

Why genies don't go back into bottles

Thwarting bioterror by restricting the publication of research on a deadly avian flu virus, or any other potential biothreat for that matter, is doomed to fail.

Deep in the editorial vaults of two of the world's most prestigious journals, *Nature* and *Science*, sits an epidemic waiting to happen, or perhaps a biological bomb just waiting to be set by a terrorist or rogue researcher—at least if you believe some of the headlines that have been circulating in recent weeks. What we know at the time of writing is that each journal has a paper on H5N1 influenza, the contents of which are so unsettling that an arm of the US government concerned with biodefense has stepped in and asked the editors to cover up certain information within them. This has set off a firestorm of controversy over what types of science should be censored and indeed how to censor information in papers that describe a potential biothreat.

As *Nature Biotechnology* went to press, there are a lot of unknowns, known and unknown. The two papers in question center on work from the groups of Ron Fouchier of the Erasmus Medical Center in Rotterdam, The Netherlands, and of Yoshihiro Kawaoka of the University of Wisconsin, Madison, and the University of Tokyo's Institute of Medical Science. Little has been revealed about the Kawaoka experiments submitted to *Nature*, but the Fouchier work under consideration at *Science* is already an open secret. Fouchier has presented his research at scientific meetings, and the relatively simple methods his team used are well known to virologists.

Today, H5N1 virus (a.k.a bird flu) is a seasonal occurrence in at least 63 countries. It rarely transmits from animal hosts to people. But when it does, it turns out to be extremely virulent—with overall mortality rates in the region of 60%. All of which is of particular concern when one considers the world's population has no preexisting immunity to H5N1, no stockpiles of antiviral drugs and no certainty of a reliable vaccine in the few short months it would take a pandemic to establish itself.

It appears that it was these considerations that prompted the US National Science Advisory Board for Biosecurity (NSABB) to step in—although, puzzlingly, similar papers have been published without such action (*Virology* 422, 105–113, 2012). It is also clear that opinions on the pros of open publication (science as an open activity; shared information allows the greatest number of minds to speed countermeasure development) and the cons (easier access for rogue states and individuals; less time for authorities to prepare countermeasures) differ widely.

In the coming weeks, we expect to see 'redacted' (censored) versions of the H5N1 papers in both journals. Details of the virus sequence or locations of genetic alterations will be expunged. Part or all of the experimental protocols are likely to be omitted. There is also a suggestion that restricted access to full versions of the papers—replete with mutations, experimental details and all—will be made available to bona fide

researchers. At the time of publication, just how this will work and the criteria for who qualifies for access remain unclear.

One of the many questions prompted by this is what is the point of a redacted paper that lacks central results or methods? In particular, what is the point if the take-home message—that enhanced mammalian transmissibility of H5N1 can be achieved with relatively few passages—is already out in the open (thanks to Fouchier talking to anyone who would listen, the NSABB's December press release and the resultant media furor)?

A second question concerns the security of computer systems. Most terrorist hackers or government agents bent on espionage would regard the firewalls and other security systems used by researchers, referees and publishers as laughable. By widely publicizing its decision, the NSABB has essentially affirmed to the world at large that this set of H5N1 influenza mutations is extremely valuable. The ensuing high-profile media discussion serves only to make certain that a giant 'HACK HERE' sign is posted on the H5N1 data wherever they may be replicated.

Thus, redaction is a cat-less bag, a horse-less stable, an after-act of the most feeble and ineffectual proportions. It will incite the ire of the scientific community and exacerbate concerns of exclusion from officials in countries like Indonesia that hold valuable H5N1 samples. The only upside is it might propel a sober and serious discussion about the types of research that should be funded with open publication as an end goal.

It is possible to argue that, in many areas of science, *a priori* discussion of ethical and security issues are simply not possible. The issues are too ethereal, the cognoscenti too few, the implications too abstruse.

But this is not so with H5N1. Humans might not want to lose their chickens, but they are not really that bothered about a few million dead birds. It is the possibility of mammalian transmission that really grabs people's attention. And yet the scientific community has not really engaged in the debate—perhaps because to do so would have risked an Asilomar-like moratorium on the important work of understanding influenza transmission. But such a discussion does seem worthwhile as a way of clarifying which research should be funded in the first place rather than how the results should be disseminated after the fact.

Avoiding researcher-led debates on the potentials of dual-use science resulted, at least on some occasions, in politically led debates on the same subjects. That road led to President George W. Bush's ban on embryonic stem cells and the European Union's moratorium on genetically engineered crops. Let's hope the debate on influenza transmission follows a more rational path.