

Moral obligation and to better serve the society: Bioethics and its significant importance in the field of Microbiology

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ABSTRACT: Ethics is about what is morally correct and what is wrong, as per some predefined norms and standards. In the field of Biology, Medicines, Sciences, it is referred to as Bioethics. Medical and life sciences research produces development, which have as mission to better the quality of life of the society. Due to the sensible nature of science, research can lead to misuse, threats, bioterrorism, spreading of disease, discrimination, human rights violation, and injustice. Bioethics examines the ethical issues that arise due to these advances in research and englobes social, judicial, and environmental aspects that affect the society. Advances but also risks for dangers. Areas whereby ethics were most challenged has been genetically modified organisms, biotechnology and nanotechnology, access to medicines and health care devices, assisted procreation, end of life, human cloning, organ trafficking biodiversity, environmental ethic and protecting the integrity of participants in therapeutical trials. Bioterrorism, misuse of chemicals that can be hazardous, a duty of care for the public, accountability and working for the benefits of goodness of the society forms part of the responsibilities of any scientist conducting bioresearch. Any research conducted on medical, biology, microbiology and sciences must follow ethical guidelines. This paper elaborates the four principles of Beauchamp and Childress¹², which are autonomy, nonmaleficence, beneficence, and justice as well as the need to be bioethical at all stages of research for both safety reasons and to avoid harm of any form to the public, nature and the world.

KEYWORDS: Microbiology, bioethics, science, research, society

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I. INTRODUCTION

In the early 2020's the UK-based Nuffield Council on Bioethics made recommendations to policymakers about ethical concerns¹. This commentary explores one of the report's key findings: that there needs to be a broader approach to what has traditionally been considered to constitute 'research ethics'. This field of ethics is often narrowly construed as relating only, or primarily, to independent ethical review systems, with a particular focus on the scrutiny of consent processes. However, ethical considerations cannot be confined to one-off processes of review, and nor can they be considered in a vacuum. Rather, they arise throughout the lifecycle of research, from setting funding priorities to sharing and implementing findings. They are highly dependent on context; and are the responsibility of many actors in the research sector. These wider ethical considerations emerge with particular acuteness during emergencies—but are also relevant in research more broadly. Biomedical Ethicists explore field such as the impact of technological advances (such as genomics, stem cell research, etc.), Neuroethics, Issues of health care access and public health policy, End of life issue, Medicine and the media, Medicine and society and Empathy and the experience of illness among various sensible topics. The origin of bioethics dates back to the drafting of the Nuremberg code, which was based on the Nazi trials conducted by the Nazi doctors in Nuremberg, Germany (hence, the name "Nuremberg trials"). These nefarious trials were conducted during the World War II on prisoners in the military concentration camps. The American judiciaries to prosecute the involved doctors (Doctor's trial) generated the Nuremberg code, which constituted ten principles to guide scientist.

II. LITERATURE REVIEW

The American Society for Microbiology (ASM) has raised both the issues of defending scientific commitments to openness in publication and insisting scientists take an active role in stopping bioterrorism². The International Union of Microbiological Societies (IUMS) is having a target:

- 1) To promote the microbiological sciences studies internationally.
- 2) To start, expedite and coordinate research and other scientific activities involving international cooperation.
- 3) To safeguard the dialogue or reviews and circulation of the results of international conferences, symposia and in their reports publication².

The goal is to constantly advance the knowledge of the microbiological sciences in order to always enhance human well-being³. The advances in the field improve understanding in microbiology through research on infection mechanisms & microbial communities interactions. The introduction of working practices guidelines to protect laboratory personals, and the environment further improves quality assurance and management. The need for centers of expertise in microbial culture isolation, identification and maintenance to conserve microbial gene pool had been realized internationally for future study⁴. Biosecurity is governed by the non-proliferation approach of the Biological and Toxin Weapons Convention (BTWC). Two other globally important fundamental for biosecurity includes: the World Health Organization (WHO) Laboratory Biosecurity Guidance of 2006 (WHO/CDS/EPR/2006.⁵) (WHO, 2006) and the International Union of Microbiological Societies (IUMS) and Code of Ethics (IUMS, 2006). The other codes of conduct also includes: the Dutch Code of Conduct for Biosecurity (Royal Netherlands Academy of Arts and Sciences, 2008) and the DFG Code of Conduct on work with highly pathogenic micro-organisms and toxins (German Research Foundation, 2013). These codes are based upon the essential demands of the documents to furnish the guiding Principles for all the institutions related to microbial work. The biosecurity guidance for culture collections has been developed by Organization for Economic Cooperation and Development (OECD) in 2001⁵. The OECD biosecurity best practice guidelines cover some of the following important aspects such as Assessing biosecurity risks of biological material, Biosecurity risk management practices, Security management of personnel & visitors, Incident response plan, Staff training and developing a biosecurity-conscious culture, Material control and accountability, Supply of material, Transport security and Security of information⁵.

III. DISCUSSION

The threat of Malicious misuse

The aim is to prevent microbial Biological Resource Centers (BRCs) from directly or indirectly contributing to the malicious misuse of biological agents and toxins, including the development or production of biological weapons.

There are different codes of conduct. Three different types of codes can be distinguished.

- a) Aspirational (codes of ethics)
- b) Educational/Advisory (codes of conduct)
- c) Enforceable (codes of practice)

However, the key aim of a code is prevention. The conclusion was that BRCs needed a binding code of conduct specific to their needs. The Code of Conduct on Biosecurity for BRCs is concise, simple, and clear and addresses all laboratories holding dangerous organisms. The difficulties of risk assessment in microbiology include four elements: Hazard identification & Exposure assessment, Dose-response relationship & Risk characterization.

Ethical and moral obligation to avoid disease spreading

The molecular techniques can provide very clear information regarding different microbial relational patterns in an outbreak^{6,7,8}. Despite the fact that the results of such techniques must be understood in the context of traditional epidemiological information but even then, the most probable route of transmission is rarely the only one possible. The more certainty/validity on the microbial relational patterns by molecular techniques found in an outbreak introduces an ethical debate that needs to be resolved^{9,10}. The discussions about who is responsible for infection or outbreaks are complex with no simple or single conclusions; however, it is tempting to jump from information about 'who infected whom' to judgments about responsibility for infection. However, it is ethically problematic to attribute the responsibility to individuals for outbreaks of infectious diseases, even with the most sophisticated microbial molecular typing techniques. This is because molecular microbial typing methods can help to elucidate potential transmission pathways, yet additional conditions are required before moral responsibility can be attributed to individuals for the spread of infection. All the test results are private or confidential unless disclosure is authorized. The laboratory must assure that data is stored. There must be reasonable security against loss, illegal approach, and tampering or other data misuse.

IV. FINDINGS

Four commonly accepted principles of health care ethics, from Beauchamp and Childress¹², are namely;

1. Principle of respect for autonomy,
2. Principle of non-maleficence,
3. Principle of beneficence,
4. Principle of justice.

1. Respect for Autonomy

Any notion of moral decision-making assumes that rational agents are involved in making informed and voluntary decisions. In health care decisions, our respect for the autonomy of the patient would, in common parlance, imply that the patient has the capacity to act intentionally, with understanding, and without controlling influences that would mitigate against a free and voluntary act. This principle is the basis for the practice of "informed consent" in the physician/patient transaction regarding health care. In a *prima facie* sense, we ought always to respect the autonomy of the patient. Such respect is not simply a matter of attitude, but a way of acting so as to recognize and even promote the autonomous actions of the patient. The autonomous person may freely choose values, loyalties or systems of religious belief that limit other freedoms of that person. For example, Jehovah's Witnesses have a belief that it is wrong to accept a blood transfusion. Therefore, in a life-threatening situation where a blood transfusion is required to save the life of the patient, the patient must be so informed. The consequences of refusing a blood transfusion must be made clear to the patient at risk of dying from blood loss. Adesiring to "benefit" the patient, the physician may strongly want to provide a blood transfusion, believing it to be a clear "medical benefit." When properly and compassionately informed, the particular patient is then free to choose whether to accept the blood transfusion in keeping with a strong desire to live, or whether to refuse the blood transfusion in giving a greater priority to his or her religious convictions about the wrongness of blood transfusions, even to the point of accepting death as a predictable outcome. This communication process must be compassionate and respectful of the patient's unique values, even if they differ from the standard goals of biomedicine.

2. The Principle of Nonmaleficence

The principle of nonmaleficence requires of us that we not intentionally create a harm or injury to the patient, either through acts of commission or omission. In common language, we consider it negligent if one imposes a careless or unreasonable risk of harm upon another. Providing a proper standard of care that avoids or minimizes the risk of harm is supported not only by our commonly held moral convictions, but by the laws of society as well. This principle affirms the need for medical competence. It is clear that medical mistakes may occur; however, this principle articulates a fundamental commitment on the part of health care professionals to protect their patients from harm. In the course of caring for patients, there are situations in which some type of harm seems inevitable, and we are usually morally bound to choose the lesser of the two evils, although the lesser of evils may be determined by the circumstances. For example, most would be willing to experience some pain if the procedure in question would prolong life. However, in other cases, such as the case of a patient dying of painful intestinal carcinoma, the patient might choose to forego CPR in the event of a cardiac or respiratory arrest, or the patient might choose to forego life-sustaining technology such as dialysis or a respirator. The reason for such a choice is based on the belief of the patient that prolonged living with a painful and debilitating condition is worse than death, a greater harm. It is also important to note in this case that this determination was made by the patient, who alone is the authority on the interpretation of the "greater" or "lesser" harm for the self.

A typical example might be the question as to how to best treat a pregnant woman newly diagnosed with cancer of the uterus. The usual treatment, removal of the uterus is considered a life saving treatment. However, this procedure would result in the death of the fetus. What action is morally allowable, or, what is our duty? It is argued in this case that the woman has the right to self-defense, and the action of the hysterectomy is aimed at defending and preserving her life. The foreseeable unintended consequence (though undesired) is the death of the fetus. There are four conditions that usually apply to the principle of double effect:

a) The nature of the act.

The action itself must not be intrinsically wrong; it must be a good or at least morally neutral act.

b) The agent's intention.

The agent intends only the good effect, not the bad effect, even though it is foreseen.

c) The distinction between means and effects.

The bad effect must not be the means of the good effect,

d) Proportionality between the good effect and the bad effect.

The good effect must outweigh the evil that is permitted, in other words, the bad effect¹².

3. The Principle of Beneficence

The ordinary meaning of this principle is that health care providers have a duty to be of a benefit to the patient, as well as to take positive steps to prevent and to remove harm from the patient. These duties are viewed as rational and self-evident and are widely accepted as the proper goals of medicine. This principle is at the very heart of health care implying that a suffering supplicant (the patient) can enter into a relationship with one whom society has licensed as competent to provide medical care, trusting that the physician's chief objective is to help. The goal of providing benefit can be applied both to individual patients, and to the good of society as a whole. For example, the good health of a particular patient is an appropriate goal of medicine, and the

prevention of disease through research and the employment of vaccines is the same goal expanded to the population at large. It is sometimes held that nonmaleficence is a constant duty, that is, one ought never to harm another individual, whereas beneficence is a limited duty. A physician has a duty to seek the benefit of any or all of her patients, however, a physician may also choose whom to admit into his or her practice, and does not have a strict duty to benefit patients not acknowledged in the panel. This duty becomes complex if two patients appeal for treatment at the same moment. Some criteria of urgency of need might be used, or some principle of first come first served, to decide who should be helped at the moment. An example exists in health care where the principle of beneficence is given priority over the principle of respect for patient autonomy. This example comes from Emergency Medicine. When the patient is incapacitated by the grave nature of accident or illness, we presume that the reasonable person would want to be treated aggressively, and we rush to provide beneficent intervention by stemming the bleeding, mending the broken or suturing the wounded.

4. The Principle of Justice

Justice in health care is usually defined as a form of fairness, or as Aristotle once said, "*giving to each that which is his due.*" This implies the fair distribution of goods in society and requires that we look at the role of entitlement. The question of distributive justice also seems to hinge on the fact that some goods and services are in short supply, there is not enough to go around, thus some fair means of allocating scarce resources must be determined.

In fact, our society uses a variety of factors as criteria for distributive justice, including the following:

- To each person an equal share
- To each person according to need
- To each person according to effort
- To each person according to contribution
- To each person according to merit
- To each person according to free-market exchanges

V. CONCLUSION

Microbiology as a discipline has a commitment to society and the community it serves. In other words, the end results of the microbial work can be better used for the service of the community¹³. It is therefore important that professionals i.e. microbiologists are well prepared to meet these issues and reflect on ethical implications of using the techniques in outbreak management. This requires awareness about the existing ethical guidelines in to be able to formulate the conditions under which they may be applied in public health practice. The dangers of Bioterrorism and spread of diseases and uncontrolled proliferation of viruses, bacteria and fungus cannot be underrated and microbiologists have both a moral obligation and accountability towards stakeholders and authorities. Beauchamp and Childress¹²'s principles are guidelines that should be considered with due diligence.

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Dedication;

I, dedicate this paper to **Mrs Kritya Jugessur**, my loving caring mother, my friend, my lover, my baby who passed away on the 30th Jan 2023. After the shock of 15.07.22, her health deteriorated till her death.