

The “Dual-Use” of Synthetic/Artificial Microorganisms and Terrorism, as a National Security Issue

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Abstract

The term dual use especially in national security circles, relates to the possibilities of abuse of items initially created via advancements in scientific development, for human good. That is, items that can be used with harmful intent against its ordinary intent for alleviating human sufferings or pains. Since human existence and development, many items developed via scientific breakthroughs, have later down the years been modified as a weapon or tool for human miseries. For instance, commercially developed drones, now being employed with major or minor modifications as tools for terrorism, drug smuggling etc. These commercial drones were first created for private recreational uses. More military advance drones have played a lot of roles in “hell fire” missions targeted against enemies in combat, this writer actively saw this in combat while serving in Afghanistan. Today many countries and later narco-terrorist (narcotics terrorist) groups, own many variations of drones for their illegitimate missions, in most cases detrimental to humanity and life expectancy. Similar dual uses have been seen with biological agents or microorganisms.

Keywords: *Dual Uses; Synthetic or Artificial Microorganism; Terrorism; National Security*

Introduction

The “dual-uses” term is just like a “coin” that has two sides, that can be very subjective in terms of description, depending from which side it’s being observed from. Take for example, airplanes were initially created for human commercial or recreational flights, today modified as a fighter plan used in combat as a tool for destruction. Another item, like an atom, with its discovery later employed in the development of deadly weapons like atomic or hydrogen bombs. In the biological sciences, the development of molecular techniques, brought a lot of improvement in live sciences, today same tool or techniques have being employed to manipulate or recreate modified organisms, which in the hands of individuals or state agents, could end up with the development of harmful microbial agents.

Biosecurity experts are more concern about this “dual-uses” issue following the uses of biological agents in wars or as agent for terrorism, especially now with increase in this era of religious, environmental or racial terrorisms. Literature abound of cases where microorganisms have been employed as a weapon for bioterrorism or biowarfare. It is thus a very important issue among scientific communities, national security experts and policy makers. The report that, scientists can now create novel and newer organisms, with completely new genes, increases the concerns.

As a young microbiology student and later young microbiologist in the research field, this writer has always been excited with the ability to manipulate the microbial agents for the good of humanity via the improvement of health or disease management, and agriculture through the development of ‘insect or disease resistant’ seeds or crops etc. However, during this writer’s post-doctoral research fellowships

and his exposure to genetic manipulation and molecular biology/ cloning of microbes, his worries or questions about possible abuses of scientific creations/manipulations (what is now known as dual uses) especially in the hands of people or persons with harmful intentions, became more real. This fear became more intense after writer enlisted in the military and worse when he was in combat and was exposed to certain claims/threats that, the Al Qaeda terrorist group, was thinking of exploring the possibilities of using bioagents as a weapon to attack its enemies [1].

The nefarious use of microbes in wars, biowarfare, and now in this era of terrorism, can be traced back to early use of corpses/cadavers, or mycotoxins inside rye ergot in the 4th or 6th centuries BC in wars. During the Native American’s war clothes were infected with smallpox, while during the World Wars I and II, livestock were insidiously infected with *Burkholderia mallei*, and many more as enumerated in the writer’s dissertation published by Lambert Academic Publishing [1].

Synthetic/artificial microorganism

Synthetic or artificial microorganisms are microorganisms that were produced via human manipulation in the laboratory, that are uniquely and genetically different from a naturally occurring one. The manipulation of microbes is not new especially on a micro level keeping the organisms as natural as possible, since it remains the foundation for numerous biological research especially in drug development, resistant agriculture related products, (like seeds, crops, fruits etc.), or in the environmental cleansing like oil pollution cleanup.

There are ethical guidelines or regulations or best practices either in national levels or laboratory, to ensure safety; like with handling of especially highly infectious or sensitive organisms, storage, transportation or destruction/disposition of microorganisms. All processes are to prevent accidental or intentional dissemination of harmful microbial agents into the community or get into the possession of those prohibited from having access, especially in this era of terrorism. Despite all these precautions, reports exist in public records of numerous lapses that led to wrongful dissemination of certain infectious agents. Recently the Center for Disease Control and Prevention (CDC) was reported to have shut down a US Army medical research Institute of Infectious Diseases laboratory handling levels 3 or 4 classed microbial agents, like Anthrax, Ebola etc [2]. It was reported that this closure was because of “lapses in biosafety procedures” at the laboratory, with the New York Times, reporting that the laboratory lacked “sufficient systems in place to decontaminate waste water” since its steam sterilization plant was damaged during the 2018 flood [3]. Securing biological agents especially those with bioweapons capabilities, remains a major global concern.

Literature indicated that, the desire to synthesize or create a completely new organisms, tend to have increased following the successful “design of the first complete synthetic genome” [4. Pg. 29] as at 2010. A group of researchers in the United Kingdom is reported in *The Biomedical Science*, 2019 to have designed a synthetic version of the enteric bacterium, *Escherichia coli* (*E. coli*), by rewriting its genetic code in order to create this living artificial bacterium. It is called the Syn61 *E. coli*. This synthetic bacterium has a genome four times larger than past previously designed ones, it has four million base pairs long and it grows more slower than the natural *E. coli*, but its cells are functional producing proteins normally. This scientific achievement is just the beginning, as the future will be the creation of bigger synthetic microbial agents [4].

Applying this dual-use possibilities, access to this or other functional artificial or synthetic organisms by individuals with terrorist intentions or tendencies, could spell serious medical problem for the community it is deployed into. Medical emergencies or epidemic as a result of these synthetic microbes, increases the possibilities of defying medical intervention, at least in the very early and crucial period of medical response, since the health providers might not be in possession of any effective and sensitive antimicrobial or vaccines. Synthetic organism like the Syn61 *E. coli*, (or other like it), would tend to exhibit unique antigenic properties, different from the naturally occurring *E. coli*, bacterium, thus insensitive to antibiotics specific against the natural *E. coli*.

While it will be inimical to prevent or advocate against advancement in molecular research, the scientific community should endeavor to strengthen ethical processes or self-regulate, so as to ensure that negative *dual-uses* are made more difficult to attain/or access by educating scientists in the biomedical field, with the enforcement of bio safety security measures globally. As earlier stated, even the highly regulated and secure military research laboratories have been faulted for lacking adequate biosecurity compliance, so with many other private or public laboratories [2,3].

Conclusion

In conclusion, the employment of laboratory altered microbes or its byproducts in biowarfare or bioterrorism, is the most fearsome situation in any infectious diseases’ epidemic for managers, responders and or healthcare providers. It is therefore very imperative that the scientific community, policy makers and institutions involved in research and development, reinforce biosecurity measures with “dual uses” possibilities in context that are not only practical, but also enforceable, in order to prevent or at best mitigate against the access to such synthetic or artificial bioagents by individuals with terroristic intentions.

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