Genome editing and farmed animals: ethical issues

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Nuffield Council on Bioethics

NUFFIELD COUNCIL ON BIOETHICS

- Independent organisation that examines ethical issues arising from developments in biological and medical research
- Established in 1991
- Jointly funded by MRC, Nuffield Foundation, Wellcome
- 15-20 Council members
- 12 Executive staff
- Convenes specialist working groups for each in-depth inquiry


Genome editing and human reproduction
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BIOETHICS
BRIEFING NOTE
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Patient access to experimental treatments


Human bodies:
donation for medicine and research
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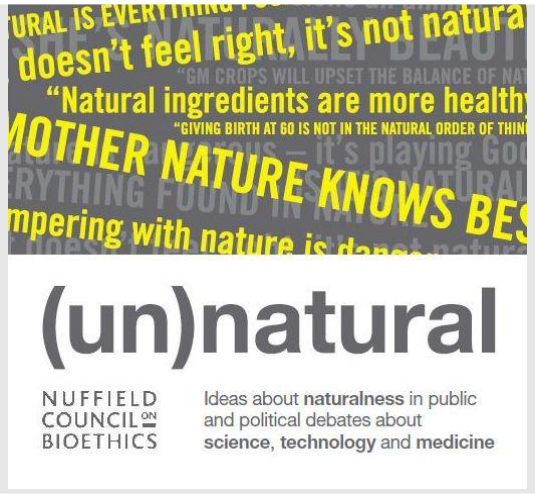
doesn't feel right, it's not natura
"Natural ingredients are more health
MOTHER NATURE KNOWS BE
(un)natural
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Ideas about naturalness in public and political debates about science, technology and medicine


BIOETHICS
BRIEFING NOTE
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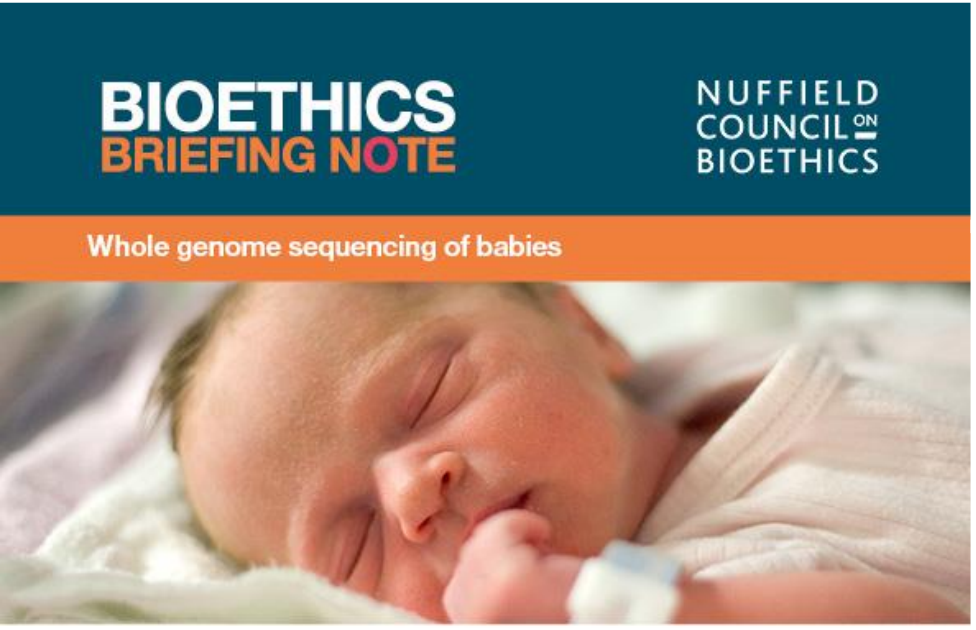
The search for a treatment for ageing
OVERVIEW


BIOETHICS
BRIEFING NOTE
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Whole genome sequencing of babies
OVERVIEW


BIOETHICS
BRIEFING NOTE
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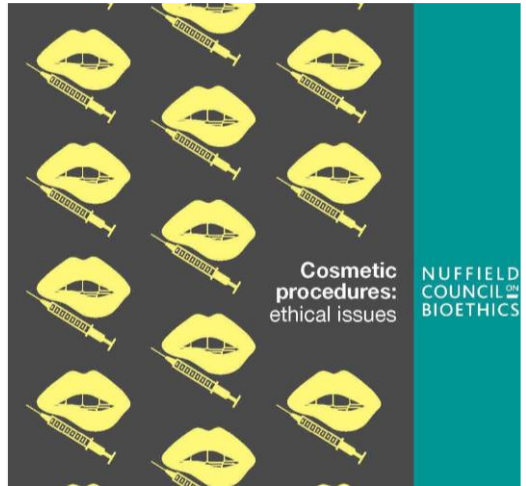
Artificial intelligence (AI) in healthcare and research
OVERVIEW


Cosmetic procedures:
ethical issues
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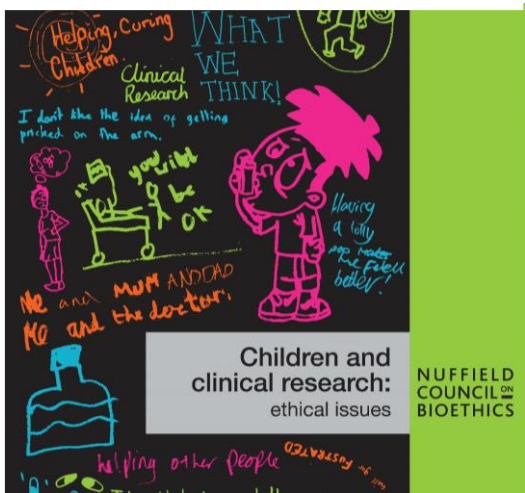
Helping, Caring
Clinical Research
WHAT WE THINK!
Children and clinical research:
ethical issues
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Our interest in genome editing

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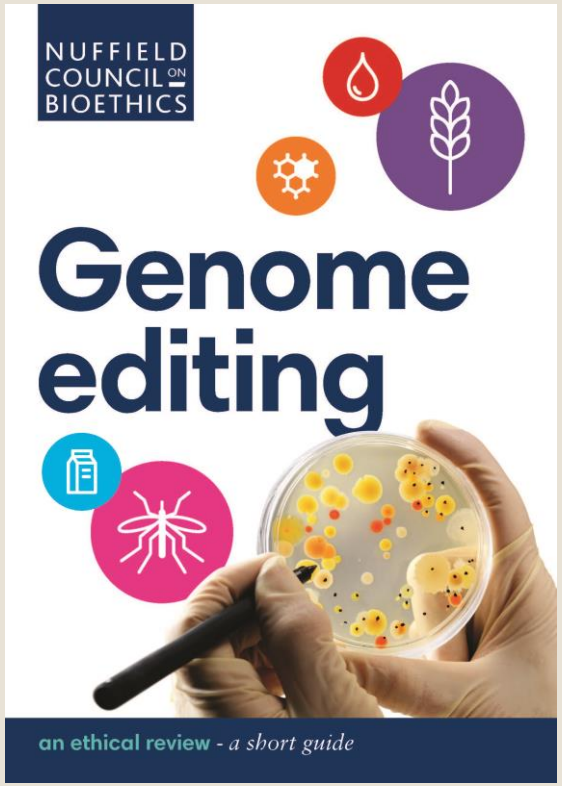
- Genome editing can potentially be used across a range of applications in living things
- Transformative technology
  - Accessible
  - Inexpensive
  - Increases overall rate of research
  - Could transform our expectations and ambitions
- Public interest

What we've done so far

- Review into the impact of recent advances in genome editing technologies (published 2016)
- Identified two applications that require urgent ethical scrutiny
  - Human reproduction (published 2018)
  - Farmed animals



Farmed animals

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- Raises issues of **significant public interest**, though there's been little debate so far
- No distinctive **regulatory controls**
- Close to implementation, e.g.
  - Polled cattle
  - PRRS virus resistance in pigs
- Other questions: traceability, labelling, moral significance of food

Our inquiry

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- Began in 2019
- Two-year inquiry
- Interdisciplinary working group – law, philosophy, genetics, biotechnology, political theory, animal welfare, animal health, food and society, sociology, and economics

Evidence gathering

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- Background paper(s)
- Literature review
- Fact-finding meetings
- Open call for evidence
- Site visits
- Citizens' jury (?)
- Report will be published in summer 2020

Open call for evidence

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- Seeking views from a range of stakeholders on the following areas:
  - Current research and trajectory
  - Social context of research and innovation
  - Ethics
  - Policy, regulation, and law
- To open shortly, close in summer

Call for evidence:
Current research and trajectory

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Seeking views on:

- Current or emerging research
- Advantages of genome editing over existing agricultural technologies
- How quickly is research in this field progressing?

Call for evidence:
Social context of research and innovation

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Seeking views on:

- Societal and policy challenges that genome editing could be used to address
- Benefits and drawbacks of genome editing versus alternative, non-technological interventions
- Broader social, economic and political drivers that will support/frustrate genome editing applications
- Individuals / groups likely to benefit
- Affect of public attitudes

Call for evidence: Ethics

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Seeking views on:

- Significance of directly intervening in animal genomes
- Potential impacts of genome editing technologies on animal welfare, the environment, and human health
- Conditions under which genome editing might be permissible

Call for evidence: Policy, regulation and law

NUFFIELD COUNCIL ON BIOETHICS

Seeking views on:

- Appropriate regulation and policy
- Major risks that regulation should seek to manage
- Proportionate approach to regulation of genome editing
- National and international policy implications for strategic security and biosafety of genome editing applications in farmed animals
- Roles of regional / national policy and markets in relation to shaping livestock farming practices

Ethical Issues

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- **The following slides reflect my own preliminary views about what are the main ethical issues arising in this area, and do not reflect conclusions of the enquiry.**

The “Yuck Factor”

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- Term coined by bioethicist Arthur Caplan to refer generally to hostility to new technologies.
- Much more specifically refers to a reaction to GM, especially transgenics.
- Possible that recent genome editing techniques will be less susceptible to Yuckiness, as not generally transgenic. Possible relevant factors:
  - Extent to which genome editing separates itself in public imagination from precursor technologies
  - Extent to which realistic views of the genome can be disseminated. (Vs. ”magical”, essentialist ideas.)
  - Does it matter whether a gene is literally taken from another organism, or a copy is artificially created?

Slippery Slope Arguments

- Classic instance: from addressing monogenic disease to “designer babies”
- In present context, perhaps, from the cow without horns to the cow that wants to be eaten
- One response to this kind of argument is, again, to criticise magical genome thinking, and also to explore carefully what kinds of modifications are realistic. Cases should be discussed on their individual merits.

Animal Welfare

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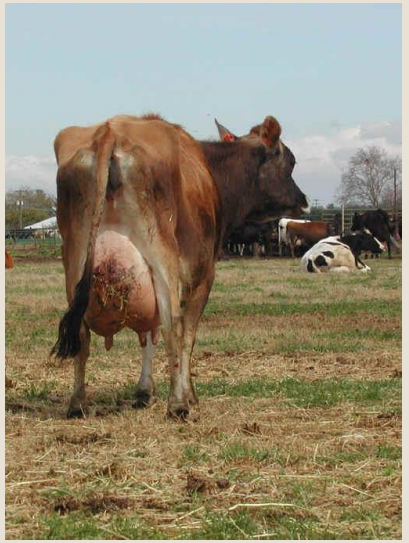
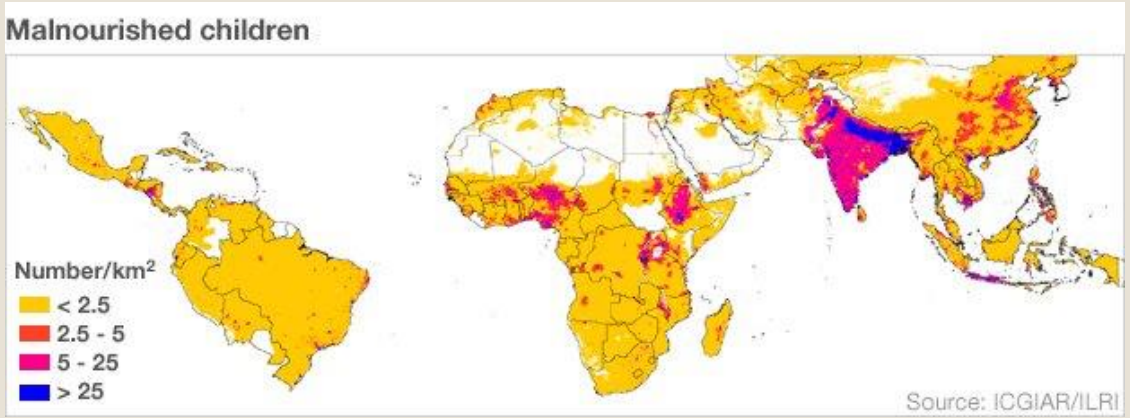
- Animals don’t care about their genomes.
- It is possible to breed/design animals that have intrinsically or potentially higher suffering: flat-nosed dogs; very high milk yield cows.
- Modifying animals better to fit optimal rearing conditions might be a way of improving animal welfare. Naturally or artificially polled breeds of cattle avoid the pain of dehorning or disbudding.
- But there are concerns about facilitation of lower welfare farming methods. E.g. hornless cattle, however produced, as a means to increase stocking density.



The Bigger Picture

- Precise control of the genomes of any arbitrary organism may raise unprecedented abilities to provide new solutions to human food needs.
- Arguments for genome editing of livestock are often grounded in global food needs. But this strategy is likely to confront arguments that animal rearing in general is an inefficient use of resources, harmful to the environment, and/or unethical.
- This isn't the occasion to discuss the general ethics of meat-eating, but it is likely that this will arise in the context of attacking/defending genomic modification of livestock.



Some Preliminary Concluding Thoughts

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- Intelligent discussion of issues raised by genome editing first requires countering of common misunderstandings of the nature of the genome.
- Given a realistic understanding of the genome there is no obvious *general* objection to genome editing of livestock.
- There may, however, be various *specific* concerns about animal welfare. These are best addressed by robust regulatory procedures.
- If genome editing is defended on the basis of concerns about future global food supplies, it is hard to avoid wider questions about the appropriate role of animals in the human food chain.

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