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A CONCLAVE WITH CALAMITY: A JURIDICAL INSIGHT INTO THE EXORDIUM OF BIOENGINEERED PANDEMICS

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ABSTRACT

As technology precedes thought and creation, our generation lies on the radar of many unprecedented threats, one of these being – Bioengineered Pandemics.

Despite due cognizance through international treaties and conventions, the unbinding nature of these has lead to lack of legislations, especially in the state of India. Obsolete are the days when laboratories were deemed necessary to create biological weapons; nowadays with advanced equipment, mass destruction is a recipe concocted on screens. Originating in warzones and fragile states, once spread, it is difficult to control the extensive outreach of such epidemics. These "barbarous inventions", according to the International Committee of The Red Cross, continue to augment Bio-Terrorism that is deemed as an inevitable fate by many experts.

While many developed nations have formulated mandates that regulate the manufacturing, distribution and research on biological strife, India, in the dearth of akin legislations stands at a disadvantage in the wake of peril. The only plausible course of action is to choose an offensive and/or defensive approach. Opposing schools of thought such as that of Neo-Luddism have also originated from the insecurity arising due to modern technology and prescribe the use of precautionary principles.

Through this paper the authors intend to engage in identification of bio-weapons and the quagmire that surrounds such biological and genetic warfare. The paper will include, firstly – A preview of the laws governing the Indian and international bio warfare scenario; secondly – An analysis of the medical, legal, social and political implications; thirdly and fourthly – Ethicality and accountability involved along with the possible recourses and remedies. Furthermore the paper intends to accord recommendations with regards to this magnanimous hazard that may prove to be the Achilles heel for our country's polity and people alike.

Keyword(s) – Bioengineered Pandemic, Bio-Terrorism, Bio-Weapons, Neo-Luddism, Subsisting Legislations, Ethicality

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INTRODUCTION –

Modern society exists in an isolated yet comfortably cushioned environment that has ceased to anticipate the hazards that lurk around due to the advancement of modern technology. While humans have been exuberantly minimalistic in aspects of the potential threats that pose them, they've also been a prey to the phenomenon of *availability heuristic* which involves the probability extravagation of pre-existing events and undermining the existence (probability) of instances that one cannot recall leading to poor preparation. As we continue to face existential risks that threaten to wipe out humanity, there have been creators who have foreseen the possible catastrophes that our being is likely to face; the earliest prophecies dates back to mystics like Nostradamus who tried to calculate the calamity day or the end of the world. There has also been a lot of modern day content creation that aims at the prophesizing a probable end for our species; Kass Morgan the writer of the popular television series *The 100* anticipates a technological catastrophe that befalls the human existence and on a similar tangent Roland Emmerich has written *2012* to depict a world consumed by human negligence.

The world that we see today has been an aggregation of a great number of pandemics where the natural kind has been more commonly witnessed as opposed to the bioengineered kind.

The word Pandemic originated in the mid 17th century from the Greek word *pandemos* that means *pertaining to all*.[2] They are usually epidemics or diseases that have spread globally.

Pandemics have been known to be of two kinds – natural and bioengineered. Natural pandemics are generally those epidemics that have a worldwide effect. The current natural pandemics existing in the world are HIV and AIDS. However such are natural pandemics that were not concocted according to the whims and fancies of man in his laboratories. This, would lead us to the second kind of pandemics that exist; bioengineered pandemics. Bioengineered Pandemics, also known as *germ warfare* or *bioengineered/biological warfare* is the intentional use of living organisms or their toxic products to cause death, disability, or damage in man, animals, or plants. The target is man, either by causing

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2 Oxford Dictionary, 3rd Edition

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sickness or death or through limitation of his food supplies or other agricultural resources.[3] The cause of biological warfare or biological pandemics is forwarded and fulfilled through the usage of biological weapons. Bioweapons form the ammunition for the carrying on of biological warfare. The Geneva Protocol of 1925 refers only to bacteriological methods of warfare, however there is a lack of a specific and precise definition. Article 1 of the Biological Weapons Convention has discussed the prohibition of 'microbial or other biological agents, or toxins whatever their origin or method of production, of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes'[4] thereby regulating the amount and cause for many nations that wish to research on the same. These articles under the Convention act as salient guidelines for the member nations. The Convention also prohibits 'weapons, equipment or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict.' Biological weapons are thus defined based on their intended purpose, which is often referred to as a general-purpose criterion.[5]

While the positive societal implications of improved biotechnology are apparent, the "black biology" of bioweapon development may be "one of the gravest threats we will face.[6] There is a general understanding among states that biological weapons are organisms or toxins that could be used to deliberately cause or spread diseases, intended to harm or kill humans, animals or plants. Thus, biological weapons include disease-causing agents such as bacteria, virus, protozoans, parasites and fungi, rickettsiae, or other living organisms, as well as toxins, i.e. poisons extracted from living organisms, or similar substances produced synthetically.

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3 Guide to Federal Records in the National Archives of the United States, General records of the Department of Health, Education and Welfare, (last accessed 24th August 2017, 10:07am), https://www.archives.gov/research/guide-fed-records/groups/235.html

4 United Nations, Biological Weapons Convention 1972, https://www.un.org/disarmament/geneva/bwc

5 International Law and Policy Institute, Biological Weapons Under International Law, (last accessed 24th August 2017, 10:38am), http://nwp.ilpi.org/?p=5739

6 M. Ainscough, Next Generation Bioweapons: Genetic Engineering and Biowarfare, Available at http://www.au.af.mil/au/awc/awcgate/cpc-pubs/biostorm/ainscough (last accessed 24th August 2017, 11:05am)

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Poisoning and the intentional spread of disease as a weapon of war is nothing new – the utilization of biology for hostile use can be traced far back in history.[7]

There were usually specific purposes as to why there were usages of traditional biological and chemical agents. While the traditional biological and chemical agents were used against the decimation and demolition of enemy troops and forces i.e. for the purpose of defense, the modern agents of biological and chemical warfare were used so as to improve and augment the strength of ones own military. In such cases too, these modern agents were weapons despite not being used "against" a particular individual. This can be better understood by taking the example of body armors. Biological performance enhancers may pose challenges to ensure respect of various aspects of humanitarian international law as their purpose may induce increase in hostility and aggression, which may redirect an individual towards committing violations that go against the law of the land. [8]

HISTORY –

Certain historians consider the genesis of bio-warfare in the 14th Century when the Tartar army had besieged the city of Kaffa in Ukraine. The army had initiated an outbreak of bubonic plague amongst their own troops and then flung the bodies of the victims over the walls of Kaffa to initiate a plague amongst the other residents.[9] In 1710, the Russian army used the tactic of catapulting the bodies of plague victims to gain control over Sweden occupied Revel (in Estonia).[10] The first actual recorded biological agent to be "weaponized" in North America was smallpox, which was delivered through blankets. This had occurred during the French and Indian Wars in the mid 18th Century.[11] There was

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7 B. R. Schneider, 'Biological Weapons', *Encyclopædia Britannica,* Available at: http://global.britannica.com/technology/biological-weapon.

8 M. Wheelis and M. Dando, 'Neurobiology: A Case Study of the Imminent Militarization of Biology', *International Review of the Red Cross*, Vol.87 No.859, September 2005, pp. 562-3.

9 Mayor A. Dirty Tricks in Ancient Warfare. Mil Hist Quart. 1997:10, 1: 37

10 Dire DJ, Long DA, Williams LD, Historical Aspects of Biological Warfare, Emedicine

11 Parkman F. The Conspiracy of Pontiac and the Indian War After the Conquest of Canada. Boston; Little Brown & Co; 1901

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extensive dearth of information and knowledge regarding such similar disease transmission, it was only after the developments attributed to Louis Pasteur and Robert Koch in late 1800's and early 1900's it became possible to produce, isolate and weaponize biological agents.[12]

The Institute of Bacteriology in Bucharest identified anthrax and glanders, leading to great developments in the modern biological warfare scenario. Before USA even entered into the warfare scenario, covert German warfare through bacteria had already been attempted in the states though infected horses and animal feed.[13]

Unit 731, Japan's biological warfare program at Manchuria from 1932 until the end of the war, experimented on prisoners leading to more than 10,000 deaths. Bred fleas were fed upon plague infected rats adnd later these fleas were contained and released over Chinese cities through low flying aircrafts. [14] The British biological warfare involved the delivery of anthrax through conventional bombs at the Gruinard Island off the coast of Scotland, however, the outbreak of anthrax was also seen in cattle in Scotland and its decontamination was considered impossible. This brings forth a major disadvantage of biological warfare; the difficulty of decontamination.[15]

The US offensive biological warfare, in 1942 where there was large-scale biological weapons production at Camp Detrick and a "pilot plant" produced 5000 anthrax bombs.[16]

USA also elected the use of "Surrogate Biological Agents" which were used to simulate the employment of deadly organisms, however this was shut down in 1969. There were also tests conducted in the New York subway system to check its vulnerability in 1966 when Bacillus Subtilis was released.[17] President Nixon signed National Security Decisions

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12 Bulloch W, The History of Bacteriology. New York: Oxford University Press, 1938

13 Witcover J. Sabotage at Black Tam: Imperial Germany's Secret War in America, 1914 - 1917. Chapel Hill: Algonquin Books of Chapel Hill; 1989

14 Harris S. Japanese Biological Warfare Research on Humans: a case study of microbiology and ethics. Annals of NY Academy Sci. 1992; 666: 21 - 52

15 Harris R, Paxman JA. A Higher Form of Killing. New York, NY: Hill & Wang; 198

16 Harris R, Paxman JA. A Higher Form of Killing. New York, NY: Hill & Wang; 1982

17 Cole LA, Clouds of Secrecy: The Army's Germ Warfare Tests Over Populated Areas, Rowman & Littlefield, Totowa, NJ 1988

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in February of 1970 terminating the United States offensive BW weapons program. As a direct result of the termination of the offensive BW program, the US Army Medical Research Institute for Infectious Disease (USAMRIID) was established at Ft. Detrick, MD.[18] By 1972, the United Nations Convention on the Prohibition of the Development, Production, and Stockpiling of Bacteriological and Toxin Weapons and Their Destruction (BWC) [31] was ratified by member nations. There were some notable violations.

The Soviet Union continued offensive biological warfare program after signing the 1972 BWC under the title of Biopreparat.[19]

IDENTIFICATION OF BIO WEAPONS –

Even though bioweapons have been used for ages in war, there has been a fairly nascent surge both in the understanding and usage of genetics and also computational power (technology). Genetic engineering has been played a major role in the development of new bioweapons. The bioweapon industry has the ability to create, manipulate and control genes and can even be aimed at enhancing their virulence, survivability, drug resistance and infectivity.[20] Another fact that has surfaced is that, while researchers are moving from DNA sequencing to DNA synthesis it is slowly going to become possible to synthesize a virus whose DNA structure and sequence is known. This had first occurred in 2001 when Dr. Eckard Wimmer resynthesized the poliovirus an again in 2005 with the recreation of the influenza virus.[21]

Usually, biological agents are naturally occurring organisms (viruses, fungi, bacteria, toxins) and can lead to large-scale death and destruction. There are two primary

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18 Biological Warfare and Terrorism, Medical Issues and Response, Satellite Broadcast, September 26-28, 2000

19 United Nations Convention on the Prohibition of the Development, Production, and Stockpiling of Bacteriological and Toxin Weapons and Their Destruction, 1972

20 M. Ainscough, Next Generation Bioweapons: Genetic Engineering and Biowarfare (April 2002). http://www.au.af.mil/au/awc/awcgate/cpc-pubs/biostorm/ainscough.pdf (last accessed 25th August 2017, 12:16pm)

21 Federation of American Scientists, Introduction to Biological Weapons (2011). http://www.fas.org/programs/bio/bwintro.html (last accessed 25th August 2017, 12:30pm)

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characteristics that enhance how efficacious a biological weapon can be: (1) since biological agents, other than toxins, reproduce, even a small sized infectious agent can cause disease; (2) most biological agents, except toxins, require something known as an incubation period of a few hours and/or days to settle down and manifest signs and hence the affected soldier is unclear on whether or not a infectious agent attack has taken place unless he falls ill.[22]

The reality of threats that can possibly annihilate the human existence in the 21st century is best reflected through the Twin Tower attacks and the distribution of anthrax-spore-laced letter through the U.S. Postal Service. In 2001, an incident occurred in India when the Indian Postal Department received 17 "suspicious" letters that contained what was beleievd to be Bacillus Anthracis spores. [23] Since pathogens and toxins such as smallpox, yellow fever etc. are commonly used bioweapons, the same can be spread through various means such as aerosol producing equipment, spray devices, bombs, aircrafts, vessels, letters, blankets etc.[24]

Common microbes used as biological weapons include:

- Bacteria - these prokaryotic organisms are capable of infecting cells and causing disease. Bacteria cause diseases such as anthrax and botulism.
- Viruses - are about 1,000 times smaller than bacteria and require a host to replicate. They are responsible for disease including smallpox, flesh-eating disease, Ebloa disease, and Zika disease.
- Fungi - some of these eukaryotic organisms contain deadly toxins that are harmful to plants, animals, and humans. They cause diseases such as rice blast, wheat stem rust, aspergillosis (caused by inhaling fungal spores), and bovine foot rot.

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22 Section III, Biological Weapons Technology, https://fas.org/irp/threat/mctl98-2/p2sec03.pdf (last accessed 25th August 2017, 1:20pm)

23 Plamen A. Demirev, Andrew B. Feldman, and Jeffrey S. Lin, Chemical and Biological Weapons: Current Concepts for Future Defenses, John Hopkins Technical Digest, Vol 26, No. 4

24 Norlander L, Norqvist A, Roffey R, Sandström G, Sjöstedt A
A briefing book on biological weapons, Swedish Defense Research Agency, Umeå (1995)

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Toxins - poisonous substances that can be extracted from plants, animals, bacteria, and fungi. Toxic substances that can be used as biological weapons include ricin and venom from animals such as snakes and spiders.1

The new technologies provide us with the capability of (1) developing biological agents that have increased virulence and stability after deployment; (2) targeting the delivery of organisms to populations; (3) protecting personnel against biological agents; (4) producing, by genetic modification, pathogenic organisms from non-pathogenic strains to complicate detection of a biological agent; (5) modifying the immune response system of the target population to increase or decrease susceptibility to pathogens; and (6) producing sensors based on the detection of unique signature molecules on the surface of biological agents or on the interaction of the genetic materials in such organisms with gene probes. The specific technologies used in realizing these capabilities include (1) cell culture or fermentation; (2) organism selection; (3) encapsulation and coating with straight or crosslinked biopolymers; (4) genetic engineering; (5) active or passive immunization or treatment with biological response modifiers; (6) monoclonal antibody production; (7) genome data bases, polymerase chain reaction equipment, DNA sequencers, and the rapid production of gene probes; and (8) the capability of linking gene probes and monoclonal antibodies on addressable sites in a reproducible manner. [25]

In America, there exists a robust and well-equipped surveillance and detection regime underlying which are various sensor systems in order to identify the existence/presence of chemical or biological warfare agents. As far as bioweapons are concerned, there are a few potential molecular targets such as – RNA, metabolites, DNA, proteins that allow for the recognition of microorganisms.[26] It has been realized that amongst the existence of 1400 infectious agents, more than 500 bacterial agents and 200 viral agents can be pathogenic to humans.[27]

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25 Section III, Biological Weapons Technology, https://fas.org/irp/threat/mctl98-2/p2sec03.pdf (last accessed 25th August 2017, 1:27pm)

26 Plamen A. Demirev, Andrew B. Feldman, and Jeffrey S. Lin, Chemical and Biological Weapons: Current Concepts for Future Defenses, John Hopkins Technical Digest, Vol 26, No. 4

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The Center for Disease Control and Prevention have identified three types of agents (bioweapons) based on their ability to cause damage –

- **Category A:** High-priority agents that result in high mortality rates and have potential for a mass impact. The intensity and speed of impact can trigger panic in local populations.
- **Category B:** Moderate-priority agents cause relatively less damage
- **Category C:** Low-priority agents are emerging pathogens that are readily available and can thus be easily mutated or engineered to get desired results in a short span of time.[28]

The process of identification is also being carried out by assessing the area for biological attack hazards, forensic technologies are also being used to figure out the geographical origins/source of such bioweapons. The process of decontamination and biosensing through use of anti bodies, biochemical testing and cellular responses is also being undertaken.[29]

OFFENSIVE AND DEFENSIVE APPROACH –

The 1972, Biological Weapons Convention continued to manage and regulate bioweapon usage, storage and offensive attack of biological warfare.[30] Biological warfare, though created with the intention to destroy has to types – offensive and defensive. In the scenario of international politics where the primary concern of a state is its security, there exist these two basic options. The theory of "offensive-defense" also known as the "security dilemma theory" was given by Stephan William Van Evera. This theory argues that in international conflict is more likely when offensive is in an advantageous position as

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 Taylor, L. h., Latham, s. m., and Woolhouse, m. e. J., "risk Factors for human Disease emergence," Phil. Trans. R. Soc. Lond. B 356, 983–989 (2001).

28

 Kinds of Bioterrorism Agents, https://www.cdc.gov (last accessed 25th August 2017, 3:15pm)

29

 Kim E. Sapsford, Christopher Bradburn, James B. Delehanty, Igor L. Medintz, Sensors for Detecting Biological Agents, Vol 11, Issue 3.

30

 "Loner Likely Sent Anthrax, FBI Says". Los Angeles Times. Archived from the original on 7 April 2008. Retrieved 30 March 2008.

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opposed to defense and in a similar way, peace is highly likely when defense is advantageous over offense.[31]

i. Offensive Approach

There are various kinds of offensive approaches/warfare.

The competitive state in the biological warfare field led to the advent of the Biological Weapons Convention (BWC) in 1972 that restricted and regulated research in the offensive technologies. Unfortunately, many nations regardless of their membership in the BWC have offensive bioweapon programs.[32]

Offensive warfare can be anti-personal warfare[33] where usually one attacks the public and army of the nation with toxic biological weapons leading to disability and death amongst the individuals.

There can also be an anti-agricultural warfare, such as what was done by Japan over China in order to destroy vegetation, livestock, crops and fisheries of the enemy country leading to starvation amongst the people.

Entomological warfare is where the infected insects are used by one state over the military personnel, public and agriculture of the other state in order to attack them leading to epidemic break outs.

Genetic warfare is also a type of offensive biological warfare and if and when used can lead to vaccines being ineffective and diseases that are resistant to antibodies. They can also alter the genetic mapping of an individual.[34]

ii. Defensive Approach

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31 Defensive to Offense in India, http://www.ipripak.org/india-from-defensive-to-offensive (last accessed 26th August 2017,5:08pm)

32 Ghita Mezzour, William Frankenstein, Kathleen M.Carley, L Richard Carley, Systematic Assessment of Nation-States 'Motivations and Capabilities to Produce Biological Weapons

33 "Loner Likely Sent Anthrax, FBI Says". Los Angeles Times. Archived from the original on 7 April 2008. Retrieved 30 March 2008.

34 Kenneth Alibek and S. Handelman. Biohazard: The Chilling True Story of the Largest Covert Biological Weapons Program in the World – Told from Inside by the Man Who Ran it. 1999. Delta (2000) ISBN 0-385-33496-6

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Possible defenses against any biological warfare basically constitute the defensive approach. These are a set of measures that were designed in order maintain as well as increase the efficaciousness of the armed forces and the general well being of the public. There are two main kinds of biological defense systems; active defense and passive defense.

Active defense primarily includes measures such as the prevention of biological attacks from reaching target areas. Such kinds of defenses include techniques for intercepting and annihilating enemy germ banks and biological warheads mainly at the place of manufacturing or where the weapons are stockpiled.[35]

Passive defense primarily consists of secondary measures of prevention in order to minimize health consequences such as the spread of a disease after the attack by a bioweapon. The important measures being – assessment of hazard, technology detection, identification, physical protection, diagnosis and medical counter measures.[36]

The BWC allowed for defensive research unlike its stance on the offensive matters. Defensive research included experimentation with offensive microbes and pathogens. Superpowers and other actors (including rogue states) that were trapped in security dilemmas took advantage of genetic engineering and intensified research in the area.[37]

It is known that a strong opposition towards defense approach is that research in defensive measures could covertly be of assistance in the offensive weaponisation program and the development of offensive measures will always be far ahead the defensive ones.[38]

The Indian context is such that India has ratified the Biological and Toxic Weapons Convention and has agreed to abide by its obligations. India has a defensive approach towards biological weapons and has conducted many researches in relation to countering

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35 Graham Pearson and Brad Roberts, “Defending against Biological Attack: Importance of Biotechnology in Preparedness,” Defence Science Journal 51, (4), October 2001, p. 380.

36 Graham Pearson and Brad Roberts, “Defending against Biological Attack: Importance of Biotechnology in Preparedness,” Defence Science Journal 51, (4), October 2001, p. 383

37 Ghita Mezzour, William Frankenstein, Kathleen M.Carley, L Richard Carley, Systematic Assessment of Nation-States ’Motivations and Capabilities to Produce Biological Weapons

38 Susan Wright, Biological Warfare and Disarmament, (Rowman and Littlefield, Maryland, 2002, pp. 80-86.

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diseases. India also has a duel use pharmaceutical policy.[39] On 3rd June 2015, USA and India signed an agreement regarding defense framework that included the provisions regarding development of defense capabilities inclusive of a lightweight protective suit effective in biological hazard environments.[40] New Delhi has both the infrastructure and capability to launch a bioweapon program that is offensive but that has not been the case. As far as the capacity is concerned, India too has the ability to produce aerosols and deliver them through various systems such as ballistic missiles. However in the public domain, there doesn't exist any information regarding the Indian governments interest in similar delivery matters.[41] Despite having an infrastructure that is well developed with well-trained scientists and resources (Biosafety Labs) India does not produce bioweapons for offensive purposes. In October 2002, APJ Abdul Kalam, the then President of India stated that India will not make biological weapons since it is cruel to human beings. [42] A lot of India's facilities are dedicated towards developing defensive measures in order to save itself against biological attacks. The biodefense industry in India is concentrated and centered around the Defense Research and Development Organization and its primary lab located in Gwalior known as the Defense Research and Development Establishment. [43]

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39 In 2012, the State Department reported that India did not engage in activities prohibited by the BWC, and therefore was not included in 2012, 2013, 2014, and 2015 reports. U.S. Department of State, "Adherence to and Compliance with Arms Control, Nonproliferation and Disarmament Agreements and Commitments," June 2015, www.state.gov; U.S. Department of State, "Adherence to and Compliance with Arms Control, Nonproliferation and Disarmament Agreements and Commitments," July 2014, www.state.gov; U.S. Department of State, "Adherence to and Compliance with Arms Control, Nonproliferation and Disarmament Agreements and Commitments," July 2013, www.state.gov; U.S. Department of State, "Adherence to and Compliance with Arms Control, Nonproliferation and Disarmament Agreements and Commitments," 2012, www.state.gov; U.S. Department of State, "Adherence to and Compliance with Arms Control, Nonproliferation and Disarmament Agreements and Commitments," August 2011.

40 Jim Garamone, "U.S., India Sign 10-Year Defense Framework Agreement," US Department of Defense, June 4, 2015, www.defense.gov

41 India's Biological Weapons, http://www.nti.org/learn/countries/india/biological (last accessed on 27th August 2017, 11:14am)

42 "India Not to Make Biological Weapons: President," *Press Trust of India*, October 28, 2002, via www.lexis-nexis.com (last accessed on 27th August 2017, 11:34am)

43 Basrur, Rajesh M., Joseph, Mallika, "Chemical Biological, Radiological and Nuclear Terrorism Threats: A case Study on India," *Landau Network- Centro Volta South Asia Security Project: Case Study 1/2007*, December 2007, pp 14

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Conclusively, it is safe to understand that India does possess the ability to launch an offensive bioweapon program however it choses against doing the same. It has put in adequate checks and balances in its growing market to ensure that the growth isn't jeopardized due to vested interests. At other levels, there is however, a need to increase effective disease surveillance right from the point of entry into the country, in order to prevent the spread of dangerous pathogens. This will reduce a lot of financial burden and the loss of human life.[44]

BIOTERRORISM –

The U.S. Center for Disease Control and Prevention has defined bioterrorism as the intended and deliberate release of toxins, bacteria, viruses or any other injurious or harmful agents that can cause death or ailment to the people, animals or plants to which they are exposed. These agents are inherently found in nature, however they can be mutated or altered as well in order to enhance their efficaciousness.[45] The US is spending more and more each year on defense and research against bioterrorism that includes; $91m in 1998 and a staggering $336.6mn in 2000. Clinton, U.S.A's former president announced that he wanted $2.85bn to counter bioterrorism threats and he intended to ask Congress for the same.[46] The situation in India is a little different. Experts of bioterrorism believe that India should increase and expand its disease surveillance. India has not had many instances of bioterrorism apart from a few suspicious occurrences such as the typhus outbreak during the Indo-Pak war in 1965, the dengue outbreak in Delhi in 1996 and the unidentified outbreak of encephalitis in Siliguri in 2001, to recall a few.[47] India has more commonly faced agricultural attacks such as the Bengal famine of 1943 which was a

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44 India's Stand Towards Bioweapons, https://www.scribd.com/document/102457740/INDIA-S-STAND-TOWARDS-Bio-Weapon-BW (last accessed 27th August 2017, 1:08pm)

45 Bioterrorism Case Definitions, https://emergency.cdc.gov/bioterrorism/casedef.asp (last accessed on 27th August 2017, 2:09pm)

46 Bioterrorism, QJM International Journal of Medicine on https://academic.oup.com/qjmed/article/94/4/227/1569226/Bioterrorism (last accessed on 27th August 2017, 3:39pm)

47 India Wakes Up to The Threat of Bioterrorism, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1121283 (last accessed on 27th August 2017, 4:12pm)

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terrible man made disadter and there was a great fall in food grains leading to epidemics such as malaria, dysentery, cholera, AIDS, typhoid etc.[48] A number of viral diseases affecting crops in India are transmitted by insects such as the Tungro virus. New strains of natural influenza have also emerged such as H1N1.[49]

CONVENTIONS –

There are two primary conventions that should be taken into consideration when trying to understand biological warfare –

1) **BIOLOGICAL WEAPONS CONVENTION** –

The Convention on the Prohibition of the Development Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons on their Destruction was the first treaty that had come forth amidst the two world wars in order to limit and regulate the usage of bioweapons. Its articles focus on restricting the acquiring or retention of weapons under any scenario, to not assist, encourage or transfer biological weapons. The UN Security Council is the investigating body.[50] India has repeatedly stressed on the need to strengthen implementation of the various regulations of the biological weapons convention because of the growing probability of it being a threat. India ratified the convention in 1974.[51]

2) **GENERVA CONVENTION** –

The Convention prohibits the usage of both chemical and biological weapons in war, also known as the Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or other Gases, and of Bacteriological Methods of

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48 Sen, Amartya, and John Dreze. 1999. *Omnibus*, Oxford University Press, London

49 Bannerjee, Kalyan, India and Agricultural Bioterrorism, https://www.nap.edu/read/11848/chapter/14#116 (last accessed on 28th August 2017 10:03am)

50 The Biological Weapons Convention, https://www.un.org/disarmament/geneva/bwc (last accessed 28 August 2017, 11:21 am)

51 Biological Weapons Convention Signatories and States-Parties, https://www.armscontrol.org/factsheets/bwcsig (last accessed 28th August 2017, 12:03pm)

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Warfare. The Geneva Convention of 1925 was primarily in relation to prohibition of biological and chemical weapons but does not relate to the production, storage and transfer of such weapons. India had signed the convention in 1925.[52]

ASPECTS –

POLITICAL AND SOCIAL –

The developments in medicine and modern biology have helped with the production of bioweapons in the 20th century. During both the World Wars, the advances in the field of bacteriology had helped various countries such as Japan and USA in employing bacteria and other such microorganisms against their various enemies. Many horrific experiments were conducted especially by Japan and after the rapid industrialization that took place; many countries started developing their offensive and defensive policies. Most of these programs that were initiated by the various countries were abandoned after the Biological Weapons Convention was brought into force however, a lot of violations were also made by many countries due to the unbinding nature of international treaties. However this convention has been a source of great negotiation and contention and has been quite revolutionary in restricting warfare.[53] Political aspects play an important role in the decision to develop and the decision to use vaccines for biodefense. The decisions however, made by one country in the development of vaccines against a bioweapon implies the knowledge that another country has bioweapons and also the intent, will and means to use such an agent. For instance, if one country starts resuming the use of a smallpox vaccine it will be of a grave concern to other nations. Politically, this sends out an important message to neighboring nations and domestically, political concerns exist as well. Just as nations before recognized a need to agree to prohibit the use of bioweapons in times of peace and wars, nations now might agree for a need to collaborate internationally

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 The enevaConvention, https://www.un.org/disarmament/wmd/bio/1925-geneva-protocol/ (last accessed 28 August 2017, 11:21 am)

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 New Genetics and Society, Vol. 22, No. 2, August 2003
Biological weapons, genetics and social analysis: emerging responses, emerging issues—I
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to develop vaccines against bioterrorism.[54] We must also consider the social issues and aspects that are involved in the deployment and development of vaccines. In a USA based example, the scarcity of biodefense vaccines raises questions regarding the rationing of the distribution of those vaccines in times of need. The biodefense vaccines that are currently licensed (e.g., anthrax and smallpox vaccines) remain in the near exclusive use of the military, but we would need to consider civilian distribution in times of imminent threat and of course post-exposure. In preparation for potential bioterrorist use of smallpox in 2003 and 2004, public health officials gave consideration to a number of strategies including ring vaccination of those in direct contact with diagnosed smallpox patients in the event of an attack, preparatory vaccination of first responders, and voluntary population vaccination.[55]

MEDICAL –

India has a very well developed biotechnical infrastructure that has well trained scientists with years of experience in dealing with infectious diseases, numerous pharmaceutical production facilities and laboratories for bio-containment. In December 1998, India began training medical personnel to deal with the eventualities of a bioterrorist act.[56]

The National Rural Health Mission (NRHM) strives to strengthen health provision at the grass-root level by providing for a village health worker—Accredited Social Health Activist (ASHA), in villages, supported by the Village Health and Sanitation Committee. The Primary Health Centres (PHCs), the Community Health Centres (CHCs), and the district hospitals are being utilized, maintained and developed for ensuring minimum public health standards for health care. Once strengthened, the primary health care system will be in a position to detect early warning signs, feed information into the national surveillance system and help the district health officials in case management.

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54 Gregory A. Poland, Robert M. Jacobson, Jon Tilburt and Kristin Nichol , The Social, Political, Ethical, and Economic aspects of biodefense vaccines https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2831650 (last accessed 28th August 2017, 1:44pm)

55 CDC. Recommendations for using smallpox vaccine in a pre-event vaccination program. Supplemental recommendations of the Advisory Committee on Immunization Practices (ACIP) and the Healthcare Infection Control Practices Advisory Committee (HICPAC) MMWR. 2003:1–16.

56 India and Biology, http://www.nti.org/learn/countries/india/biological/ (last accessed 29th August 2017, 10:08am)

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The Central Government Health Scheme (CGHS) and central government run hospitals provide general and specialised medical professionals for clinical management of cases.[57] The National TB Programme, National Vector Borne Disease Control Programme, National Programme for Control of Iodine Deficiency Disorders and National AIDS Control Programme have their networks throughout the country. These programs dwell on strategies that are renewed in accordance with emerging threats such as TB, malaria, HIV-AIDS. The future health threats shall be avoided through the backbone built by the experience of such programs.[58] In India, the study of toxicology and biochemical pharmacology is carried on at the Defence Research and Development Establishment (DRDE) in Madhya Pradesh (Gwalior).[59]

LEGAL/LEGISLATIVE –

The situation in India with regards to terrorism is not as developed as one would've wanted it to be, but it surely has been on a progressive path. For instance, India's National Institute of Communicable Diseases advises and aids the government in matters relating to communicable diseases in the country.[60] The Indian government has also worked for the establishment of biological, chemical and nuclear warfare directorates both in the armed services as well as the inter-services coordination committee to monitor the program. An NBC Cell was established at the Indian Army Headquarters to study the effects of NBC warfare. India's first NBC reconnaissance vehicle was handed over to the Indian Army in 2003.[61] The Indian government has also established the Central Industrial Security Force

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 National Disaster Management Guidelines—Management of Biological Disasters, 2008. A publication of National Disaster Management Authority, Government of India. ISBN 978-81-906483-6-3, July 2008, New Delhi.

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 National Disaster Management Guidelines—Management of Biological Disasters, 2008. A publication of National Disaster Management Authority, Government of India. ISBN 978-81-906483-6-3, July 2008, New Delhi.

59

 Lele Ajay, Technical Aspects of Bio-Defence, October 2006, Volume: 30, Issue 4

60

 Inputs are based on author's field trip (in the year 2003) to DRDE, Gwalior and www.nicd.org (last accessed 30th August 2017, 10:34am)

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has been established to defend the transportation hubs, nuclear facilities and heavy industries against both nuclear and biological attacks.[62] India also has many bioweapon related export controls; despite not being a member of the Australia Group, India continues to have stringent export rules and regulations outlined in India's national export product control list, the Special Chemicals, Organisms, Materials, Equipment, and Technologies (SCOMET).[63] The Disaster Management Act, 2005 issues guidelines for preparing action plans for holistic and coordinated management of all disasters. The biological disaster guidelines under the Disaster Management Act 2005 focus on biological disaster management skills, prevention, mitigation, medical response and relief. The Epidemic Diseases Act of 1897 provides for prevention against spread of epidemic diseases. The 73rd Constitutional Amendment focuses on providing for a three-tiered local self-government structure where health can be acted upon and services can be developed.[64]

In 2015, India and USA became signed a 10 year long defense framework that includes provisions to work on defense capabilities including "a lightweight protective suit effective in chemical and biological hazard environments", and also on cooperative relations.[65]

ETHICALITY AND ACCOUNTABILITY

 India's First NBC Recce Vehicle Launched in Pune," *DNA India*, December 22, 2010, www.dnaindia.com (last accessed 30th August 2017, 11:47am)

62

 "Special Force to Tackle Nuclear or Biological Attack in India," Xinhua, November 10, 2002, news.xinhuanet.com (last accessed 30th August 2017, 3:09pm)

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 "Guidelines for Exports of SCOMET Items," Directorate General of Foreign Trade, Ministry of Commerce and Industry, Government of India, http://dgft.gov.in; "India's Export Controls: Current Status and Possible Changes on the Horizon," SECURUS Strategic Trade Solutions, LLC. July 10, 2011, pp 3-4, www.securustrade.com (last accessed 30th August 2017, 5:09pm)

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 National Disaster Management Guidelines—Management of Biological Disasters, 2008. A publication of National Disaster Management Authority, Government of India. ISBN 978-81-906483-6-3, July 2008, New Delhi.

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 Jim Garamone, "U.S., India Sign 10-Year Defense Framework Agreement," US Department of Defense, www.defense.gov (last accessed 30 August 2017, 8:44pm)

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Often known as – 'The poor man's atomic bomb'- the effects of such weapons are more devastating and widely far-reaching. [66] There is a need to institutionalize a code of ethics for scientists that are working with potentially dangerous toxins and pathogens. One organization called the Federation of American Scientists (FAS) makes its first-year graduates do atleast one course on the essentials of treaties, laws, regulations and other programs, that aid in controlling biological warfare.[67] Recent weapons that target certain species of plants and animals have made possible mass destruction in let's say, a region where monoculture (large acreage of genetically-identical crops or even animals) is the norm.[68] Questions of biodefense preparedness can lead to various political battles, implementation issues, questions of sound judgment as well as obligations to the society.[69] It is necessary to engage in vaccine development programmes and meet several ethical challenges of – establishing informed consent during clinical testing, defining obligations of healthcare workers and allocation of vaccines.[70] Furthermore a prioritization of who gets the vaccine first, as per need, and whether certain populations like children, pregnant women, the elderly etc should be tested, are also ethically unsound issues that need to be addressed. For example, the Secretary of the Department of Health and Human Services and the Commission of the Food and Drug Administration in the USA discarded a study of smallpox vaccine within children of the age 2-5 years old.

CONCLUSION AND SUGGESTIONS

A biological warfare would create for all mankind, a very complicated disaster scenario, where only a programme that runs in sync with the government and non-government

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66 Daniel Reyes, "The Ethics of Biowarfare", http://www.actionbioscience.org/biotechnology/reyes.html (last accessed on 31st August 2017, 9:03pm)

67 Federation of American Scientists. 2002. "Collaborative Project on the Biological Sciences: Risks, Responses & Responsibilities.", http://disarmament.un.org/education/docs/fas.pdf (last accessed on 29th August 2017, 10:15 am)

68 Supra note 67

69 Gostin LO. Public health and civil liberties in an era of bioterrorism. Crim Justice Ethics. 2002;21(2):74–6. (last accessed on 30th August 2017, !0:25 pm)

70 Beauchamp TL, Faden R. Informed consent II Meaning and elements. New York: Macmillan Reference USA; 2004 (last accessed on 1st September 2017, 12:05 pm)

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entities can provide the right kind of relief to the citizens of the state. There are various suggestions that can be taken up by the authorities such as:

1. Investment in the infrastructure of Biotechnology, such as aspects of Nanotechnology, Sensor Technology and Information Technology, for development of better mitigating resources.
2. A robust surveillance system involving human clinicians and veterinarians may identify a bioweapons attack early in the course of an epidemic.
3. State parties must show compliance to the provisions of the Biological Weapons Convention and must be prepared to respond and assist each other in times of such peril.
4. The Review Conference of the International Committee of the Red Cross should establish an effective mechanism for assessing the implications of developments in science and technology for the BWC.
5. A universal effort in promotion, ratification and accession of the BWC should be shown by the states, with increased implementation in municipal law.
6. More programmes should be initiated to study the diseases and pathogens that have been eradicated to mitigate their outbreak in the future.
7. Investments in the field of Biotechnology should be encouraged with updated cost-benefit analyses to keep a track of the progress made by these programmes.
8. Better oversight of genetic engineering because experiments with genetic material often lead to the unexpected consequence of production of relevant bio-material.
9. India needs to develop an offensive Biological Warfare approach as well, and so a system of checks and balances needs to be put in place to ensure no problems in growth, due to invested interests.
10. Programmes pertaining to Biological Warfare should be under the control and power of the Public Sector and harsher restrictions should be imposed on manufacture, sale, test, use, transport etc of these weapons.
11. Induction of more medical staff such as nurses, doctors and other specialists in case of a disaster that may occur.

It is imperative to take some action now, for there will come a time, when this slippery road of unknown disasters, will prove to be the biggest calamity the world has and will. ever know.

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