Bioethics in War, Biological Weapons and Genetic Means of Warfare

Sorour Farrokh Ahmadi

Faculty of Law

McGill University, Montreal

A thesis submitted to McGill University in partial fulfillment of the requirements of the degree of Master of Laws

December 2019

"*We* have built the weapons

We have ripped the chests

Lest we accuse the words

Maybe "war" wanted to be the name of a flower…"

- Mohammad Afandideh, Iranian Poet

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Abstract

Advancements in biotechnology have led to development of biological weapons and genetic means of warfare. Today, one important concern is the publicly available biological information that has increased the risk of bioterrorist attacks. On the other hand, with advancements in genetic science, genetic information is now being used more than ever for military purposes. Furthermore, other than the ethical issues related to development of weapons, there are medical decisions that must be taken during wartime which require specific bioethical principles.

This study follows the steps of bioethical principles in their journey from national guidelines to international instruments. The aim is to raise ethical issues related to development of biological weapons and genetic means of warfare and review the current international instruments to find out to what extent those instruments have taken bioethical principles into account. From another perspective, another aim of this study is to provide ethical guidelines for preparation against possible bioterrorist attacks and ethical principles for making medical decisions during wartime.

Résumé

Les progrès de la biotechnologie ont conduit au développement d'armes biologiques et de moyens de guerre génétiques. Une préoccupation important est les informations accessibles au public qui ont augmenté le risque d'attaques bioterroristes. D'un autre côté, avec les progrès de la science génétiques, l'information génétique est maintenant plus que jamais utilisée à des fins militaires. En outre, outre les questions éthiques liées au développement des armes, certaines décisions médicales qui doivent être prises en temps de guerre nécessitent des principes bioéthiques spécifiques.

Cette étude suit les étapes des principes bioéthiques dans leur cheminement des directives nationales aux instruments internationaux. L'objectif est de soulever des questions éthiques liées au développement des armes biologiques et des moyens génétiques de guerre et de revoir les instruments internationaux actuels pour savoir dans quelle mesure ces instruments ont pris en compte les principes de la bioéthique. Dans une autre perspective, un autre objectif de cette étude est de fournir des directives éthiques pour la préparation contre d'éventuelles attaques bioterroristes et des principes éthiques pour prendre des décisions médicales en temps de guerre.

Acknowledgments

I wish to thank all the people whose assistance was a milestone in the completion of this project.

First and foremost, I wish to express my sincere appreciation to my supervisor Professor René Provost, for his precious support and guidance. I am truly grateful for his patience in directing me throughout this journey.

I also wish to express my gratitude to Dr. Eugene Bereza who was my mentor and teacher at the Biomedical Ethics Unit of McGill University. He was the one who introduced the world of bioethics to me, and his endless encouragement and support inspired this thesis.

I would also like to express my gratitude and thanks to McGill University Faculty of Law for their support throughout this remarkable educational experience.

Lastly, I must thank my parents, for their unconditional faith in my abilities and unequivocal support. Words cannot express how grateful I am to my mother, Shahnaz, and my Father, Masoud, for all of the sacrifices they have made to make it possible for me to be where I am today.

Introduction

Humans have used weapons since the beginning of time. Whether it has been for hunting or fighting, there has always been some sort of tool that has been used as weapon; from stone, arrows and bows to knives, swords and guns. As technology has developed over the past centuries, so have the means and methods of warfare. "The nature of conflict and the weaponry used to fight it, have changed dramatically in the last 100 years. Before the twentieth century, few countries maintained large armies and their weapons -while certainly deadly- mostly limited damage to the immediate vicinity of battle. The majority of those killed and wounded in pre-twentieth century conflicts were active combatants".[1] But the time of man-to-man combats has almost come to an end. Conventional weapons that have been used in battles and limited the damages to battlefields alone, turned into unconventional weapons with wider range of destruction that could not discriminate between combatants and civilians. The damages caused by wars started to target civilians more than combatants. "The overwhelming majority of violent conflicts today are fought within States, their victims mostly civilians. Certain marginalized populations -women, children, the elderly, the disabled, the poor—are particularly vulnerable in conflict and bear the brunt of its harm globally"[2]. Although for years the international community has tried to put an end on using weapons of mass destruction, the efforts do not seem to be paying off; a claim that could be confirmed by the chemical weapons attacks taken place in Syria in the past few years. A report shows that "there have been at least 336 chemical weapons attacks over the course of the Syrian civil war".[3]

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[1] Melissa Gillis, *Disarmament a Basic Guide*, 3rd ed (New York, United Nations, 2012) at 1.
[2] *Ibid* at 2
[3] Tobias Schneider, Theresa Lütkefend, "Nowhere to Hide: The Logic of Chemical Weapons Use in Syria", Report by Global Public Policy Institute (February 2019) at 3, online: Global Public Policy Institute <www.gppi.net/media/GPPi_Schneider_Luetkefend_2019_Nowhere_to_Hide_Web.pdf>

Biotechnology has played an important role in shifting from conventional weapons to weapons of mass destruction; but with these advancements, comes ethical issues. Biological weapons and genetic means of warfare are types of unconventional weapons that raise different ethical questions. Whether it is about testing or development of biological weapons or obtaining genetic information for military purposes, there is always some ethical dilemmas related to these weapons.

In this study, I will raise a number of ethical issues with regard to biological weapons and genetic means of warfare, bioterrorist attack and making medical decisions during wartime. Publicly available biological information has increased the risk of biological attacks by non-state armed groups. This is a serious risk that requires specific attention of governments. Bioterrorist attacks could cause serious crises and the role of bioethics in these situations would be to provide ethical guidelines for management of these crises. However, ethical dilemmas related to war are not limited to development of weapons and management of crises. During wartime, there are situations in which medical staff have to make ethical decisions but the bioethical principles that are used in peacetime could not provide a solution during wartime.

To address these ethical issues, first, in chapter one I will provide a general background on biological weapons and genetic means of warfare and provide examples of modern military use of genetics to raise the related ethical issues in the next chapter. In chapter two, first I will analyze the impact of the World War II and the international instruments that have been adopted after that on internationalization of bioethical principles and review some of the unethical medical experiments conducted on humans during and after the World War II. Then I will provide ethical guidelines for management of crises during war and bioterrorist attacks and address some of the most important ethical issues raised during wartime, finally, I will use the examples of weapons and means of warfare introduced in chapter one, to raise ethical issues concerned with their

development and use and also review some of the international instruments to find out to what extent they have taken bioethical principles into account.

Chapter One: Biological and Genetic Weapons

This chapter provides a conceptual background on biological weapons and genetic means of warfare. In the first section of this chapter, I will provide a general background on one of the most known weapons of mass destruction namely biological weapons and explain how they have been obtained and used in the past. In the second section, I will introduce a more modern means of warfare, namely genetic means of warfare. The aim of this chapter is to briefly explain the efforts of the international community to create new types of weapons of mass destruction and then to try to prohibit the use of these deadly weapons and also to explain that means of warfare are evolving in a way that some of them are not even seen as weapons anymore. This chapter provides a conceptual background for the second chapter that intends to analyze the conflicts between these weapons and bioethics. Using the examples of means of warfare that I will introduce in this chapter, in the next chapter I will examine some of the international instruments in the field of bioethics to find out to what extent those documents have taken bioethical principles into account for development of weapons.

A. Biological weapons

"Biological warfare and bioterrorism involve the deliberate use of biological agents (such as viruses and bacteria) as weapons against humans, animals or plants. In addition to causing serious illness and death, the use of such weapons could result in widespread disruption and immense economic harm"[4]. This sections aims to provide a general background on production of biological

[4] Melissa Gillis, s*upra* note 1 at 43.

weapons in the past. It further discusses the use of biological agents in terrorism known as bioterrorism and the modern use of biological weapons in today's world.

1. Early Developments

There is no exact date in the history to be pinpointed for start of using poison as means of warfare in armed conflicts. One of the most well-known usages of biological weapons in history is by Mongols in 1346 AD during the war in Kaffa as a result of which bubonic plague broke out which is said to be the first stage of the Black Death among Europeans.[5] Other examples in different stages of history include giving smallpox-infected blankets to American-Indians during the English-French war in America during the 1750s.[6] Many countries throughout history have produced and used biological and toxin agents in armed conflicts. "[T]he United Kingdom, the United States, and the former Soviet Union, had active biological warfare (BW) programs during World War II and the subsequent Cold War, with various claims and counterclaims about possible use that are difficult to assess".[7]

After 1945, the world was a mess. WWII had destroyed many countries and their economies and millions of people all over the world were killed, injured and displaced. In this context, some powerful countries, namely the US, the UK and the Soviet Union were working on their biological weapons programs. Eventually the US and the UK ended their programs and Russia, which inherited the program from SV, claimed to have ended it, which was never confirmed.

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[5] Douglas Holdstock, "Chemical and Biological Warfare: Some Ethical Dilemmas", (2006)15 Cambridge Q. Healthcare Ethics 356 at 357.
[6] *Ibid.*
[7] *Ibid.*

It is said the Cold War was the main reason why the US was pursuing a biological weapons program for almost two decades after WWII was ended.[8] If USSR, the US's biggest enemy at the time, was developing biological weapons, the US had to have it too. In this context, it is noteworthy to mention the *theory of deterrence*. The competition between the two powers was becoming more dangerous every day. "As is generally the case in hegemonic competitions, the stakes were high: control of the international system lay in the "balance"".[9] Before the WWII, the international system was multipolar as there were a few states who had the power to influence other states and the international system; however, after the WWII, the system suddenly changed and there was a shift of power from Europe to two superpowers out of the European system. The original deterrence theory was born in this context.[10] Although this theory has been mostly used in the context of nuclear weapons, in general, it could apply to other situations. Deterrence theory is based on the balance of powers and believes that fear of reciprocity plays an important role in stopping actions. This theory is all about distribution of power. When power is equally distributed among actors in a system, "peace is more likely since no one state has an incentive to upset the status quo and challenge another".[11] It was in this context that the US started its BW program.

The US saw two phases of development of biological weapons: offensive phase and defensive phase.[12] In the offensive phase which lasted from 1945 to 1969 different tests were done which first included testing only on animals but eventually test experiments were done on human subjects.[13] "The tests used hot agents like Francisella tularensis, the causative agent for tularemia,

[8] Mark Wheelis, Lajos Rózsa & Malcolm Dando, ed, *Deadly Cultures Biological Weapons since 1945* (USA, Harvard University Press, 2006) at 9.
[9] Frank C. Zagare & D. Marc Kilgour, *Perfect Deterrence*, (Cambridge University Press, 2000) at 3.
[10] *Ibid* at 4.
[11] *Ibid* at 7.
[12] Mark Wheelis, Lajos Rózsa & Malcolm Dando, *supra* note 8 at 10.
[13] *Ibid* at 24.

on monkeys, goats, sheep, mice, rabbits, and guinea pigs…. A major program carried out at Dugway Proving Ground was the 1954 St. Jo project, designed to test an agent-weapon combination, bomb clusters loaded with anthrax, against an unprotected population. It was a success: a large number of animals were infected". [14] The first US army project that included human subjects was *Operation Whitecoat* which took place between 1954 and 1973. In this project, vulnerability of humans against specific bacteria and viruses was assessed. Subjects were infected and then treated according to their disease. No deaths or permanent incapacitations were contributed to this research. But this was not the only project that was done during the offensive phase which involved human subjects. "A 1996 report bythe Chemical Weapons Exposure Study Task Force gives the most complete listing of human testing throughout the offensive phase of the program. Subjects were exposed to Bacillus subtilis, Francisella tularensis, ricin, botulinum toxin, Venezuelan equine encephalitis, Coe virus, rhinovirus, Mycoplasma pneumonia, Coxiella burnetii, Brucella species, Bacillus anthracis, smallpox virus, influenza virus, staphylococcal enterotoxin, and Rickettsia rickettsii, the agent of Rocky Mountain spotted fever…. Although the 1966 report listed injuries, it did not report any fatalities."[15]

Starting from 1969, biological weapons program of the US army inclined towards a more defensive approach. Then-President Richard Nixon's approach towards developing biological weapons was very different than his precedents'. There were concerns about the structure of biological and chemical warfare programs and US's national policy relating to such programs.[16] Eventually on Nov. 25, 1969, a speech was delivered by President Richard Nixon which is known

[14] *Ibid* at 25.
[15] *Ibid* at 26.
[16] *Ibid* at 34.

as the *Statement on Chemical and Biological Defense Policies and Programs*. In this speech, the end of offensive phase of the US biological weapons program was announced.

Same approach was adopted by the UK during the Cold War which turned UK's offensive program of developing biological weapon into a defensive mode. UK's biological weapons program started before WWII and continued throughout the war and after that. Over the course of the war, the UK "[D]eveloped a stockpile of anthrax-contaminated cattle feed cakes, to be used as an anti-livestock weapon in the event of needing to retaliate in kind against a German biological warfare attack."[17] The UK has two justification for continuing its biological weapons program after the WWII and during the peace time: the first one was that the US was continuing its program and the second justification was that the geographic situation of the UK (being an island) which would make it an easy target for possible future biological attacks as the attackers would not fear that the diseases will spread.[18] However, just like the US, UK also decided to shift towards a defensive mode due to national and international reasons.

Although biological weapons were produced, stockpiled and used for many years, use of poisonous agents in wars has been forbidden almost since the first times that they were used in wars and this prohibition was even included in old legal documents. The earliest law forbidding use of poisonous material in armed conflict is the *Manusmriti* in Hinduism.[19] After that, many religious texts and armed conflict guidelines have prohibited use of poisonous materials in wars in different ways. The *Instructions for the Government of the Armies of the United States in the Field* also known as the *Lieber Code* is one of the modern codifications of the armed conflict laws that

[17] *Ibid* at 48.
[18] *Ibid* at 49.
[19] K. Reddy, "The Regulation of Chemical and Biological Weapons in International Law: Preserving the Paradox of Humane War", (2008) 2008 J. S. Afr. L. 669 at 672.

was issued by President Abraham Lincoln in 1863. Article 70 of this instruction clearly forbids use of poison in wars:

> "The use of poison in any manner, be it to poison wells, or food, or arms, is wholly excluded from modern warfare. He that uses it puts himself out of the pale of the law and usages of war."

The cold war period was the time during which the contest to invest in and develop biological weapons was in progress. The aim was to develop biological weapons capability for military forces, civilian population or agriculture resources.[20] "Biological weapons proliferation among states has been a concern since before the end of the Cold War, and concerns about biological weapons in terrorist hands became a prominent issue in the early 1990s"[21]. In an effort to regulate the use of poisonous substances in armed conflicts and following the use of different chemical agents in World War I, the international community in the form of League of Nations, adopted the 1925 *Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare.*[22] The protocol expressly prohibits using chemical and biological agents by stating that "The use in war of asphyxiating, poisonous or other gases, and of all analogous liquids, materials or devices, has been justly condemned by the general opinion of the civilized world" and "The high Contracting Parties, so far as they are not already Parties to Treaties prohibiting such use, accept this prohibition, agree to extend this prohibition to the use of bacteriological methods of warfare". Unfortunately, the protocol only prohibited the "use" of those gases and agents and not their development and stockpiling.

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[20] *Ibid*.
[21] Mark Wheelis, Lajos Rózsa & Malcolm Dando, *supra* note 8 at 1.
[22] *Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare*, 17 June 1925, (entered into force 8 February 1928).

Despite this weakness, the WWII witnessed a limited use of biological weapons; however, some countries continued to do researches in this filed during and after the War and during the Cold War period. Anthrax, smallpox, plague and tularaemia were among the biological materials used in these programmes. [23] "All the principal biological weapons powers of the immediate postwar period eventually discontinued their programmes".[24] The UK shifted from offensive to defensive program in the 1950s. The US unexpectedly renounced offensive biological weapons in 1969. Canada, which had never had an independent offensive biological weapons programme discontinues its collaborative program with the US and the UK in 1969. Russia, which inherited the Soviet Union's offensive programme, apparently ended it in the early 1990s.[25] The late 1960s witnessed efforts of the international community to prohibit not only the use of biological weapon, but also their production and stockpiling. The result of these efforts was the adoption of the *1972 Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction* or the *Biological Weapons Convention (BWC).*[26] As the first multilateral disarmament treaty banning an entire category of weapons of mass destruction, this convention has 183 parties as of August 2019.

BWC bans development, production, stockpiling, and transfer of both biological and toxin agents not intended for prophylactic, protective, or other peaceful purposes. According to article 1 of the convention, the regulations of the convention apply to all "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". "Apart from biological

[23] Melissa Gillis, s*upra* note 1 at 43.
[24] Mark Wheelis, Lajos Rózsa & Malcolm Dando, s*upra* note 8 at 5.
[25] *Ibid*.
[26] *Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction or the Biological Weapons Convention*¸ 10 April 1972, (entered into force 26 March 1975).

weapons, the convention also applies to the production, development and stockpiling of "toxins". Toxins are biologically produced chemical substances which differ from biological agents in that they do not reproduce within the host organism. Toxins may be produced by chemical synthesis as well as by biological methods. The broad definition of toxins in article I ("whatever their origin or method of production") means that there are no exclusions from the provisions of the convention".[27] Also article 1, emphasizes that the state parties undertake 'never in any circumstances' to develop, produce, stockpile or otherwise acquire or retain which clarifies that "the convention, like the Geneva Protocol, is operative in times of war as well"[28]

Although the BWC has banned production and use of any kind of biological and toxin weapons, it is important to keep in mind that almost 50 years have passed since the adoption of the convention hence the international community must make efforts to ensure that the convention is up-to-date and covers all kinds of new developments in biotechnology. In the next section, I will review the most recent developments in the field of biological warfare and also Bioterrorism.

2. Modern Use of Biological Warfare and Bioterrorism

The recent developments in biotechnology in the past century led to development of new bio-warfare and increased the risk of using biological weapons in armed conflicts. Several factors[29] contributed to this development the most important ones of which are the followings:

[27] K. Reddy, *supra* note 19 at 677.
[28] *Ibid* at 678.
[29] Jan van Aken, Edward Hammond. "Genetic engineering and biological weapons. New technologies, desires and threats from biological research" (2003) 4: Spec No, EMBO reports 57 at 57.

- Expansion of modern biotechnology in medical and pharmaceutical research and production which led to a worldwide availability of knowledge and facilities;
- Requirement of small effort and simple genetic technics for transforming natural biological agents into agents that could be used in warfare;
- Possibility of creating completely new warfare.

Despite the efforts of the international community to ban using biological weapons from armed conflicts, we cannot definitely say that there are no more biological weapons in the world anymore. Of course, the Biological Weapons Convention played an important role in removing explicit use of the biological weapons in armed conflicts but threat of biological attacks –whether by state or non-state actors- still exists and as long as there is a risk of biological attack, it is only logical to assume that states must be prepared for the attacks and countermeasures must be taken for this preparedness. This potential risk has caused the offensive biological programs to be turned into defensive programs and as long as the risk exists, research and development programs to identify potential risks and countermeasures will continue. As long as programs for research and development of modern biological warfare continue, so do the incidents caused by researches. For instance, in May 1979 unintentional release of pulmonary anthrax from a military base in the Soviet city of Svedlovsk caused deaths of civilians.[30] It was a simple mistake; the technician of the military base had removed the cleaning filter of the machine and left a note which was not seen before the machines were switched back on hence the anthrax dust leaked from the facility.[31]

[30] Nicole H. Kalupa, "Black Biology: Genetic Engineering, the Future of Bioterrorism, and the Need for Greater International and Community Regulation of Synthetic Biology", (2017) 34 Wis. Int'l L.J. 952 at 957.
[31] Madsen Pirie, "SVERDLOVSK ANTHRAX LEAK", (2 April 2019), online: Adam Smith Institute < www.adamsmith.org/blog/sverdlovsk-anthrax-leak>.

Although the Biological Weapons Convention is still one of the most important instruments banning use of any kind of biological agents and toxins in armed conflicts, the international community takes every possible step to ensure that biological weapons are not being produced or used. The importance of this prohibition has been highlighted in some of the Security Council Resolutions. For instance, Resolution 1540[32] adopted by the UN Security Council on April 24, 2004 is one of those steps that took the non-state actors into consideration. According to this Resolution, "Security Council decided that all States shall refrain from providing any form of support to non-State actors that attempt to develop, acquire, manufacture, possess, transport, transfer or use nuclear, chemical or biological weapons and their means of delivery, in particular for terrorist purposes. The resolution requires all States to adopt and enforce appropriate laws to this effect as well as other effective measures to prevent the proliferation of these weapons and their means of delivery to non-State actors, in particular for terrorist purposes."[33] In 2006, the Security Council adopted Resolution 1673 which is reaffirmation of Resolution 1540. This protocol decided to "extend the mandate of the 1540 Committee for a period of two years, with the continued assistance of experts, until 27 April 2008"[34]. In 2011, the Security Council adopted Resolution 1977 "which lengthened the UN commitment to end the proliferation of biological weapons and other weapons of mass destruction and extended the committee for Resolution 1540 until 2021"[35].

Although different measures have been taken to regulate the use of biological weapons, advances in science and technology have made it difficult for regulations to develop as fast as technology.

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[32] *UN Security Council Resolution 1540*, 28 April 2004, S/RES/1540.
[33] "UN Security Council Resolution 1540 (2004)", United Nations Office for Disarmament Affairs (Last Visited Sep. 18 2019), online: <www.un.org/disarmament/wmd/sc1540/>
[34] UN Security Council *Resolution 1673*, 27 April 2006, S/RES/1673.
[35] Nicole H. Kalupa, s*upra* note 30 at 958.

It is also very important to take into account that it is not only states that could use biological weapons; non-state armed groups could also possess and use biological warfare the danger of which could be even more than that of using biological warfare in an armed conflict between states and this has now become a serious threat to international security.

When it comes to the word "terrorism" the first thing that comes to mind is a suicide attack by bomb or shooting people in malls. But these are not the only ways terrorist could attack people. Use of biological agents and toxins by terrorist groups also known as bioterrorism is a relatively new issue in international law of armed conflicts. "Biological terrorism first emerged as a major security issue in the mid-1990s due to three factors. First, and most important, were reports that Aum Shinrikyo, the Japanese cult responsible for the nerve gas attack in the Tokyo subway system in 1995, had also developed biological weapons. Aum Shinrikyo was widely viewed as the harbinger for other non-state actors interested in causing mass casualties and capable of acquiring nuclear, biological, chemical, or radiological weapons. The second factor was the nexus between states that were developing biological weapons and states that were linked to international terrorist groups. All seven nations on the State Department's list of state sponsors of terrorism in the 1990s were believed to have BW programs at the time. The third factor was the social and economic upheaval in Russia that increased the risk that terrorist groups might obtain expertise or materials from the former Soviet BW program that could facilitate their development of biological weapons".[36] Bioterrorism has been a threat to the international community ever since and threats have actually turned into actions and caused casualties. For instance, after the Sep. 11 2001 attacks

[36] Gregory D Koblentz, *Living Weapons*: *Biological Warfare and International Security,* (USA: Cornell University Press, 2009) at 201.

in the US, some letters containing anthrax were mailed to different media offices and senators which caused 5 deaths and 17 injuries.

Bioterrorism has evolved in the past years. This progress could be categorized in forms of generations.[37] "First-generation biological terrorism uses materials naturally infected with a pathogen or toxin".[38] The first generation of bioterrorism uses simple yet effective materials that could be found in the nature and could cause infections or diseases. An example of the first generation weapons is the sharpened bamboo sticks smeared with feces that would cause infection of the wounds. This weapon was used during the Vietnam War and caused 2% of deaths of the American soldiers.[39] For the second generation weapons, small quantities of biological agents are produced which are transferred to the victims either through a simple medium such as fomites (objects or materials that are likely to carry infection) and food or by direct injection. "The most successful example of second-generation biological terrorism was the use of Salmonella Typhimurium by members of the Rajneeshee cult to poison salad bars in The Dalles, Oregon, in 1984. From the establishment of their ranch in The Dalles in 1981, the Rajneeshee found themselves in a series of disputes with state and local authorities. As part of a strategy to influence a local election, the cult contaminated ten salad bars in the town with Salmonella Typhimurium that they had produced in their medical clinic. This contamination resulted in 751 townspeople becoming victims of food poisoning".[40] "Third-generation biological terrorism capabilities require the ability to disseminate pathogens or toxins in an aerosol of particles in the 1–10 micron range. The only successful example of this form of biological terrorism was the 2001 anthrax letter

[37] *Ibid* at 203.
[38] *Ibid*.
[39] *Ibid*.
[40] *Ibid*.

attacks."[41] The difference between the second and the third generation bioterrorism weapons is the dissemination. But the fourth generation is a totally different category. It includes genetic modification of agents to be used as biological weapons. Up to date, no terrorist group has obtained genetically modified biological weapons. "Given the difficulty that terrorists have faced in successfully carrying out even crude biological attacks with toxins, let alone developing a sophisticated capability based on an aerosolized weapon, it is unlikely that they would be able or willing to devote the additional resources to develop a genetically engineered pathogen".[42]

The history of bioterrorism shows that not so many successful attempts have been made by terrorist groups to produce and use biological weapons. But it does not necessarily mean that there will not bioterrorism attacks in the future and there are a few factors that have increased this risk. "First, globalization is making the multiuse ingredients necessary for biological terrorism—information, expertise, equipment, and materials—more widely available. Second, advances in the life sciences are not only generating new knowledge and techniques that can be misused for hostile purposes, but, more important from a counterterrorism perspective, they may be reducing the level of expertise required to utilize previously developed techniques. Both of these trends may increase the pool of individuals who can exploit biotechnology for hostile purposes. The third trend is the continuing increase in the lethality of terrorist organizations. The first eight years of the twentieth century have seen more terrorist attacks that have killed over one hundred people than there were in the entire twentieth century."[43] Now the question is what can be done to put a stop on use of biological weapons and bioterrorism.

[41] *Ibid*.
[42] *Ibid* at 214.
[43] *Ibid* at 227.

As explained in the first section, Biological Weapons Convention was adopted to prohibit production and use of any kind of toxins and biological weapons. This convention was the first multilateral treaty that banned an entire category of weapons of mass destruction. 10 states such as Israel, Namibia and South Sudan have not joined the convention and 5 states such as Syria and Egypt that have signed the Convention, have not taken the required steps by their national legislations in order to enforce it.[44] Nevertheless, this convention is still one of the most important conventions banning weapons of mass destruction.

As for bioterrorism, it is more difficult to say that the situation is under control. Having a system to control actions of terrorist groups is not very realistic; however, there are steps that could be taken in order to be more prepared. For instance, capabilities of known terrorist groups must be assessed constantly. "Part of that preparation should involve research and development on needed tools and approaches. These include modeling techniques, bioforensics, methods for defining threats, specific and broad-spectrum antibiotic and novel antiviral agents, and means for rapid vaccine fielding."[45] Research and development is the most important part in the preparation steps. Vulnerability against bio attacks starts with lack of information on how to respond to a given attack and not being able to identify the agents that have been used in the attack. "Modeling and scenario building will be essential for cities and states to evaluate and improve their capacity to respond".[46]

Preparedness is the key factor in case a biological attack occurs. As the biological science and technology develops the risk of attacks by unknown biological agents or toxin increases as well.

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[44] "The Biological Weapons Convention" (Last visited 11 December, 2019), online: United Nations Geneva < www.unog.ch/80256EE600585943/(httpPages)/04FBBDD6315AC720C1257180004B1B2F?OpenDocument>

[45] National Research Council (US) Panel on Biological Issues, "Countering Bioterrorism: The Role of Science and Technology", (Washington (DC): National Academies Press, 2002) at 27.

[46] *Ibid* at 30.

As long as there is a risk of biological attack, the work on adopting countermeasures must continue constantly.

B. Genetic Means of Warfare

Recent developments in biotechnology and genetics have definitely had important impacts on medical issues but given their especial character, they have also create challenges for international peace and security. This section will first provide a general background on general engineering and its application in agriculture, animals and human. It will further discuss advances made in this field that have made it possible to use the genetic science as means of warfare.

1. Genetic Engineering

Genetic engineering emerged in 1970s and developed rapidly in 1980s. "Genetic engineering, also called recombinant DNA technology, involves the group of techniques used to cut up and join together genetic material, especially DNA from different biological species, and to introduce the resulting hybrid DNA into an organism in order to form new combinations of heritable genetic material and thereby change one or more of its characteristics. The main difference between genetic engineering and natural genetic variations is that in genetic engineering the different pieces of DNA used for the recombination can come from any organism even those that are far apart as a bacterium and a cow or plant."[47] In 1970s, researchers found out that they were actually able to make modifications on living organisms. The first genetically engineered virus and bacterium were

[47] Eugene Rosenberg, *It's in Your DNA: From Discovery to Structure, Function and Role in Evolution, Cancer and Aging,* (London: Academic Press, 2017) at 81.

created in 1972 and 1973 respectively; only a year later in 1974, the world's first ever genetically engineered animal was created using "foreign viral DNA into the genome of a mouse embryo". [48] The developments were fast and there were no regulations governing the use of genetic engineering. The extent to which genetic modifications could be used was unknown and the risks were high. The science community was concerned hence the first conference on genetic modification was held shortly after the emergence of this new technology, on February 1975 in Asilomar Conference Center in Pacific Grove, California mainly to adopt voluntary guidelines to ensure safety of the researches.[49] These basic guidelines were eventually replaced in June 1976 by a formal set of *Guidelines for Research Involving Recombinant DNA Molecules* established by the National Institutes of Health which is used to date and becomes updated on regular basis as more information and technology become available. "It should be emphasized that the Asilomar and NIH guidelines dealt exclusively with the safety of laboratory experiments. No consideration at that time was given to the ecological safety, economics, and ethics of actually commercially producing genetically engineered products, now commonly referred to as genetically modified (GM) products."[50]

Genetic engineering could be categorized into three main categories: agriculture, animals and humans.

i. Genetic Engineering in Agriculture

[48] *Ibid* at 82.
[49] *Ibid*.
[50] *Ibid* at 83.

Genetic modification has been practiced since a long time ago in agriculture; however it was not until the emergence of this new technology in 1970s that it formally turned into a technology. Traditionally, farmers would save the best harvested seeds to be used for subsequent plantings.[51] Today genetic modification is mostly used to make crops pest and herbicide resistant.[52] This technology also helps grow high quality corps with reduced cost and decreased use of pesticide.[53] In addition to that, genetic modification could also improve the shelf-life of the products and make them virus and disease resistant. "Examples of genetically engineered foods include an apple that has been modified to resist browning, known as the Nonbrowning Arctic Apple, a genetically modified cassava enhanced with protein and other nutrients (called BioCassava), maize genetically modified to resist drought (called DroughtGard), and a seed oil crop, Camelina sativa, that has been engineered to accumulate high levels of the beneficial fish oil omega-3 long-chain polyunsaturated fatty acids." [54] Although genetic modification has had different positive implications on agriculture industry, there are also some concerns about it. They mostly concern the adverse effects of genetic engineering on the environment as the modification changes the way the plants are naturally supposed to be in the nature.[55] There are also concerns regarding the impacts of genetically modified plants on the lives of threatened or endangered species.[56] Genetic engineering in agriculture has the potential of supplying the good-quality food in enough quantity to humans on one hand and damaging the environment and the ecosystems on the other hand.

[51] Holly Beth Frompovicz, "A Growing Controversy: Genetic Engineering in Agriculture" (2006) 17:1 Vill EnvtI LJ 265 at 265.
[52] *Ibid* at 267.
[53] *Ibid* at 268.
[54] Eugene Rosenberg, s*upra* note 47at 86.
[55] Holly Beth Frompovicz, *supra* note 51 at 268.
[56] *Ibid* at 269.

"Maintaining this delicate balance between technology and environmental stability requires a combination of cautious acceptance and proper regulation".[57]

ii. Genetic Engineering in Animals

"Several terms are used to describe genetically engineered animals: genetically modified, genetically altered, genetically manipulated, transgenic, and biotechnology-derived, amongst others".[58] Modification of genes in animals includes transfer, deletion or manipulation of genes. Controlled breeding which was traditional form of genetic modification in animals, included only the genetic material contained in a single species while modern genetic engineering allows introduction and modification of foreign genetic material. [59] Genetic engineering in animals could be used in different fields the most important ones of which are farm animals and food industry and healthcare.

In farm animals, genetic engineering is normally used to enhance specific characteristics to increase nutrition values of milk and meat or to make them disease-resistant.; with the world population increasing, genetic engineering is a potential help to increase the food supply for humans. For instance, British scientists from University of Edinburgh's Roslin Institute, have recently announced that they were able to "delete the section of DNA that leaves pigs vulnerable to porcine reproductive and respiratory syndrome, which is estimated to cost European farmers

[57] *Ibid* at 283.
[58] Elisabeth H Ormandy, Julie Dale & Gilly Griffin, "Genetic engineering of animals: ethical issues, including welfare concerns." (2011) 52:5 Canadian Veterinary J 544 at 544.
[59] Andrew B. Perzigian, "Brief Summary of Genetic Engineering and Animals" (2003), online: Animal Legal and Historical Center of University of Michigan < https://www.animallaw.info/article/brief-summary-genetic-engineering-and-animals>

£1.5bn a year in loss of livestock and decreased productivity".[60] "Scientists in both China and Argentina have genetically engineered cows to produce milk similar in composition to that made by humans. After modifying embryos, an Argentinian cow – Rosita Isa – was born that expressed milk containing proteins present in human milk but lacking in cow milk".[61]

Healthcare industry is one of the most important fields in which genetic engineering is used on animals. Major scientific breakouts in medical science such as organ transplantation and cancer researches have been done using genetic modification on animals because of the similarities between genomes of humans and some animals. [62] Scientists are now trying to work more on xenotransplantation, which is transplanting organs of one species to another and hope that in the future transplanting organs of animals to humans might resolve the issue of organ shortage for humans.[63]

iii. Genetic Engineering in Humans

As the genetic technology advances, more ethical and scientific issues are arising out of it. This technology has traditionally been used on plants and animals mostly for economic reasons but modifying the genetics of humans has opened a whole new door in the scientific community. It has direct impact on human reproductive technology which allows us to modify our offspring and gives us the ability to create different sorts of humans.[64] Although it seems like the story of a sci-

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[60] Ian Tucker, "Genetically modified animals", The Guardian, (24 Jun 2018), online: <www.theguardian.com/environment/2018/jun/24/genetically-engineered-animals-the-five-controversial-science>

[61] *Ibid*.

[62] Chad West, "Economics and Ethics in the Genetic Engineering of Animals" (2005-2006) 19 Harv JL & Tech 413 at 415.

[63] *Ibid*.

[64] Erik Seedhouse, *Beyond Human: Engineering Our Future Evolution*, (Berlin: Springer, 2014) at 3.

fi novel to say that human genetic engineering allows us to create humans, it is not really that unlikely. "The truth is, human genetic engineering is already here in the form of prenatal health screenings, and it won't be long before more and more of your children's traits will be things you can decide for them".[65]

In 1988, a special committee of the U.S. National Academy of Sciences introduced a project known as the *Human Genome Project* (HGP) which was an international research program aimed at mapping and understanding all genes of human beings. The first draft of findings was published in 2001 and the full sequence was completed and published in 2003 which revealed that there are probably about 20,500 human genes. [66] "A startling finding of this first draft was that the number of human genes appeared to be significantly fewer than previous estimates, which ranged from 50,000 genes to as many as 140,000."[67]

But why is this information important and what benefit can humans get from genetic engineering on humans? "The goal of human genetic engineering is the alteration of a human's genotype, or inherited genetic information".[68] There are two types of genetic modification: somatic and germ line. Somatic mutation is used on all cell types, except sex cells in a single body cell and cannot be inherited while germ line mutation deals with treatment of sex cells and can be passed onto offspring. [69] Somatic gene therapy is currently being used to treat different genetic disorders in humans such as cystic fibrosis. The germ line mutation on the other hand, has its own ethical issues and controversies. While some scientists believe that germ line therapy could be used to avoid

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[65] *Ibid*.
[66] National Human Genome Research Institute, "What is the Human Genome Project?", (last visited 20 September 2019), online: <www.genome.gov/human-genome-project/What>
[67] *Ibid*.
[68] Erik Seedhouse, *supra* note 64 at 13.
[69] *Ibid*.

genetic diseases, many believe that this technology could lead to having "designer babies".[70] For many years, due to the ethical issues arising out of germ line therapy, this technology was only used on animals; however, recently scientists have tried to use it on humans as well. One of the most important germ line therapies that has been done recently is the project done by the Chinese scientist *Jiankui HE*, in which he genetically altered a pair of twin girls who were born in October 2018 and are claimed to be the world's first genetically edited human babies. What HE was targeting was a gene called CCR5 which is responsible for immune system functions and mutations to which could give people resistance to HIV but the problem is CCR5 has a bigger role in the body than just making people vulnerable to HIV. [71] The debate over the ethical and scientific aspects of this modification is still going on; however, most scientists believe that this mutation could shorten life expectancy the baby girls.[72]

Human genetics has a long way to go. As the technology grows, scientists and ethicists must make sure that germ line –and even somatic- genetic engineering experiments are not used on humans unless there is a guaranty that it will not result in damages and unexpected results in humans. After all, genetic modification–like many other technologies- was first introduced to help humans have a better life; yet again, this technology –like many other technologies- could be misused in such a way that destroys humanity. In the next section, I will elaborate more on the misuse of this technology and explain how it could be used against humans particularly in armed conflicts.

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[70] *Ibid* at 14.
[71] James Gallagher, "He Jiankui: Baby gene experiment 'foolish and dangerous'", BBC News, (3 June 2019), online: <www.bbc.com/news/health-48496652>.
[72] *Ibid*.

2. Use of genetics as weapons

The recent advancements in genetic sciences have given humans the power to make changes not only in plants and animals but also in humans themselves. *The Human Genome Project* that was discussed in the above sub-section revolutionized the knowledge and understanding of humans about human genes and their functions. Like any other technology, genetic advancements could be used both for helping humans live a better life on planet Earth and for assisting them to destroy it.

Unfortunately, technology has made it easy for terrorists to access genetic information to use in bioterrorism. But it is not only terrorists who could use genetic engineering as weapons. Genetic technology could also be used by militaries around the world for creating new types of weapons. Revolution in Military Affairs (RMA) is a hypothesis in military about the evolution of warfare in the future. "According to Andrew Marshall, director of the Office of Net Assessments in the Office of the Secretary of Defense: "A Revolution in Military Affairs (RMA) is a major change in the nature of warfare brought about by the innovative application of new technologies which, combined with dramatic changes in military doctrine and operational and organisational concepts, fundamentally alters the character and conduct of military operations.""[73] With the advancements in the biotechnology and the use of genetic engineering in warfare, one could say that genetic

[73] Jeffrey McKitrick et al, "The Battlefield of the Future" - 21st Century Warfare Issues", Air University, (http://www.cdsar.af.mil/battle.bfoc.html) Chapter 3, p. 1, cited in "The Revolution in Military Affairs Special Report", NATO Parliamentary Assembly (November 1998), online: <www.iwar.org.uk/rma/resources/nato/ar299stc-e.html#1>

engineering is a kind of Revolution in Military Affairs.[74] In this section I will discuss how genetic engineering could be used in terrorism, weapons and wars.

i. Black Biology

Threats of biological weapons and bioterrorism which were explained in the previous section become even more serious and dangerous if they are combined with genetic engineering. Applying genetic mutation on agents used in bioweapons could result in diseases that are resistant to known therapies or are more infectious; this could be the next generation of bioweapons.[75] “"Black" biology is the use of genetic engineering to enhance the virulence of a pathogen or the targeting of a specific genetic code for use in terrorism.”[76] This means that terrorists could create genetically engineered viruses of a common disease that could act different than the normal virus and show secondary effects.[77] “One example of black biology was the work done by Sergei Popov, a department chief in the Soviet bioweapons program. Popov reported success in developing a strain of plague that was resistant to multiple antibiotics, and a strain of anthrax that was resistant to both the anthrax vaccine and multiple antibiotics.”[78]

Using synthetic biology or genetic engineering, terrorists could create either completely new viruses that do not exist in the nature or a different form or more resistant type of already existing viruses. As more information about the DNA and genetic sciences has been published, the risk of

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[74] Michael J. Ainscough, Colonel, USAF, “Next Generation Bioweapons: The Technology of Genetic Engineering Applied to Biowarfare and Bioterrorism”, Report by Maxwell Air Force Base, Alabama (April 2002) at 11. (pdf available) <www.fas.org/irp/threat/cbw/nextgen.pdf>.
[75] *Ibid* at 1.
[76] Nicole H. Kalupa, *supra* note 30 at 954.
[77] *Ibid*.
[78] Roberge Lawrence F, “Black Biology-A Threat to Biosecurity and Biodefense”, (2013) 2:3 Biosafety 139 at 139 DOI: <10.4172/2167-0331.1000e139>.

bioterrorism using genetic engineering has increased. "Now, anyone with a laptop computer can access public DNA sequence databases via the Internet, access free DNA design software, and place an order for synthesized DNA for delivery".[79]

The most important risk of getting attacked by genetically engineered agents is the countermeasure. "The pathogen may be released clandestinely so there will be a delay between exposure and onset of symptoms".[80] While it might take days for people to start showing symptoms, they could start spreading the disease immediately. Medical staff would be the next victims; hospitals would be infected and there would be civil disorder and chaos everywhere.[81] While this is only a scenario that resembles a sci-fi horror movie, it is important to keep in mind that this scenario could actually happen and being prepared for possible bioterrorism attacks is the only way to avoid this horror movie from being created.

ii. Ethnic Weapons

In 2004, *The Guardian* reported that it might be possible for scientists to create weapons that could target certain ethnic groups.[82] The BMA report "warns that genetic weapons, which would attack people selectively on the basis of their ethnicity, are becoming a feasible option".[83] In order to achieve this technology, three aspects of knowledge would be necessary: understanding of the

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[79] Michele S. Garfinkel Et Al., Synthetic Genomics: Options for Governance 2 (Oct. 2007) cited in Nicole H. Kalupa, s*upra* note 30 at 964.
[80] Michael J. Ainscough, *supra* note 74 at 16.
[81] *Ibid*.
[82] David Adam, "Could you make a genetically targeted weapon?", The Guardian, (28 Oct 2004) online: <www.theguardian.com/science/2004/oct/28/thisweekssciencequestions.weaponstechnology>
[83] Wendy Barnaby, "The BMA report on biological and genetic weapons", (1999) 15:3 Medicine, Conflict and Survival J 286 at 286.

human genome, human genetic diversity and ways in which genes functions could be disrupted.[84] As the technology has developed over the past years, this information has become more available than ever and creating this type of weapons has never been more feasible. According to *The Guardian*, "If the sequence of the target gene varies between two different populations the technique could be used to interrupt key body functions in one population and not the other".[85]

Although the BMA report warned that creation of ethnic bioweapons is *becoming* feasible, it is noteworthy to mention that this technology –although not really as weapons- had already been used before the report was published. According to an article published in *PBS FRONTLINE* "In 1998 South Africa's Truth and Reconciliation Commission held hearings investigating activities of the apartheid-era government. Toward the end of the hearings, the Commission looked into the apartheid regime's Chemical and Biological Warfare (CBW) program and allegations that it developed a sterility vaccine to use on black South Africans, employed toxic and chemical poison weapons for political assassination, and in the late 1970s provided anthrax and cholera to Rhodesian troops for use against guerrilla rebels in their war to overthrow Rhodesia's white minority rule".[86] In this project, the government had tried to use vaccines to sterilize black population which could be considered a use of biological agents to target a specific ethnic group. According to the same article the apartheid regime's biological weapons "included an infertility toxin to secretly sterilize the black population; skin-absorbing poisons that could be applied to the clothing of targets; and poison concealed in products such as chocolates and cigarettes."[87]

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[84] *Ibid* at 287
[85] David Adam, *supra* note 82..
[86] "Plague War: What Happened in South Africa?" Frontline PBS, (last visited 18 September 2019) online: <www.pbs.org/wgbh/pages/frontline/shows/plague/sa/>
[87] *Ibid*.

The article in *The Guardian* was published 15 years ago, when the genetic science had not been as advanced as it is today. The possibility of creating this type of weapons was still at question when this report was published. However, 15 years later in 2019, *The Telegraph* reported that according to a report published by Cambridge University, the world must prepare for biological weapons that target ethnic groups based on genetics.[88] According to *The Telegraph,* the world is not yet ready to protect people from these weapons and there is an immediate need for creation of groups to assess the risk of this technology and prepare protocols to protect people against them. Unfortunately, like Malcolm Dando, professor of peace studies at Bradford University and author of the BMA report once said, "The problem is that the same technology being developed to create new vaccines and find cures for Alzheimer's and other debilitating diseases could also be used for malign purposes." [89] Today we are witnessing that this technology that originally was created to make life easier for humans is now becoming a threat to the humanity.

iii. Gene Therapy as a Weapon

As explained in the previous sub-section, gene therapy involves replacement of a bad gene by a healthy gene in the recipient. According to the *Biotechnology: Genetically Engineered Pathogens* report[90] published by US Air Force in 2010, "Gene therapy is expected to gain in popularity. It will continue to be improved upon and could unquestionably be chosen as a bioweapon. The rapid

[88] Sarah Knapton, "World must prepare for biological weapons that target ethnic groups based on genetics, says Cambridge University", The Telegraph (13 AUGUST 2019), online: <www.telegraph.co.uk/science/2019/08/12/world-must-prepare-biological-weapons-target-ethnic-groups-based/>

[89] David Adam, *supra* note 82.

[90] Joel O. Almosara, Lt Col, BSC, USAF, "Biotechnology: Genetically Engineered Pathogens", Report by Maxwell Air Force Base, Alabama (June 2010) at 11. (pdf available) <apps.dtic.mil/dtic/tr/fulltext/u2/a556597.pdf >.

growth in biotechnology could trigger more opportunities to find new ways to fight diseases or create new ones. Nations who are equipped to handle biotechnology are likely to consider gene therapy a viable bioweapon."[91]

The report further continues with explaining different kinds of viruses and diseases that using gene therapy, could be considered as potential weapons. The first type of viruses that the report considers as potential future weapons are Stealth Viruses. Stealth viruses act just like gene therapy. They enter the body using a vector and stay formant until an internal or external trigger activates them; then they will produce infections that could spread to human cells.[92] "Imagine having a cancer causing virus enter a human cell and lay dormant until an external signal triggers the disease. When the signal gets activated the cells become abnormal and could rapidly generate abnormal cell growth leading to a tumor and ultimately, death. Now, apply this concept to a population where an HIV virus gets disseminated within a target population. At a specific time chosen by the perpetrator, the signal would be triggered to harm an entire population all at once."[93]

Another type of virus that could be used as genetic weapon are viruses that could cause Host Swapping diseases. The report explains that some viruses naturally live in the body of some animals without causing any disease to their hosts; however, when the host environment changes, i.e. when the virus is transferred from that host animal to human body, it could cause serious illnesses for humans.[94] Examples of this type of virus are Ebola and AIDS which are naturally hosted by bats and chimpanzees respectively. Although not as a weapon, this type of virus has

[91] *Ibid* at 15.
[92] *Ibid*.
[93] *Ibid*.
[94] *Ibid* at 16.

already been used on humans. "With the rapid increase in biotechnology and with its dual-use nature, these genetically engineered pathogens can be extremely debilitating to a populace."[95]

iv. Entomological warfare

Although insects seem to be the furthest things from weapons, it's been centuries that they have been used by humans in wars. Napoleon Bonaparte was defeated in three wars because of insects; in 1799 against the Ottoman Empire due to flea-borne plague, in 1802 in Haiti due to fever mosquitos and in 1812 in Russia where he lost 200,000 soldiers due to louse-borne typhus.[96] In WWII, Japan used millions of infected insects against China; by the end of the war these insects were responsible for more deaths than the atomic bombs dropped on Japan.[97]

Throughout history, insects have been used in wars in different ways; "insects directly used as weapons, insects used to destroy crops, and insects used as vectors to inflict disease".[98] The history of entomological weapons involves using natural insects as weapons and using the capacity of insects to transfer natural diseases. Since there is no biological manipulation or genetic engineering involved in this type of weapon, it does not fall within the scope of this research hence for the purpose of this research, only the use of insects as weapons in agriculture will be discussed.

For decades, countries have been accusing one another of using insects to destroy their crops; an accusation that is very difficult to prove. Insects have been used to destroy crops either with the

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[95] *Ibid* at 17.
[96] Jeffrey A. Lockwood, *Six-Legged Soldiers: Using Insects as Weapons of War*, (USA: Oxford University Press, 2008) at 2.
[97] *Ibid*.
[98] Ryan C. Gott, "The Sting of Defeat: A Brief History of Insects in Warfare", Entomology Today (JULY 13, 2018), online: <entomologytoday.org/2018/07/13/sting-defeat-brief-history-insects-entomological-warfare/>.

intention of starving the enemy or crippling its economy. In 1962 Cuba accused the Americans for infecting sugarcane farms to cripple Cuba's export economy; "[I]n 1997 Cuba formally charged the U.S State Department with releasing thrips to decimate the island nation's agriculture. The United Nations concluded that the pest outbreak "most likely" arose from an accidental introduction."[99] North Vietnamese also accuses the Americans of using killer insects against them.[100]

The traditional use of insects against agriculture industry of the enemy, was limited to releasing natural insects in the conflicted areas; however, as the technology has advanced, new methods of using insects as weapons have been discovered. In Oct. 2018, *the Guardian* reported that "[G]overnment-backed researchers in America are aiming to use virus-carrying insects to genetically engineer crops – raising fears the technology could be used for biological weapons."[101] According to the report which is based on an article[102] published in the journal *Science*, this program which is called "Insect Allies" has been funded by US Defense Advanced Research Projects Agency and aims to use "genetically modified viruses that have been engineered to alter the chromosomes of crops".[103] Although the Agency claims that the research aims to increase crops security by imparting beneficial genes, international lawyers and scientists have warned that this technology could be used in military as a weapons. If not used in the intended peaceful way, this technology could be used to spread any kind of disease to any kind of crop. If the technology

[99] Jeffrey A. Lockwood, *supra* note 96 at 3.
[100] *Ibid*.
[101] Erin Durkin, "US plan to genetically alter crops via insects feared to be biological war plan", The Guardian (4 Oct 2018), online: <www.theguardian.com/environment/2018/oct/04/us-plan-to-genetically-alter-crops-via-insects-feared-to-be-biological-war-plan>.
[102] Kai Kupferschmidt, "Crop-protecting insects could be turned into bioweapons, critics warn", Science (Oct. 4, 2018), online: <www.sciencemag.org/news/2018/10/crop-protecting-insects-could-be-turned-bioweapons-critics-warn>.
[103] *Ibid*.

succeeds, it could be against the provisions of the Biological Weapons Convention that clearly bans "the development of any biological agents "that have no justification for prophylactic, protective, or other peaceful purposes," says Silja Voeneky, a legal scholar at the University of Freiburg in Germany"[104]. Voeneky argues that since this technology is hard to control and not really practical in peaceful time, it cannot be justified; she further argues that if the intention of the program is increasing the security of plants, it would be easier to spray the plants than using insects to genetically modify them.[105]

Conclusion

Biological weapons and genetic means of warfare have been used by humans for centuries. As the science has developed over the past years, more information has become available to public about using genetics in creating biological agents that could be used against humans. The Biological Weapons Convention has made it clear that using and producing any kind of biological weapons under any circumstances are forbidden. Yet, development of new biotechnologies has made it clear that two important issues must be taken into consideration. The first issue is Black Biology which is the use of genetics for creating biological agents that could be used in terrorist attacks. Accessing genetic information and creating biological weapons has never been easier for terrorists. Although not many successful attempts have been made over the past years, governments must be prepared for taking countermeasures against bioterrorism. It is important for governments to be prepared for possible bioterrorist attacks. Management of this type of crisis requires preparation and ethical guidelines which will be discussed in the next chapter. The second

[104] *Ibid.*
[105] *Ibid*.

issue is the use of genetic engineering for creating ethnic weapons; weapons that could target population with a specific DNA. Although this technology has not been developed yet, it is important to take preventive measures to prohibit use of this unethical technology on humans. Ethnic weapon is an example of use of genetic as warfare that raises many ethical issues. In order to address these issues, this weapon will be analyzed further in next chapter.

Chapter Two: Bioethics and War

When it comes to bioethics and armed conflict, the first question that comes to mind is how are these two concepts related? The answer is not that simple. It is not easy to find a direct relationship between bioethics and armed conflict; however, these two concepts are not totally irrelevant either. When one compares war to bioethics, some ethical concerns in bioethics seem truly small, if not unimportant, compared to thousands of people being killed or displaced due to armed conflicts; yet it does not mean that during wartime, bioethics loses its importance and meaning. The science continues to develop during wartime as it does during peacetime hence it is essential for bioethics to continue to monitor biological sciences during wartime as well.[106] As explained in the previous chapter, different kinds of biological and genetic developments could be used for military purposes and of course this aspect of biology gains more importance during wartime. On the other hand, the conflict between bioethical principles and the principle of military necessity could sometimes lead to complex ethical dilemmas. "Bioethical dilemmas arise when fundamental ethical principles conflict, and during war completing bioethical principles must not only content with one another but with the overriding principle of military necessity and reason of state that animate any issue of military ethics".[107] The following questions arise here: How can we apply bioethics principles during the wartime? What can bioethics do when it comes to the crises caused by war? What is the role of bioethics in development of biological weapons and genetic means of warfare? And last but not the least, what role does law play in defining the relationship between bioethics and armed conflict?

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[106] Eric Cohen, "Bioethics in Wartime", (Fall 2003), The New Atlantis, online: <www.thenewatlantis.com/publications/bioethics-in-wartime>

[107] Michael Gross & Arthur L. Caplan, *Bioethics and Armed Conflict: Moral Dilemmas of Medicine and War* (Cambridge, MIT Press, 2006) at 2 [Gross & Caplan, *Moral Dilemmas of Medicine and War*].

In this chapter, I will try to provide the answers to these questions. In the first section I will have an introduction on the relationship between bioethics and international law and follow the milestones of bioethics in its internationalization journey. In section two, I will provide examples of unethical military experiments that have been conducted during and after WII by the Japanese and the US armies and the Nazis and review the Nuremberg Trials and Code which had an important impact on internationalization of bioethics. Then, in section three, I will introduce a branch of military medicine namely 'disaster ethics' which provides guidelines for management of crises caused during wartime and bioterrorist attacks. Finally, in section four, I will use the examples of weapons and means of warfare that have been introduced in chapter one to discuss some of the most important ethical dilemmas they could cause. I will also review some international bioethical instruments to find out if use of genetic science for military purpose has been regulated under international humanitarian law.

A. Bioethics and International Law

Both law and morality provide guidelines on human behavior in certain situations. Depending on the type of legal theory that is used to define the relationship between law and morality, the relationship between the two concepts could vary. According to natural law, law and morality are deeply connected and in fact laws are defined by moral values; an unjust law is considered "not a law" hence any law that is good is moral and a law that is based on moral values is good. Based on this theory, the natural law prevails over the human law. "In this regard, natural law dictates that all human-made laws must be in accordance with fundamental natural law principles, such as Aquinas' notions of doing good, avoiding evil and promoting the common good".[108] On the other hand, legal positivism sees laws as command of human being and believes that there is no necessary connection between law and morality. Although there are different schools of thought with regard to the relationship between law and morality, it is difficult to deny that some aspects of law have been influenced by morality. Hart in his arguments in the article *Positivism and the Separation of Law and Morals* mentions this when he criticizes Bentham's idea of this separation and talks about what the Utilitarians did not mean by insisting on separation of law and morality.[109] According to him, it was accepted that there is an intersection of law and morals and that development of law has historically been influenced by moral opinions and moral standards have also been influenced by law. Hart also argues that Bentham has never denied that "moral principles might at different points be brought into a legal system and form part of its rules, or that courts might be legally bound to decide in accordance with what they thought just or best".[110] It is therefore logical to conclude that in at least some respects, law has been influenced by moral

[108] William C. Starr, "Law and Morality in H.L.A. Hart's Legal Philosophy" (1984) 67:4 Marquette L Rev 673 at 674.
[109] H. L. A. Hart, "Positivism and the Separation of Law and Morals" (1958) 71:4 Harvard L Rev 593 at 598.
[110] *Ibid* at 599.

principles. "We cannot but be aware of the evident analogies between morality and the criminal law, for example, or notice that legal discourse depends upon, indeed seems committed to, moral categories like responsibility, fault, compensation, justice, and rights. These similarities may persuade us that morality either dictates the actual content of legal norms or else provides procedures of practical reasonableness that necessarily regulate the positive law". [111]

Of course the relationship between law and morality is not a new debate and the dispute over this issue between natural law and legal positivism is in fact one of the oldest and most controversial disputes in the history of legal theory. However, for the purpose of this research, I will not discuss the relationship between law and morality; instead, I will raise an even more complex issue, that is, the relationship between law and bioethics.

If ethics is defined as the principles governing human behavior as to what is right and wrong, then bioethics could be defined as the principles governing human behavior as to what is right and wrong with regard to anything that is related to human body. Looking back at the history of bioethical codes, they mostly took the form of oaths. The Hippocratic Oath as one of the oldest and most famous oaths, includes bioethical principles of respecting confidentiality, beneficence and non-maleficence. Over the years, religion played an important role in establishing ethical principles. Muslim, Jewish and Christian scholars began writing on ethical issues. There are different examples of Christian ethical teaching in the works of scholars after the eleventh century. For instance "Aquinas condemned the demanding of an excessive fee, or even the refusal to give free treatment to a patient who could die without it… A leading sixteenth-century canonist, Navarrus, condemned euthanasia, whatever its motive".[112] By mid 1950s, medicine had developed

[111] William C. Starr, *supra* note 108 at 292.
[112] Michael Freeman, ed, *Law and Bioethics*, (Oxford Scholarship Online, 2009) at 3.

to the extent that allowed humans to transplant organs from one human to another. This significant development in medicine, raised so many ethical and legal issues. Development of contraceptive pill, controversies over abortion, reproduction evolutions and other remarkable developments in medicine in the following years and the confusions about laws governing these issues, made it clearer than ever that importance of the relationship between bioethics and law.

"There are few, if any, areas in which there is a closer interface between law and ethics than in the area of medicine. Law and ethics (and bioethics) employ many of the same conceptual categories: rules, principles, right. In addition, they use the same language, though not, or not necessarily, the same sources".[113] In my perspective, the relationship between bioethics and law is derived from the need of humans to protect their bodies and lives; a protection that mere non-binding ethical principles could not provide. Law does not merely resolve the ethical issues; this relationship reminds us that there could be no right or wrong answers when facing an ethical issue and sometimes for making a decision, it might be required to use the overarching legal principles instead of ethical principles. It is noteworthy to mention that this relationship is not a one-way street. While law has added safety and determination to ethical principles, bioethics has brought new human issues to law and has helped to maintain dynamism of law. Bioethical issues are related to human body but unlike other legal issues related to human body, they are not about assaulting the body; they are making decision about the human body, genetic, reproductive technology and other developments in medicine that involve human body.

After emergence of bioethical issues and principles and national guidelines, the principles slowly started to appear at the international level. In the following sub-sections, I will review a few of the

[113] *Ibid* at 6.

most important milestones in the journey of bioethics from national to international level through trials, committees, legally non-binding declarations and legally binding instruments.

1. Nuremberg Trials

Perhaps the first appearance of bioethics as a set of generally accepted principles in an international setting was the *Nuremberg Code*. The Nuremberg Code is a set of judicial guidelines on protection of participants in medical experiments that was formulated by the judges of the *Doctors' Trial*, one of the Nuremberg Trials that dealt with prosecution of Nazi leaders involved in conducting unethical medical experiments on prisoners of war. The Nuremberg Trials were the turning point not only in international criminal law, but also in ethics of conducting medical experiments. During the WWII, the idea of prosecuting the enemy for conventional war crimes such as torture of prisoners of war was not an unrealistic idea as there already were legal provisions and conventions on these issues; however the idea of prosecution of war leaders for encouraging atrocity was something that the Nuremberg Trials brought to the table.[114] On November 20, 1945, The International Military Tribunal opened trial proceeding against twenty one of Nazi war criminals at the Palace of Justice in Nuremberg. "For the first time in history, an international tribunal took on the grave responsibility of hearing a case against economic, political and military leaders charged with crimes involving the commission of conspiracy, crimes against the peace, war crimes, and 'crimes against humanity' (involving persecution, mass deportation, and extermination on political, racial, or religious grounds)".[115] Twelve more trials including the

[114] Philippe Sands, *From Nuremberg to The Hague: The Future of International Criminal Justice*, (Cambridge University Press, 2003) at 2.
[115] Herbert R. Reginbogin & Christoph J.M. Safferling, ed, *The Nuremberg Trials: International Criminal Law Since 1945*, (Walter de Gruyter, 2016) at 11 (doi.org/10.1515/9783110944846.11).

Doctors' Trial were held against Nazi leaders in Nuremberg; however these trails were held under the sole jurisdiction of the USA as the occupying power in this sector of Germany.[116] The Doctor's Trial led to concluding a set of judicial guidelines on protection of participants in medical experiments known as the *Nuremberg Code* that provides research participants with safeguards, both at an individual and collective level. Before the Nuremberg Code, there were no comprehensive norms and principles on conducting researches on human subjects and it was served as a cornerstone for some of the most important bioethical instruments adopted later. I will provide more details and elaborate more on the Doctors' Trial and the Nuremberg Code in the next section where I review the history of Nazi experiments on prisoners of war.

2. *World Medical Association Declarations*

Served as the corner stone for future guideline and ethical instruments such *the Declaration of Helsinki*, the Nuremberg Code was the first generally accepted code on ethical principles related to conducting experiments on human subjects and is often seen as a turning point in taking bioethics a further step into international level. The Nuremberg Code never became a legally binding instrument and neither did the two other important prominent declarations adopted by the *World Medical Association (WMA)* that were adopted based on this code; namely the *Declaration of Geneva*[117] adopted in 1948 and the *Helsinki Declaration: Ethical Principles for Medical Research involving Human Subjects*[118] adopted in 1964. Declaration of Geneva which was mostly

[116] *Ibid* at 12.
[117] *WMA Declaration of Geneva*, Adopted by the 2nd General Assembly of the World Medical Association, Geneva, Switzerland, September 1948.
[118] *WMA Declaration of Geneva adopted in 1948 and the Helsinki Declaration: Ethical Principles for Medical Research involving Human Subjects,* Adopted by the 18th WMA General Assembly, Helsinki, Finland, June 1964.

focused on ethical and professional duties of physicians and was revised several times since adoption, most recently in 2017, emphasizes on human dignity and human rights. In comparison to the Geneva Declaration, the Helsinki Declaration is much more detailed and provides guidelines for conducting medical researches. The Helsinki Declaration was revised several times since adoption, most recently in 2013.

3. The 1949 Geneva Conventions and the Additional Protocols

The 1949 *Geneva Conventions* and their subsequent additional protocols serve as the most important treaties covering different aspects of armed conflict including treatment of wounded and sick persons (Geneva Convention I), wounded and sick person at the sea (Geneva Convention II), prisoners of war (Geneva Convention III) and civilians (IV).

The first Geneva Convention, formally *Convention (I) for the Amelioration of the Condition of the Wounded and Sick in Armed Forces in the Field*[119]*,* was the fourth updated version of the Geneva Convention on the wounded and sick following conventions adopted in 1864, 1906 and 1929. Article 12 of this convention provides provisions for protection and care of the wounded and sick and most importantly, it prohibits conducting "biological experiments" on them. Articles 19 to 23 of the convention have been dedicated to protection of medical units and their impartiality. Also according to Article 50, conducting any kind of biological experiments on the wounded and sick is a grave breach of the Convention.

[119] *Convention for the Amelioration of the Condition of the Wounded and Sick in Armed Forces in the Field*, 12 August 1949, 17512 UNTS 3 (entered into force 21 October 1950).

The second Geneva Convention, formally *Convention (II) for the Amelioration of the Condition of Wounded, Sick and Shipwrecked Members of Armed Forces at Sea*[120], in its Article 13, provides the exact same protection as stated in article 12 of the above convention for the persons protected under this convention. Article 51considers biological experiments on the wounded and sick to be a grave breach of the Convention.

The third Geneva Convention, formally *Convention (III) relative to the Treatment of Prisoners of War*[121] in its Article 13 explicitly states that "no prisoner of war may be subjected to physical mutilation or to medical or scientific experiments of any kind which are not justified by the medical, dental or hospital treatment of the prisoner concerned and carried out in his interest". According to Article 130, conducting any kind of biological experiments on prisoners of war is a grave breach of the Convention.

The fourth Geneva Convention, formally *Convention (IV) relative to the Protection of Civilian Persons in Time of War*[122], in its Article 32 prohibits "not only to murder, torture, corporal punishment, mutilation and medical or scientific experiments not necessitated by the medical treatment of a protected person, but also to any other measures of brutality whether applied by civilian or military agents". According to Article 147, conducting any kind of biological experiments on the protected persons is a grave breach of the Convention.

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[120] *Convention for the Amelioration of the Condition of Wounded, Sick and Shipwrecked Members of Armed Forces at Sea,* 12 August 1949, 17512 UNTS 3 (entered into force 21 October 1950).
[121] *Geneva Convention Relative to the Treatment of Prisoners of War,* 12 August 1949, 75 UNTS 135 (entered into force 21 October 1950).
[122] *Convention relative to the Protection of Civilian Persons in Time of War, 12 August 1949,* 75 UNTS 135 (entered into force 21 October 1950).

Second additional protocol, formally *Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of Non-International Armed Conflicts*[123] adopted on 8 June 1977, in its Article 5(2)(e) prohibits to subject the persons deprived of their liberties due to reasons related to armed conflict "to any medical procedure which is not indicated by the state of health of the person concerned, and which is not consistent with the generally accepted medical standards applied to free persons under similar medical circumstances".

Emphasizing on prohibition of biological experiments on both prisoners of war and civilians is perhaps a result of the painful experience of inhuman experiments conducted by the Japanese Army and the Nazis during the WWII. I will elaborate more on these experiments in the section three of this chapter.

4. United Nations

Perhaps one of the important steps taken by the international community that caused bioethics to be taken more seriously than ever, was creation of *UNESCO's International Bioethics Committee* (IBC) in 1993. The United Nations Social, Educational and Cultural Organization (UNESCO) was among the first international organizations that addressed bioethical issues. According to Article 2 of the Statutes of the IBC[124], the main tasks of the IBC are to address ethical and legal issues raised by scientists in the field of life sciences and of course to contribute to promotions of principles set out in the *Universal Declaration on the Human Genome and Human Rights.*[125] The

[123] *Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of Non-International Armed Conflicts* (Protocol II), 8 June 1977, 17513 UNTS 609 (entered into force 7 December 1978).
[124] *Statutes of the International Bioethics Committee (IBC*), Adopted by the Executive Board at its 154th Sess. 7 May 1998.
[125] *Universal Declaration on the Human Genome and Human Rights,* Adopted at UNESCO 29th General Conference in 11 November 1997.

Universal Declaration on the Human Genome and Human Rights is not the only declaration issued by the UNESCO. *Universal Declaration on Bioethics and Human Rights*[126] and *International Declaration on Human Genetic Data* are two other declarations issued by the UNESCO in the field of bioethics. I will elaborate more on these declarations in the last section of this chapter.

Another UN agency that has contributed to development of bioethics is the *World Health Organization* (WHO). In 2002, WHO established its *Global Health Ethics Unit* dedicated to examination of ethical issues raised by activities throughout the organization and supporting Member States in addressing ethical issues that arise in their own countries including but not limited to public health surveillance to developments in genomics, and from research with human beings to fair access to health services.[127] Later, the unit was further expanded to include development of programs on ethical issues in both clinical and research setting worldwide, particularly in resource-poor nations.[128]

5. *International Criminal Law*

The relationship between international criminal law and bioethics has been formed through criminalization of violation of bioethical principles that have been included in the International Humanitarian Law (IHL). In fact, the 1949 Geneva Conventions are the main connection between bioethics and international criminal law. One of the most important international criminal law sources that has taken bioethics into account, is the 1988 *Rome Statute of the International*

[126] *Universal Declaration on Bioethics and Human Rights*, Adopted at UNESCO 33rd General Conference in 19 October 2005.
[127] "Ethics and health" (last visited 11 December 2019), online: *World Health Organization* <www.who.int/health-topics/ethics>
[128] Henk A. M. J. ten Have & Bert Gordijn, ed, *Handbook of Global Bioethics* (Springer, 2014) at 32.

Criminal Court[129] (Rome Statute). According to Article 8(2)(a)(ii) of the Rome Statute, "biological experiments" committed against persons protected under the 1949 Geneva Conventions are considered as war crimes. Also according to Article 8(2)(b)(x) of the Rome Statute, "[s]ubjecting persons who are in the power of an adverse party to physical mutilation or to medical or scientific experiments of any kind which are neither justified by the medical, dental or hospital treatment of the person concerned nor carried out in his or her interest, and which cause death to or seriously endanger the health of such person or persons" is a war crime. Although the Rome Statute has considered "biological experiments" on prisoners of war, a war crime, it is noteworthy to mention that as it will be explained in section three, the Nazi doctors were prosecuted in the Doctor's Trial for committing not only war crimes, but also crimes against humanity. My perspective is that although the Rome Statute has not explicitly considered unethical experiments against prisoners of war a crime against humanity, other inhuman treatments that do not fall under the definition of "biological experiments" but are somehow related to human body such as forced sterilization, could be considered crimes against humanity. Other than the Rome Statute, Article 2(b) of the 1993 Statutes of the *International Criminal Tribunal for the former Yugoslavia*[130], Article 4 of the *International Criminal Tribunal for Rwanda*[131] (violations of Article 3 Common to the Geneva Conventions and of Additional Protocol II) have considered bioethics into account as well.

The most important feature of the Rome Statute is that unlike the International Court of Justice which has jurisdiction only over states, it gives jurisdiction to the International Criminal Court (ICC) to deal with cases of commitment of war crimes and crimes against humanity (among other

[129] *Rome Statute of the International Criminal Court, 17 July 1998, A/CONF.183/9 (entered in force on 1 July 2002).*
[130] *Statute of the International Criminal Tribunal for the Former Yugoslavia*, SC Res. 827, 3217th Mtg., UN Doe. S/RES/827 (1993).
[131] *Statute of the International Tribunal for Rwanda*, UNSC Res 955, UN Doc S/RES/955, Annex (1994).

crimes) by individuals; since war crimes and crimes against humanity as specified in the Rome Statute include bioethics, hence according to the Rome Statute the ICC has jurisdiction to deal with bioethical cases which was a huge step for bioethics to be taken more seriously in the 1980s. It is noteworthy to mention that biological experiments and forced sterilization are not the only bioethical issues that could be considered as crimes under the Rome Statute. By looking at international crimes from a bioethical point of view other crimes that are of interest of bioethics, such as sexual slavery or forced impregnation, would also be considered bioethical war crimes or bioethical crimes against humanity.

6. Human Rights

From the above documents, it is evident that bioethical principles found their way to international law. They also slowly became a part of human rights norms and principles. Today, bioethics and human rights are connected in a way that they cannot be considered entirely distinct any more, however "bioethics as such is not regarded as automatically transferable to human rights, not even in a codified form. But it is more and more common that bioethical norms take over legal expressions or even concrete legal techniques used in human rights instruments".[132] One reason why these two fields are mutually intertwined is the crucial role that "human dignity" plays in both of them. "The concept of intrinsic human dignity operates in modern times as the bedrock of the international human rights system that emerged in the aftermath of the Second World War. It plays also a key role in the international policy documents relating to bioethics that have been adopted since the end of the 1990s. Human dignity can be characterized as the "shaping principle" of

[132] Judit Sandor, "Human Rights and Bioethics: Competitors Or Allies - The Role of International Law in Shaping the Contours of a New Discipline" (2008) 27:1 Med & L 15 at 16.

international bioethics or as the "overarching principle" of the global norms governing biomedical issues".[133] Another reason is that biomedical activities are directly related to the most basic human rights, namely the right to life and physical integrity and it is only logical to assume that these activities must be protected by human rights norms.[134] Another very important reason for using human rights to promote bioethics is that there are few, if any, mechanisms available other than human rights to function as a global normative foundation in biomedicine.[135] From this point of view, bioethics needs human rights to achieve an acceptable global position and it is only through human rights principles and instruments that bioethics could be globally promoted. However, this increasing attachment of bioethics to human rights, does not necessarily mean that bioethics, as an independent filed, will be vanished and become completely encapsulated by human rights and legal form. "Though ethics and law interact in various ways and may significantly overlap with one another, they will always remain as two different normative systems".[136]

One of the prominent human rights instruments that paid special attention to bioethics was the 1966 *International Covenant on Civil and Political Rights*[137] (ICCPR).The role that has played in promoting human rights and liberties is without a doubt a very significant one. In Article 7 it has been mentioned that "no one shall be subjected without his free consent to medical or scientific experimentation". Although this article covers only the concept of "free" and not "informed" consent, it is still valuable that this important instrument has included this principle in its articles.

As explained above, UNESCO's 2005 Universal Declaration on Bioethics and Human Rights is also an important step towards integration of bioethics and human rights principles. I will use this

[133] Henk A. M. J. ten Have & Bert Gordijn, *supra* note 128 at 46.
[134] *Ibid* at 53.
[135] *Ibid* at 54.
[136] *Ibid*.
[137] *International Covenant on Civil and Political Rights*, 16 December 1966, 999 (Entry into force: 23 March 1976).

declaration and some other international document in the last section to analyze the adaptability of biological weapons and genetic means of warfare to bioethical principles. Before that, in the next section, I will briefly review the history of unethical during and after WWII in Japan, United States of America and Germany.

B. Unethical Military Experiments

In chapter one, synthetic biology, genetic engineering and their use as weapons and means of warfare were discussed. In this chapter, I aim to discuss the ethical issues of synthetic biology and genetic engineering and their use in military as weapons and means of warfare and provide examples of unethical military experiments.

The main ethical issue associated with synthetic biology and genetic engineering is the unknown effects they could be having on the environment and on public health. "Much like the poisoned crops and water supplies of old, synthetic biology has the potential to contaminate the environment on a much larger and more globalized scale. Moreover, and even more threateningly, it has already been demonstrated that de novo DNA synthesis can be used to produce pathogenic viruses". [138] It is possible that in near future new types of manipulated viruses, pose serious threats to the safety of mankind.

The threats posed by synthetic biology and genetic advancements and their use in modern warfare are very serious. One potential risk is the leak of harmful agents from laboratories or facilities that could cause serious damages to the environment or public health. I discussed in the first chapter how unintentional release of pulmonary anthrax from a military base in the Soviet city of

[138] Nicole H. Kalupa, *supra* note 30 at 960.

Svedlovsk caused deaths of civilians. In order to prevent major disasters in case of escape of harmful biological agents and ensure safety of the civilians, facilities that develop harmful biological agents for use in military, must be located as far as possible from cities and villages. However, this issue is more of a safety issue rather than an ethical issues.

In chapter one, I also discussed biological weapons and genetic means of warfare and how synthetic biology and genetic engineering –against their inherent nature- have contributed to development of weapons to be used against humans. Synthetic biology and genetic engineering, arise different kinds of ethical dilemmas as they directly relate to life science and human body. One issue is the aim and objective of synthetic biology and genetic engineering. "Synthetic biology aims at creating or designing new forms of life, following a human "architecture" and plan. This aim per se raises certain ethical questions related to the relationship between humans and other living organisms and the moral status of the products of synthetic biology".[139] By creating artificial living organisms, machines would no longer be the only human-made artificial devices. It would be unclear how artificial living organisms must be treated; whether as living organisms or as machines. On one hand, they have been designed and created by humans which make them closer to the definition of 'machines'. On the other hand, they would still have the characteristics of living organisms such as the ability to reproduce. "Those arguing that living organisms have intrinsic value may therefore be confronted with a question regarding the moral status of artificial organisms and the responsibility that the "creator" would have towards it". [140] The same argument applies to genetic engineering. The product of genetic engineering could be considered a living machine which could raise a number of ethical questions including the possibility of converting

[139] Markus Schmidt et al, ed, *Synthetic Biology: The Technoscience and Its Societal Consequences* (Dordrecht: Springer, 2009) at 67.
[140] *Ibid*. at 73.

living organisms into machines and the differences between the two concepts.[141] Answering these fundamental ethical questions would be out of the objective of this research which mainly focuses on the use and ethical issues arising out of these scientific advancements in warfare. When talking about ethical dilemmas of biological weapons and genetic means of warfare, one of the first ethical issues that comes to mind is the experiments that have been done on human subjects for creating the weapons. I will elaborate more on this issue by providing examples of experiments done on human subjects for military purposes.

1. Japanese Military Experiments

Some of the most lethal experiments that were conducted on human subjects for creation of biological and chemical weapons were the experiments done on Chinese, Korean, Mongolian and Russian prisoners by Unit 731 during World War II. Unit 731 was a biological and chemical research and development unit of Imperial Japanese Army. Unit 731 consisted of a number of scientists and professional soldiers. Different experiments were conducted on human subjects not only to increase knowledge about development of biological and chemical weapons, but also to understand hidden aspects of medical science. Japanese scientists conducted different types of experiments on prisoners; these experiments included but were not limited to anthrax, yellow fever, plague, typhoid, typhus, smallpox, gas gangrene and countless other diseases that were endemic to the communities and surrounding regions.[142] The experiments were barbaric, inhuman, degrading and against all principles of medical and research ethics. Other than these medical

[141] *Ibid*.
[142] Sheldon H. Harris, *Factories of Death: Japanese Biological Warfare 1932-1945 and the American Cover-Up*, 1st ed (New York: Routledge, 1995) at 59.

experiments, weapons experiments were also conducted on human subjects. Subjects were injured by guns, swords, knives and by dropping heavy objects on them so that the patterns of injuries and wounds could be studied.

Unit 731 was not the only unit of the Japanese Army responsible for conducting biological researches. Another department, was the BW department of Unit 100 which was responsible for studying methods of bacteria reproduction, livestock viruses, especially nose ulcer, sheep pox, ox plague, management and production of animals for future experiments, organic chemistry with emphasis upon medicines that kill and viruses to destroy crops.[143] Bacteria in large scales were being produced in Unit 100 laboratories. "It is known that in 1941 and 1942 the laboratories produced annually 1000 kilograms of anthrax bacteria, over 500 kilos of nose bacteria, and possibly as much as 100 kilos of glanders bacteria. Huge quantities of herbicides were also manufactured every year the unit operated".[144]

According to historian Sheldon Harris, "[h]undreds, if not thousands, of experiments were conducted on humans in the underground laboratories" in Japan.[145] In his 1994 book titled *Factories of Death: Japanese Biological Warfare, 1932-1945, and the American Cover-up*, Harris revealed his findings about the Japanese warfare experiments and how after the war, the Americans helped the scientists responsible for these experiments to be protected from war crime prosecution in exchange for the data obtained by their scientists. The reason was that in order to prosecute the Japanese scientists, some of the knowledge obtained by them would have become public knowledge and "[t]here would have been little possibility for retaining such information in US-

[143] *Ibid* at 87.
[144] *Ibid*.
[145] *Ibid* at 62.

only hands in such a case".[146] Therefore it was agreed there would be little gain by proceeding with prosecution hence immunity was offered to the scientists in exchange for detailed information.[147] However, involvement of Americans in biological warfare researches done by Japanese Army was not limited to obtaining their data. It is said that the Japanese Army, used American war prisoners during the World War II as human subjects and exposed them to lethal biological agents as part of its research.[148]

2. The US Military Experiments

Japanese scientists were not the only scientists conducting experiments on human subjects for military purposes. The US military, too, has conducted different experiments for military purposes. For instance, in September 1950, the U.S Navy sprayed *Serratia marcescens* into air of northern California. *Serratia marcescens* is associated with urinary and respiratory infections, endocarditis, osteomyelitis, septicemia, wound infections, eye infections, and meningitis. [149] "Serratia marcescens was one of the biological simulants commonly employed in testing. Because of its red color, it was attractive as a biological agent that would be easy to track during testing. Furthermore, during the initial years of its use, serratia marcescens was thought to be an innocuous biological agent".[150] The name of this project was *Operation See Spray* the objective of which was to assess the preparedness and reaction of big cities to possible biological attacks. As a result of this test,

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[146] *Ibid* at 222.
[147] *Ibid*.
[148] Kathryn DuBois, "The Unknowing Volunteers: Population Testing in the United States" (2011) 1 J of Biosecurity, Biosafety & Biodefense L 1 at 4.
[149] Jane Buckle, *Clinical Aromatherapy: Essential Oils in Healthcare* (London: 2016, Churchill Livingstone) at 140.
[150] Kathryn DuBois, *supra* note 167 at 3.

one patient recovering from cancer died.[151] I will elaborate more on this experiment in section four of this chapter.

During 1950s, the US Army also conducted a few experiments to test the practicality of employing mosquitoes to carry agents as entomological weapons. Operation Drop Kick was one of these tests that was conducted in 1956. It is claimed that in this operation "600,000 uninfected mosquitoes from a plane at Avon Park Bombing Range, Florida [were released]. Within a day, the mosquitoes had spread a distance of between one and two miles and had bitten many people. The mosquitos were released across several Black communities in Florida. In the predominantly Black community of Avon Park, dozens of Black people became ill, and eight people died".[152]

Another example is the experiments done at Holmesburg Prison in Philadelphia. Between 1965 and 1966, the famous American physician, Dr. Albert M. Kligman, who is better known for development of skin acne treatment "Retin-A", conducted experiments on almost seventy five prisoners at Holmesburg Prison in Philadelphia to test the toxicity effects of dioxin, the main poisonous ingredient of the Orange Agent, a chemical agent mostly used during the Vietnam War.[153] "Records from the experiments have been destroyed, and the Environmental Protection Agency's 1981 investigation into the matter failed to identify the exact participants, rendering the long-term effects of the exposure untraceable. Nonetheless, prisoners who participated in dermatological experiments under Dr. Kligman's hand in 1965 and 1966 report that they still experience scars, blisters, cysts, and ongoing rashes".[154]

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[151] *Ibid* at 5.
[152] Jae Jones, "Operation Big Itch And Operation Drop Kick: Fleas And Infected Mosquitoes Dropped Over Black Towns" (4 April 2018), online: *Black Then* <https://blackthen.com/operation-big-itch-operation-drop-kick-fleas-infected-mosquitoes-dropped-black-towns/>
[153] Keramat Reirter, "Experimentation on Prisoners: Persistent Dilemmas in Rights and Regulations" (2009) 97:501 California Law Review 501 at 501.
[154] *Ibid.*

As discussed in chapter once, *Operation Whitecoat* is the name of another long-term bio-defense medical research that the US army conducted on human subjects from 1954 through 1973. Participants in this research were around 2,300 young men who were conscientious objectors because of their religious beliefs. They were assigned duties in support of medical research and volunteering in researches after providing consent.[155] Perhaps the main characteristic of this project was that the 2300 subjects who participated in it were informed of the experiment and had provided consent to participate in it; however, although a voluntary, witnessed and signed consent was required for participation in the project, there was no mandate that the participants be fully informed of the research details.[156] The participants were exposed to different levels of biological agents in order for the US army to study the effects of different agents on human body in the battlefield and in workplace. "These experiments resulted in the development of vaccines to protect the American troops at risk of exposure to biological agents and infectious diseases on the battlefields of Korea, Vietnam, Desert Shield and Desert Storm".[157]

Efforts of the US military scientists and researchers were not limited to creating new weapons; they were also trying to find ways to enhance the powers and performances of human soldiers or as Dr. Marion Sulzberger envisioned, armor the individual soldiers both internally and psychologically through new forms of biomedicine and biotechnology; an internally embedded biological armor that he termed "Idiophylaxis.".[158] Dr. Sulzberger who was also known as "Mr. Dermatology", was an American dermatologist who presented a paper at the Army Science

[155] Mark S. Williams et al, "Retrospective Analysis of Pneumonic Tularemia in Operation Whitecoat Human Subjects: Disease Progression and Tetracycline Efficacy" (2019) 6 Frontiers in Medicine 1 at 3.
[156] Kathryn DuBois, *supra* note 167 at 10.
[157] *Ibid*.
[158] Andrew Bickford, "From Idiophylaxis to Inner Armor: Imagining the Self-Armoring Soldier in the United States Military from the 1960s to Today" (2018) 60:4 Comparative Studies in Society & History 810 at 810 [Bickford, "Idiophylaxis"].

Conference at West Point in 1962 in which he introduced his idea of enhancing the abilities and powers of combat soldiers. “From Sulzberger's analysis of disease and illness casualties in World War II and Korea he realized that soldiers’ “first line of defense” in combat was their own body, which needed to be steeled, hardened, and fortified to withstand the demands of combat in ways heretofore medically and technologically unachievable”.[159] The rationale behind this idea is that the strength of an army mostly depends on its soldiers; the stronger the soldiers, the stronger the army. Since the beginning of time, armies have tried to make their soldiers stronger and armour them against the enemies. “Soldiers are supposed to be made into, and then embody and project, an ideal of steely resolve and fortitude, unwavering bravery and compliance”.[160] The truth is, from a logical point of view, as the weapons are advancing in the battlefield, so should the soldiers; but is this really possible? That remains the unanswered question. The history of enhancing the powers of soldiers in battlefield is as old as the history of war itself. For centuries, efforts have been made to create undefeatable warriors by developing protections such as armor or helmets. But as biotechnology is developing every day, the idea of internalizing the armor and making biologically undefeatable warriors is becoming more realistic. A part of military medicine deals with application of biotechnology to achieve desired effects in a military context one of which is designing and making better soldiers. Environmental effects and infectious diseases are the main threats that could impact the abilities of soldiers and the focus of the US military biomedical research has been on these threats. “US military biomedical research is intended to provide soldiers with protections to allow them to deploy in any condition or climate around the world and protect them from any and all pathogens they might encounter on the battlefield. As the US military increasingly sees the entire world as a battlefield, it must anticipate, imagine, and design new ways

[159] *Ibid*.
[160] *Ibid* at 811.

to protect soldiers in order to make them deployable anywhere in the world".[161]As discussed above, external protection of soldiers' bodies does not seem to be enough for US military. US military has been investigating the use of performance-enhancing drugs since the WWII. "The early wartime physiological research focused on extending normal biological performance with hormones, nutrients, and stimulant drugs. The same enthusiasm for improving human biology has continued, with new medical technologies including newer drugs".[162] In the 1970s, military scientists were looking for simple pharmacological solutions, including pills that could increase smartness of soldiers or make them fearless. Today, the goal of US military biomedical and performance-enhancement research is bigger than just designing brave or smart soldiers. The aim of the researches is to making the soldiers immune, whether it be from nuclear flash burns or from bug bites.[163] Sulzberger's plan was to use some kind of vaccination and medication to immune soldiers against two types of conditions: the actual diseases in the battlefield and medical conditions caused normally in the battle field such as wounds, blisters and rashes.[164] After years of research and based on Dr. Sulzberger's idea of Idiophylactic soldiers, in 2007, Dr. Micheal Callahan, program director of Defense Science Office of The Defense Advanced Research Projects Agency (DARPA) (an agency of the United States Department of Defense) introduced the Inner Armor project. In his speech, Callahan stated:

> "I am developing technologies that will extend the soldier's personal protection beyond bullets and bombs, to include protection against environmental threats, infectious diseases and chemical, biological and

[161] Andrew Bickford, "Kill-proofing the Soldier" (2019), 60:19, Current Anthropology 39 at 39 [Bickford, "Kill-proofing].
[162] Karl E. Friedl, "U.S. Army Research on Pharmacological Enhancement of Soldier Performance: Stimulants, Anabolic Hormones, and Blood Doping" (2015), 29:11 J of Strength & Conditioning Research 71 at 71.
[163] Bickford, "Kill-proofing", *supra* note 180 at 40.
[164] *Ibid* at 41.

> radioactive weapons. The effort will require orthogonal strategies to harden the warfighter against extremes of temperature … to rapidly adapt Soldiers to high altitude, to blue water operations, to prevent infection before it occurs, and to protect the soldier against new-generation weapons of mass destruction. The objective is to fortify the *entire* soldier against attack from the enemy—or from the environment. I call this comprehensive protection *Inner Armor"*.[165]

Enhancing the powers and abilities of soldiers means direct manipulation and militarization of the soldier's own body for military purposes.[166] "Militarization and military medicine do not bring a body into being, but they do prepare the body for war and trauma, and in this sense they make the soldier ready to take part in the violent embodiment of war".[167] Although it might not include genetic alteration, militarization does include biological manipulation. The question of whether this manipulation is ethical or not and whether it violates the human rights of soldiers, will be discussed in the next section where I talk about ethical dilemmas arising out of military medicine and warfare development.

3. Nazi's Experiments

When talking about military experiments, there are two names that cannot be forgotten; Hitler and the Nazis. Nazis conducted a series of different experiments on human subjects in the 1940s during the World War II and different physicians and scientists participated in conducting these

[165] Bickford, "Idiophylaxis", *supra* note 177 at 829.
[166] Bickford, "Kill-proofing", *supra* note 180 at 40.
[167] Bickford, "Idiophylaxis", *supra* note 177 at 813.

unethical medical experiments on the prisoners of war. "The initiators and facilitators of these experiments were Reichsführer SS Heinrich Himmler, together with SS-Obergruppenführer Ernst Grawitz, the chief physician of the SS and police, and SS-Standartenführer Wolfram Sievers, the secretary general of the Ahnenerbe (Ancestral Heritage) Association and director of the Waffen SS Military-Scientific Research Institute".[168] The scope of experiments conducted by Nazis is very wide and discussing all of them would be out of the scope of this research; hence for the purpose of this research, I will only discuss the military experiments and experiments related to Nazi racial ideology.

Dachau Camp was the first regular concentration camp established by the Nazis in which different medical experiences were conducted on prisoners. Some of these experiments dealt with the survival of military personnel. "Physicians from the German air force and from the German Experimental Institution for Aviation conducted high-altitude experiments on prisoners to determine the maximum altitude from which crews of damaged aircraft could parachute to safety".[169] Other experiments included freezing experiments on prisoners to find an effective treatment for hypothermia and tests for finding a method of making seawater drinkable.

Auschwitz camp is another one of Nazi's concentration camps which is mostly known for the inhuman experiments conducted in it. "It is estimated that the SS and police deported at least 1.3 million people to the Auschwitz camp complex between 1940 and 1945. Of these deportees, approximately 1.1 million people were murdered".[170] Among these experiments, was the research

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[168] "Medical experiments" (last visited 28 November 2019), online: *Memorial and Museum Auschwitz-Birkenau* <auschwitz.org/en/history/medical-experiments/>.

[169] "Nazi Medical Experiments" (Last modified 30 August 2006), online: *United States Holocaust Memorial Museum* <encyclopedia.ushmm.org/content/en/article/nazi-medical-experiments>.

[170] "AUSCHWITZ" (Last modified 16 March 2015), online: *United States Holocaust Memorial Museum* <encyclopedia.ushmm.org/content/en/article/auschwitz>.

to find the best and the easiest method to sterilize an unlimited number of persons in the shortest possible time.[171]Although not a real weapon, sterilization was a method which would allow the Nazis to biologically destruct people of certain "undesirable" people in a short period of time hence it was widely being studied by Nazi scientists namely Carl Clauberg and Horst Schumann. "Clauberg developed a method of non-surgical mass sterilization. Under the pretext of performing a gynecological examination, he first checked to make sure that the Fallopian tubes were open, and then introduced a specially prepared chemical irritant, which caused acute inflammation. This led to the growing together of the tubes within a few weeks, and thus their obstruction".[172] On the other hand, Schumann's developed method was different as he was testing the effects of x-ray on fertility. His experiments consisted of the exposure of the women's ovaries and the men's testicles to x-rays which caused severe radiation burn on the bodies of the subjects and other complications which lead to many deaths.[173] "Only a small portion of the victims of Clauberg and Schumann's experiments, fully aware of how they had been permanently harmed, survived Auschwitz".[174]

Aside from these experiments, research and development of chemical weapons was also a priority to Nazis. Chemical weapon experiments involving human subjects were formally organized and allowed in the Nazi regime; organizations conducting these experiments had to request permission for conducting research on humans. They had to submit applications "substantiating scientific objectives as well as the required number of prisoners and duration of experiments. There is no doubt that military experts were informed about specific human experiments with chemical agents in concentration camps. Some of the military experts were also involved in their preparation and

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[171] "Carl Clauberg" (Last visited 28 November 2019), online: *United States Holocaust Memorial Museum* <auschwitz.org/en/history/medical-experiments/carl-clauberg>
[172] *Ibid*.
[173] "Horst Schumann" (Last visited 28 November 2019), online: *United States Holocaust Memorial Museum* <auschwitz.org/en/history/medical-experiments/horst-schumann>
[174] *Ibid*.

evaluation".[175] The experiments included toxicological evaluation, developing technologies of defensive protection and treatment of injuries. The experiments were painful and caused a long-term health complications for the participants. Although not fully informed about the health risks of the experiments, military participants knew that they were participating in these researches. There are other allegations against the Nazi regime claiming that death row inmates were also participating in chemical weapons researches without consenting to participate. [176] Although a 1931 guideline named *Regulations Concerning New Therapy and Human Experimentation* prohibited experimenting on humans without obtaining their consent, according to historian Ulf Schmidt military researchers either ignored this guidelines or were not aware of their existence.[177] "In many cases, it is unclear if sufficient animal testing had taken place prior to the human experiments with chemical agents. In contrast to this complete lack of any institutionalized regulation of ethical issues concerning human experiments, the Nazi regime established such regulations for animal experiments in line with the animal protection law of 1933".[178] After being attacked with mustard gas by Polish troops in 1939, the Nazis started investigating and conducting experiments with mustard gas on inmates in the concentration camps. At least two series of experiments were conducted in the concentration camp at Sachsenhausen on a total of 31 inmates.[179] The wounds caused by the experiments were very painful and the infected prisoners developed sepsis with high temperatures, shivering, swelling of the glands, and enlarged spleens.[180] During the next years, more experiments were conducted on human subjects with

[175] Bretislav Friedrich et al, ed, *One Hundred Years of Chemical Warfare: Research, Deployment, Consequence* (Springer Open, 2017) at 233.
[176] *Ibid*.
[177] *Ibid at 234.*
[178] *Ibid*.
[179] *Ibid* at 235.
[180] *Ibid* at 238.

different types of poisonous gases. From 1942 to 1944, Professor Otto Bickenbach was conducting experiments on prisoners with antidotes of phosgene in Natzweiler (a concentration camp) gas chamber.[181] "The victims were Gypsies who had been transferred from Auschwitz, the previous year to serve as human guinea pigs for SS doctors experimenting with anti-typhus injections".[182] The last series of chemical experiments took place in Neuengamme concentration camp between 1944 and 1945. In these series of experiments, first "hypochlorous acid was added to the drinking-water supply at Neuengamme to perform a large-scale test on approximately 10,000 inmates to see if the water with the added decontamination compound would lead to health problems"[183]. The experiment did not go as planned and no health complications occurred hence the researchers decided that additional experiments with nitrogen mustard gas were necessary. "The experiments with nitrogen mustard were conducted in January 1945. In February 1945 it was reported that "the nitrogen mustard experiments had been completed and achieved a favorable result".[184]

These experiments were only a few examples of many experiments that are known to have been conducted on human subject for military purposes. The number of experiments that were actually conducted and were never publicized is unknown and most of these experiments were publicized many years after they were conducted. One cannot know what types of biological or genetic experiments scientists might be doing on humans right now; we can just wait to see what the future will reveal about these experiments. For now, we could only learn from the experiments conducted in the past and find ways to ensure that ethical principles are taken into account when conducting experiments involving human participants. Nazi experiments, though truly unethical, contributed

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[181] "Natzweiler-Struthoff Concentration Camp" (Last visited 28 November 2019), online: *Holocaust Education & Archive Research Team* <www.holocaustresearchproject.org/othercamps/natzweiler.html>.

[182] *Ibid*.

[183] Bretislav Friedrich, *supra* note 194 at 249.

[184] *Ibid* at 251.

to establishment of ethical principles and guidelines on conducting medical experiments. *Doctor's Trial* and the *Nuremberg Code* which I will explain below, contributed significantly to the ethics of medical research.

i. Doctor's Trial and the Nuremberg Code

The *Doctors' Trial*, formally *United States of America v. Karl Brandt, et al.* was one of the twelve Nuremberg trials that was held against twenty three defendants twenty of whom were medical doctors (and the other three administrators) for organizing and taking part in war crimes and crimes against humanity in form of conducting unethical medical experiments on prisoners and civilians. One of the main features of this trial was that there were victims who gave eloquent testimony about what had actually happened and this caused the trial documentation to gain iconic status.[185] The charges of war crimes included experimental surgeries, shootings and different kinds of experiments (as explained above) which were all part of a bigger picture of beating, torture and killings, particularly killings of Jews for anatomical research and euthanasia of disabled prisoners. Emphasizing on the role of Jews in the researches, the prosecution tried to link the experiments to Nazi's racial philosophy. The trials were a turning point on trying not only individuals "but also organisations – notably the SS and military high command, and in adopting 'crimes against humanity' as a major charge". [186] Seven of the defendants who conducted the experiments were sentenced to death and executed; nine were sentenced to jail time and seven were acquitted.

[185] Volker Roelcke, Sascha Topp & Etienne Lepicard, ed, *Silence, Scapegoats, Self-reflection: The Shadow of Nazi Medical Crimes on Medicine and Bioethics*, 1st ed (Vandenhoeck & Ruprecht: 2015) at 29.
[186] Paul Julian Weindling, *Nazi Medicine and the Nuremberg Trials: From Medical War Crimes to Informed Consent*, 1st ed (Palgrave Macmillan, 2004) at 94.

Another important result of the trial was concluding a set of judicial guidelines on protection of participants in medical experiments known as the *Nuremberg Code* that provides research participants with safeguards, both at an individual and collective level. The three American judges of this trial, formulated a set of standards and principles on human research ethics instead of just ruling on the guilt or innocence of the defendants. It is noteworthy to mention that the Nuremberg Code was mostly influenced by the human rights outburst in late 1940s and this "judicial declaration should be considered in the context of a wider human rights discourse".[187] In formulating these principles, the judges were influenced by the work of Dr. Andrew Ivy, an expert witness sent by the American Medical Association ("AMA") to testify on medical ethics at the trials. "Dr. Ivy conducted experiments in the United States on questions similar to those pursued by the Nazi researchers, including seawater desalination and the effects of high altitudes. More significantly, Dr. Ivy sometimes used human subjects".[188] The Nuremberg Code, aiming to protect humans participating in researches from exploitation and inhuman treatment, includes the following 10 principles:

1. Voluntary consent of the participant;
2. Useful result for the society;
3. Prior testing on animal subjects;
4. Avoiding any kind of physical or mental suffering;
5. Avoiding experiments that could cause death or disability;
6. Proportionate risk that should never exceed the benefits;
7. Adequate protection of subjects against injury;

[187] Volker Roelcke, Sascha Topp & Etienne Lepicard, *supra* note 204 at 33.
[188] Jonathan D Moreno, "Reassessing the Influence of the Nuremberg Code on American Medical Ethics" (1997) 13:2 J Contemp Health L & Pol'y 347 at 348.

8. Scientific competence of the researchers;
9. Participants' right to withdraw; and
10. Termination of the experiment upon occurrence of injury or death of the subjects.

Before the Nuremberg Code, there were no comprehensive norms and principles on conducting researches on human subjects. Although as explained above, some countries such as Germany, had national ethical guidelines for conducting experiments involving humans, bioethics was not taken really seriously until after the Nuremberg Trials. The 10 principles of the Code are based on the main ethical principles of autonomy, beneficence and non-maleficence.

The Nuremberg Code brought into light, a modern aspect of bioethics. The modern bioethics does not merely describe what is ethically good or bad, "but also uses the language of rights and frequently formulates norms very similarly to human rights instruments. In some cases, bioethics is even disguised as human rights, and partly codified as rules of conduct to be abided by forming an organic part of international law".[189] As explained in the first chapter, after the Nuremberg Code, bioethical principles were being included in different instruments some of the most important ones of which I have reviewed below.

In this section, I briefly reviewed the history of conducting unethical experiments on humans for development of weapons. In the next section, I will introduce a branch of bioethics, namely disaster ethics that provides guidelines for management of crises during wartime and bioterrorist attacks.

[189] Judit Sandor, *supra* note 132 at 16.

C. Disaster Ethics

In this section, I will elaborate on the ethics of military medicine and the ethical dilemmas that arise during the crises caused by wars or in the context of this research, by bioterrorist attacks. According to the World Health Organization, "crisis" is defined as "[a] situation that is perceived as difficult. Its greatest value is that it implies the possibility of an insidious process that cannot be defined in time, and that even spatially can recognize different layers/levels of intensity. A crisis may not be evident, and it demands analysis to be recognized".[190] A crisis is normally an unexpected situation which could cause different kinds of damages and pose a threat to the goals of a specific community and cause social problems. With this definition in mind, it could be argued that wars and bioterrorist attacks cause crisis in the conflicted areas. The role of bioethics in crises is to help manage the situation while trying to respect, as much as possible, the main ethical principles and human dignity. "Bioethics can and should provide arguments and rods to confront and solve the series of crises we are currently going into".[191]

In this section, I will briefly explain the most important concerns of bioethics during wars and bioterrorist attacks namely, management of these situations and propose ways for better management of these situations under the light of bioethical principles.

As it has been explained in the previous chapter, in addition to armed conflict between states, bioterrorist attacks are also an important concern when it comes to biological weapons and their bioethical dilemmas. In fact, "bioterrorism events have the potential to place the physician at greater initial and temporally increasing personal risk for contamination and exposure to toxins or

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[190] "Humanitarian Health Action" (last visited 27 November 2019), online: *World Health Organization* <www.who.int/hac/about/definitions/en/>

[191] Carlos Eduardo Maldonado, "Crisis of Bioethics and bioethics in the midst of crises" (2012) at 120, online (pdf): *SciElo Colombia* < www.scielo.org.co/scielo.php?script=sci_arttext&pid=S1657-47022012000100010>

radiation from both the event and the affected patients".[192] During wars and bioterrorist attacks, one important concern is the medical decisions that must be made. War and bioterrorism could create disasters and this could be a challenge for practicing medicine and making important ethical decisions. "[D]isaster situations are related [to] public health ethics more than they [are to] medical ethics, and accordingly may require stronger effort to achieve a balance between individual and collective rights. In public health, there is generally a conflict between autonomy of the individual and the desire to protect and promote the health of the population. This "dual loyalty", which also exists in many disaster situations, stands in the middle of most ethical dilemmas".[193] In response to disasters during wars or bioterrorism, modern military models have been used which have caused a new speciality ofmedicine to emerge which is called "Disaster Medicine".

"Disasters are often classified into two main aetiological groups: natural, e.g. drought, earthquakes, floodings, tidal waves and high winds, and manmade, e.g. wars and terrorist activities, chemical and nuclear accidents, fires, major transportation accidents, famine and epidemics".[194] Ethics in disaster medicine deals with ethical issues arising out of natural and human-made disasters. For the purpose of this research and in the context of this section which mainly discusses the relationship between bioethics and war and bioterrorist attacks, we only discuss the human-made disasters. "Disaster ethics is a very broad field, in a sense that it compasses numerous topics from individual to collective ethics; nevertheless, it focuses mainly on macro-ethics rather than micro-ethics. Disaster ethics is usually addressed in three phases: (i) pre-disaster (pre-event) or preventive phase, ii) disaster (event/ crisis) and early response phase, and

[192] G. Richard Holt, "Making difficult ethical decisions in patient care during natural disasters and other mass casualty events" (2008) 139:2 Otolaryngology–Head and Neck Surgery 181 at 182.
[193] C Ozge Karadag & A Kerim Hakan, "Ethical Dilemmas in Disaster Medicine" (2012) 14:10 Iran Red Crescent Med J 602 at 602.
[194] N.D. Reis & E.Dolev, ed, *Manual of Disaster Medicine* (Berlin: Springer-Verlag, 1989) at 14.

iii) post-disaster (post-event) or rehabilitation phase".[195] The pre-disaster phase is a preventive phase which includes creating a plan for disaster prevention and management.[196] In a manmade disaster such as war or bioterrorist attack, it is somehow impossible to have plans to prevent disaster hence in these types of disasters, this phase only includes disaster management plans. As explained in the previous chapter, one of the most important measures that must be taken with regard to fighting bioterrorism is being prepared and having a plan for managing the disaster before it spreads. One important objective of this plan must be mapping of potential disaster areas.[197] The disaster caused by unintentional release of pulmonary anthrax from a military base in the Soviet city of Svedlovsk which was discussed in the previous chapter shows how important it is for potential disaster areas to be mapped. Another example is the Chernobyl accident of 1986 which was the result of a flawed reactor design that led to an explosion. In total 237 people were reported to suffer from acute radiation sickness.[198] 31 people died and 115,000 members of the public had to be evacuated from the area around the plant.[199] "The accident caused the largest uncontrolled radioactive release into the environment ever recorded for any civilian operation, and large quantities of radioactive substances were released into the air for about 10 days. This caused serious social and economic disruption for large populations in Belarus, Russia, and Ukraine".[200] After the accident, the next step was to clean up the plant so that the other reactors could continue to work. "About 200,000 people ('liquidators') from all over the Soviet Union were involved in the recovery and clean-up during 1986 and 1987. They received high doses of radiation, averaging

[195] C Ozge Karadag & A Kerim Hakan, *supra* note 141 at 603.
[196] N.D. Reis & E.Dolev, *supra* note 142 at 17
[197] *Ibid*.
[198] "Chernobyl Accident 1986" (last modified June 2019), online: *World Nuclear Association* <www.world-nuclear.org/information-library/safety-and-security/safety-of-plants/chernobyl-accident.aspx>
[199] "Health Effects of the Chernobyl Accident" (August 2018), online: *Canadian Nuclear Safety Commission* <nuclearsafety.gc.ca/eng/resources/health/health-effects-chernobyl-accident.cfm>
[200] "Chernobyl Accident 1986" (last modified June 2019), online: *World Nuclear Association* <www.world-nuclear.org/information-library/safety-and-security/safety-of-plants/chernobyl-accident.aspx>

around 100 millisieverts".[201] These examples show the importance of recognition of potential disaster areas in order to be more prepared to face a potential disaster. Another objective of the pre-disaster phase must be to train "mobile and self-contained units for disaster intervention"[202] which includes a medical rescue team that provides only preliminary services to stabilize the patients for being transported to a hospital.

The next phase of the disaster ethics is the early-response phase. The duration of the early-response phase depends on the type of disaster; in wars, this phase could take weeks or months. During a disaster such as war or a bioterrorist attack, it would be very difficult to ensure application of the four principles of justice, non-maleficence, beneficence and the respect for autonomy which will be explained in section three. When it comes to making medical decisions, conflicts between individual rights and collective rights create ethical dilemmas. In the distribution of limited medical resources in disasters, highest priority should be given to the principles of beneficence and justice.[203] The most important aspect of the principle of justice in disaster situations such as war and bioterrorist attack is distribution of resources. As a matter of fact, according to the *World Medical Association's Statement on the Medical Ethics in the Event of Disasters*[204] one of the characteristics of disasters is "acute and unforeseen imbalance between resources and the capacity of medical professionals, and the needs of survivors who are injured and whose health is threatened". It is worth mentioning that the goal of medical response during disasters is to save as many lives as possible. Under normal circumstances, it is only logical to allocate all possible resources to improve the health status of an individual person but in such disasters, there must be

[201] Ibid.
[202] N.D. Reis & E.Dolev, *supra* note 142 at 18.
[203] C Ozge Karadag & A Kerim Hakan, *supra* note 141 at 603.
[204] *WMA Statement on Medical Ethics in the Event of Disasters*, (Adopted by the 46th WMA General Assembly, Stockholm, Sweden, September 1994, Revised October 2006 and October 2017).

a shift from standard of care to altered standard of care. "The term "altered standards" has not been defined, but generally is assumed to mean a shift to providing care and allocating scarce equipment, supplies, and personnel in a way that saves the largest number of lives in contrast to the traditional focus on saving individuals". [205] Altered standards could have different meanings based on the situation. Examples of altered standard are applying principles of field triage to determine who gets what kind of care, changing infection control standards to permit group isolation rather than single person isolation units, limiting the use of ventilators to surgical situations, creating alternate care sites from facilities never designed to provide medical care, such as schools, churches, or hotels, or changing who provides various kinds of care or changing privacy and confidentially protections temporarily.[206] An example of altered standard of care during a bioterrorist attack would be a scenario in which a highly communicable biological agent was released in a populated area. In this case, group isolation of diagnosed patients instead of individual isolation, possible use of experimental and expired drugs, vaccinating medical staff and using alternative sites other than hospitals could be forms of altered standard of care provided during a bioterrorist attack.[207] It is important to remember that during disasters only minimum care required for stabilizing the patients must be provided and patients must be prioritized. In this regard, Article 8.2.1 of the WMA Statement, reads as follows:

> "It is ethical for a physician not to persist, at all costs, in treating individuals "beyond emergency care", thereby wasting scarce resources needed elsewhere. The decision not to treat an injured person on account of priorities

[205] "Bioterrorism and Other Public Health Emergencies: Altered Standards of Care in Mass Casualty Events" (2005) at 8, online (pdf): *Homeland Security Digital Library* <www.hsdl.org/?view&did=453728>
[206] *Ibid*.
[207] *Ibid*. at 12.

dictated by the disaster situation cannot be considered an ethical or medical failure to come to the assistance of a person in mortal danger. It is justified when it is intended to save the maximum number of individuals."

The final phase of disaster ethics is the post-disaster or the rehabilitation phase. According to Article 8.4.1 of the WMA Statement:

"In the post-disaster period the needs of survivors must be considered. Many may have lost family members and may be suffering psychological distress. The dignity of survivors and their families must be respected"

Like the early-response phase, this phase, too, may take days, weeks or months depending on the nature of the disaster. "The main objectives of the health services will be to minimise additional exposure and risks to the affected population and to re-establish pre-disaster services".[208]

In this section, I discussed an important bioethical concern about disaster medicine for better management of disasters caused by wars and bioterrorist attacks. There are other ethical issues that could arise when developing weapons or during wartime. In the next section, I will discuss the most important ethical dilemmas that could arise during wartime and also with regard to development of some of the biological and genetic weapons that have been introduced in chapter one.

D. Ethical Dilemmas of War and Ethical Dilemmas of Military Researches Involving Humans for Development of Weapons

[208] N.D. Reis & E.Dolev, *supra* note 142 at 20.

In the previous chapter and the first sections two and three of this chapter, I discussed the different types of biological weapons and genetic means of warfare, military and disaster medicine and provided examples of military researches that have been conducted in the past. In this section, I will discuss the ethical dilemmas that could arise and the ethical principles that must be taken into account during wartime and while conducting military researches involving humans.

1. Ethical Dilemmas during Wartime

Although bioethics and war have some principles in common, there are some important conflicts between them too. As Michael Gross argues in his book *Bioethics and Armed Conflict: Moral Dilemmas of Medicine and War*, the principles underlying the ethics of medicine and war are the principles of "the right to life", "respect for autonomy", "human dignity" and "utility".[209] The most important conflict between the principles of bioethics and war is the right to life. There is no question that it is a duty of the physician to protect the life of the patient. From a broader point of view, it is the State's obligation to protect its citizens' right to life. While the State's obligation is to protect a collective right, the physician's obligation is a narrower obligation which is mostly limited to the life of an individual patient.[210] It is the war that creates the biggest conflict. While bioethics tries to protect the life of human beings, war jeopardizes the lives of soldiers and civilians. "Soldiers enjoy but a conditional right to life that they will lose once they don a uniform and take up arms against one another. During wars, civilians only retain a limited right to life… Humanitarian law protects non-combatants from wanton harm, but not from unintentional death

[209] Gross & Caplan, *Moral Dilemmas of Medicine and War, supra* note 107 at 28.
[210] *Ibid.*

and destruction".[211] The obligation of physician to protect the right to life of soldiers is only one of the many ethical issues that could arise during wartime.

As explained in the first chapter, the general provisions governing bioethics during wartime are the 1949 Geneva Conventions and the 1988 Rome Statute. The provisions of Geneva Conventions and the Rome Statute are mostly related to conducting biological experiments; however, during wartime, ethical dilemmas could arise that have nothing to do with conducting experiments but are related to making medical decision in the battlefield or the obligations of medical staff during wartime. There are general bioethics principles that govern similar situations during peacetime, but it would be unrealistic to expect the principles that have been designed for peacetime to be equally applicable during crises and wartime. These principles reflect the valuable work of Childress and Beauchamp. As Childress and Beauchamp have discussed in *Principles of Healthcare Ethics*, there are four principles in the healthcare ethics:[212]

1. Beneficence (the obligation to provide benefits and balance benefits against risks);
2. Non-maleficence (the obligation to avoid causing harm);
3. Respect for Autonomy (the obligation to respect the decision-making capacity of autonomous persons); and
4. Justice (obligation of fairness in the distribution of benefits and risks).

Since the situation during wartime and crises is different than the situation during peacetime, the bioethics principles during wartime would also be different than those during the peacetime.[213] For instance the definition of "justice" might differ during wartime based on the situation or it

[211] *Ibid*.
[212] Richard E. Ashcroft et al, *Principles of Health Care Ethics* 2nd, ed (John Wiley & Sons Ltd., 2007) at 3.
[213] Amir Ahmad Shojaiy & Fereshteh Abolhasan Niaraki, "Bioethics and Disasters" (in Farsi) (2011), 4:6 J Medical Ethis & History 27 at 31.

might not be possible to distribute the resources based on justice in an emergency situation during war. Another example is "autonomy" which is basically ignored in emergencies and crises because it would be impractical if not impossible to obtain informed consent during a crisis due to urgent nature of the situation. "[W]ar fundamentally transforms the major principles and central issues that engage bioethics. A patient's rights to life and self-determination contract; human dignity strains under the barrage of military necessity; and the interests of the state and political community may outweigh considerations of patients' welfare. Also, actors and interests multiply. Combatants and noncombatants, enemies and allies, states and individuals, citizens and soldiers, prisoners of war, the wounded and the dying, those who can return to combat duty and those who cannot—all of these litter the battlefield".[214] As explained in the first section of the chapter, during wartime or bioterrorist attacks, a situation of crisis will govern the ethical principles and the ethical issues arising in these situations would be different than those in peacetime. The important issue of ethics of management and obligations of physicians during these situations were addresses in the first section. In this section, I will address other ethical issues that are specific to wartime.

i. Medical Neutrality

The concept of medical neutrality seems to be a clear concept; however in some situations it could be confusing and vague. A simple definition of medical neutrality is 'non-interference with medical services for people in war zones'. After ratification of the *Geneva Conventions* in 1949 "[t]he breach of medical neutrality became regarded as war crime, due to its impact on civilians

[214] Gross & Caplan, *Moral Dilemmas of Medicine and War, supra* note 107 at 22.

and the health personnel who have a duty to save lives and treat the wounded in and around war zones"[215]. According to Article 19 of the 1949 Geneva Convention (I):

> "Fixed establishments and mobile medical units of the Medical Service may in no circumstances be attacked, but shall at all times be respected and protected by the Parties to the conflict. Should they fall into the hands of the adverse Party, their personnel shall be free to pursue their duties, as long as the capturing Power has not itself ensured the necessary care of the wounded and sick found in such establishments and units.
>
> The responsible authorities shall ensure that the said medical establishments and units are, as far as possible, situated in such a manner that attacks against military objectives cannot imperil their safety."

According to this article, units of the medical service could not be considered as military targets. Also according to clause 1 of Article 22 of the same convention, medical personnel are allowed to be armed for self-protection and protection the wounded and sick persons in their charge and still they would not be considered as armed forces and this would not deprive them of the protection granted to them in Article 19.[216] According to the 2016 commentaries of the International Committee of the Red Cross (ICRC) on the Geneva Convention (I), the rationale behind protection of medical units in Article 19 is their function: they provide medical care to the military wounded and sick, which is the central aim of the Geneva Convention (I). It is obvious from these articles

[215] Soumitra S Bhuyan, Ikenna Ebuenyi & Jay Bhatt, "Persisting trend in the breach of medical neutrality: a wake-up call to the international community" (2016) at 1, online (pdf): BMJ Global Health <gh.bmj.com/content/bmjgh/1/3/e000109.full.pdf>

[216] The following conditions shall not be considered as depriving a medical unit or establishment of the protection guaranteed by Article 19:
(1) That the personnel of the unit or establishment are armed, and that they use the arms in their own defense, or in that of the wounded and sick in their charge.

that the International Humanitarian Law (IHL) clearly distinguishes between medical personnel and combatants. But is it true to say that in return for this protection, IHL expects the medical personnel to be neutral in wars too? Could the concept of medical neutrality in this sense exist at all? The question becomes more important when it comes to distribution of scarce medical sources based on utility rather than medical need and treating one's own sick and wounded soldiers and civilians before the enemy's.[217] When the medical personnel have to choose one person over another for different reasons, could they be considered neutral?

"Medical neutrality may mean either "impartiality" or "immunity". These are two distinct meanings, and in considering medical ethics in time of armed conflict, the WMA interprets neutrality in both senses".[218] The principle of medical neutrality in the meaning of immunity has been violated many times, most recently in Yemen by Saudi-led coalition[219] and in Syria by Russian Air Forces.[220] "According to data from the WHO, there have been 113 attacks [on health facilities] in 17 countries in the first half of 2016… A 2015 WHO report stated that about 654 medical personnel had lost their lives since the onset of the war in Syria. Health workers and facilities continue to be targets of attack with the majority of the incidents under-reported. In another attack, a trauma centre in Kunduz, Afghanistan, was destroyed by the US air forces, leading to the death of 42 people".[221] These statistics are horrifying and although breach of the

[217] Gross & Caplan, *Moral Dilemmas of Medicine and War, supra* note 107 at 175.
[218] *Ibid* at 176.
[219] Rick Gladstone, "Saudi Airstrike Said to Hit Yemeni Hospital as War Enters Year 5" (26 March 2019), online*: The New York Times* <www.nytimes.com/2019/03/26/world/middleeast/yemen-saudi-hospital-airstrike.html>
[220] Christiaan Triebert & Evan Hill, "Russia 'bombed four hospitals in Syria in four hours', report finds" (13 October 2019), online: *Independent* <www.independent.co.uk/news/world/middle-east/russia-syria-bomb-hospitals-war-kurds-putin-assad-idlib-a9153786.html>.
[221] Soumitra S Bhuyan, Ikenna Ebuenyi & Jay Bhatt, *supra* note 215 at 1.

medical neutrality principle is a war crime, the international community has shown little interest in standing up for those who have become victims of this crime.

On the other hand, medical neutrality principle in the meaning of impartiality is what could cause ethical dilemmas. Impartiality could impose obligations on military medical staff to treat the wounded and sick persons without discrimination and without considering whether they are their own people or they are the enemy. In WMA's *Code Of Conduct: Duties of Physicians Working in Armed Conflict and Other Situations of Violence*, the issue of impartiality has been clearly stated: Physicians must in all circumstance "[a]dvocate and provide effective and impartial care to the wounded and sick (without reference to any ground of unfair discrimination, including whether they are the "enemy")". [222] Here, the contrast between bioethics at peacetime and at wartime becomes more visible. At peacetime, the attention of bioethics is mostly on the patients and their preferences while in wartime, military ethics focuses on the rights and interests of combatants, non-combatants and the state.[223] The issue of medical impartiality could in some cases be in conflict with the interest of the state.

In ethics, it is not always possible to have a concrete principle and apply it to all cases. Instead, each case must be examined separately and the factors that could affect the decision must be highlighted. But there are some overarching principles that act as an umbrella and are applicable in general. The principle of "maximum utility" is one of these principles. "Utilitarianism seeks to maximize good acts associated with good and correct pleasure and, at the same time, it seeks to minimize pain. Pleasure is associated with happiness and the absence of pleasure with unhappiness

[222] *WMA Regulations in Times of Armed Conflict and Other Situations of Violence,* Adopted by the 10th World Medical Assembly, Havana, Cuba, October 1956.
[223] Michael L. Gross, "Bioethics and Armed Conflict: Mapping the Moral Dimensions of Medicine and War" (2004) 34:6 Hastings Center Report 22 at 23 [Gross, "Bioethics and Armed Conflict"].

or pain. Therefore, what is useful is that which gives the most happiness to the greatest number of people, granting the concept of useful, which is primarily individual, a greater social breadth in the explanation of daily acts".[224] So according to utilitarianism, ethical dilemmas could be resolved by maximizing utility and promoting human welfare. However, as mentioned above, it is not always possible to stick to one principle and apply it to all cases hence bioethics has placed utility maximization alongside other principles[225]. "Military ethics, on the other hand, elevates utility in a way that may run roughshod over other fundamental principles, as utility allows military necessity to trump other moral constraints on military action".[226] Military necessity is one of the essential components of the International Humanitarian Law which justifies measures that are deemed necessary to achieve a military goal that are not prohibited by IHL. "In the case of an armed conflict the only legitimate military purpose is to weaken the military capacity of the other parties to the conflict."[227] Military necessity, unlike bioethics at peacetime, focuses on the welfare of the state, its army and its citizens. And whether we, as ethicists, like it or not, it is the principle of military necessity that wins in most of the ethical dilemmas arising in wars. "[N]ecessities of war, therefore, reflect multiple interests. While a state's and its army's welfare are of first and foremost concern, neither is always an overriding force when calculating the expected utility of going to war or adopting various tactics to wage war".[228] Military necessity retains a distinct if not superior status and one reason could be that the interest of State gains special importance during wartime. "Military necessity, therefore, joins the pantheon of other principles that guide medicine

[224] Marcela Parada-Contzen & Jose R. Parada-Daza, "Utility, ethics and behavior" (2013) at 3, Online (pdf) *Journal of Academic and Business Ethics* < www.aabri.com/manuscripts/131452.pdf>.
[225] Gross, "Bioethics and Armed Conflict", s*upra* note 223 at 23.
[226] *Ibid*.
[227] "Military necessity" (Last visited 28 November 2019, online": *ICRC Online Casebook* <casebook.icrc.org/glossary/military-necessity>
[228] Gross, "Bioethics and Armed Conflict", s*upra* note 223 at 26.

and war and contributes to the peculiar dilemmas that characterize bioethics during armed conflict".[229]

ii. Wounded Soldiers and Obligation of Physicians and other Medical Staff

Another concern is "the difficult issue of how to make ethical decisions in caring for patients, both existing patients and casualty patients, in the face of limited resources and expanding scope of the disaster".[230] As explained above, in disasters such as war, the physicians must treat patients only to the extent that is required to stabilize them and it is ethical not to persist to treat them beyond emergency care; however, even with this general principle in mind, it would still be difficult to make ethical decisions during crises. An important question that could create an ethical dilemma is whether soldiers are considered ordinary patients or they must be treated differently?

The answer is not that simple. "During war, a state no longer has an overriding duty to preserve the lives of all its citizens. The state may not wantonly harm its own soldiers or jeopardize their lives needlessly, but it will certainly place many of its young men and women in harm's way… Soldiers therefore lose their right to life conditionally in armed combat and only insofar as the risk of death serves broad, usually very broad, military goals".[231] Is it true to say that soldiers participating in a war have waived their rights to life and consented to be killed?

According to Article 25 of the United Nations' 1948 *Universal Declaration of Human Rights*[232] "Everyone has the right to a standard of living adequate for the health and well-being of himself

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[229] *Ibid*.
[230] G. Richard Holt, *supra* note 140 at 182.
[231] Gross & Caplan, *Moral Dilemmas of Medicine and War, supra* note 107 at 138.
[232] *Universal Declaration of Human Rights*, proclaimed by the United Nations Gen Assembly in Paris in 10 December 1948.

and of his family, including food, clothing, housing and medical care and necessary social services". This article is the foundation of the right to receive medical care and gives everyone the unconditional right to access healthcare. The right to access medical care is derived from the right to life and in fact it secures this right. However, as described above, "deprived of the right to life and many civil liberties that anchor medical care, it is not clear why and how soldiers gain a right to receive treatment when injured. After all, if a soldier is sent to die, why is it necessary to care for him or her when wounded?"[233] It is noteworthy to mention that these type of decisions that are made in armed conflicts do not merely have a medical nature; military necessity plays an important role in making such decisions regardless of patient's right and physician's duty. The military needs its men to keep its strength so it is only logical to provide medical care to the wounded soldiers to be able to get them back to the battlefield. "Military necessity, morale and duty are compelling reason for treating wounded soldiers… Morale is another important benefit of medical care, without which soldiers are reluctant to fight. Duty emphasizes the state's obligation to care for those willing to die on its behalf"[234]. Although providing medical care to wounded soldiers could be justified, one must keep in mind that soldiers are not ordinary patients. They have voluntarily been deprived of their right to life and under the circumstance in the war, they are not completely autonomous as they normally have no option but to accept treatment.[235] Almost deprived of their right to autonomy and to reject treatment, the concept of informed consent which only makes sense when the patient has the option to accept or reject the treatment, loses its meaning too.

Another question that raises here is the question of obligation of physicians and medical staff to participate in the care of patients injured during war or a bioterrorist attacks. According to the

[233] *Ibid* at 66.
[234] *Ibid* at 70.
[235] *Ibid* at 101.

directive of the US Department of Health and Human Services titled *Bioterrorism and Other Public Health Emergencies—Altered Standards of Care in Mass Casualty Events* which is a guideline for public health emergencies that has been published in response to the bioterrorist anthrax attack after the 9/11 attacks, during a bioterrorist attack "staff shortages are likely at all hospitals due to concerns about exposure to the infection. A recent survey suggests that as many as 50 percent of hospital workers may not show up for work during a bioterrorism event".[236] It is true that the physicians are obliged to care for the victims injured due to any kind of disaster – whether natural or manmade- but the scope of this obligation could be questioned. In some disasters such a bioterrorist attack, helping victims could place the health and even life of the physician and other medical staff at risk.

"In the context of a threat to the health and safety of a population, the unavailability of healthcare professionals to provide needed medical care, due not to casualties among them but rather to individuals' refusal to assume personal risk, could be viewed as a serious failure of medical professionalism".[237] Some philosophers in healthcare area, argue that the known risks of a profession are assumed accepted by those who choose to work in that field; for instance, firefighters are well aware of the risks that they might face when providing their services and yet, they choose to work as a firefighters.[238] I must argue here that 'known' risk is a vague and broad concept and could cover any kind of risk that a person might face when providing a professional service. The scope of obligation of physicians during wars and bioterrorist attacks could not be defined merely using this principle as one could argue the 'known risks' include the risk of getting

[236] "Bioterrorism and Other Public Health Emergencies: Altered Standards of Care in Mass Casualty Events" (2005) at 12, online (pdf): *Homeland Security Digital Library* <www.hsdl.org/?view&did=453728>
[237] Karine Morin, Daniel Higginson, & Michael Goldrich, "Physician Obligation in Disaster Preparedness and Response" (2006), 15 Cambridge Quarterly of Healthcare Ethics 417 at 419.
[238] *Ibid*.

killed due to injury or the illness hence based on this theory, the physicians would be obliged to accept any kind of risk and provide medical care in all disastrous situations.

The most effective way to address this issue is to assume an obligation for the physicians but to limit it. The obligation of general beneficence mandates that physicians should do everything in their power to prevent a negative outcome from befalling others if it involves making a moderate sacrifice that does not involve risking their health; however, if the obligation has no limits, it could result in excessive demand on the physicians.[239] "In establishing these limitations, ethicists often consider the urgency of the situation, severity of the consequences if nothing is done, ability of the moral agent to prevent such severe consequences, and the appropriate sacrifice the moral agent would have to make".[240] By applying these limitations particularly the principle of 'the appropriate sacrifice the moral agent would have to make' on the general principle of beneficence, the scope of obligation of physicians in every given situation could be defined. The *Fukushima Daiichi* nuclear power plant disaster, is an excellent example to define the scope of obligation of physicians in situations where physicians might have to risk their lives for providing medical services. "The disaster in Fukushima was initiated by a large earthquake with a subsequent tsunami which seriously damaged the Fukushima Daiichi nuclear power plant (NPP) on March 11, 2011. The explosion at the NPP unit 1 building was followed by events that severely damaged the unit 2, 3 and 4 buildings over the following 4 days".[241] Were physicians obliged to travel to the affected area and provide medical services to patients knowing that this could expose them to radiation? By applying the limitations discussed above particularly the principle of 'appropriate sacrifice',

[239] A Akabayashi, Y Takimoto & Y Hayashi, "Physician obligation to provide care during disasters: should physicians have been required to go to Fukushima?" (2012) 38 Journal of Medical Ethics 697 at 697.
[240] *Ibid*. at 698.
[241] M. Narita, Y. Tokuda & P. Barnett, "Professionalism of physicians at a major teaching hospital during the Fukushima nuclear disaster" (2016) 109:7 An Intl J Medicine 447 at 447.

we could conclude that given the risk-benefit ratio of the situation, "while physicians were obligated to travel to medical stations in affected areas…,they were not necessarily obligated to lend assistance to workers at Fukushima Daiichi nuclear power plant".[242] Of course, in order to be able to make such decisions in real disasters, "an accurate assessment of risks and benefits associated with the physician's trip to the affected region is absolutely necessary".[243]

2. *Ethical Dilemmas of Development of Biological Weapons and Genetic Means of Warfare*

In the first chapter, I discussed different types of biological weapons and genetic means of warfare. Biological weapons and genetic means of warfare, depending on how they are used, could be considered as types of weapons of mass destruction. "Weapons of mass destruction (WMDs) constitute a class of weaponry with the potential to, in a single moment, kill millions of civilians, jeopardize the natural environment, and fundamentally alter the world and the lives of future generations through their catastrophic effects". [244] One of the aims of the United Nations has since its establishment has been to eliminate all categories of WMDs and to address global issues and threats to peace that affect the international community. In general, the international community leans towards prohibition of any kind of weapons of mass destruction, whether it be biological, chemical, nuclear or genetic weapons. That being said, different multilateral treaties have been adopted since the establishment of the United Nations. These treaties include the Biological Weapons Convention (BWC), the Chemical Weapons Convention (CWC),the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), the Treaty Banning Nuclear Weapon Tests

[242] A Akabayashi, Y Takimoto &Y Hayashi, *supra* note 239 at 698.
[243] *Ibid.*
[244] "Weapons of Mass Destruction" (Last visited 287 November 2019), online: *UNRCDP* <unrcpd.org/wmd/>.

In The Atmosphere, In Outer Space And Under Water, also known as the Partial Test Ban Treaty (PTBT), and the Comprehensive Nuclear-Test-Ban Treaty, which was signed in 1996 but has yet to enter into force. Other treaties on preventing the proliferation of missiles and related technologies, which can be used as a vehicle to deliver WMD payloads include the Hague Code of Conduct (HCOC) and the Missile Technology Control Regime (MTCR).[245] Since the focus of this research is on biological weapons and genetic means of warfare, here I will only review the instruments that are related to these types of weapons.

In chapter one, I discussed that the Biological Weapons Convention bans development, production, stockpiling, and transfer of both biological and toxin agents not intended for prophylactic, protective, or other peaceful purposes. This convention covers all aspects of development and use of biological weapons. But has it been totally successful in eliminating all kinds of biological weapons from the face of the earth? Like many other treaties, this convention, too, has been violated in the past. The offensive BW program of the Soviet Union, a state-party and one of the convention's depositary states was one of the most controversial programs that existed after adoption of the convention. "Russia says that this program has been terminated, but questions remain about what happened to elements of the Soviet program".[246] Iraq's biological weapons program, which was uncovered by the UN Special Commission on Iraq after the Persian Gulf War I another example of violation of the convention. The United States, too, raised concerns in 2001 about whether some of its biological research activities are permitted under the BWC. [247] Like any other multilateral treaty, the BWC, too, has been violated by its members and it is only

[245] *Ibid*.
[246] "The Biological Weapons Convention (BWC) At A Glance" (Last modified September 2018), online: *Arms Control Association* < www.armscontrol.org/factsheets/bwc>.
[247] *Ibid.*

logical to assume that currently some state-members might be conducting experiments including biological agents. Notwithstanding that the convention has been violated, the fact that development and use of any kind of biological and toxin weapons has been regulated under the international law is important and valuable.

In the first chapter, I also introduced some types of genetic means of warfare among which the ethnic weapon is the most controversial one and could be considered as some kind of weapon of mass destruction. Whether considered weapons of mass destruction or not, genetic means of warfare are modern weapons that have not been specifically regulated under the international regime. Although one might argue that they could fall under the scope of the Biological Weapons Convention, it could be argued that, as explained in the first chapter, not all genetic means of warfare include external biological agents and weapons such as ethnic weapons (in case it is developed in the future) would not fall under the scope of the BWC. Nonetheless, just like biological weapons, it is only logical to assume that at the present time, there are researches and experiments being done in order to develop genetic means of warfare. Keeping this in mind, in this section, I will investigate the ethical concerns associated with researches and development of these kinds of weapons. For this purpose, I will use some of the examples of weapons and experiments that I provided in the previous and current chapters and analyze them using the main bioethical principles.

i. Informed Consent and the Right to Withdraw

As I explained earlier in the chapter, the principles of "beneficence", "non-maleficence", "autonomy" and "justice" are the main principles of bioethics. According to Beauchamp "[t]he

principle of respect for autonomy is rooted in the liberal western tradition of the importance of individual freedom, both for political life and for personal development. 'Autonomy' and 'respect for autonomy' are terms loosely associated with several ideas, such as privacy, voluntariness, choosing freely, and accepting responsibility for one's choices".[248] In researches, the most important aspect of autonomy could be found in informed consent of the person whose body is involved in the research. According to Article 5 of the Universal Declaration on Bioethics and Human Rights "[t]he autonomy of persons to make decisions, while taking responsibility for those decisions and respecting the autonomy of others, is to be respected. For persons who are not capable of exercising autonomy, special measures are to be taken to protect their rights and interests". Article 6 of the same declaration explains consent and how it should be obtained as follows:

> "1. Any preventive, diagnostic and therapeutic medical intervention is only to be carried out with the prior, free and informed consent of the person concerned, based on adequate information. The consent should, where appropriate, be express and may be withdrawn by the person concerned at any time and for any reason without disadvantage or prejudice.
>
> 1. Scientific research should only be carried out with the prior, free, express and informed consent of the person concerned. The information should be adequate, provided in a comprehensible form and should include modalities for withdrawal of consent. Consent may be withdrawn by the person concerned at any time and for any reason without any disadvantage or

[248] Richard E. Ashcroft et al, *supra* note 212 at 6

prejudice. Exceptions to this principle should be made only in accordance with ethical and legal standards adopted by States, consistent with the principles and provisions set out in this Declaration, in particular in Article 27, and international human rights law.

2. In appropriate cases of research carried out on a group of persons or a community, additional agreement of the legal representatives of the group or community concerned may be sought. In no case should a collective community agreement or the consent of a community leader or other authority substitute for an individual's informed consent."

Convention for the Protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine: Convention on Human Rights and Biomedicine[249] also emphasizes on the essential role of informed consent in its Article 5. The *Convention for the Protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine* also known as the *Convention on Human Rights and Biomedicine* or the *Oviedo Convention* was signed in 1977 and came into effect in 1999. This instrument is "the best current example of how to promote the protection of human rights in the biomedical field at a transnational level. The importance of this instrument lies in the fact that it is the first comprehensive multilateral treaty addressing biomedical human rights issues".[250]

According to both instruments (Article 7 of the Declaration and Article 6 of the Convention), researches involving persons who do not have the capacity to consent must be conducted only if

[249] Council of Europe, *Convention for the Protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine* (1997).
[250] Roberto Andorno, "The Oviedo Convention: A European Legal Framework at the Intersection of Human Rights and Health Law" (2005) 2 J Intl Bus L 133 at 133.

they are in direct benefit of the participant and the opinion of the person concerned shall be taken into consideration to the extent possible.

In general, informed consent is known as the process of providing complete and true information about benefits, risks and alternatives of a given procedure or intervention by a health care provider to a patient. It almost has the same definition in research except that in research, there are not only patients involved but sometimes healthy participants are involved as well. All participants must be educated about risks, benefits and their ratio. "In 1982, Appelbaum and colleagues reported on findings from interviews with patients with psychiatric disorders that documented failure to appreciate the difference between research and treatment, labeling the phenomenon *therapeutic misconception*"[251] hence particularly in clinical trials, the difference between treatment and enrolment in a research must be clarified for the participants.

In this chapter, I provided different examples of experiments that were conducted on human participants mostly without their consent and sometimes even without their knowledge. Obtaining consent of participants in experiments is directly related to the principle of respect for autonomy which is one of the most important principles in bioethics. There is no doubt that, today, for conducting any kind of research involving humans, informed consent of individual participants must be obtained. However, when it comes to conducting experiment on a population as a whole, it is not that simple to make such a statement.

In this regard, Kathryin DuBois argues that there are inherent differences between tests on general population and on individual human subjects. According to DuBois "[e]xperimentation on populations, as opposed to individual testing, presents a significant burden on obtaining the

[251] Gail E Henderson et al, "Clinical Trials and Medical Care: Defining the Therapeutic Misconception" (27 November 2007), online: *PLOS Medicine* <doi.org/10.1371/journal.pmed.0040324>.

informed consent of all potential participants. Not only is it difficult to reach each and every participant to ensure consent, but there is also the likelihood that the testing may not be as effective if the subjects are aware they are being studied"[252]. If we agree with this statement, we are accepting that the principle of autonomy could be violated when conducting research on populations. But how could the researchers ensure safety of the participants who do know are participating in an experiment and how could they apply the inclusion/exclusion criteria on them? *The Operation Sea Spray* which was illustrated in section two of this chapter is an example of population experiment that has been conducted without obtaining consent of the participants. As a result if this experiment, a cancer-recovering patient named Edward Nevin, lost his life. "In 1950, Edward Nevin was a patient recovering from a prostate gland operation at Stanford University Hospital. Both his family and doctors were seemingly perplexed when he later died from *bacterial endocarditis,* a medical condition not directly related to his prostate operation".[253] Death of Edward Nevin and illness of 11 other residents of San Francisco who developed infections after this operation confirm that conducting experiments on population without obtaining their consent is not just unethical but by making it difficult to identify weaknesses of participants, it increases the risk of the experiments for vulnerable people such as Nevin.

In my perspective, obtaining informed consent from participants in population experiments is even more important than obtaining consent in individual experiments. The reason is that while individual experiments is normally conducted by individual researches and mostly for clinical purposes, most of the population experiments are conducted by governments and militaries. In order to prevent abuse of power by governments and militaries in these researches, it is required

[252] Kathryn DuBois, *supra* note 167 at 2.
[253] *Ibid* at 5.

to obtain individual –and not collective- informed consent from each individual participating in the experiment. Talking about the power of the researchers, it is noteworthy to mention that in experiments, other than informed consent, voluntary participation and the right to withdraw are also other aspects of autonomy which gain even more importance in experiments where the researchers are the governments or militaries. Not only the participants must be completely informed of the risk, benefits and the purpose of the experiment, they must also freely choose to participate in it and have the right to choose to withdraw from participating at any point during the experiment; these are essential principles that must be respected in each and every medical experiment but were widely violated in some of the examples I provided in the previous section, particularly by the Nazis. It is important to take all the required measures to avoid exploitation of the participants. Fear of the researchers, or the power that the researchers might have over the participants must in no way induce or force them to take part in the experiments.

ii. Biological Manipulation of Soldiers

Human enhancement technologies have been used for many years by militaries. Vaccinations could count as an enhancement of the human immune system, and this would place the first instance of military human enhancement at the American Revolutionary War in 1775-1783.[254] In section three of this chapter, I discussed about biological manipulation of soldiers' bodies to militarize them. Militarization of soldiers' bodies means enhancing their bodies and preparing them for war and trauma. "For the military, the "body" is not necessarily an existential or

[254] Patrick Lin, "More Than Human? The Ethics of Biologically Enhancing Soldiers" (16 February 2012), online: *The Atlantic* < www.theatlantic.com/technology/archive/2012/02/more-than-human-the-ethics-of-biologically-enhancing-soldiers/253217/> .

philosophical problem to solve, but is a material problem rooted in the needs of war and combat. In many ways, the military's "body problem" is a labor issue: how can the military extract as much labor, or "combat capability," from the soldier as possible without actually harming the soldier?"[255]. Militarization of soldiers means bodies of soldiers will be temporarily or permanently dedicated to war and to the military. Enhancement of soldiers' bodies could be performed in variety of forms but one of the most controversial and feasible enhancement is the use of pharmaceutical agents to alter brain functioning or enhancing cognitive functions such as memory, reasoning, attention, motivation and arousal.[256] "Many military tasks, especially in operational theatres, require personnel to remain alert and attentive for long periods of time in anticipation of an emergency or a surprise attack. Furthermore, operational personnel inevitably suffer from sleep deprivation, sometimes severe, and this can have tangible effects on cognitive performance and increase the risk of human error".[257] In light of this information, it is not unreasonable to think that the capacity to eliminate the need for sleep could be a very important advantage in armed conflicts. In fact some military pilots are obliged to take drugs-known as "go pills" on long-distance missions, or they would lose their jobs.[258] Eliminating the need for sleep is not the only body function that could be altered in the military. Elimination of other basic human needs such as hunger or feelings such as fear could also enhance the performance of soldiers. Obligatory vaccination against infectious diseases or biological agents that might be used in the battle fields is also another way of biological enhancement of soldiers.

[255] Bickford, "Idiophylaxis", *supra* note 177 at 814.
[256] "Brain Waves Module 3: Neuroscience, conflict and security" (February 2012) at 26, online (pdf): The Royal Society <royalsociety.org/-/media/Royal_Society_Content/policy/projects/brain-waves/2012-02-06-BW3.pdf>.
[257] *Ibid* at 32 [Brain Waves Module 3].
[258] Patrick Lin, *Supra*.

It must be noted that, allowing the military to change the way a normal human body functions not only arises different ethical dilemmas, but could also violate some of the soldiers' human rights. Of course depending on the type of enhancement, the impact it could have on soldiers' human rights could vary; however, the most important human rights of soldiers that could be violated by these enhancements are the following rights:

- *The Right to Life*

As briefly discussed above, the right to life of soldiers is somehow curtailed when the soldiers are in the battlefield; however, it does not mean that the state could intentionally put them in situations where there is more risk of losing their lives. The right to life imposes a duty on the states to establish frameworks of laws and procedures to protect lives to the greatest extent possible. "Soldiers are expected (and expect) to risk—and even sacrifice—their lives if necessary in the course of an armed conflict; however, this expectation does not entirely preclude liability on the part of the State with respect to the right to life of its own soldiers".[259]

The right to life could be viewed from two aspects in this regard. The first aspect is the life of soldiers whose bodies have been manipulated. If the enhancement causes the soldiers to put themselves in a dangerous situation –something they would not have done had their bodies not been manipulated- and as a result of that, they lose their lives, would this fall under the scope of liability of the state? To what extent is a state responsible to protect the lives of its soldiers? In my perspective this situation could be considered as an infringement of the right to life of soldiers,

[259] Heather A. Harrison Dinniss & Jann K. Kleffner, "Soldier 2.0: Military Human Enhancement and International Law" (2016) 92 Intl L Studies 432 at 456.

that is, in general soldiers accept the known and standard risks of the war and if the state is putting them in an unusual situation that causes them to lose their lives, the state must be held responsible.

The other aspect of infringement of the right to life is the wrongful death of others by soldiers when they are under the influence the enhancements. For instance in April 2002, near Kandahar in Afghanistan, "a U.S. Air Force F-16 pilot dropped a bomb on Canadian troops conducting a firing exercise, believing them to be Taliban fighters".[260] As the result of this attack, four Canadian soldiers were killed and eight others injured. During the investigations, the pilots raised as part of their defense that they had been told by their superiors to use amphetamine during their mission and they were under the influence of dextroamphetamine when the mistakenly bombed the Canadian troops. Although eventually the pilots were held responsible for not following standard procedures, "a number of medically qualified commentators have noted that the use of amphetamines for longer missions required of pilots by the Air Force is likely to have led to the pilots' failure to wait for confirmation of the targets' identity and to believe they needed to act in self-defense".[261] This examples clearly demonstrates how body enhancement of soldiers could result in infringement of the right to life of third parties and raise the issue of responsibility of state.

- *The Right to Rest*

According to article 24 of the *Universal Declaration of Human Rights*, "[e]veryone has the right to rest and leisure, including reasonable limitation of working hours and periodic holidays with pay". As explained above, one way to enhance soldiers' bodies is to eliminate their need for sleep.

[260] *Ibid* at 458.
[261] *Ibid.*

Depriving soldiers of rest and sleep by manipulating their brain function could be considered a violation of this article and it could cause physical and mental harm.

- *Bodily Integrity and Inhuman Treatment*

The right to bodily integrity, security and control over one's body is itself a controversial right and there have been ongoing debate as to what must be covered under this right.[262] Bodily integrity includes autonomy and self-determination with regard to one's own body, prohibition against slavery and the right to human treatment. In other words, it is the right of a person to determine what may or may not be done to his or her body and how it should be done.

Self-determination or deciding what may or may not happen to one's body raises the question of whether the military personnel should be obliged to accept biological enhancements. As mentioned in section one, the ICCPR in it Article 7 prohibits any kind of medical or scientific experimentation without participant's free consent. The question of whether military personnel are allowed to refuse enhancement to their body is a complex question to answer. Some may argue that like vaccines, if using medicine has become a part of standard pre-deployment procedure, then it is acceptable for soldiers to be obliged to take that medicine.[263] I must argue here that there is a huge difference between being obliged to be vaccinated and taking medicines for enhancement reasons, that is, vaccination is to provide further protection for the soldier while taking medicine enhances function of the body which is not necessarily in favor of the soldier. "[M]andatory use of pharmacological performance enhancing agents may infringe on personal liberties, and raises concerns over the possibility of coercion. While coercion may be explicit if guidelines are

[262] Gowri Ramachandran, "Against the Right to Bodily Integrity: Of Cyborgs and Human Rights" (2009) 87:1 Deny UL Rev 1 at 5.
[263] Heather A. Harrison Dinniss & Jann K. Kleffner, *supra* note 259 at 460.

formalised, it may be indirect whereby one has to partake in order to compete".[264] Any kind of bodily intervention must be performed after obtaining prior, free and informed consent of the person concerned hence obliging the military personnel to accept these interventions is in conflict with this vital ethical principle. Although the principle of military necessity could be used to justify some enhancements such as involuntary vaccination, it is doubtful that this principle could justify other enhancements –particularly the permanent ones such as neural implant- that lead to dedication of soldiers' bodies to war and depriving them of their human rights. Nevertheless, it would not be possible to apply a general rule on all of these interventions. Each of them must be examined separately and thoroughly from scientific and ethical points of view in order to find out their risks and benefits. It is noteworthy to mention that when enhancement is still in the experiment phase and soldiers are considered participants in a medical research, they sure have the right to refuse participation or withdraw from the research at any time. However, some authors argue that due to the hierarchy in the military, in some cases, providing free consent is not really an option for soldiers.[265]

Furthermore, prohibition against slavery and the right to human treatment which are closely related concepts are the other side of this coin. Prohibition of slavery means that "humans are fundamentally ineligible for the legal status of property- that which persons (including corporations) may both exercise control over and alienate, either in whole or in part".[266] Treating humans as objects or properties is degrading and a violation against human dignity. From my perspective, I find most interventions to enhance soldiers' body in obvious conflict with the most important common principle of human rights and bioethics which is respect for human dignity.

[264] "Brain Waves Module 3", *supra* note 256 at 27.
[265] Heather A. Harrison Dinniss & Jann K. Kleffner, *supra* note 259 at 461.
[266] Gowri Ramachandran, *Supra* at 6.

By eliminating the basic human needs such as sleep and hunger and feelings such as fear, the military is turning soldiers into machines, degrading and dehumanizing them. These interventions are unethical instances of 'the end, justifies the means'. The militaries are using the desired result of winning the war to justify the unethical method of dehumanization of soldiers to achieve their goals.

Other than these human rights, there is always the issue of reintegration of enhanced soldiers into the society after the war is finished. Assuming that some enhancements are permanent, the complications arising out of returning the enhanced soldiers to the society including how they would be treated by the society are other concerns that due to their social (and less ethical and human rights) nature, are out of the scope of this research.

iii. Genetics

In the first chapter, I highlighted the most important uses of genetic science and engineering in developing new weapons and reviewed some of the weapons made or planned to be made using advancements in genetics. In this section I will outline the ethical issues that must be taken into consideration when using genetics to develop weapons. For this purpose, I will review two international instruments namely the *Universal Declaration on the Human Genome and Human Rights* and the *International Declaration on Human Genetic Data.*

"The Universal Declaration on the Human Genome and Human Rights was adopted unanimously and by acclamation at UNESCO's 29th General Conference on 11 November 1997, addressing the main issues of researches involving genetics. The following year, the United

Nations General Assembly endorsed the Declaration".[267] This declaration was adopted in order to fulfil the requirement of coordination of efforts in anticipation of the international social implications of genome research and the need to harmonize related national policies, following the Human Genome Project that was introduced in the first chapter.[268] Although a comprehensive and modern documents for its time, this declaration has not addressed human rights issues adequately. Some have argued that more weight has been given to protection of the human genome rather than protection of human rights while others have suggested that the instrument emphasizes on freedom of research instead of human rights.[269] Another weakness of the Declaration is vagueness in the sense that no definition of concepts have been provided. "For example, Article 6 prohibits genetic discrimination "that is intended to infringe or has the effect of infringing human rights, fundamental freedoms and human dignity". However, the instrument does not provide any guidance as to what practices would be objectionable as diminishing the right to human dignity". With all its faults, this declaration was a huge step towards globalization of bioethics and protection of human genome.

When genetic information is obtained, it must be stored. How this data will be stored and used was the main concern of many governments, organizations and scientists and that's why to "address these concerns, the *International Declaration on Human Genetic Data*[270] was adopted unanimously and by acclamation at UNESCO's 32nd General Conference on 16 October 2003".[271]

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[267] "Universal Declaration on the Human Genome and Human Rights" (Last visited 28 November 2019), online: *UNESCO* <www.unesco.org/new/en/social-and-human-sciences/themes/bioethics/human-genome-and-human-rights/>.

[268] Allyn L Taylor, "Globalization and Biotechnology: UNESCO and an International Strategy to Advance Human Rights and Public Health" (1999) 25:4 Am J L & Med 479 at 480.

[269] *Ibid* at 510.

[270] UNESCO, 32nd Gen Con, *International Declaration on Human Genetic Data* (2003).

[271] "Universal Declaration on the Human Genome and Human Rights" (Last visited 28 November 2019), online: *UNESCO* <www.unesco.org/new/en/social-and-human-sciences/themes/bioethics/human-genetic-data/>.

According to the Declaration, human genetic data are special data that must be collected, used and stored in a special way taking into account the limitations and obligations stated in the declaration.

In its Article 1, the Universal Declaration on the Human Genome and Human Rights (UDHGH) refers to human genome as "the heritage of humanity".[272] It furthermore emphasizes on human dignity and how "dignity makes it imperative not to reduce individuals to their genetic characteristics and to respect their uniqueness and diversity".[273] International Declaration on Human Genetic Data (IDHGD), too, in its Article 1 emphasizes on the importance of respecting human dignity and human rights in the process of collecting and storing genetic data. Now the question is, how human dignity must be respected during genetic experiments?

The main concern is the use of this fast-growing technology for purposes contrary to human rights. In the first chapter, I outlined the ways genetics, contrary to its nature, could be used as means of warfare against humans. According to Article 10 of UDHGH, "[n]o research or research applications concerning the human genome, in particular in the fields of biology, genetics and medicine, should prevail over respect for the human rights, fundamental freedoms and human dignity of individuals or, where applicable, of groups of people". From my standpoint, developing and using any of the genetic means of warfare introduced in chapter one would be against human rights. Genetics is not a weapon and it would be an inhuman act to take advantage of a peaceful technology that has been developed for improving human's health and life and turn it into a weapons and it is also against the principle of human dignity.

[272] Article 1 "The human genome underlies the fundamental unity of all members of the human family, as well as the recognition of their inherent dignity and diversity. In a symbolic sense, it is the heritage of humanity."
[273] Article 2(b).

Out of the weapons outlined in chapter one, the ethnic weapon is the most controversial one. Although not yet developed, the very idea of creating a weapon that could target specific people of certain race or ethnicity is against human rights. Nonetheless, I will use this example to further analyze the process of obtaining, storing and using genetic information for military purposes.

The controversy over ethnic weapons started 20 years ago, when London's *Sunday Times* published an article in November 15, 1998, and claimed that according to Israeli military and western intelligence sources, Israel was developing some kind of biological weapon that would kill or harm Arabs and not Jews[274]. "In developing this "ethno-bomb," the British paper went on, Israeli scientists are trying to exploit medical advances by identifying distinctive genes carried by some Arabs, and then create a genetically modified bacterium or virus. The goal is to use the ability of viruses and certain bacteria to alter the DNA inside the host's living cells. The scientists are trying to engineer deadly microorganisms that attack only those bearing the distinctive genes".[275]

Notwithstanding the feasibility of developing such a weapon, there are some ethical concerns that must be taken into consideration when conducting experiments for developing it. Although these ethical issues might sound unimportant when compared to the final result of using an ethnic weapon on humans, it is noteworthy to mention that respecting these ethical issues could put an end to development of these kinds of inhuman weapons.

As mentioned earlier in this section, and as outlined in all bioethics instruments including both the UDHGH and IDHGD, an essential part of every experiment involving human genome is

[274] Mark Weber, "Israel is Developing 'Ethnic Bomb' for Growing Biological Weapons Arsenal" (1998) 17:6 J Historical Rev 24 at 24. Online: *Institute for Historical Review* <hwww.ihr.org/jhr/v17/v17n6p24_Weber.html>

[275] *Ibid*.

obtaining informed consent of the person concerned. One of the main components of informed consent is 'disclosure'. When providing healthcare, disclosure "often addresses possible treatment and testing options of the current medical diagnosis and medical outlook".[276] In experiments or studies, however, disclosure must address the purpose of the study and how material obtained from participants will be used. For developing ethnic weapons, DNAs of specific groups of people are required. Based on the principle of informed consent, participants must be clearly informed of how the material obtained from their bodies will be used and what the purpose of the study/experiment is. It is only logical to assume that if this information is provided to the participants, they will refrain from participating in an experiment or from donating their bodily material to studies that could result in developing weapons against them. While this might seem a simple solution, there is always the concern of using data and material from genetic databanks and bio-banks respectively. In this regard, the IDHGD in its Article 5, has specified the purposes for which genetic data may be collected. These purposes included: diagnostic and healthcare, medical and scientific research, forensic medicine or any other purpose consistent with the Universal Declaration on the Human Genome and Human Rights and the international law of human rights. Based on this article, the framework of genetic databanks and bio-banks must be aligned to the above international instruments to act as barriers to uptake of genetic information for purposes that are against human rights including development of weapons. The IDHGD also emphasizes on the purpose of collection of genetic data in Article 16 by stating that "[h]uman genetic data, human proteomic data and the biological samples collected

[276] Jessica Minor, *Informed Consent in Predictive Genetic Testing* (Springer, 2015) at 9.

for one of the purposes set out in Article 5 should not be used for a different purpose that is incompatible with the original consent".[277]

Another issue of concern is transfer of genetic material or data without consent. As a general principle of informed consent, persons whose bodily material or genetic data is being obtained must be completely informed about where and by whom this information or material will be used. For developing an ethnic weapons for instance, it would be required to obtain genetic information/material of persons from a specific area and transfer them to the place where the experiment is being conducted. It is logical to assume that this place would be located outside the country where the participants are living. In order to protect the genetic information of their citizens, governments must take appropriate measures to monitor transfer of genetic data and material outside their borders. For instance, in 2007, Russia's Federal Customs Service banned export of all human biological materials, from hair to tissue and blood samples. "An article[278] in the Russian online newspaper *Kommersant* says that the decision is thought to have arisen from a report submitted to President Vladimir Putin by the Federal Security Service (formerly the KGB), which warned of the possible development by Western countries of genetic biological weapons against particular nations". [279] Although banning export of all material is an example of extreme response to this concern and could have other negative impacts on clinical trials and

[277] Article 16 – Change of purpose
(a) Human genetic data, human proteomic data and the biological samples collected for one of the purposes set out in Article 5 should not be used for a different purpose that is incompatible with the original consent, unless the prior, free, informed and express consent of the person concerned is obtained according to the provisions of Article 8(a) or unless the proposed use, decided by domestic law, corresponds to an important public interest reason and is consistent with the international law of human rights. If the person concerned lacks the capacity to consent, the provisions of Article 8(b) and (c) should apply mutatis mutandis.

[278] "Russia observes the human model" (in Russian) (30 May 2007), online: *Kommersant* <www.kommersant.ru/doc/769777>

[279] Vasiliy Vlassov, "Russian clinical research is threatened by ban on export of samples" (2007) 334:1237 British Medical J 334:7606 1237 at 1237.

medical researches in the country, this example shows clearly the importance of protection of biological samples and monitoring their transfer outside the country.

Other than ethnic weapons, in chapter one I also discussed black biology and how it could be used as means of warfare. Described as "use of genetic engineering to enhance the virulence of a pathogen or the targeting of a specific genetic code for use in terrorism"[280], black biology does not use human genetics hence it does not fall within the scope of the UDHGH and IDHGD. Gene therapy and entomological warfare are not covered by the principles of these two instruments either as they do not need human genetics information or material for being developed into weapons. They are all, however, covered by the general principles of the Universal Declaration on Bioethics and Human Rights (UDBHR) and *Convention on Human Rights and Biomedicine*.

In its Article 3, the UDBHR emphasizes on the importance of human dignity and prioritizing the interest and welfare of individuals over science or society. Other than this article, other principles of the declaration are general principles applicable to all researches involving humans. There is no specific principle with regard to protection of humans from advancements in biomedicine technology that could harm human beings. There is no principle specifying the purposes of researches and banning experiments that could result in development of weapons or other means of warfare.

The *Convention on Human Rights and Biomedicine,* provides more protection in this regard; however, as this convention has been adopted more than twenty years ago, its principles do not provide the protection required to cover the advances made in the biomedicine technology. In its Article 13, the convention states that "[a]n intervention seeking to modify the human genome

[280] Nicole H. Kalupa, s*upra* note 30 at 954.

may only be undertaken for preventive, diagnostic or therapeutic purposes and only if its aim is not to introduce any modification in the genome of any descendants". Although a considerate article with regard to purpose of modification of human genome, it does not cover black biology, gene therapy and entomological warfare.

As discussed in the first chapter, biological weapons have existed for hundreds of years while genetic means of warfare are a more recent development. From the current international regulations and instruments, it appears that the international community has mostly focused on banning development and use of biological weapons and regulating use of genetic information. On the other hand, the experiments that are conducted in order to develop modern genetic means of warfare and the purposes of the experiments seem to have been overlooked. It is of great importance to remember that while these technologies and advancements could be used for peaceful purposes, they could also be used against humans.

Conclusion

Bioethics has come a long way from national guidelines to international declarations and instruments after the WWII. Criminalization of violation of bioethical principles covered by the Geneva Convention by the Rome Statute, made it clearer than ever that bioethical principles are now officially a part of international law. Although the ethical principles related to IHL have been well established, the relationship between war and bioethics is still a complex relationship. If war does not set aside all ethical principles, it sure changes them. The main principles of bioethics, namely "beneficence", "non-maleficence", "autonomy" and "justice" are interpreted differently during wartime and in the shadow of principle of "military necessity". Obligations of medical staff,

too, changes during wartime and the focus shifts from individual patient to interest of the state. On the other hand, developing biological weapons and genetic means of warfare requires conducting experiments involving humans. The history of experiments shows that during and after World War II many unethical military experiments have been conducted particularly by the Japanese and the US armies and the Nazis. Today, with the advancements in the field of biotechnology, militaries are closer more than ever to creating super-soldiers and genetic means of warfare. Using these technologies for creating weapons or enhancing soldiers' abilities could be not only unethical but also against human rights. Although some international instruments such as the UDHGH and The Convention on Human Rights and Biomedicine provide a limited protection, most of these experiments fall outside the scope of protection provided by bioethics instruments.

Conclusion and Recommendations

Advancements in the biotechnology have led to development of methods that allow humans to interfere with how human body functions. Although inherent nature of these developments is to help human beings and to enhance the quality of their lives, like every other technology, if not used correctly, these technologies could be harmful for humans.

One of the aims of this study was to introduce different types of weapons and means of warfare that have been –or are planned to be- developed, using biological agents and genetic modification. Although the Biological Weapons Convention bans development, production, stockpiling, and transfer of both biological and toxin agents, the convention has been flagrantly violated in the past. The Soviet Union, Iraq and the US are among the countries that have violated the Convention. Like any other multilateral treaty, it is only logical to assume that some countries are still conducting researches for development of biological weapons. One important concern is that development of biotechnology over the past years has caused more information on biological agents to be available to public. This has increased the risk of using this information by terrorists. Black biology and bioterrorists attacks must be taken very seriously by the governments. There is no realistic way to prevent bioterrorist attacks and the only possible option is to be prepared and that is where disaster ethics provides guidelines. Disaster ethics is a branch of bioethics that is concerned with all moral dilemmas and decision-making issues arising during disasters, whether natural or manmade. Considering wars and bioterrorist attacks as disastrous situations, disaster ethics helps with preparedness and management under crisis situations. Although not many successful attempts have been made over the past years by terrorists, governments must be prepared for taking countermeasures against bioterrorism and being familiar with disaster ethics would provide better guidelines for management of the situation.

Other than disaster management, another ethical concern during wars and bioterrorist attacks is making medical decisions. Keeping in mind that ethical principles lose their rigidity during disasters, the meaning of principle of justice under these situations is interpreted as saving as many lives as possible. Under normal circumstances, all possible resources are allocated to improve the health status of an individual person but in disasters, there must be a shift from standard of care to altered standard of care. Although there is no clear definition of the term 'altered standard of care', it could mean doing whatever that is possible and what is normally not part of the routine standard of care to save as many lives as possible; even if that means using expired drugs.

One important aim of this research was to review the prominent international instruments that included bioethical principles and had played a role in internationalization of bioethical principles. Before the Nuremberg Code, there were no comprehensive norms and principles on conducting researches on human subjects and this code was served as a cornerstone for some of the most important bioethical instruments adopted later. Including articles related to "biological experiments" in the 1949 Geneva Conventions and criminalization of violation of those articles by the Rome Statute showed that the international community had been seriously hurt by the unethical medical experiments conducted by the Japanese Army and the Nazis during the WWII and would make an effort to ensure this would not happen again.

Another aim of this study was to discuss some of the most important ethical dilemmas that arise during wars and while conducting researches for development of weapons. During and after WWII, many inhuman and unethical experiments have been conducted on prisoners mostly for understanding the effects of different biological or chemical agents on human body and developing biological weapons. In absence of international regulations and in the midst of war, many prisoners lost their lives due to the experiments conducted by the Japanese Army and the Nazis. Looking

back at those experiments, it is obvious that the element of 'consent' is missing in all of them. Informed consent being the most important aspect of principle of autonomy is the main ethical principle that must be respected in all experiments involving humans. Whether it is an individual or a population experiments, informed consent must be an integral part of the process. In population experiments, consent must be obtained from each single individual participating in the research.

Another important ethical issue is militarization of soldiers which means enhancing the abilities of soldiers for participating in wars. Militarization requires soldiers' bodies to be dedicated to war which itself could raise an ethical dilemma. Using medications to enhance soldiers' abilities is not only unethical but is also against human rights. I argued that militarization is an inhuman process that dehumanizes the soldiers and is against the principle of human dignity.

The last aim of this study was to review international bioethical instruments to find out if enough protection has been provided with regard to genetic experiments. Unlike biological weapons, development and use of genetic means of warfare have not been specifically regulated under the International Humanitarian Law. The most controversial genetic means of warfare is the ethnic weapon, the very idea of developing which is against human rights. When conducting genetic experiments especially with military purposes, it is of great importance to obtain informed consent of participants in the sense that they must be fully informed of the purpose of experiments. They also have the right to know where and how their bodily material will be used. UDHGH and IDHGD provide not complete but a general protection against misuse of genetic information. Lack of international regulation has caused genetic modification to be considered as a suitable replacement for biological weapons. Other ways that genetic science could be used as means of warfare have not been covered in international instruments. The world is witnessing more biotechnology

developments every day and it is clear that current international instruments do not provide enough protection in this regard. Using genetic sciences for military purposes must be specifically regulated under the International Humanitarian Law and a specific instrument regarding use of genetic information for military purposes is required.

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