different conferences solely orally; however, the conclusions on the safety assessment of the modified H5N1 were also altered, downgraded, in the later publication. At a later stage the authors called a 60-day research moratorium that was to provide time to discuss the circumstances of publication in the scientific world, and finally the WHO (2012) got involved in a leading management position in this entire affair. A complete chronological listing of all events of the H5N1-case has been published by Sandmann (2012).

It appears to be opportune to discuss the management of research by Fouchier. However, when it comes to questions of self- understanding and — determination of science, the attempt of the NSABB to prevent a full publication seems to be the real core point and main problem to discuss, for it touches the highest right within science: the *Freedom of Science*. This term implies mainly that science is doing its self-chosen work, including publication of research results, free of political, religious or any other influence from outside science, and the recommendation of the NSABB therefore represents a serious attempt to curtail this right.

DISCUSSION

The question why the NSABB requested a censored publication particularly in this case finds a partial answer in the contents of the dramatic presentation of the research results by Ron Fouchier.

The presumed attractiveness of a virus to terrorists, announced in the beginning of the entire H5N1-publication case by the inventor as "airborne" and "highly contagious" in combination with "100%-deadly" speaks for itself. A human to human spread appears an obvious horrific idea of a possible terroristic threat. Furthermore, due to the fact of a relatively low number of anti-viral drugs and any other anti-viral treatments a further element of a possibly high attractiveness to terrorists seems to be given in the low chances to fight that virus in case of pandemic spread.

The justified concerns that the publication on the modified H5N1 virus could be misused as an instruction manual for building a weapon of mass destruction has not been reduced by the finally published conclusions of the researchers that just 5 gene-modifications are necessary to build a most dangerous modified virus, but has been even increased by its relative simplicity.

It is obvious that bio weapons other than the modified H5N1 virus are relatively easy to obtain and maybe easier to produce in regular labs at hospitals, universities and research facilities. However, this fact does not speak against the probability of a potential misuse of the H5N1-research results by terrorists; and also it does not speak against possible necessary preventive measures — like censorship — in this case, but generally just for a much stronger control of any facility dealing with bacteria and viruses: actually, it only supports the call for restrictive measures up to a possible censorship also referring publications on so-called "kitchen recipes" for potential terroristic weapons.

The questions concerning probabilities, logic and why especially since the devastating terroristic attack on 9/11, and in modern times until now generally in only a few cases terrorists used bio-weapons, is even not explained in current research on terrorism, as well as — by analogous reasoning — it probably keeps forever unexplained why it took until 09/11 that terrorists used commercial airliners as air-to-ground-missiles — and not before that date. Taken into consideration that current terrorists obviously aim at attacks on big targets with highest possible death rates and highest psychological effects on the public, also science shall be open-minded to the possibility of a fatal misuse of their research and publications and rethink their traditional unrestricted policy of publications disregarding a possible misuse.

Furthermore, it has to be said that especially the example of the improbable 9/11-attacks shows clearly that the probability of certain ways of terroristic acts could be inversely proportional to the probability that terrorists choose especially them; the lower the probability of a certain way of terroristic act the higher may be the probability of realising an attack with a low probability method as an element of surprise. Obviously, no one has foreseen that the most improbable attack using civil airplanes as missiles is a fair choice for terrorists by its improbability, and the fact that it is highly improbable that terrorists may use a gene-modified virus may be exactly the argument making it highly attractive to terrorists.

After the inquiry of censorship of the NSABB to Science and Nature became public, a strong reaction from within science could have been expected, but nothing like this was observed. (Only a few publications discussing the issue can be found, e.g. Schultz, 2012) The reasons for that indifference of science are unknown.

European scientists may evaluate this issue as a local American one, and think therefore that this does not concern them. This would be a misjudgement. First of all, the main author and researcher in the present case is *Ron Fouchier*, working in Rotterdam, Netherlands, and it was he who tried to publish the research results in *Science* and *Nature*. Secondly, nowadays science is international in many ways but especially when it comes to publication and consideration of research results.

It could be the case that science sees no obligation dealing with questions of censorship of their publications and therefore did not react to that or that at least bigger parts of science agreed with the NSABB suggestion.

A possible logical objection against the requested censorship of the NSABB may be actually valid for all attempts of censorship in science: it is doomed to failure.

Nowadays information within science spreads faster than at any time before in science history. Already by December 2011, the unpublished H5N1 paper has been obviously read by dozens of people, and it is not a too bold an idea that the number of readers has been growing every day ever since. In addition, on many websites the information that only five mutations are needed to make the original virus even more dangerous than it already is has been available from before the final publication in scientific journals. (It may have played a major role for the fast spreading news on that research case that at the occasion of different press conference and video meetings Fouchier himself called the modified H5N1 "probably one of the most dangerous viruses you can make" (Enserink, 2012)). Whether this leak originates from one of the reviewers or — for possible political reasons in the struggle with the NSABB one of the authors — is absolutely unclear. Nevertheless, to keep scientific information successfully a secret is nowadays quite improbable. However, if any censorship of scien-

tific publications may be an attempt in vain, the question of appropriate measures dealing with research results being finally a potential conceivable threat to public safety is open, and requires a discourse.

In such a discourse, first of all, the question of responsibility has to be clarified.

That in democratic states *the State* is responsible for public safety is beyond question and serious doubts. Nevertheless science has to deal with the question if it — as an originator and "source" of possibly dangerous information — is not, indeed, even primarily responsible for the question how to deal with safety aspects of its work.

However, from History of science we have learned that science is usually not interested in self-reflection and in dealing with aspects and consequences of research beyond pure scientific activities (Wernher von Braun, Werner Heisenberg and Robert Oppenheimer may each be an example for that. Von Braun did research on rockets for the Nazi-regime, and Heisenberg tried to build the atomic bomb for Nazi-Germany; Oppenheimer finally successfully built the atomic bomb for the United States. All three always underlined that they were not responsible for what has become or may have become of their research results).

Due to the debatable but still wide-spread self-understanding of science, being "only" responsible for discovering facts of the material world, the question how results of scientific work shall be used is outside its realm. This is especially valid when it comes to consequences of its research in terms of dual-use-research.

Furthermore, from bioethics we have learned that science usually does not show exorbitant resistance to the hegemony of external forces, managing them by establishing rules and regulations.

All these facts may explain why science did not resist the censorship inquiry by the NSABB, for it simply defines itself as not being responsible for that problem. This indifferent and apolitical attitude is equivalent to a tacit agreement to the NSABB request, and leads in its consequence to the conclusion that all science needs surveillance and organisation from outside in terms of politics and ethics, for science itself is incapable and unwilling to deal with such aspects of its work.

CONCLUSIONS

Any kind of research that can be identified as dual-use-research needs necessary restrictions for the benefit of a safer society. Balancing of legally protected interests show unambiguously that the safety of society — as the higher Good — outweighs the right of publishing scientific results, but also outweighs the right to do dual-use-research uncontrolled.

As science has not developed any internal self-control instruments regarding the real possibility that terrorists use scientific publications to develop weapons of mass destruction, mechanisms to prevent this chance have to be established from outside science. Restrictions and prohibition of certain publications are as logical as appropriate, but unfortunately do not touch the roots of the real problem of spreading scientific information in modern times, as already mentioned above. Censorship of publications with a potential of misuse falls short, for it obviously cannot guarantee that delicate information will not fall into the wrong hands. The leaked information in the H5N1 publication case shows that details of unpublished research cannot be completely protected. Appropriate countermeasures have to be established "up-stream", at a higher stage in the organisation of science.

Scientists doing dual-use-research shall be obliged to get a security clearance for their work, organised by the State. It may appear necessary that scientists doing dual-use-research shall be freed from their obligation to publish their results. In this frame the necessary interaction of scientists — guaranteeing an appropriate exchange of data and information — can be guaranteed by establishing international science communities, consisting only of researchers with a security clearance on the same level.

The NSABB has shown its excellent expertise in evaluation of possibly dangerous scientific information and can be called an example for establishing cooperating boards also in other countries, taking care for the security clearance of scientists doing dual-use-research as well.

In view of the global terrorist menace that has become visible at and since 09/11 a concerted international and interdisciplinary action is required, also to prevent misuse of publicly available scientific information. Given the state of the art in Life sciences - e.g. the ability to develop 100% lethal viruses - the first concrete steps in this direction must be taken as soon as possible.

Some scientists might object that science itself, as the originator of dual-use-research, should take appropriate measures, but science has ever acknowledged safety problems as one of its duties and science is neither willing nor capable of doing so. The fact that a bigger part of science has accepted the way the NSABB has taken in a first step, can be called a wise decision and shows the way into the future of dealing with possible threats originating from science: the State has to organise the frames of science.

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