

This response was submitted to the consultation held by the Nuffield Council on Bioethics on Emerging biotechnologies between April 2011 and June 2011. The views expressed are solely those of the respondent(s) and not those of the Council.

Nuffield Council on Bioethics: *Emerging Biotechnologies*

Question 1

***How would you define an 'emerging technology' and an 'emerging biotechnology'?
How have these terms been used by others?***

Emerging technology is commonly described as a concept which is relatively new or one which has not yet been accepted into practice. Over time the meaning has evolved to include new ways of applying existing technology and consequently the development of new processes to promote efficiency¹. As a result technology has impacted on the development of society both in a positive and negative manner. At its core is the uncertainty that lies with new technology and its potential impact on both industry and economics. Consideration must be taken into the management of such technology and the safety risks it may possess.

In clinical practice emerging technology can be a pitfall for healthcare finance. Information technology in particular has been targeted from improving the quality, safety and efficacy of the healthcare system. Despite the large investment quality of care is still deemed to be suboptimal². The ability to judge its relative effects can be dependent on the quality of information available at that particular point in time. By not investing in emerging technology the quality of patient care can be compromised contributing to negative views of healthcare system.

The impact on the environment may also need to be considered with emerging technology³. Research may provide reproducible methods and reliable data, but can fail to analyse its environmental impact. Hence the author may not want to portray a negative impact to the reader to maximise its potential uptake.

In the future, consideration must be taken into the development process of emerging technology in an attempt to influence direction and rationalise limited resources.

In defining emerging biotechnology many facets need to be taken into consideration. It is implied that a definitive definition of the term is not applicable. The term itself infers new technology, with a biological element as a focus, which uses biology and living organisms scientifically to advance society. The term 'emerging' carries with it positive connotations, and the promise of a brighter future which may be misleading. The phrase may also suggest that such technologies are developed and used with a focus on improving health as its core principle, such as with stem cell research and genetic screening. However, this technology also looks to improve the engineering and manufacturing industries⁴.

Furthermore biotechnology encompasses advancements which focus on human improvement with the aim to overcome human limitations. Examples include the use of genetic engineering and nanotechnology. In such cases the emerging biotechnology may not be seen as directly being of benefit to the public as a whole⁵. Consequently, many people view emerging biotechnology and technology as replacing humanity.

What is more biotechnology can be used with a single application, like in the genetic modification of food to multiple applications such as in the practice of DNA profiling where the technology can be used by the criminal justice system as well as in medical science⁶. Those involved in science and these disciplines tend to look upon these advances more favourably than the general public.

With all this in mind the key behind the definition of emerging biotechnologies is in advancement of scientific processes and the use of biological science. However it is perhaps more appropriate to suggest that there is a set of criteria which a technology would have to meet in order to come under the heading of emerging biotechnologies rather than trying to define exactly what it is.

References

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Question 11

What ethical principles should be taken into account when considering emerging biotechnologies? Are any of these specific to emerging biotechnologies? Which are the most important?

In the current financial climate it is important to acknowledge ethical dilemmas that could be faced by the National Health Service when considering emerging biotechnology.

The NHS, free at the point of access and available to all, will face tough ethical dilemmas in allocation of emerging biotechnologies. As previously identified a further social cultural divide in healthcare could be precipitated particularly within regenerative medicine, nanotechnology and human enhancement technologies .¹

With great power of advanced technology will also come responsibility of regulation. Who should be in charge of regulating emerging technologies? Who should be responsible for ensuring their safety, their allocation and financial cost? Independent bodies could express bias to ensure financial reward and recognition and therefore fail to declare all risks. Contradicting this, government bodies controlling the NHS may wish to play down emerging biotechnologies due to financial burden and ethical issues involving postcode lotteries. Advisory bodies such as NICE could offer a solution however as new biotechnologies emerge there is little evidence base for these bodies to make informed, fair decisions. This leads to further dilemmas of testing new biotechnologies with many involving invasive procedures of which current long term consequences are unknown.

While solutions to these issues have been attempted via regulation by the Human Genetics Commission, there is still speculation that there is substantial government involvement.

As biotechnologies advance, careful and purposeful considerations need to be carried out on how the application of biotechnologies will affect future generations. If they are put at a disadvantage, then it should not be implemented. Ideally, the biotechnologies should support environmental sustainability. This would allow future generations to benefit from actions performed by previous generations.

Before animals are used for research, other alternatives should be sought. If biotechnologies do involve the use of animals, a certain level of duty of care towards the animal should be implemented. All tests performed on the animals should be monitored and only performed to achieve a specific objective. This would help avoid unnecessary testing. Any form of distress or pain caused to the animal during the research should be avoided or minimised as much as possible².

Techniques such as stem cell research raise the issue of destruction of embryonic life. Destruction of an embryo goes against religious and moral outlooks of society. This view is dependent on whether people believe human life and moral status both begin at the point of conception. Conversely this type of research may be of great benefit for treatment of debilitating diseases.

Pre-implantation genetic diagnosis involves a single cell being removed from the very early embryo and tested to see if it carries the genetic fault that causes the condition. The embryos that do not carry the defective gene are implanted in the mother. This raises the ethical issue in the future of what would happen to the remaining people who are living with a genetic disease in society³.

Justice dictates how the application of emerging technologies can contribute to the progression of society and whether countries in the developing world will benefit, even though many techniques are currently trialled and tested in these developing nations (such as novel therapeutic drugs and formulations). Therefore, will the new technology benefit those upon whom it is being tested? Furthermore, will the recipients of treatments or interventions be different to those in society who are viewed as less deserving or less socially progressed? Do all members of society have equal access to any new treatments available as should be in the NHS?

Ethical principles specific to biotechnology relate to the potential for harm to recipients of technologies not yet fully elucidated. Those techniques which are still underdeveloped may have the inherent potential for harm, such as GM crop production. The ability to affect present and future generations by interventions in the current population must also be taken into account.

Of vital importance, the emergence of a human super-race, use and abuse of genetic information, the possibility of damaging ecosystems and disrupting the natural balance of food production to possibly damage and destabilise third world economies, as well as unfair access to new treatments for the poor and infirm, are major issues to consider.

References

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