

## “Meat *in vitro*” the Credible Alternative?!”

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### Introduction

Nowadays, the meat sector faces many criticisms regarding the conditions of rearing, the harmful effects this produces on the environment and on the health of consumers. Among the proposed solutions, there is the advent of *in vitro* meat that researchers propose as the “miracle” solution to the problems of the meat industry. This results in a meat that would be entirely designed in a laboratory from a single meat muscle cell, all in one tube. Nevertheless, this solution remains much less miraculous than its supporters are willing to admit, the democratization of meat *in vitro* will bring new economic, societal and environmental challenges.

### How is *in vitro* meat manufactured?

This synthetic meat is produced by a complex and expensive process: in the muscles of adult cattle, stem cells are taken which can reproduce and form muscle fibers. Placed in a nutrient solution, they proliferate to form at the outset a formless mass of cells, then solid muscle tissue. This nutrient solution is composed of carbohydrates, amino acids, lipids, vitamins, growth factors, hormones (insulin, thyroid hormones and/or growth hormones). All these elements are necessary to maintain cell viability and enable them to proliferate. Thus, 40 billion cells are assembled to constitute some 20,000 muscle fibers, which then form enough meat to fill a Petri dish.

### I. Organoleptic and nutritional problems

At the first tasting of the Franken burger in August 2013, the Austrian nutritionist Hanni Rützler presents the product live on television. This product has a flavour close to meat, but not as juicy and fatty. After this analysis, other nutritional specialists of the artificial steak noted that the latter is low in iron and low in vitamins, in particular vitamin B12. The complexity of skeletal muscle composition determines its food quality. Adipocytes as the main fat deposits make the meat rich in flavour and taste. Each constituent (adipocytes, connective tissue,) contributes differently to the taste, smell and nutritional value of meat. In addition, the importance of organoleptic and processed meat products varies according to consumer habits and preferences. There is strong competition and challenge from the point of view of the consumer. (Arkadiusz Orzechowski, 2014).

However, those who view skeletal muscle as fair being raw meat should be aware that muscle development (myogenesis) is of paramount importance to the quality of meat and meat from food (Collins and Partridge 2005). The Dutch team wants to improve its “Franken

burger” by adding fat and strengthening its nutritional qualities to become perfectly equivalent to a classic steak. This means that this meat is not only an artificial meat but also a meat containing a significant amount of synthetic additives.

## **II. Health, Environmental and Ethical Issues**

### **1. Absence of toxicological risk assessment**

The absence of the toxicological risk assessment does not exclude the Pathogenicity of this meat and the disappearance in the medium or long term of Animal species and grazing areas:

- The materials used to grow cells in culture are for some of animals (sera) presenting a risk of Contamination, too, it would be difficult to use the term “humane meat “If the muscle tissue is grown on sera collected from calves Fetal or new-born (Arkadiusz Orzechowski, 2015).
- It is essential to assess this risk, which has not yet been done “Production of artificial meat outside laboratories, “notes Jean-François Hocquette, researcher at the National Research Institute (INRA). In an INRA publication that he records with ten other researchers, they note that the culture medium in which Muscle cells can “be easily invaded by Contaminants such as bacteria or fungi “, and are therefore generally “enriched with antibiotics and fungicides”.
- What would happen if we completely stopped using animals? In pushing the hypothesis to the extreme, would it not sound the end of many species? Also leading to the disappearance of a large volume of Pastures and cultivated land that will lose all natural forms concentrating the remaining animals on all small spaces will in no way satisfy the natural needs of these animals.
- Meat *in vitro* therefore brings no progress for the animal world, some will continue to be slaughtered to provide a food choice and other will be laboratory accessories to feed the new food chain of *in vitro* products.
- This artificial product raises many questions. At Begin with its ethical dimension: can we cultivate tissues, otherwise Says parts of a living being in the lab?

### **2) “False” polemic of water consumption**

The figure of 15,000 liters of water to produce one kilo of beef was Widely publicized (Me konnen and Hoekstra 2012). This is a calculation on complete cycle of water in an ecosystem: more than 95% of this water footprint of livestock is constituted by virtual water, essentially evaporation. The water actually consumed by animals is between 200 and 550 Liters per kilogram of beef (Carson and Doreau 2013). In the end, Meat consumption as little as the production of artificial meat (Despite the lack of precise data).

### **3) Environmental Controversy**

The environment would be impacted by the manufacture of artificial meat. Indeed, there would be the rejection of the organic molecules coming from the culture media. By A complete environmental assessment is premature in the absence of a precise definition of the modes of industrial production of artificial meat.

## **III. Socio-economic problems**

Crisis of breeders in France, the price of meat is in free fall, Changes in consumer eating habits and competition Violent

- Livestock is an economic activity that provides millions of People: what will be their income if they are suddenly by laboratories or meat factories?
- Problem of culinary diversity, highlighted by many critics. It must be said that for the time being, research is still far from to be able to recreate different meats, from steak to pork, because the fabric structure is too complex. Moreover, according to the German confederation of the meat industry, the consumer is not ready to switch to test-piece meat: “already very critical of flavour enhancers and colorants, Will surely not welcome enthusiastically the meat grown in the laboratory “.

#### **IV. Are there other alternatives to steak?**

In another register of dietary practices, entomophagia (eating insects) was recommended in 2013 by FAO (see its file and site). According to the UN agency, there are 1,900 species of edible insects. This “mini-livestock” has a higher protein and mineral content than meat. In addition, it takes only two kilos of food to feed a kilo of insects, compared to eight kilos for a kilo of beef. If they suffer in Europe a degree of legal uncertainty and repulsion, they are already adopted and eaten by millions of people in Asia, Africa and South America, and are beginning to appear on the menu A few restaurants.

Price revision, an increase in prices (reducing consumption frequency but eating quality meat) contributes positively to the preservation of the environment and animal welfare.

Strengthen regulations and create responsible production (industrialists, breeders, quality, animal welfare, etc.)

Promote consumption, balance and vary (red meat, meat White, vegetables, fruits ...) on the other hand, it can be feared that *in vitro* meat will produce a two-tier food system, a natural food choice for an affluent class and a food choice for laboratory (artificial) products for others.

The commercialization of *in vitro* meat will naturally reduce the requirements of currently marketed products. This competition will entail a mass slaughter of the animals which will “Double” *in vitro* in the shelves.

Quorn is the only true analogue of meat on the market (sold in the USA and Northern Europe). The “quorn” is formed from mycoproteins produced by the cultivation of the filamentous fungus *Fusarium venenatum*. This alternative is a simple and inexpensive production technique in contrast to *in vitro* meat production.

#### **Conclusion**

Meat *in vitro* is certainly an invention of genius and an incredible discovery, but it reminds us exactly of the discovery of GMOs in the 1970s. The world saw GMOs as a gift of god to save mankind from famine and evil especially in developing countries. So it was also a genius discovery a few years after GMOs were blamed for several diseases and health problems. The European Union with 16 member countries at that time was the first that officially banned the cultivation of transgenic seeds as well as the sale and circulation of GMO food products in its territories. So the meat *in vitro* without a study and a thorough evaluation of toxicological health risks that will take many years, this meat will have the same fate as that of GMOs. We will certainly see countries prohibiting this type of meat, we will also see Logos on packaging's with the mention; “Non-*In Vitro*” similar to that “Non-GMO”.

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