Biological Weapons: Coronavirus, Weapon of Mass Destruction? by U.C. Jha and K. Ratnabali, Vij Books India Pvt Ltd, New Delhi, 2020, Rs 1250, pp. 293

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War, when all else fails. The reasons for war could be ideological or for greater control over finite resources but war invariably has violence at its epicentre. Ethics and wars have rarely been concentric in human history; therefore, wars have seen the employment of all possible means. Victory, as the ultimate aim, has forced warring sides to look at multiple options and biological weapons are one such method. Biological weapons are as old as war itself and their primitive recorded use was centuries ago. Development of weapons based on gunpowder and mobility gained pre-eminence and biological weapons remained on the sidelines. With the advent of nuclear weapons, the significance of biological weapons declined further. A formal closure for the biological weapons at the international level came through the 1972 Biological and Toxin Weapons Convention.

Have all stakeholders crossed out the option of biological weapons? Definitely not. Although there have always been doubts about the efficacy of biological weapons to achieve military objectives, a number of players continue to explore options in this field. The breakout of the COVID-19 pandemic has reminded the world of the possible impact a biological weapon could have on the health, economy and power of states and societies. The year 2020 redefined the meaning of security. At this juncture, a book to analyse various facets of biological weapons and its

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possible usage is apt and that is what U.C. Jha and K. Ratnabali's book is all about.

The book is divided into seven chapters. The first chapter gives a detailed definitional account of all terms associated directly with biological weapons. The historic perspective of development, use and outcome of biological weapons is covered in the second chapter. The next chapter explains the threat from pathogens and implications on crops, livestock and humans. The fourth chapter gives a descriptive account of the coronavirus and how it has changed society and states. Evolving biotechnology and its likely impact on the creation of biological weapons is covered in the fifth chapter. The penultimate chapter covers stages of development of the Biological Weapons Prohibition Regime. The last chapter proposes a way ahead for a safe and secure future for humankind on this planet by controlling the use of biological weapons.

As early as the sixth century BC, biological weapons were part of military strategy to force enemy capitulation. During that era, all civilisations and settlements were around potable water sources. So, contamination of the water source was an often-used tactical move and agents employed varied from rye ergot to skunk cabbage, and graduated to animal corpses. Once the maritime forces came into play in military conflict, serpent-filled earthen pots were hurled at enemy ships to shock the sailors. These were primitive methods of disruption using biological weapons. As the study of biology and specifically medicine and communicable diseases advanced, it was possible to identify the causes of various diseases and their impact on crops, livestock and humans. This new knowledge opened gates for the development and deployment of a new set of biological weapons. Plague and Smallpox were the most often used tools. While the Hague Convention prohibited the use of biological weapons against humans, its obvious loophole was about livestock. At a time when militaries depended heavily on horses and mules, these animals were prime targets of biological weapons.

Bacteriology and its greater understanding formed the basis of modern biological weapons. Several countries explored and experimented with biological weapons for offensive use. Modern science allowed a greater understanding of communicable diseases and their causes and methods of transmission. This allowed storage, development and dissemination systems of various biological agents that could cause the intended damage to the defined ecosystem. An efficient system developed for targeting crops, water sources, livestock and humans. Almost all major military

powers had some capability for biological warfare by the middle of the last century. Of course, these capabilities were developed by testing and trials that caused a loss of lives. Prisoners or non-military personnel of captured territory were often the guinea pigs. Japan's Unit 731 possibly was the biggest experiment for biological weapons, and the US gained data and knowledge from that experiment by granting amnesty to involved scientists, after the end of World War II.

Anthrax, Viral Haemorrhagic Fevers including Ebola, Smallpox, Plague and Tularaemia are the most significant biological agents. These biological agents and Botulinum Toxin are discussed in detail in the chapter on Pathogens. Not only does the chapter cover the history of use of such agents with specific cases, it also includes a scientific explanation about the agent, its dispersion characteristics and impact in great detail. Although explicit biological terms make the reading tough, yet its simple explanation on impact helps the reader understand the significance of the agent. But these are not the only agents that are at play. As virology and its understanding improves, a new generation of biological agents can be identified, isolated and deployed. And Coronavirus is one such case.

Survivability, growth and mutation of the Coronavirus has been the reason for its almost uncontrolled spread across all continents. While the story of COVID-19 is still unfolding, it is a stark reminder to humanity about the fragility of the human race and the limitations of current scientific forays. Though many vaccines are trying to control further damage, within one year COVID-19 has claimed over 2.2 million lives and counting. It is still not clear as to how did it start but Wuhan, is identified as ground zero. Can Coronavirus be used as a biological weapon? Of course. But once the populace is adequately vaccinated, such a tool will lose its applicability.

The most significant lesson from the COVID-19 crisis is that, even though banned, biological weapons can be very effective. With new technology and evolving biotechnology, a new generation of biological weapons are not beyond the realm of reality. The biological weapons that can be tailored to target crops, livestock or humans with certain genetic characteristics, are foreseeable. Synthetic biology and gene editing are maturing. Making a pig glow by inserting the jellyfish bioluminescence genetic code or improving agricultural yield, or making crops drought-resistant is already prevalent. CRISPER-Cas 9, an efficient gene-editing tool, on the one hand, allows better agriculture, disease prevention and control and ecosystem conservation, but on the other, it poses a new set

of challenges for biosafety and biosecurity. Such easy-to-use tools can create unique genetic systems that may pose a number of unprecedented complications in the prevailing ecosystem. Creation of a new virus or harmful toxins, though unethical, cannot be ruled out. Technology is giving more tools to tinker with nature and may not always be for the betterment of the human race. There is a need to exercise utmost care.

The chapter on the biological weapon prohibition regime is exhaustive, starting with its genesis through the 1868 St Petersburg Declaration, to its current incarnation as the 1972 Biological and Toxin Weapons Convention (BTWC). The limitation of the current regime is brought out clearly. Like most international conventions, even BTWC suffers from lack of sound and objective verification and monitoring systems. It is based on good faith and States often put their interests above the common set goal. That is why, biological weapons may never become history. The most difficult aspect of biological weapons is to control events of bioterrorism. With hybrid war and the use of non-state actors by various states to achieve their objectives, on the rise, bioterrorism is a real threat.

The issue of biological weapons has been on the back burner for decades. Biological weapons did not gain enough traction because of moral and ethical problems but most importantly because of the possibility of uncontrolled escalation and the disease engulfing friendly forces. As technology develops further, a resurgence of biological weapons to target specific genetic sequences is a possibility. Notwithstanding BTWC, this area needs further deliberation and careful examination. This book helps, by being a primer for biological weapons with adequate data and examples. It is suitable for all stakeholders in national security and medical science. Hopefully, with this book, a debate on an important aspect of national security will recommence.