

IN FERRETING OUT SCIENCE'S SECRETS, THERE IS NO ROOM FOR CENSORSHIP



Ferret photo via Wikimedia Commons

On Tuesday afternoon, the Washington Post announced that the National Science Advisory Board for Biosecurity (NSABB) has officially asked two scientific journals to censor portions of manuscripts that are pending for publication:

The federal government on Tuesday asked two science journals to censor parts of two papers describing how researchers produced what appears to be a far more dangerous version of the “bird flu” virus that has circulated in Asia for more than a decade.

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After weeks of reviewing the manuscripts the board recommended their “general conclusions” be published but “not include the methodological and other details that could enable replication of the experiments by those who would seek to do harm.”

The board – 23 scientists and public-health experts from outside the government, and 18 from within – cannot stop publication. Its advice goes to the Department of Health and Human Services, whose leaders will ask the journals – Science, published in Washington, and Nature, published in London – to comply.

The folly of the board's request is monumental. First of all, it's already too late for the workers to "not include the methodological and other details that could enable replication of the experiments". Key portions of this work were described in a November 23 ScienceInsider article that summarized even earlier publications:

The virus is an H5N1 avian influenza strain that has been genetically altered and is now easily transmissible between ferrets, the animals that most closely mimic the human response to flu. Scientists believe it's likely that the pathogen, if it emerged in nature or were released, would trigger an influenza pandemic, quite possibly with many millions of deaths.

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Although he declined to discuss details of the research because the paper is still under review, Fouchier confirmed the details given in news stories in *New Scientist* and *Scientific American* about a September meeting in Malta where he first presented the study. Those stories describe how Fouchier initially tried to make the virus more transmissible by making specific changes to its genome, using a process called reverse genetics; when that failed, he passed the virus from one ferret to another multiple times, a low-tech and time-honored method of making a pathogen adapt to a new host.

After 10 generations, the virus had become "airborne": Healthy ferrets became infected simply by being housed in a cage next to a sick one. The airborne strain had five mutations in two genes, each of which have already been found in nature, Fouchier says; just never all at once in the same strain.

At this point, if the details of just which precise mutations occur in the pathogenic virus that was developed are published, it should make no difference, because press reports have already confirmed that the most basic approach one could take, involving a simple genetic selection experiment, gives the result of the more pathogenic virus. It's even likely there are other combinations of mutations that would make an extremely pathogenic virus if the selection process were repeated in a new experiment.

But the folly of the NSABB decision goes much deeper and is just another aspect of the hysteria that has gripped the United States since the al Qaeda attack on 9/11 and the anthrax attack just a few weeks later. One aspect of this hysteria has been an attempt to make far too many things secret. Much attention has been paid to the over-classification of intelligence information, but the over-classification of scientific information is just as insidious.

No matter how many bits of intelligence or scientific information are made secret, the fact remains that determined terrorists have a multitude of fully described weapons systems to employ in an attack. By stifling publication of basic scientific research into materials that could have weapons potential, the opportunity to develop useful countermeasures becomes significantly diminished.

A real-world example from around the time of the 2001 attacks provides a perfect demonstration of

the value of publication of basic information.

In his book *The Demon in the Freezer*, Richard Preston describes how an Australian scientist, Ronald J. Jackson, was conducting experiments aimed at developing new methods to control mouse populations by rendering them sterile.

Jackson's group worked with the mousepox virus, which is very closely related to the deadly human smallpox virus. From another description:

It was a classic purely scientific experiment. Australian researchers were interested in, of all things, mouse contraceptives. To this end they modified a mousepox virus to contain the gene for interleukin-4 (IL-4) as well as the mouse egg shell protein (ZP3). The egg shell protein was there to encourage a contraceptive response against the mouse's own eggs. The IL-4 gene was there to increase the immune response against ZP3 protein, so as to make the contraceptive response more effective. The mousepox itself was a relatively benign virus, of little threat to the health of the mice themselves.

The results were, to put it mildly, unexpected. When the genetically engineered mousepox was put into mice the mice simply died. The supposedly benign mousepox virus was discovered to have become a killer. And not only a killer, but a super-killer: *100% of the mice died*. The scientists thought they might learn something useful about mouse contraception, but instead they had learned how to create a universally fatal virus. And this killer virus had been created via a very simple genetic manipulation, accessible to every country with a few PhD microbiologists. Imagine their surprise.

The same controversy now facing the bird flu researchers faced Jackson and his group. They first described their results in a poster at a

meeting in Montpellier, France in September, 2000. The publication question was discussed by BBC in January, 2001:

The potential for abuse of this discovery is real but virus expert, Professor [John] Oxford, argues that to prevent all similar research would hinder efforts to tackle disease. Similarly concerns have been raised concerning publishing such findings and the freedom of the scientific press.

Before publishing their study the mousepox researchers consulted the Australian Department of Defence. The researchers reasons for wanting to publish were found to be justified when they explained that they wanted to make the scientific community aware that creating severe organisms can happen by accident. A full report is due to appear in the Journal of Virology in February.

One aspect of the Jackson virus noted in Preston's book is that the engineered virus even killed most mice that had been vaccinated against the unchanged mousepox virus. This work was extended in 2009 and then used to develop a treatment plan that defeats the souped-up virus:

A research team backed by a federal grant has created a genetically engineered mousepox virus designed to evade vaccines, underscoring biotechnology's deadly potential and stirring debate over whether such research plays into the hands of terrorists.

The team at Saint Louis University, led by Mark Buller, created the superbug to figure out how to defeat it, a key goal of the government's anti-terrorism plan.

The researchers designed a two-drug cocktail that promises to defeat their exceptionally deadly virus. They hope to

publish their work soon in a peer review journal.

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Some feared that publication of such information, regardless of whether scientists' intentions are altruistic, could help terrorists create biological weapons laced with genetically modified superbugs. Such germs are created by splicing drug-resistant genes in viruses normally defeated by vaccines.

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Buller counters that publicizing such work will deter terrorists by showing that scientists can build defenses against souped-up bioweapons. Buller also believes scientists must genetically engineer pathogens to understand how to defeat them.

If Jackson's work had been suppressed, Buller wouldn't have known where to start in developing his virus for which he was able to develop an effective treatment. Development of an enhanced smallpox virus using Jackson's discovery seems highly unlikely, since smallpox has been eradicated from nature and it is believed that very few laboratory samples remain viable, so it seems virtually impossible for terrorists to get access to the virus in order to make the simple changes Jackson discovered.

However, in the case of the bird flu version of influenza virus, the basic flu virus is found worldwide and undergoes rapid changes. The fact that flu virus changes rapidly suggests that, as mentioned in the snippet above from ScienceInsider, a version similar that developed in the controversial experiment could even arise naturally. Those who would suppress publication of details on how Fouchier's group developed the pathogenic virus would prevent responsible researchers repeating the work in order to develop an effective treatment for the virus.

Since the virus could arise naturally, preventing work on a treatment is completely irresponsible.

No killer virus was produced and unleashed on the world because of publication of the Australian mouse virus work. And partly because the work was published, there now is a model treatment plan that could be used even if an engineered smallpox virus were released or evolved unexpectedly from an unknown reservoir.

Full publication of the bird flu virus work is essential for us to have the best possible chance for effective treatment if and when such a pathogenic version evolves in the wild.