

3,565 views | Oct 17, 2018, 07:32am

How Israel Became The Most Promising Land For Clean Meat



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MOSA MEAT

“The Lord said to Moses and Aaron, “Say to the Israelites: ‘Of all the animals that live on land, these are the ones you may eat: You may eat any animal that has a divided hoof and that chews the cud. There are some that only chew the cud or only have a divided hoof, but you must not eat them. [...] You must not eat their meat or touch their carcasses; they are unclean for you.”

[Leviticus, 11, 1-8]

On August 5, 2013, Dutch scientist Mark Post presented to the world the [first lab-grown burger ever created](#). The event took place in London, the burger was cooked by chef Richard McGeown, and only Hanni Ruetzler and Josh Schonwald – two food critics – could taste it. Hanni Ruetzler said that it tasted like meat, “just not as juicy.”

First lab-grown burger tried and tested in London



The burger cost a devilish €250,000 to produce. Five years later – last July – Dutch startup [Mosa Meat](#) – whose Chief Scientific Officer is Professor Post – announced its aim to [start commercializing lab-grown burgers in three years](#). It will not be a \$1 McBreak but an expensive delicatessen for high-end restaurants. Yet, it will be possible to buy it.

This article tells the story of the quest to create lab-grown meat and of the country that is spearheading this revolution. And no – plot twist – it’s not the Netherlands. Rather, the Netherlands is certainly a country that is playing a major role in making this innovation a reality but there’s another nation, even smaller (its size is exactly half of the Netherlands actually), where cultured meat is being pioneered. That nation is Israel.

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Before we delve into the reasons that put the Promised Land on the map in such a peculiar field, we better address the question of what clean meat is and why it's a product that could potentially revolutionize the lives of billions of beings on this planet.

The potential of clean meat

In a nutshell, “[clean meat](#)” (we'll see in a bit how the use of this term is intensively debated) is meat grown from in-vitro animals' cell culture instead of from slaughtered animals. There are different procedures to grow it that also depend on the kind of meat being produced (at the moment, the main efforts are focusing on beef, chicken, and pork).

Mosa Meat [harvests muscle tissue from a living cow with a biopsy](#). The muscle cells are then dissected, divided, and cultured (from one muscle cell, its possible to obtain up to one trillion of them). Afterward, the cells merge in a so-called myotube that is used to create muscle tissue. But, as I said, the process varies and the race is on to find the best way to cheaply produce clean meat.

Symbolically, this race started in 1931 when Winston Churchill [famously suggested](#): “We shall escape the absurdity of growing a whole chicken in order to eat the breast or wing, by growing these parts separately under a suitable medium.”

The British Nobel prize for Literature also foresaw that we would obtain the first samples of such meat in just 50 years. Alas, we missed the mark because, as it can be seen from this [handy timeline of the history of clean meat](#), the field started to truly develop only in the twenty-first century when technological innovations and political, social, and environmental necessities gave it a boost.



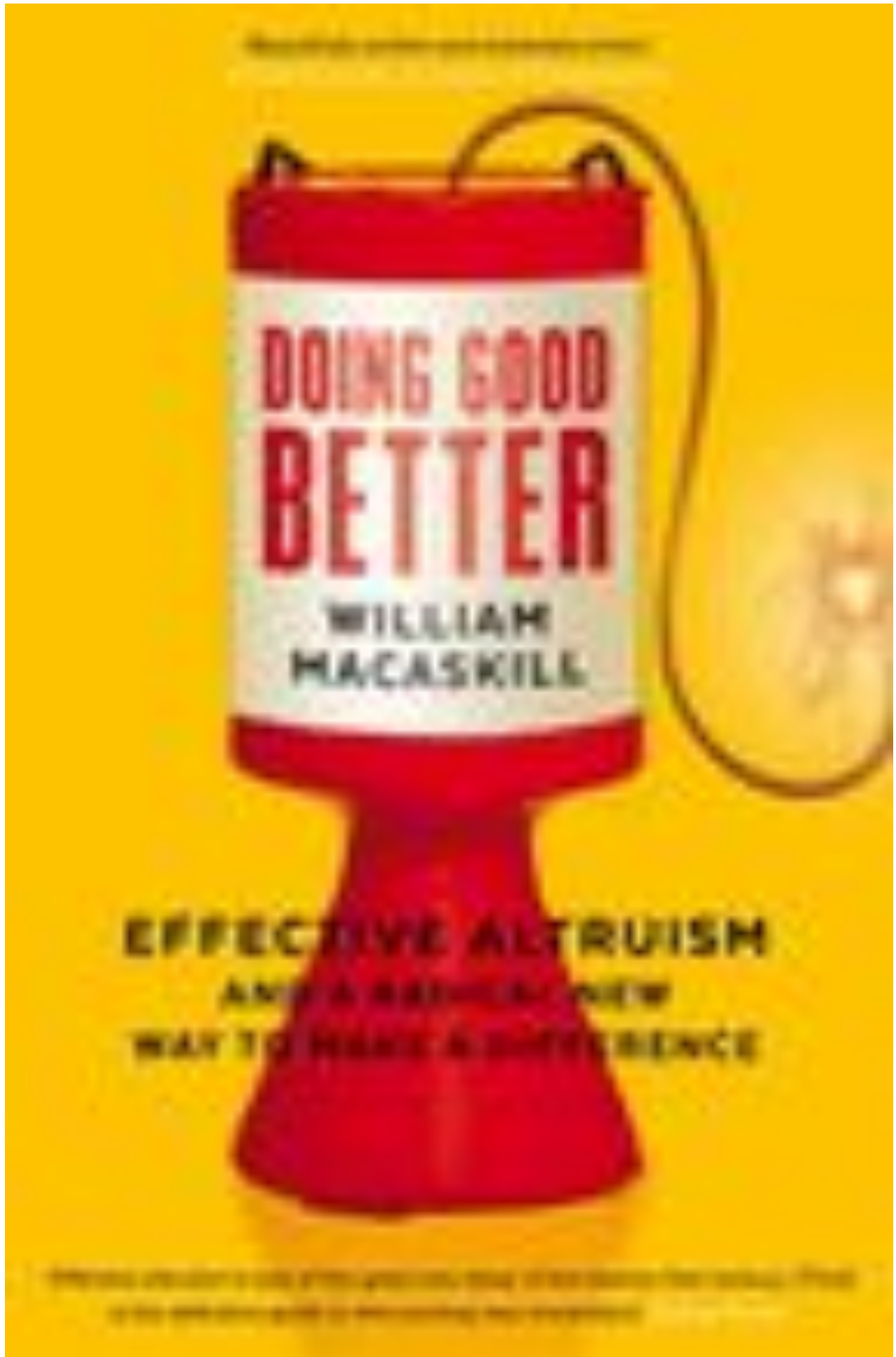
Yes, Winston Churchill won the Nobel Prize for Literature [HTTPS://COMMONS.WIKIMEDIA.ORG/WIKI/FILE:SIR_WINSTON_CHURCHILL_-_19086236948.JPG](https://commons.wikimedia.org/wiki/File:Sir_Winston_Churchill_-_19086236948.JPG)

Indeed, if clean meat would replace intensive farming as an industry standard, the benefits for the environment would be immense. As consumers, we would also have “cleaner” meat, meaning a product that doesn’t have the antibiotic

residues and bacterial contamination that come with slaughtered meat. Moreover, cheap quality meat could also represent an asset in the fight against hunger. We would also save the lives of **over 56 billion animals annually**. Yes, that's the number of farmed animals that are killed every year by humans.

Clean meat sounds then like a silver bullet that could relieve humanity of some of its most pressing challenges. This is why it has become one of the favorite themes of the **Effective Altruism movement**, the philosophy that “uses evidence and analysis to take actions that help others as much as possible.” And with “others”, they mean animals too, of course.

Clean meat is appealing to them since it may be a highly effective way to tackle one of the issues that rank the highest in their cause-priority list: factory farming. Moreover, the Effective Altruism movement is particularly popular in the tech and startup worlds, and with all its emphasis on efficiency and impact it's not difficult to understand why.



"Doing Good Better" by William MacAskill, sort of EA's gospel RANDOM HOUSE

That's the other aspect which makes the clean meat revolution so appealing for so many bright minds. Were this to take place, it wouldn't just be a way to reduce the suffering of millions of beings. It would also be a gigantic business opportunity. In this regard, it's no coincidence that American seed accelerator [Y Combinator](#) – the launchpad of companies like AirBnB and Reddit - indicated clean meat as [one of the nine ideas they'd like to fund in the coming year](#).

In other words, clean meat is poised to become the clean energy of food. To make this idea work, we should start consistently sticking it to this name: "clean meat". If only it were that simple.

A war of words

Over the years, clean meat has been defined in myriad ways. Obviously, in the beginning – when the media was still not interested in this field – the preferred choice was usually clunky scientific terminology. "Tissue-engineered meat" or, at best, "in-vitro meat" were among the most popular options.

However, it quickly became evident that if the tissue-engineered meat producers wanted to have a shot at popularizing their product, they needed to change its name. Otherwise, the media would have come up with names of their own, as they actually did, starting to call this weird, new futuristic food "lab-grown", "synthetic", or, at worst, "frankenmeat". (My utopian favorite term would undoubtedly be the retro-steampunk "Churchillian meat.")



Definitely, someone you'd rather not think of while eating PIXABAY

To fix the situation, the [Good Food Institute](#) – an American non-profit organisation that promotes plant-based and clean meat – [researched](#) terms more likely to elicit a positive reaction in potential buyers and now encourages the use of the term “clean meat”.

I also have a feeling that “clean meat” is an optimal way to express what this new product will be about: a sustainable version of traditional meat. Obviously, defining something as “clean” implies that the opposite is “dirty” which is not a particularly enthralling perspective for traditional meat producers that are fighting against the use of this expression.



Well, certainly factory farming isn't clean... WIKIPEDIA

For this story, I interviewed several entrepreneurs and scientists active in this field. The general consensus was that, at the moment, “clean meat” is the best option available. “But probably each country will have its own expression because ‘clean meat’ doesn’t translate equally well in all languages,” remarked [Didier Toubia](#), CEO of Israeli clean steaks startup Aleph Farms.

The debate around the possible names of clean meat may sound trivial to a layman but at stake is the possibility to have a public debate in which this new product is less likely to be framed as an aberration created by some mad scientist rather than a much-needed sustainable innovation.

“Words are the most powerful tool of the human arsenal,” the Jewish tradition suggests in this regard. “Words have power, holiness, and even a life of their own,” cautions Rabbi Lazer Gurkow. The fact that Jewish teachings give such importance to the power of language is coincidental but it offers itself as a serendipitous bridge to the idea that is the core of this article: the Israeli tech ecosystem as a particularly fertile ground for the cultivation of clean meat.

In this sense, it’s difficult not to think that, in the Jewish context, the expression “clean meat” echoes the divine warnings about clean and unclean animals contained in the books of Deuteronomy and Leviticus.

The promised land for clean meat

In Israel, there are four promising startups working to create the meat of the future: [Aleph Farms](#), [SuperMeat](#), [Future Meat Technologies](#), and [BioFood Systems](#). Interestingly, they focus on four different products. Aleph Farms’ aim is to grow nothing less than a whole steak; SuperMeat wants to bring its customers lab-grown chicken, FM Technologies is developing a “distributive manufacturing” model that would allow small businesses (and ideally even individual consumers) to produce small quantities of clean meat, and BioFood Systems wants to produce beef products using bovine embryonic stem cells.

While SuperMeat’s attempt sounds like the most realistic and FM Technologies’ as potentially the most revolutionary, Aleph Farms promises to bring to your table the Holy Grill of clean meat: a perfect replica of the juicy chunk of meat you put on the BBQ.



I'm looking forward to the day when I'll be able to sink my teeth into a cruelty-free and environmentally-sustainable version of this

Clean meat startups usually focus on growing processed meat (e.g. hamburgers) rather than entire cuts (e.g. a t-bone steak) because it's quite complicated to recreate their labyrinthine structure of blood vessels. For this reason, as soon as I heard about Aleph Farms' challenge to hit the market with a fully lab-grown steak, I reached out to its CEO and co-founder Didier Toubia. A biologist and food-engineer by education, Didier Toubia worked for many years in the field of medical innovation before switching to the clean meat space.

“In my career, I always looked for ways to combine business and worthy causes,” he told me via phone, “I’m doing this also for the next generation. I’m a father of two children and I want to leave them a healthier and cleaner world.”.

It's easy to imagine that Toubia's medical background influenced his approach to clean meat sphere, conceived by him not “just as a mass of muscle cells but as a tissue with a precise structure.” Indeed, to develop its lab-grown steak, Aleph Farms acquired from the Israel Institute of Technology the rights for the use of a patented tissue, originally developed for medical applications.

“This is the first competitive advantage of the Israeli clean meat ecosystem,” highlighted Mr. Toubia, “As a country, we have a noteworthy pedigree in science and technology studies, especially in stem cells research. And this way we can leverage the know-how of the many good universities that are based here.”

I then asked him about others competitive advantages of Israeli firms in the clean meat field. He states, “in Israel, there’s the world’s largest per capita population of vegans, around five percent of the population. The average consumer is usually keen on exploring meat alternatives. This is also due to the fact that animal welfare is held in high regard by the Jewish tradition.”

Right after my discussion with Didier Toubia, I bumped into a video on the Youtube channel of SuperMeat, the Tel Aviv-based startup that aims to develop cultured chicken meat.

In the video, several rabbis discuss why we should consider clean meat “kosher”. In particular, Rabbi Shlomo Aviner argues that the essential issue is whether “we should rule according to the process” or “according to the result.” Quite convincingly, he claims that we should just look at the process (after all, that’s what the whole concept of kosher is about) and therefore conclude that lab-grown meat is clearly “parve”, neutral.

Clean meat will be kosher.



Intrigued by this video, I reached out to [Shir Friedman](#), SuperMeat's VP of marketing. "Certainly, there are also cultural reasons behind Israel's interest in clean meat. Veganism for ethical reasons is a quite popular choice here," she told me.

Also [Shaked Regev](#) agrees on this point. He's working for [The Modern Agriculture Foundation](#), an Israeli accelerator devoted to the research and promotion of cellular agriculture and he's also a PhD student in Computational and Mathematical Engineering at the University of Stanford.

"I started to be interested in clean meat around 2011, when I found out about Mark Post's attempt to create the first burger in Maastricht," Shaked Regev told me. "We were a tight-knit community of animal rights activists and we soon spotted the potential of clean meat, we realized that it could make intensive farming obsolete. For us, this was not just a side interest; in many cases – myself included – it influenced what we decided to study at university."

As for other contributing factors, Shaked Regev points to the usual suspects: "the world-class know-how in the field of stem-cell and tissue-culture research and the right mix of governmental support of technology and innovation."

The reference to the governmental support brought up in my mind that this wealth of innovation is happening within a highly controversial political backdrop.

I wasn't sure whether I should have mentioned it here. Obviously, the work in the clean meat field of these scientists, entrepreneurs, and academics has nothing to do with governmental policies and the Israeli-Palestinian conflict. However, two considerations prevailed in my judgment.

On the one hand, technological innovation doesn't spawn out of thin air; it's always entrenched into the social and political fabric. Therefore, it's relevant to keep the bigger picture in mind (i.e. the socio-economic context) every time we discuss it, not to wield it as a rhetorical weapon but just for the sake of a more complete story. On the other hand, it's also somewhat hopeful to observe that the

site of the “[world’s most intractable conflict](#)” is also one where a most pressing human challenge is being fruitfully tackled. If solved, the clean meat challenge could make the whole world a much better – clean, peaceful, livable – place.

Beyond clean meat

But what happens if clean meat turns out to be an impractical solution? Maybe the tech will never scale, the price tag will never drop substantially, and this high-tech food will remain at best a gastronomic extravaganza, a sort of new molecular cuisine.

All of this may well be true. History proliferates of examples of much-hyped technologies that never really took hold. After all, we’re still waiting to see the Virtual Reality boom happen.

Yet even the possible failure of clean meat is in itself a stride in the right direction, part of the greater debate to fix urgent problems of global hunger, animal welfare, and climate change. If clean meat is not the silver bullet that we’re hoping for, it just means that we’ll have to try different strategies. “It doesn’t matter whether a cat is black or white, as long as it catches mice,” famously stated Deng Xiaoping.

Developments in the field of plant-based meat, for example, may render superfluous our quest to grow real muscle tissues in a lab. For the layman, plant-based meat consists of vegan products that mimic the flavor, shape, and structure of real meat. One of the best examples is the [Impossible Burger](#), a vegan burger that “bleeds”. (Israel is also at the forefront of this field with larger corporations like [Soglowek](#) investing big money in the sector.)

Or maybe we could all just switch to a vegetarian lifestyle that doesn’t need meat, be it clean or plant-based. Maybe, the future of meat is that there is no future for meat.

Beyond this array of possible solutions, one thing is doubtless: we need to end intensive animal farming.

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- *Meathooked* by Marta Zaraska is an account of the "history and science of our 2.5-million-year obsession with meat"
- *Clean Meat* by Paul Shapiro is a readable and complete overview of the history of clean meat
- [Our Kinder landscape of the future of meat in Europe](#) features the biggest European players in the clean and plant-based meat spaces