3D Bioprinting: Ethical Aspects and the Big Picture

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Game plan

• Ethics and bioethics
  • What ethics/bioethics does and where does it fit?
  • Ethics, applied ethics, research ethics and bioethics
  • Ethical assessment
  • Ethical frameworks
  • The ‘whether’ and the ‘how’?

• 3-D bioprinting: identifying the issues
  • Sourcing the cells
  • Social justice and access
  • Regulatory issues

• The big picture: our biomedical futures
  • Playing God, natural vs artificial
  • Our biotechnological bodies and minds
  • Enhancement or treatment?

• Summary and further directions: guiding the future
**Ethics and bioethics - Questions**

**ACTION GUIDING**
- Does kidney made in a laboratory should belong to me?
- Should we produce artificial organs?
- Is there anything ethically problematic or impermissible in producing tissues in the laboratory?
- Should we treat tissue sourced from embryos any different to non-embryonic tissue?
- Do we have an obligation to ensure fair access to new healthcare interventions?

**CONCEPTUAL & ARGUMENT CLARIFICATION**
- What do we mean by ‘playing God’ and what is, if anything, ethically wrong about it?
- What does ‘natural/artificial,’ ‘treatment/enhancement’ mean ethical force?
- What does concepts such as ‘species,’ ‘gene,’ ‘justice’ refer to?
- What are the possible sources of special value of embryos?
Where does ethics fit?

Guiding innovation and application (Ends)

• ‘Big picture issues’
  • Why do we do it?
  • What are the possible consequences?
  • How to do it so it supports leading good lives?
  • Who do we have obligations to?

Innovation process (Means or Process)

• Research ethics
  • E.g. how to do research ethically
  • Participant autonomy, consent, data sharing, privacy and confidentiality
  • Who derives benefits and is research responsive to community needs?

• Medical ethics
  • E.g. Duties of physicians
  • Patient autonomy, consent, data sharing, privacy, and confidentiality

• Bioethics
  • Empirical
  • Philosophical
Ethics: from constraining to empowering

- Examples of collaborations
Ethical frameworks - NEST-Ethics

Ethical assessment I

- Collective utility (consequentialism)
- Fundamental principles, rights and duties (deontology)
- Good life (virtue ethics)
- Distribution of benefits and burdens (justice theories)

Ethical assessment II

- The direction of technological change
- Its moral implications
Ethical assessment

• Ethical questions are normative

• Gut reactions vs arguments and reasons

• Deliberation, dialogue and public understanding
Two levels of ethical assessment: the ‘whether’ and the ‘how’

• Ends and means
  • Virtue ethics

• 3-D bioprinting: ends and means
Stem cell sourcing

Issues

• Practical & political: activist backlash
• Embryonic stem cells
  • The value of the embryo
  • The ethical permissibility of induced abortion as related to cell sourcing
• Therapeutic and research cloning
• Cost/benefit balance of alternative (non-embryonic) sources of stem cells, including both human and xenogeneic cells
• Consent and information of donors
• Financial benefit from products derived from altruistically derived cells
Ownership

Issues and ethical questions

• What is ownership? Ownership as a bundle of rights
• Is body a property?
• How do patients perceive devices and lab-grown organs in the context of their bodies?
• Intellectual property

• Who owns a lab-produced organ and what rights and duties this ownership should convey?
• Who should be responsible (and legally liable) in case of synthetic organ failure?
• Is current system of property rights and intellectual property rights assuring best science development and just distribution of benefits and burdens?
Issues: justice and access

- Who sets research direction
- Which issues are prioritised?
- Who carries the burden of research?
- Who benefits from research most?
- How to assure fair access to benefits?

E.g.
- Maximin
- Merit
Playing God & natural vs artificial

• Does 3D bioprinting amounts to ‘playing God’?

• If yes, then what (if anything) is wrong with it?

• Blurring the distinction between natural and artificial

• What connotations do those concepts bring? Do they carry any normative force?
• Is it permissible to use bioprinted tissues and organs for enhancement and not treatment?

• Is there an ethical difference between treatment and enhancement uses of a technology?

• What are the ‘proper goals’ of medicine?

• Should we aim for radical human enhancement and can 3D bioprinting aid or undermine that project?
Our biotechnological bodies and minds

Issues and questions

• Soft impacts
  • Discounting might lead to public discontent
  • The way technology is integrated into society, and consequently the benefits it brings, depends on co-created meanings
  • Would the use of 3D printed organs change the culture and human practices in a significant way? (e.g. phones, internet, microwaves)

• Further future
  • Together with other biomedical technologies, how does 3D bioprinting change our perceptions of our bodies?
  • What are the perceptions of people about bioprinted products?
  • Would people prefer bioprinted products over altruistic donation?
  • What are the perceptions and feelings patients have about bioprinted products and how does it influence outcomes?
Concluding thoughts: ethics and bioprinting

Summary

Guiding the future