菩提田
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重建世界—基因工程引起的倫理問題《續》

Redesigning the World: Ethical Questions about Genetic Engineering (continued)

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生物戰爭

許多國家都在進行秘密工作，發展基因工程改造的細菌與濾過性病原體，以用於生物戰爭。國際恐怖份子已經開始認真地考慮它們的用途。要管制，幾乎不可能，因爲商用設備與科技很容易地就可以轉移爲軍用。

蘇聯解體前有三萬二千位科學家致力於生物戰爭的工作，包括軍用基因工程。如今大部份科學家下落不明，還有他們帶走了些甚麼，也沒有人知道。在他們的研究中較引人注目，也較有發展前途的是以馬的腦炎，或 Ebola 濾過性病原體，所改造過的天花濾過性病原體。在一所實驗室裡，雖然有最嚴格的防範規定，然而這些原本從美國軍方偷來的濾過性肺炎病毒，還是感染了在建築物內出沒的野鼠，這些野鼠後來脫逃到野外去了。（註24）

也有證據間接指出，所謂的「波斯灣戰爭症候群」絕大部份的起因，可能來自一個經基因工程改造的生物戰爭作用劑，經過一段較長的潛伏期之後開使蔓延。幸而抗生素療法似乎對這那種作用劑生效用。（註25）當生物一旦被蓄意改造成抗拒所有目前已知的療法時，又會是怎樣的情形呢？

諾貝爾獎金的基因學得主、洛克斐勒大學退

Biowarfare

Secret work is going forward in many countries to develop genetically engineered bacteria and viruses for biological warfare. International terrorists have already begun seriously considering their use. They are almost impossible to regulate, because the same equipment and technology that are used commercially can easily and quickly be transferred to military application.

The former Soviet Union had 32,000 scientists working on biowarfare, including military applications of genetic engineering. No one knows where most of them have gone, or what they have taken with them. Among the more interesting probable developments of their research were smallpox viruses
engineered either with equine encephalitis or with Ebola virus. In one laboratory, despite the most stringent containment standards, a virulent strain of pneumonia, which had been stolen from the United State military, infected wild rats living in the building, which then escaped into the wild.[24]

There is also suggestive evidence that much of the so-called Gulf War Syndrome may have been caused by a genetically engineered biowarfare agent which is contagious after a relatively long incubation period. Fortunately that particular organism seems to respond to antibiotic treatment.[25] What is going to happen when the organisms are purposely engineered to resist all known treatment?

Nobel laureate in genetics and president emeritus of

休榮譽校長約書亞・勵德伯（Joshua Lederberg）在關懷國際間對生物武器控制方面，一直是眾人的前驅；然而當我以書信方式請教他關於將基因工程用於生物戰所牽涉的道德問題時，他回答道：「這不跟煉鋼的道理一樣嗎－－鋼可以用來造橋，也可以用來造槍；除此之外，我看不出還有甚麼可討論的。」（註26） 和多數的科學家一樣，勵德伯無法認知到，科學研究者對於自己的發明用在什麼地方，是有責任的；因此他未能意識到，孫悟空一旦出了煉丹爐，想再把他鎖回去是辦不到的。換言之，基因工程方面的研究，自然會導引到爲生物戰爭之用，所以在進行任何基因工程研究之前，應該清楚地評估它在生物戰爭中可能的用途。許多參與「曼哈頓計劃」製造出第一枚原子彈的科學家，在瞭解原子戰爭的恐怖之後，內心反思痛苦掙扎不已。令人驚訝的是，更多的基因學家居然看不到這兩者的相同之處。

附註：

24. 見理查・普萊斯頓（Richard Preston）著、刊載於一九九八年三月九日的《紐約客》第五十二至六十五頁，「戰爭年鑑：生物武器家」一文。亦見茱蒂絲・米勒（Judith Miller）與威廉・柏萊德（William T. Broad）合著、刊載於一九九八年十二月八日《紐約時報》的「伊朗人製造生物武器之狼子野心：前蘇聯科學家被引誘」一文。http://online.sfsu.edu/~erone/GE%20Essays/Iraninas%20Bioweapons%20ExSoviet%20Scientists.htm，以及「前線疫疾戰爭」http://www.pbs.org/wgbh/pages/frontline/shows/plague/。

25. 詳見葛斯・尼可森（Garth Nicolson）博士與南絲・尼可森（Nancy Nicolson）博士的分子醫學研究院的網站http://www.trufax.org/gulfwar2/news-rel.html。

26. 引用我在一九九八年春所收到勵德伯（Lederberg）博士的電子郵件 。

ᘐ待續

Rockefeller University Joshua Lederberg has been in the forefront of those concerned about international control of biological weapons. Yet when I wrote Dr. Lederberg for information about ethical problems in the use of genetic engineering in biowarfare, he replied, "I don't see how we'd be talking about the ethics of genetic engineering, any more than that of iron smelting - which can be used to build bridges or guns."[26] Like most scientists, Lederberg fails to acknowledge that scientific researchers have a responsibility for the use to which their discoveries are put. Thus he also fails to recognize that once the genie is out of the bottle, you cannot coax it back in. In other words, research in genetic engineering naturally leads to its employment for biowarfare, so that before any research in genetic engineering is undertaken, its potential use in biowarfare should be clearly evaluated. After they became aware of the horrors of nuclear war, many of the scientists who worked in the Manhattan project, which developed the first atomic bomb, underwent terrible anguish and soul-searching. It is surprising that more geneticists do not see the parallels.

After reading about the dangers of genetic engineering in biowarfare, the president of the United States, Bill Clinton, became extremely concerned, and, in the spring of 1998, made civil defense countermeasures a priority. Yet, his administration has systematically opposed all but the most rudimentary safety regulations and restrictions for the biotech industry. By doing so, Clinton has unwittingly created a climate in which the production of the weapons he is trying to defend against has become very easy for both governments and terrorists.[27]

NOTES:

24. See Richard Preston, "Annals of Warfare: the Bioweaponeers", New Yorker (March 9, 1998): 52-65. See also Judith Miller and William T. Broad, "Iranians, Bioweapons in Mind, Lure Ex-Soviet Scientists" New York Times, Dec. 8, 1998 <http://online.sfsu.edu/~rone/GE%20Essays/Iranians%20Bioweapons%20ExSoviet%20Scientists.htm>; and "Frontline: Plague War" <http://www.pbs.org/wgbh/pages/frontline/shows/plague/>.

25. See Dr. Garth and Dr. Nancy Nicolson's Institute for Molecular Medicine website for details: <http://www.trufax.org/gulfwar2/newsrel.html>.

26. Quoted from email I received from Dr. Lederberg in spring, 1998.

ᘐTo be continued