

Background information, cultured meat

Information sheet for press release from Chalmers University of Technology, 11-09-05

Which problems can be solved or reduced using cultured meat?

- Emissions of greenhouse gases. Meat production currently accounts for 18 percent of the total human emissions of greenhouse gases in the world, according to a report by the UN food agency FAO. That is a higher part than the global transport sector accounts for. According to a forecast by FAO, global meat consumption will double between 2000 and 2050.
- Scarcity of land for agriculture and grazing, leading to destruction of rainforests and other ecosystems. This in turn leads to loss of biodiversity as many species become extinct. More than 75 percent of the world's arable land is currently used for meat production. Agricultural land occupies, in turn, 38 percent of Earth's total land area, but if meat consumption would increase according to FAO's forecast, agricultural land would have to occupy 65 percent of Earth's land area in 2050. This would mean that most of the world's forests would have to be converted into agricultural land.
- Water scarcity. Animals for meat production currently consume 8 percent of the available freshwater in the world.
- Eutrophication, because of nutrients spread by agriculture.
- Emissions of toxic chemicals such as pesticides.
- Animal ethical problems.
- Spread of infections between animals and humans, such as avian flu and salmonella, and the emergence of new pandemics such as swine flu.

How big would the environmental benefits be to use cultivated meat instead of meat from animals?

Compared to the rearing of cattle, grown meat would provide:

- An energy reduction of 45 percent
- Reduction of greenhouse gas emissions by 96 percent
- Reduction of the land area that must be used by 99 percent.
- A reduction in water consumption of 96 percent

The figures come from a life cycle analysis recently carried out by researchers at Oxford University and the University of Amsterdam.

<http://pubs.acs.org/doi/abs/10.1021/es200130u>

Other pros of cultured meat

- It would be possible to control the content of fat and nutrients
- The control of product quality would be better, compared to conventional meat which has a very variable quality

What do you need to grow muscle cells in a culture tank?

- Stem cells capable of dividing many times, followed by "control" of their maturation into muscle cells.
- Nutrient solution.
- Biochemical signaling molecules, which among other things, tell the cells to properly divide and then mature into muscle cells.
- Some form of "scaffolding" which the cells can grow on.
- Some sort of technology to stimulate the cells, mechanically or electrically, so that they get

"exercise" much like in a living body. This is needed for the cells to develop into muscle cells in an efficient manner.

- If you want to culture a "piece of meat" (rather than something that looks like minced meat) you also need something to replace the blood vessels in a living body, so that all cells have access to the nutrients they need.

Why will it take a long time before cultured meat hits the stores?

- Right now, the funding is very limited.
- Many fundamental scientific issues are resolved, but many remain. The engineering methods are preliminary. Much research and development is needed on all fronts.
- It is a great challenge to get the costs down, in order produce cultured meat at a reasonable cost, compared to the cost of traditional meat.
- The time span from the first demonstrated portion of cultured meat to commercial introduction is very long. There would be a long process of testing before it could become food for consumers. At the moment there are no established regulatory guidelines.

Issues that need to be resolved

- Should researchers use adult or embryonic stem cells?
- Should researchers use cells from farm animals, fish or poultry? Or even from mouse (which is much easier to work)?
- Should researchers rapidly try to provide a product demonstration, or should they try to solve more of the basic scientific questions first?
- Should researchers investigate genetically modified cells?
- What kind of end product do we want; exclusive and expensive meat or high volume products that can compete with conventional meat?