

'Cultured' Food Futures? Agricultural Power, New Meat Ontologies, and Law in the Anthropocene

Kelly Struthers Montford

Toronto Metropolitan University

Abstract: Animal agriculture in the US and Canada is a colonial geography borne of imported ontologies of property, life, land, and food shaped by and reproducing agricultural power. This article primarily examines the ontologization of in-vitro meat (IVM) and, to a lesser degree, plant-based synthetic meat relative to our current food ontologies. IVM is positioned as the pragmatic solution to food-driven climate catastrophe in that it will supposedly allow consumers to eat meat without the ethical, environmental, safety, or health concerns associated with agriculturally produced meat. I show that arguments for and against new meat technologies pivot on ontological claims about its realness. Those in favour claim that 'real meat' is nothing more than a specific chemical composition that can be divorced from the animal body and current production methods. Those against IVM claim that it cannot be separated from meat as the fetishization of meat renders these technologies intelligible in the first place, and that current production methods rely on 'livestock' and the slaughterhouse. IVM then represents a modified form of agricultural power in which the point of application moves from the animal body to the animal cell, and synthetic meat is an articulable invention due to the material and symbolic place of animal flesh in colonial orderings of life. The regulation of these new meat technologies will likely continue to ontologize farmed animals as meat, thereby continuing dominant relationships between agricultural power and food law. I conclude by considering whether new meat technologies ought to be ontologized as food.

Keywords: agricultural power; invitro meat; cultured meat; synthetic meat; food ontologies; food law; cellular agriculture

Introduction

Meat eating remains a recalcitrant practice despite overwhelming evidence that animal agriculture: is a leading cause of climate change and species extinction; that it inefficiently uses natural resources, such as grain, water, and energy in the production of meat, milk, and eggs; entails exploitative and dangerous working conditions for factory-farm and slaughterhouse employees; involves the complete commodification and exploitation of the bodies of farmed animals for human ends; and, is generally detrimental to human health (Fitzgerald, Kalof, and Dietz; International Agency for Research on Cancer; Oxfam America; Pollan; Steinfeld et al.; IPCC 'Climate Change and Land'; 'Climate Change 2022'). The enormity of death due to animal agriculture requires perspective. For example, the number of nonhuman animals killed every two years is more than the amount of humans who have lived throughout history (Sebo). Meat eating is also not nutritionally necessary nor universally practiced. Instead, it is 'a diverse set of politics,' 'a signifier of power,' and a 'currency for empire' (Chatterjee and Subramaniam 1-2).

Over the past decade, new meat technologies have been increasingly researched, funded, developed, and brought to market. By new meat technologies, I refer to in-vitro meat (IVM) and plant-based synthetic meat products. While this article mainly focuses on IVM, synthetic meat is also discussed as companies and supporters of these technologies position both as 'real' meat in various registers. Researchers, animal ethicists, and biotech firms position new meat technologies as the best of both worlds in that they will allow consumers to eat meat without the ethical, environmental, safety, or health concerns associated with agriculturally produced meat. Yet both supporters and detractors of in-vitro and synthetic meats raise various arguments about the realness and authenticity of these products, which I argue are at their foundation, ontological arguments about the 'what is' of meat. Questions about the 'what is' of food shapes how we eat and how we produce dominant ontologies of humans, and of animals who become our food. Lisa Heldke has argued for a relational ontology of food in which we evaluate the sum of relations (labour conditions, environmental impact, etc.) used to produce an edible item, and then determine whether said item should be considered 'food'. In this way, she urges us to move away from a substance-based ontology of food (can it be eaten?) to a relational one (should we call this food based on its constitutive relations?). Extending Heldke's work on food ontology and following Johanna Oksala's framework for the politicization of ontology, in

which 'ontology is politics that has forgotten itself', and reality is not the discovered account of a natural state, but 'the result of social practices and struggles over truth and objectivity' (445), I consider the ontological claims that underpin and make in-vitro and synthetic meats possible. Food ontologies are then not objective accounts of reality but are contingent expressions of agricultural power that continue to shape alimentary norms and food law.

Scholars have argued that the specificity of animal agriculture requires that we begin theorizing accordingly in terms of 'agricultural power' (C. Taylor; J. Stănescu). Namely, that while existing accounts of power, such as sovereignty, discipline, pastoralism, and biopower are helpful in understanding the treatment of farmed animals and practices in animal agriculture (see further Clarke; Cole and Morgan; Coppin; Shukin; Wadiwel, 'Cows and Sovereignty'; 'Do Fish Resist?'; *The War Against Animals*; Wolfe), the specificity and means by which they are applied requires its own analytic. In taking up Chloë Taylor's and James Stănescu's call, I do not propose a universal theory of agricultural power, but argue that in the context of Canada and the United States, agricultural power works in concert with colonial power to institute ontological and material orderings of life in these settings (Struthers Montford, 'Coda'). In these contexts, the mediation of human-animal relations by property status, and the ontologization of farmed animals as 'deaded life' is fundamental to its exercise (J. Stănescu). By this, I mean that agricultural power works to de-animalize farmed animals: they are denied their animality as interdependent beings with their own interests who, like humans, develop a sense of self in relation to others around them. Instead, they are reduced to input-output machines who can be manipulated and arranged to suit the needs of the institution at hand. Even in life, they exist as the products they will become upon their death (Guenther; J. Stănescu).

Agricultural power works to instill animal agriculture as a dominant method of food production and the most frequent way that humans in urban settings interact with animals. In doing so it establishes the norm in which 'real' meat is defined as animal-based, but also *slaughter-based* despite a lack of etymological correspondence with meat signifying flesh in the English language. As feminist theorist Carol Adams reminds us, historically the word 'meat' used to refer to any food of substance, whereas now we take it to refer exclusively to animal flesh. Environmental and political philosopher Michael Marder also points to the fact that 'etymologically, *meat* is related to *meal*' and does not refer to animals nor their flesh as does *carne* in Spanish, Portuguese, and Italian, or as in the French *viande*, 'the[ir] bygone life (*la vie*)' (101).

Arguments in support of these technologies claim that 'real meat' is nothing more than a specific chemical composition (Brown; Datar et al.; Hopkins and Dacey; Schaefer and Savulescu; Sebo). Accordingly, supporters argue that IVM and synthetic meats are structural equivalents to agriculturally produced flesh. This appeal casts animal flesh as an acceptable food that we politically, economically, culturally, and individually need not abandon. Proponents of new meat technologies also claim that these are 'clean' in the sense that animal death is not required. Current IVM production methods, however, source growth serums and cells from slaughterhouses and/or living farmed animals. I argue that these new technologies represent a modified exercise of agricultural power: cellular agricultural power. This technology of power targets farmed animals at the level of the cell rather than the body, representing agricultural power's further refinement rather than its true alternative. IVM is then better understood as a response to the over-application of agricultural power (C. Taylor) that preserves dominant ontologies of the human, the animal, and of food as animal-based. The article then considers the relationship between agricultural power and law, namely how new meat technologies might be regulated using existing legal frameworks and will prevent the culturing of human cells for meat. I then consider whether new meat ontologies ought to be ontologized as food.

Meat-eating, Humanism, and the Subject

To eat 'meat' in settler colonial contexts is to perform and reproduce western colonial humanism. During the late 19th and early 20th centuries, animal agriculture was a direct and primary mode of settler land acquisition and transformation in the United States and Canada. Farmed animals from Europe were introduced so that settlers could acquire land and remake the new world in the image of the old (Anderson). This also functioned to institute a humanist politics of life wherein animals are transformed into property and ontologized as deadened life (Struthers Montford and Taylor). These colonial projects have necessitated access not only to resources, but on Indigenous lands that constitute the Americas, have attempted to impose, and replace an Indigenous metaphysics of interrelatedness wherein humans and animals are not only of and part of the land but are dependent upon and responsible to one another (Struthers Montford and Taylor). While humans and animals – terms that are inherently colonial and not resonant with Indigenous ontologies of life – are edible in the sense that they can provide

nourishment when consumed, they are not 'meat' in the sense of being reduced to deaded life who exist in life as only the products they will become upon their death (Anderson; Plumwood, 'Integrating Ethical Frameworks for Animals, Humans, and Nature'; J. Stănescu). To be 'meat' is to then not be kin or one's sibling, but to be reduced in life to input-output machines and dismembered body parts who are exchanged on the market for capital accumulation (Plumwood, 'Integrating Ethical Frameworks for Animals, Humans, and Nature'; Robinson).

For Derrida (*The Animal That Therefore I Am*), the intensification of animal agriculture to its industrial form, and the intensified manipulation of animals it entails, represents an undeniable shift in human-animal relations that requires sustained analysis. It is not only that humans transform animals by means of various technological interventions, but that this subjugation produces and relates to a specific iteration of the human. The explicit violence inherent in animal agriculture, for Derrida, is foundational to the western ontologization of the human. In other words, it is through our participation in the carnophallogocentric economy of animal sacrifice that we come to define ourselves as human. Pre-dating Derrida, feminist scholars, largely within the field of ecofeminism, theorized common links between the subjugation of women and animals in patriarchal distributions of power (see for example Adams; Fraiman; Gaard; Grimshaw; Harding and Hintikka; Lange and Clark; Lloyd; Okin). Philosophers have also long argued that the human, and consequently 'the subject', is conceptualized in the Western philosophical tradition as an autonomous male of European descent who is more sovereign than others (see also Cuomo; Derrida, *Points . . .*; Derrida, *The Animal That Therefore I Am*; Donovan and Adams; Plumwood, 'Nature, Self, and Gender'; Plumwood, *Feminism and the Mastery of Nature*; Plumwood, *Environmental Culture*; Warren). This iteration of the human is of one who has developed farthest from the animal. He is a subject and not an object. He is not emotional, nor is he determined by his body. The human is not dependent on others for assistance nor is he disabled (see also Adams and Gruen; Mallory; Hall; S. Taylor). The western subject is therefore the antithesis of the forms of subjectivity outlined by an Indigenous metaphysics of interrelatedness (TallBear, *An Indigenous Approach to Critical Animal Studies*; 'Beyond the Life/Not-Life Binary'; Coulthard).

For Adams, the male subject is formed *via* the consumption of women and of animals; both groups subject to violence and symbolically or materially edible. Derrida argues that the consumption of meat indexes a patriarchal subjectivity formed through the exercise of

sovereignty over human and animal others, and that this subjectivity is denied to vegetarian men who do not participate in the economy of animal sacrifice. Within a framework of western humanism, to eat flesh is to directly assert one's superiority over the animal consumed. The act of eating requires the symbolic and material destruction of the animal in question and is a distinctly political act as the consumption of flesh is not natural or necessary, but deeply related to the intelligibility of the human subject (Derrida, *Points . . .*; Wolfe). As Nick Fiddes argues, meat is accorded its social and symbolic value *because* of the domination over the nonhuman required for its consumption. Jovian Parry posits that 'historically it is precisely this intentional infliction of suffering . . . which has in part made meat so desirable' (246). The human subject in western settings is then produced in relation to the consumption and disavowal of the animal. Agricultural power is a dominant means by which a colonial politics of life is structured, and its prominence necessitates various responses and corrections. IVM and synthetic meats, I suggest, emerge as a response to the over-application of agricultural power to the extent that animal agriculture is a leading cause of animal suffering, climate change, frequently results in the transmission of zoonotic diseases, and provides the conditions in which pandemics are generated. New meat technologies are then 'solutions' meant to abate the problems of agricultural power.

Cultured Meat and Pragmatism: Environment, Ethics, and Food Safety

In-vitro meat (IVM) refers to tissue that has been produced by culturing the cells of animals. For this reason, it is also referred to as 'cultured meat' or 'cellular meat'. The IVM process places cells in a growth medium (typically bovine foetal serum, though plant-based alternatives such as blue-green algae and mushroom extract have also been used) (McHugh; Stephens, 'Growing Meat in Laboratories'). The cells then grow in a bioreactor on scaffolds and can be formed into either soft or firm tissue, depending on the method used. When the flesh reaches an appropriate size, it is removed from the bioreactor, and can be seasoned and cooked as is (requires rigid tissues), or combined with other items such as bread and eggs and made into burgers (usually soft tissues) (Zuhaib Fayaz Bhat et al.; Datar et al.; Hopkins and Dacey; Jha; McHugh; *The Future of Meat by Co-Founder of Memphis Meats*; Stephens, 'Growing Meat in Laboratories'; Wolfe).

While researchers in both the university and the private sector are working to get their specific

IVM product (and unique process) to market,ⁱ what is relevant to the discussion here is that ultimately these technologies aim to produce meat in a lab and, in so doing, remove the animal body from the process. The flesh is produced without having been a body part of the animal whose host cells were used, and so does not require that animals be born and raised in animal agriculture, transported, or slaughtered for their flesh. The tissue also does not have veins, vessels, or contain blood (Datar et al.; Jha; Stephens, 'Growing Meat in Laboratories'; Wolfe). As sociologist and critical animal studies scholar Neil Stephens writes, 'With IVM, there is no whole animal to subdivide in this traditional sense; instead, the tissue is grown from cells. Birth, growth, and death appear in quite different forms to any farming method that has hitherto been used' ('Growing Meat in Laboratories' 161). IVM therefore troubles prevailing ontologies of meat, dominant modes of food production, and the politics of life related to alimentary norms.

Emancipatory Promises

Animal ethicists, animal rights organizations, researchers, and private industry promote IVM as a pragmatic solution to: animal suffering; anthropogenic climate change; predicted food shortages related to the limits of our current agricultural systems; food safety concerns, such as E.coli, listeria; as well as to local and global zoonotic diseases, such as bovine spongiform encephalopathy, swine flu (H1N1), and avian flu (H5N1) (Bhat et al.; *The Future of Meat*; Schaefer and Savulescu; Sebo). Philosophers and bioethicists G. Owen Schaefer and Julian Savulescu contend that 'the reduction in animal suffering is perhaps the most morally salient reason to support research into and production of IVM' (190). In so doing, they position IVM as a technology that should be supported by those advocating on behalf of animals.

IVM would be made in a controlled laboratory setting, making the chance of zoonotic disease transmission less likely. The chance of E. coli and other bacterial contaminants is significantly lower than with agriculturally produced meat. This is because IVM does away with the necessity of slaughtering, where faecal matter from the bowels of slaughtered animals often comes in contact with the flesh that will be sold for meat (*The Future of Meat*; Schaefer and Savulescu). Furthermore, because cultured meat is never attached to an animal body, herds of animals would not need to be kept and fed until they were killed for their flesh. In this sense, land used for grazing (26% of the world's land), and feed crops (33% of the world's arable

land), could be returned to a forested state – a state that would decrease Green House Gases in the atmosphere, as well as increase biodiversity and improve the well-being of wildlife whose habits have been destroyed for meat production (see Clare; Schaefer and Savulescu; Steinfeld et al.). Estimates of resource consumption and emissions are mobilized to position IVM as a superior mode of meat production compared to agriculture. For example, Upside Foods (formerly Memphis Meats), a cultured meat startup dubbed by *Fortune Magazine* as ‘the hottest tech in Silicon Valley’ (Zaleski) claims that their IVM process results in 78-96% fewer greenhouse gas emissions than agriculturally-produced meat, as well as uses 99% less land used, and requires 82-96% less water than meat grown from animals (*The Future of Meat*). These statistics are similar to those reported by others (Zuhaib Fayaz Bhat et al.). However, as Vasile Stănescu points out, these claims often refer to the findings of one industry-commissioned study performed by an Oxford graduate student, which in part due to the status of the University of Oxford, have been uncritically recited despite a lack of confirming peer-reviewed evidence (V. Stănescu, *A Bull Market*).

Overall, IVM is being lauded as a ‘clean’ (Valeti) and practical solution to the fact that humans, for the most part, remain recalcitrant meat-eaters despite the industry’s role in human and animal exploitation, ecological devastation, and increasing (and widely disseminated) evidence that meat consumption is linked to negative health effects such as stomach and colorectal cancers (Hopkins and Dacey; International Agency for Research on Cancer; Schaefer and Savulescu; Sebo). This recalcitrance is evident not only in the eating habits of individuals but within societies that remain economically and socially invested in ontologizing animals as meat. This remains the case despite warnings from government-appointed scientists about animal agriculture causing ecological collapse, and subsequent recommendations that nation states should shift food production and the diets of their citizens from animal-based to plant-based (Hamblin; Steinfeld et al.; IPCC, ‘Climate Change and Land’; ‘Climate Change 2022’). Those in favour of IVM take the position that if humans refuse to stop eating meat, the logical response is to make meat in a way to mitigate these harms while having an identical end product (Hopkins and Dacey; *The Future of Meat*; Schaefer and Savulescu; Sebo).

Philosopher and animal ethicist Jeff Sebo proposes strategies to support the implementation and adoption of IVM and plant-based meats. Given that meat consumption continues to increase (due in part to the imperialist export of western dietary norms, farmed

animals, and crops to developing nations), Sebo suggests that animal and food advocates focus not on whether IVM is technically an animal-based product, but instead on how the item was produced. He proposes that 'plant-based meat and cultured meat seem to be exactly the kind of alternative that the world needs in order to move away from, rather than further towards, dependence on animal agriculture' (166). For Sebo, the currently available plant-based meats, milks, eggs, mayonnaise, and butters, for example, have been able to 'play a similar functional role in certain social contexts, but everybody knew which was which for the most part' (156). New technologies however, which replicate the chemical structure of animal-based meats, could lead to the collapsing of the distinctions between real and fake, and over time, replace agriculturally produced flesh products. Indeed, given consumer opinion research on the meat-substitutes, meat-eaters reported that it was not because of a lack of ethical or health-related arguments that they did not consume plant-based meats, but because the products did not provide the same sensory experience in terms of looking, tasting, and feeling like animal-based meat (Hoek et al.). We might say that taste then, plays a role in distinguishing 'real' from 'fake' foods. For these reasons, Schaefer and Savulescu argue that IVM will be a useful product for persons not motivated by ethics, but by taste, touch, and feel. It is therefore unsurprising that IVM researchers and supporters (Datar et al.; Hopkins and Dacey; Schaefer and Savulescu; Stephens, 'Growing Meat in Laboratories') argue that IVM is a structural replica of agriculturally-produced meat, and, because of this, is 'real meat'.

The Best of Both Worlds? Substance-Based Solutions to Relational Problems

The promises of IVM pivot on claims about its authenticity and its being a solution to the problems associated with industrial animal agriculture. In some senses, proponents have taken a relational ontology of food to identify a need for IVM (harms to the environment, humans, and animals), and invoked a substance-based ontology (meat is just tissue and therefore IVM is real meat), to have food practices that are more ethical. Arguments in favour of IVM and its widespread adoption centre on its authenticity. In so doing, these authors also produce ontological accounts about the 'what is' of agriculturally-produced meat, while simultaneously revealing meat to be a negotiated and contingent object (Zuhaib Fayaz Bhat et al.; Datar et al.; Hopkins and Dacey; Jha; McHugh; *The Future of Meat*; Stephens, 'Growing Meat in

Laboratories'; Wolfe). Schafer and Savulescu, for example, argue that IVM 'can provide a rough cellular facsimile of real meat' (191). The producers of Upside Foods argue that their products are 'molecularly identical' to flesh taken from living animals (*The Future of Meat*) and that 'our chicken looks, cooks, and tastes like chicken because it is real chicken' (Upside Foods). In this sense, in terms of its properties, IVM is identical to agriculturally produced meat, and therefore is meat. Detractors however, have characterized IVM as fake, unnatural, as having unknown effects and therefore as risky, as 'franken' food, and as 'phreaked' food (Zuhaib Fayaz Bhat et al.; Hopkins and Dacey; McHugh; Parry; Stephens, 'Invitro Meat is a Promise'). These sentiments raise ontological questions as to whether 'meat' is merely a substance, or whether it is a substance that is produced in a specific way, in this case, via animal agriculture.

IVM is ontologized as 'real meat' in opposition to plant-based meats. Schaefer and Savulescu differentiate IVM as 'more or less identical to regular meat at a cellular level, unlike meat-substitutes made from tofu, beans, mushrooms, etc' (188). Philosophers specializing in applied ethics argue that IVM must not be considered:

as meat substitutes, or 'artificial' meat, or meat-like substances that are conglomerations of soy products and gelatins – not even meat substitutes that taste and have textures exactly like real meat. We are talking about the possibility of real, genuine meat – genuine animal tissue – that is animal-friendly in the sense that it requires no animal suffering and no animal death to produce. (Hopkins and Dacey 582)

Here, plant-based meats are positioned as fake substitutes whereas IVM is positioned as real because it is comprised of animal tissue. In doing so, animal-based products are reproduced as normative and the standard from which other products should be measured. IVM then stands as a way to have it all, 'eat meat and not harm animals' (Hopkins and Dacey 579). Following this logic, the problem is not animal-based diets, but *how* these diets are currently produced: industrial animal agriculture.

Whereas vegetarians and vegans might be opposed to IVM because it is animal-based and therefore *too real*, carnists might index IVM as artificial (Hopkins and Dacey). This tension raises questions as to whether 'meat' is merely an animal-based substance alone, or a substance that is not only animal-based but premised on animal harm and death. Schaefer and Savulescu

note that despite the potential for IVM to become 'wildly popular ... some consumers will prefer authentic, 'real' meat, *raised* in a traditional manner' (195, emphasis added). Cary Wolfe argues that since IVM is not premised on relations of humanism, cultured tissue would not be ontologized as meat as it is not 'life' and therefore does not entail the death of the animal and therefore the performance of patriarchal sovereignty tied to its production. He asks: 'Does sacrifice make meat taste better? Indeed, is it what makes meat "meat"?' (Wolfe 97). What these authors point to is the fact that dominant ontologies of meat are not substance-based but relational. Put another way, meat is only meat if an animal life has been taken to fulfill human ends.

Hopkins and Dacey, however, argue that meat is merely animal flesh, and in this sense, how it was produced should be irrelevant to its authenticity. They assert that to position IVM as fake is a:

conceptual mistake... What makes meat 'real' is its constituent substance, not its mode of production. On every physical level, successfully cultured meat would be real meat – real muscle tissue, real protein, real flesh ... a case of real meat that is produced in a medium other than a living animal. It is as real as it can be. (586)

In this regard, Hopkins and Dacey use the same substance-based logic as do the vegetarians above but arrive at a different conclusion. For Hopkins and Dacey, animal tissue is meat, regardless of how it is produced, and consequently meat is food. For those who argue that animals are not meat, nor are they food, IVM, regardless of how it is produced, is animal flesh, and therefore would not be food.

Synthetic meats made to resemble animal flesh chemically and structurally, but made wholly from plants, further troubles substance and animal-based ontologies of meat. Ethan Brown, CEO of Beyond Meat,ⁱⁱ argues that meat is merely a specific chemical chain that can be replicated using plants. Brown defines meat in two ways that are not mutually exclusive, as 'something that comes from a chicken, cow, pig and other animals' and as 'amino acids, lipids, water and a trace amount of minerals and carbohydrates organized in a particular architecture' (3). Meat derived from animals, for Brown, 'presents you with an ever-worsening set of problems (from human health to climate) that must be solved' (4). However, to ontologize meat as nothing more than a specific chemical architecture, for Brown, also allows humans to

eat meat without any of the associated problems. According to this scheme, Brown 'envisions a world where meat consumption – meat made directly from plants – increases and we are all the better for it' (4). In this way, Brown positions plants as 'meat' since they can be assembled to be structurally equivalent to meat, and he does so without positioning animals as food. In effect, Brown de-ontologizes animals as meat. By asking us to focus on 'what it *is* versus where it has historically come from', he ontologizes meat as 'core parts, architecture, chemistry' (Brown 4, emphasis in original). Despite his point that meat need not be animal-based, Brown's reasoning does not escape the throes of agricultural power as his products continue to uphold animal flesh as the norm from which his plant-based meat is designed. For Brown, like IVM proponents, it is not the consumption of animal flesh, nor its relationship to human supremacy that is at issue. In fact, he credits animal flesh with the evolutionary development of the human. Instead, the problem is *industrial* animal agriculture in its modern form, and his products, which provide alternative modes of meat production, are a solution. Like IVM supporters, Brown puts forth a substance-based ontology of meat as a remedy to the relational problems present in large scale animal agriculture, and the associated meat it produces.

New Animal Subjects? Cellular Domestication and Infinite 'Meat'

Those working in the field of cultured meat, eggs, and milk have referred to this technology as 'cellular agriculture'. Those behind the cultured food research institute, New Harvest, have defined cellular agriculture as:

The production of agricultural products from cell cultures. Cellular products are made of living or once-living cells. Products harvested from cell cultures are exactly the same as those harvested from an animal or a plant; the only difference is how they are made. (Datar et al. 128)

This concept represents both a continuity of product and a departure from its mode of production. In this sense, the position of animal products and their ontologization as not only food, but as *real food* is reinforced. Upside Foods, who rely on stem cell methods to grow cultured meat in the form of meatballs, chicken breasts, and duck breasts, for example, refer to their work as 'the second domestication'. Co-founder and CEO, Uma Valeti states that while

the first domestication (of animals) began 10,000 – 20,000 years ago, cultured meat represents the domestication of animal cells 'to farm meat directly' (as cited in Addady). However, while companies position their approaches as progressive alternatives, they should instead be understood as existing on a continuum of carnophallogocentrism and directly reliant on animal agriculture. If animals in agriculture are positioned as living flesh, I argue that animals used in cellular agriculture are positioned as living cells. In both instances, they ultimately remain de-animalized life forms manipulated for human ends.ⁱⁱⁱ

IVM remains materially tied to animal agriculture in such a way that individual animals 'will almost inevitably, continue to be instrumentalized in the process of making IVM a viable product' (Cole and Morgan 212). At its core, cultured meat would require biopsied cells from living or slaughtered animals to begin the IVM process, even if these could become self-replicating (Zuhaib F. Bhat et al.). Self-replicating input cells would require stem cells. To date, the most common form of IVM production used by startups takes stem cells from living animals, with variations for the types of products being cultured. For example, cells are taken from mammary glands to make cellular milk, and from ducks' livers to produce foie gras. Depending on the product being cultured however, some cells are taken from recently slaughtered animals to ensure religious compliance, such as Halal or Kosher products (Good Food Institute). Cultured meat producers, such as Upside Foods state that their 'ultimate goals [is to] remov[e] the animal from our meat production process entirely'. They currently take biopsies from living animals, and take cell samples from eggs, fish, and recently slaughtered animals – all from those produced by the food system. BlueNalu – a cellular 'aquaculture' startup – currently uses cells from farmed and free-living fish (BlueNalu).

In the case of cells obtained through biopsies, the animals need not die, but nothing about this practice is counter to the logics of property and domination that structures animal agriculture and animals cannot consent to this procedure. In fact, the Good Food Institute (GFI) is clear that this would still require farmed animals to live in captivity, just on a smaller scale, 'cultivating meat ... does not require many animals to live in close confinement' (GFI). The drawback to biopsied source cells, according to a participant in Stephens' study, is that the cells can only be cultured for two months, and therefore require ongoing biopsies from living animals. Consequently, this participant stated his preference for culturing embryonic stem cells. While the embryo from a pig or cow would be killed in the process the participant understood

this as 'ethically preferable ... because the destruction of one embryo can result in a cell line that can be cultured indefinitely, implying the potential production of infinite muscle tissue and infinite meat' (as cited in Stephens, 'Growing Meat in Laboratories' 168). In some cases, producers justify cell extraction based on other humanist practices such as pet keeping. For example, a participant in Stephens' study speculated that IVM production that used umbilical cords from ten female pigs per year could 'feed the world' (169) and that these pigs could be treated 'as queens... There's no slaughtering... As long as they [animal welfare people] accept that we keep dogs, they will accept that we keep pigs and just take care of the umbilical cord, which you throw out anyway' (as cited in Stephens, 'Growing Meat in Laboratories' 169). While this scenario is certainly preferable to other production methods that require the purchase of animal tissues, cells, and serums made available through animal agriculture, it is unclear as to whether these animals remain the legal property of someone else, whether these pigs would be forcefully impregnated, and whether they would be able to care for their piglets indefinitely. The fate of the piglets also remains unclear.

Even if forms of direct animal exploitation can be designed out of IVM production, sociologists Matthew Cole and Karen Morgan argue that this technology will always have been made possible because of its 'connection to the farm and slaughterhouse' (211). For example, the growth medium most used to incubate the cells is bovine foetal serum. Bovine foetal serum (BFS) is produced by taking blood from a foetal calf when the cow is discovered to be pregnant during her slaughter. Both cow and foetus die, one for their flesh, the other for their blood. The foetal blood is then processed in a lab and sold as BFS. While researchers promise alternative plant-based growth mediums (i.e., blue-green algae) and some have been used successfully (i.e., mushroom-based mediums), BFS remains the predominant growth medium used by IVM developers (McHugh; Stephens, 'Growing Meat in Laboratories'). A Just Inc engineer, who is attempting to develop a plant-based growth medium, describes BFS as a 'huge obstacle to scaling up production. Its usually used in medical research – and its expensive and controversial', with the result that the cellular based meats currently being developed are not slaughter-free (Thompson et al.). So, while the *promises* of IVM are positioned as a solution to industrial animal agriculture, IVM, at least as it is currently practiced, remains reliant on animal agriculture (Cole and Morgan). IVM is agricultural power, expressed differently.

Stephens writes that inasmuch as IVM production is premised on harnessing the power of animal cells, a different animal subject emerges, 'the *cell source animal*: a new, IVM-specific moral entity that IVM proponents seek to demonstrate care and responsibility toward' ('Growing Meat in Laboratories' 167). If animal agriculture pivots on the deaded life of farmed animals, then cellular agriculture will itself produce an account of animality consistent to its ends. Hopkins and Dacey write that 'in using in vitro meat one would not be instrumentalizing an animal but rather would be instrumentalizing cells and tissues' (593). They further state that the cell can be divorced from concerns over the treatment of animals provided the cells are extracted humanely and painlessly. They reject the claim that animals are ontologized as an amalgamation of cells under this production method:

Extracting cells from an animal does not imply that one sees it only as a cell source – in fact the very motivation behind much of in vitro meat research is generated by seeing animals as worthy of much more regard than merely being food sources.
(Hopkins and Dacey 594)

Farmers often employ similar narratives of respectful use and even of love toward farmed animals to explain the often-deplorable agricultural practices in which they participate (see V. Stănescu, 'Why "Loving" Animals Is Not Enough'). In the instance of cell-source animals, it could be possible for researchers on an interpersonal level to see them as more than cells, and farmers might very well see their animals as more than meat. Yet this has little meaning or political significance for the animals themselves who remain the legal property of these humans, and who remain subject to the whims of the industry in which they are incarcerated.

Hopkins and Dacey's position, however aspirational, is only articulable given the broader context in which animals are legal property and therefore suitable cell donors in the first place. In fact, they are critical of those who focus on the cells as deserving of ethical regard as 'stretch[ing] the limits of respect to fetishistic standards' (Hopkins and Dacey 593). This is a reductive approach that functionally abstracts animals from their cells. I instead argue, that farmed animal cells used in IVM cannot be divorced from the institution of animal agriculture, its legacy, and its role in the organization of contemporary social life. Because Hopkins and Dacey abstract animal cells from animal bodies, they are further able to parse the tissue as 'real meat but not a real animal part' (594). They write: 'meat has no claim on moral regard for

itself, and in vitro meat is not connected to any whole animal that does have a claim for moral regard in any morally prohibitive way' (Hopkins and Dacey 594). According to this logic, IVM becomes a substance divorced from the relations in which it was produced and the bodies from which it emerged, and thus requires no ethical evaluation.

Researchers, institutes, and biotech startups claim that IVM would require far fewer animals than the meat industry's current annual death rate of 60 billion animals (Datar et al.; Hopkins and Dacey; Schaefer and Savulescu; Sebo; Stephens, 'Growing Meat in Laboratories', 'Invitro Meat is a Promise'; Valeti). IVM therefore makes sense from the perspective of utilitarian animal ethics; and ethical objections, if any, are either minimized or promised-away by hope in future technological developments. A biopolitical frame, however, troubles the certainty of such claims. Cary Wolfe argues that in IVM we can recognize 'a more and more finely tuned control over life and 'making live' at the most capillary levels of social existence' (97). While Wolfe does not connect these ethical violations to the material use of farmed animals in IVM processes, his issue is with the logic and premise of the substance alone. In this sense, regardless of whether the growth mediums of cultured meat become exclusively plant-based, or the animals are treated well according to humane standards, the practices represent the intensification of control over life at the level of the cell and of the tissue. Consequently, Wolfe does not position animal agriculture and cellular agriculture as opposed but as institutions structured by a similar logic. Animal studies scholar John Miller writes that the perspective that widespread vegetarianism is impossible, and therefore IVM is our only viable solution, is not an alternative to 'the violent subjection of nonhuman animals within industrial capitalist cultures, but rather as a further symptom of the remarkable extent of this violence' (45). From this perspective, the promises of IVM are thrown into question, and ethical questions are raised: 'it would seem continuous with the practices of domestication, manipulation, and control of life that characterize the factory farms to which, from an animal rights point of view, it seems opposed' (Wolfe 97). I would add that not only are these institutions structurally similar, but they are different expressions of the same human and food ontologies. Both are expressions of agricultural power that rely on the de-animalization of animals, and the sovereignty of the human subject to direct natural 'resources' to specific ends.

Technological Promises, Human Actors

IVM is inextricably linked to technological promises that make sense when the identified problems are the excesses and inefficiencies of animal agriculture. In their support of IVM, Hopkins and Dacey state that 'technology can allow us to change the physical constraints of the world so that we can better avoid the bad and pursue the good' (585). In this sense, the dualisms of culture/nature and human/animal are maintained with the human positioned as the rational master of the natural world. Animals remain in the realm of nature as cell donors, whose cellular power is harnessed by humans to sustain dominant alimentary norms. A large-scale shift to IVM could also have important and beneficial material outcomes for animals and for those currently employed by the meat industry. As Cole and Morgan argue:

The IVM scientist potentially liberates not only non-human animals from the destiny of the factory farm or slaughterhouse, but also the factory farmer and the slaughterer from their violent occupations; the technician of the sterile IVM factory is a very different figure from the bloodied sticker of the killing floor. (210)

A possible implication of such an understanding is that humans, but most notably scientists, are positioned as the saviours of animals, marginalized humans relegated to abattoir industries, and the natural world by very way of manufacturing IVM – a technology itself developed in response to overapplication of agricultural power.

Cole and Morgan question why IVM is being heralded as the only pragmatic way to direct human consumption in a sustainable and ethical manner when plant-based diets are inexpensive, largely accessible in urban settings and easier to implement than lab grown meat, healthy, and have low ecological ramifications. While a shift to plant-based diets is easier from a pragmatic standpoint, they are not hegemonic in the sense of being associated with colonial whiteness (see Robinson) and are therefore taken to be unrealistic in comparison to in-vitro flesh. IVM technology is positioned as a more realistic option in the sense that it is consistent with ontologies of the human as dominant over nature and its resources. Insofar as its proponents emphasize that it is a structural copy of agriculturally produced flesh, IVM 'reproduces the cultural visibility of meat, and thereby reproduces the already existing hierarchy of food in Western diets' (Cole and Morgan 212). Animals therefore remain a means to human ends, regardless of whether it is their flesh and/or cells that are targeted by agricultural power.

Cellular Agriculture and the Potentiality of Humans as Food

IVM's inception and current technological processes remain firmly rooted in the economy of sacrifice and slaughter. Its technological promises, however, can recalibrate dominant ontologies of the human and of food as it collapses human-animal difference in terms of who *can* be produced as food. For anthropologists Simone Dennis and Alison Witchard, IVM opens possibilities for a cell source body to be *any body*, including that of humans. Dennis and Witchard argue that 'the possibility of in-vitro meat that uses human cellular inputs means that human domination dissolves into a future that we cannot visualize, since that future is no longer premised on the domination of nature and animals' (152). In this way, these authors, like Plumwood ('Integrating Ethical Frameworks for Animals, Humans, and Nature'; Plumwood, 'Tasteless'), position the status of humans as food as a powerful way to resist human exceptionalism through eating. It is this very potentiality – that IVM could also mass produce humans as food – that also sparks resistance to IVM (Dennis and Witchard; Hopkins and Dacey; Schaefer and Savulescu).

To acknowledge human cells as *food*, presents us with 'an unthinkable world' (Dennis and Witchard 160) where our place above nature and above animals is blatantly exposed as artificial. Arguments against IVM position it as unsafe, unnatural, and as providing an easy way to practice cannibalism (see further Dennis and Witchard; Hopkins and Dacey; Schaefer and Savulescu). Leaving aside the widespread colonialist and orientalist construction of cannibalism as barbaric and practiced by lesser (i.e., non-western) humans, the fact that detractors can imagine human tissue only as food for other humans, and not for other animals, shows how moments of anthropocentric uncertainty are turned to reproduce the very power relations in question. Furthermore, while IVM technology can theoretically produce human meat, I next examine how law will regulate IVM, and how this will contest and/or reproduce legal ontologies of animals and of cellular life as the private property of humans, researchers, and patent-holders, all the while excluding humans from the realm of food.

Speculative Regulations: Legal Ontologies, Food Technologies

While IVM and synthetic meat producers and supporters mobilize substance-based ontologies of meat, agribusiness lobbyists and groups are seeking to enshrine the production method as constitutive of 'meat' in law. For example, in 2018, the US Cattlemen's Association petitioned the US Department of Agriculture (USDA) to only allow products from animals who had been raised and slaughtered to be called 'meat'. They did so to prevent synthetic meat products such as Beyond Meat that are currently on the market, as well as the impending cultured meat products, from being labelled as such. The USDA denied the petition in 2021, with part of its reasoning being that non-animal derived products – in this case synthetic meat – are outside of its jurisdiction (Food and Drug Law at Keller and Heckman). In the Fall of 2021, the USDA invited comments as to the labelling of meat produced using cellular agriculture, the results of which have not been published at the time of writing (Food Safety and Inspection Service). At the state level, meat lobbies have been successful in achieving legal changes around what can be labelled as meat. The *Oklahoma Meat Consumer Protection Act*, for example, was introduced in partnership with the Oklahoma Cattlemen's Association and guided through the legislature by one of their ranchers who is also a State Representative, Toni Hasenbeck. The Act came into effect in November of 2020 and makes it so that only livestock derived animal meats can be labelled as such. To avoid charges of misrepresentation plant-based meat product labels must declare this in equal size graphics as the products' name. Challenges to this law as infringements to free speech have been unsuccessful (Plant Based Foods Association).

In December of 2020, Singapore was the first jurisdiction to approve the sale of cellular meat, specifically of Eat Just's lab grown chicken (Lucas). This regulatory approval was granted following more than three years of consultation and advocacy by Eat Just and non-governmental organizations seeking to bring cellular agriculture products to market, in which the safety of chicken flesh had to be proven using Singapore's regulatory frameworks for novel foods and that Eat Just had a consistent production process. Furthermore, the regulatory approval of the cell-cultured chicken depended on its consistency with the legal norm: farmed chicken, in which it needed to be as safe and of similar nutritional quality. This approval confirms earlier predictions for the regulation of cellular agriculture. In her work on food regulation in the context of the European Union, Ludivine Petetin predicted that despite representing a new food technology,

IVM would likely be regulated using existing legal frameworks pertaining to 'novel foods'. As such, she suggested that IVM would 'inherit the regulation of a previous innovation' (Petetin, 179) rather than being governed by legislation specific to this technology. Petetin's prediction has been borne out in the context of Singapore.

In Canada, cellular agriculture will likely be regulated under existing legislation as a 'novel food' (Suresh) because of the Canadian Food Inspection Agency's (CFIA) definition of 'meat' and 'poultry'. Specifically, the CFIA requires that only products comprising 'more than 2% poultry or meat' be labeled as beef, bison, veal, chicken, turkey, and the like (qtd. in Suresh, 18). It further stipulates that meat is 'the edible part of a carcass' (qtd. in Suresh, 19). However, in a position paper published by the Canadian Agri-Food Policy Institute, a self-described 'open think network for the agri-food sector' and 'the place for agri-food leaders to come together' (CAPI), they postulate that because of this legal definition, cultured meat products will be regulated under existing legislation as a 'novel food' as these might not qualify as 'meat'. They make this prediction based on one research source published in 2010 that states that in-vitro meat would be made up of less than 2% of *original* animal cells and therefore might not qualify as 'meat' and because the resulting food product does not come from a carcass. The CFIA's definition of meat does not consider origin cells versus replicating cells, nor whether replicating cells from a farmed animal still constitute meat, especially if the end substance is chemically identical. Their legal definition does however, set out that the threshold for 'meat' requires the life and death of the 'food animal' in question (see Suresh).

As per Division B.28.001 of the *Food and Drugs Act of Canada*, a novel food is a, 'a) substance, including a microorganism, that does not have a history of safe use as a food; b) a food that has been manufactured, prepared, preserved or packaged by a process that (i) has not been previously applied to that food, and (ii) causes the food to undergo a major change; and c) a food that is derived from a plant, animal or microorganism that has been genetically modified ... that were not previously observed in that plant, animal or microorganism,' or 'the plant, animal or microorganism no longer exhibits characteristics that were previously observed' or 'one or more characteristics of the plant, animal or microorganism no longer fall within the anticipated range' (Canada). It is unlikely that IVM would be considered a major change to the food. Proponents base the entire *raison d'être* of the product on its substantive equivalence, and any genetic modifications would be pre-existing as these would likely be from the original cell

source animal that agricultural scientists have been long genetically modifying to yield higher flesh and fat contents over shorter periods of time, for example. Based on extant research, it is also the case that cell source animals would not be genetically altered because of IVM production, and the resulting flesh product would likely fall within the same ranges as their slaughter-based counterparts (Suresh). It is therefore likely that cultured meat would be considered novel in terms of its manufacturing and production process that 'has not been previously applied to that food'. In terms of the safety assessment procedures for novel foods, the principle of 'substantial equivalence' is central. This principle means that if the product is found to be 'substantially equivalent to an existing food or food component, it can be treated in the same manner with respect to safety' (Schauzu 2). The safety assessment of novel foods does not lead to novel innovation nor the departure from dominant food ontologies. Instead, it uses normative foods as the basis against which new foods are measured. In this sense, farmed animals are re-ontologized as food and humans remain excluded from legal edibility.

The United States, while yet to approve cultured meat products, is likely to draw on its existing frameworks for regulating farmed 'meat' animals and for meat itself. In 2019, the US Food and Drug Administration (FDA) and the United States Department of Agriculture (USDA) released their plan for a joint regulatory framework for cellularly-produced foods destined for *human* consumption. This framework remains tentative and is not yet enforceable. Put simply, existing jurisdictional oversight would be extended to certain aspects of cellular agriculture and is separated based on whether the source animal is alive or 'processed'. The FDA would be solely responsible for cellularly-produced foods that will be consumed by *non-human animals* or that use cells from animals not currently regulated as 'meat'. The FDA's jurisdiction applies to all 'food' animals when they are alive. Jurisdiction for these animals and the locations they are held in, transitions to the USDA at the stages of slaughter, dismemberment, packing, and labelling stages under the Federal Meat Inspection Act (FMIA) and/or the Poultry Products Inspection Act (PPIA). The proposed regulatory framework clearly maintains the human-animal boundary around who can, or whose cells, can legally become food. For example, the joint agreement outlines 'that each Party has an important role in the oversight of *human* food, derived from cell lines of *USDA-amenable species* and required to bear a USDA mark of inspection' (FDA & USDA emphasis added, 1). Specific to cellular agriculture, the delineation of responsibilities would include that the FDA would monitor the cell collection from animals,

establishment of cell banks, and inspect the manufacturing, proliferation, and splitting of cells. When cells mature to the point of 'harvesting', the FDA would transfer responsibility to the USDA, and provide relevant information as to 'whether harvested cells are eligible to be processed into meat or poultry products that bear the USDA mark of inspection' (2). The USDA would also be responsible for inspecting locations where the cells are 'harvested, processed, packaged or labeled' and confirming that the 'resulting products are safe, unadulterated, wholesome and properly labeled' (2). At no point does the proposed framework contemplate the harvesting of human cells for human and/or animal consumption. It is also clear that live farmed animals are the intended cell source, and that the proposed framework assumes this will be the case in an ongoing manner. For example, there is no deadline stipulated in which cells used in this form of agriculture must transition to those derived from infinitely replicating sources. The fact that these laws outline some standards regarding cell source animals suggests that said animals will continue to be used cellular agriculture. This is the case in the EU, as well.

In their 2015 policy case study on IVM, EU-based research initiative, EPINET (Epistemic Networks), assessed the impact of IVM from a variety of social, scientific and technological perspectives. In their recommendations, animals are mentioned in passing when referring to the politics of IVM. EPINET states that standards of care will have to be considered as a component of 'production oversight (hygiene standards, nutrition standards, donor categories, wellbeing of cell donors, etc' (Gunnarsdottir et al.). It is worth noting that animals are not even referred to as animals in this passage. By referring to animals as 'donors', their consent is inferred. Indeed, they are 'donors' who need to be kept sterile and healthy to remain productive components in a manufacturing process premised on the extraction and harnessing of their cells. The suggestion that minimum standards of treatment be codified in law highlights the potential of cellular agriculture to function like other institutions of animal confinement such as zoos, farms, and research laboratories. As such, I suggest that 'donor' animals in IVM production will remain the legal property of individuals, and that they will remain subjected to human ends. In this sense, the liberatory potential of IVM for nonhuman others under law, seems weak at best. Instead, in geopolitical settings such as Canada and the United States, the relation of property that is foundational to both animal agriculture and territorialization remains not only unchallenged but reproduced.

A relational food ontology also insists that we consider how food regulations ensnare animals in the approval of plant-based foods and maintain animal-based food norms, despite not containing animals as ingredients. For example, animal experimentation has been used to meet regulatory standards for so-called vegan foods, such as the Impossible Burger – marketed as the vegan burger that bleeds. It bleeds because it contains ‘soy leghemoglobin,’ a protein derived from the root of soy plants that is ‘molecularly identical to the heme in meats and vegetables’ (Duggan). Because the root of soy plants is not typically eaten, Impossible Foods performed extra tests to have the USDA approve soy leghemoglobin as ‘Generally Recognized as Safe’ – a status not required for approval on the market. CEO of Impossible Foods, Patrick Brown said the company did so to be transparent and to assure customers as to the safety of their products. As such, rats were used as experimental bodies to test the effects of plant-based heme to confirm that a synthetic burger, which bleeds in such a way as to simulate animal flesh, is safe for human consumption (Duggan). I suggest that IVM companies will act similarly to Impossible Foods by engaging as many regulatory approvals as possible to secure the widest possible distribution for their products – in which the baselines are those of animal-based foods and/or experimentation. The regulatory hoops these companies jump through are also part of the loci of relations to be evaluated when determining the food status of these edible products.

‘Clean’ Meat: Should it be Food?

While those in favour of IVM argue that tissue produced under these conditions is as real as any meat that comes from a once living animal, questions remain as to whether IVM should be food if we take Heldke’s ontology of food as loci of relations rather than merely substance based. Recall that for Heldke, something edible should only be ontologized as food if its constitutive relations are determined to be ethically desirable. Heldke however positions animal life and death, unionized human labour, and soil health through organic agriculture, for example, as equivalent considerations, whereas other scholarship has recentered the animal who will become food, as central to this calculus (Struthers Montford and Taylor). As well, Heldke does not contemplate the types of relationships produced through the consumption of certain foods and bodies (Ko; Kim; V. Stănescu, “‘White Power Milk’: Milk, Dietary Racism, and the ‘Alt-Right’”; Struthers Montford, ‘The “Present Referent”’; Struthers Montford, ‘Milk and Law in the Anthropocene: Colonialism’s Dietary Interventions’; Cohen), such as the colonial

patriarchal subjectivity tied to 'meat' eating in Canada and the United States, for example (Robinson; Struthers Montford and Taylor).

Schaefer and Savulescu present ideal scenarios of animal treatment in IVM production. They argue that respect for donor animals could be achieved provided cells were extracted: in a way that was 'safe, painless and leaves minimal scarring' (Schaefer and Savulescu 194); from deceased animals who were donated for purposes of cellular donations; or, if the animals lived 'in a free and open environment... [and were] appropriately compensated for its [sic] contribution to IVM, rewarded with food, toys or other resources favoured by the species' (Schaefer and Savulescu 194). Here Schaefer and Savulescu are to a degree talking about species-specific proclivities central to respecting the beingness of animals. Contra Schaefer and Savulescu, Miller states that such 'optimisms overlook the wider situation of in vitro meat as an aspect of a still prevalent instrumentalist approach to other species' (41). A relational and contextual ontology of food that includes a concern for animal beingness would have to evaluate whether conditions of confinement such as those described by Schaefer and Savulescu sufficiently respect creaturely beingness in such a way that the tissue from their cultured cells could be considered food, even when the animals themselves do not become food. Furthermore, the foundational relation of property remains unaddressed by those who suggest that providing desirable objects and conditions of confinement assuages our ethical obligations in the context of IVM. For Maneesha Deckha, beingness offers a legal alternative to animals as property. And so, I propose that it might very well be the case that so long as animals are property, they are subject to instrumentalization. Put another way, human-animal relationships premised on respectful use might only exist when the beingness of animals is upheld in law, and enacted in practice (Deckha). If IVM is only made possible because animals remain the legal property of humans, it is my contention that it ought not be ontologized as food (and neither should the animal flesh it replicates).

Others state that the impact for farmed animals would be equivalent to a global shift to vegetarianism: 'If the standard factory farm were replaced by IVM laboratories, this would have more or less the same effect of reducing animal suffering and/or slaughter as converting everyone to vegetarianism' (Schaefer and Savulescu 189). These authors take the position that

the overall reduction in animal suffering, ecological damage, and harms to human health justifies the use of a fewer amount of well-treated animals. For them this suffices to establish the edibility of IVM. However, whether IVM is food might also consider the relationships that are produced through its consumption. Would the human maintain his exclusive position as subject while animals remain de-subjectified means to human ends? Would the consumption of cultured animal tissue transmit animalistic traits such as virility and prowess in the same way that meat supposedly does? (Fiddes; Twigg). Or, conversely, would the consumption of IVM produced in ideal conditions (plant-based growth mediums and animals treated well) work to unsettle the iteration of the human who is produced through the sacrifice of the animal? How the consumption of IVM will operate as a product that will further entrench existing human-animal relations and/or unsettle our dominant ontologies of humans, animals, and food should also be weighed when considering whether this product reflects ethically desirable relations to ourselves and with the more-than-human world.

Conclusion

This article has analysed cultured and synthetic meat technologies with a view to the ontologies of meat, animals, humans, and food that are parsed and reified in discourses surrounding in vitro and synthetic meats. In so doing, I have attempted to reorient discussions about IVM by repositioning animals as stakeholders in this process – stakeholders who are largely absented in the literature I have analysed. Those advocating for IVM argue that concerns over the use of foetal bovine serum as a growth medium, and the treatment of animals as donors will be alleviated through evermore technological development. However, the legal ontology of animals as property remains unaddressed in these future promises, while current and proposed food law and regulations confirm that such a status will continue. As such, it is my position that IVM has little potential to disrupt the property relationships that are foundational to animal agriculture. In this sense cellular agriculture is agricultural power, expressed differently. Put otherwise, a new meat technology that is premised on the cellular sacrifice of a nonhuman other and that is only made articulable within a broader context of carnophallogocentrism is yet another iteration of agricultural power that traffics in animal subjugation.

Those arguing against IVM remind us that IVM is a contingent technology that emerged because of animal agriculture and our obsession with meat not only as a food, but as a marker of domination. It is because of meat's normative position that IVM and synthetic meats have emerged as both epistemic objects of biotechnology and as *the way* to avoid the impending effects of climate change, widespread zoonotic disease, and food shortages. IVM and synthetic meat might then be the simultaneous response to the exercise of imperialist agricultural power and an attempt to prevent the sacrifice of sacrifice. This is perhaps what IVM proponents mean when they write that IVM is the best of both worlds. Those cautious of invitro futures warn that the widespread adoption of cultured meat could spurn nostalgia for agriculturally produced meat as the food of a bygone era (Miller; Parry). In Atwood's speculative fiction novel, *Oryx and Crake*, IVM is a reality. In this work, meat from once living animals is positioned as a luxury item that characters consume in protest of their alienation from nature, which they see manifested in their consumption of 'ChickieNobs' and 'SoyOBoy Burgers' (Parry 245). What Atwood's novel points to is that meat from animal death is social capital and holds a cultural place that exceeds its nutritional makeup in a way that IVM might not be able to trouble.

Food and edibility are distinct categories (Struthers Montford and Taylor), and assessing whether IVM is food requires a consideration of not only its constitutive relations, but those it can produce. Cole and Morgan warn that 'the consumption of IVM may amplify the self-construction of the human as manipulator of the natural world, to the point of abstraction from the natural world altogether' (213). If they are correct, then the production and consumption of IVM could amplify the violent dualisms of nature/culture and human/animal that Plumwood ('Integrating Ethical Frameworks for Animals, Humans, and Nature') argues should be resisted through our food practices. Conversely, however, I question whether IVM could be a means of recognizing the vulnerability of animal others as well as the vulnerability of ourselves to ecological catastrophe caused in part by the imperial exercise of agricultural power. As such, questions surrounding IVM exceed ontological concerns over its authenticity as meat. I argue instead that animal ethicists and those working in the field of IVM should concern themselves with questions surrounding whether IVM can be considered food based on its relations of production and consumption, and whether these are ethically desirable. If so, we will be better able to assess whether those advocating for sustainable, animal-friendly food systems should lend their support to this technology. To truly have a food politics that is open to human and

nonhuman others requires a revision of our symbolic and material humanist ontologies. A project in this vein is then critical of technologies that emerge because of and are sustained through the ontologization of farmed animals as meat, even *if* animals can (eventually) be eliminated.

Notes

ⁱ See Stephens ('Growing Meat in Laboratories') for an overview of various IVM technologies and procedures.

ⁱⁱ Beyond Meat is a US based plant-based meat company that produces structurally equivalent plant-based chicken strips, burgers, and beef crumbles. Beyond Meat is marketed as real meat that is made from plants that allows customers to enjoy meat without any of the drawbacks associated with its production (Beyond Meat).

ⁱⁱⁱ Supporters of IVM largely take a utilitarian approach, in which the suffering and frustration of animal interests that will still be used in IVM, are justified as the interests of most farmed animals (to not suffer as they currently do in animal agriculture, nor on the same scale), the environment, and public health will supposedly be promoted. This of course varies from a Critical Animal Studies approach which refuses the exploitation of non-human animals and the anthropocentrism which permits it, in any form. Put otherwise, advocates of IVM are forthright that animals will still be harmed, but that this harm can be different and be less than that entailed in our current food system. As well, such claims are made within a context in which such suffering is positioned as a necessary step on the way to totally eliminating animals' body parts from the production process.

Works Cited

- Adams, Carol J. *The Sexual Politics of Meat (20th Anniversary Edition): A Feminist-Vegetarian Critical Theory*. 20th Anniversary ed., Bloomsbury Academic, 2010.
- Adams, Carol J., and Lori Gruen. 'Introduction.' *Ecofeminism: Feminist Intersections with Other Animals and the Earth*, Bloomsbury Academic, 2014, pp. 1-6,
<https://www.bloomsbury.com/us/ecofeminism-feminist-intersections-with-other-animals-and-the-earth-9781628926224/>.
- Addady, Michal. 'You Could Be Eating Lab-Grown Meat in Just Five Years.' *Fortune*, 2 Feb. 2016, <http://fortune.com/2016/02/02/lab-grown-memphis-meats/>.
- Anderson, Virginia. *Creatures of Empire: How Domestic Animals Transformed Early America*. Oxford University Press, 2006.
- Beyond Meat. *About*. 2017, <http://beyondmeat.com/about>.
- Bhat, Zuhaib F., et al. 'Technological, Regulatory, and Ethical Aspects of In Vitro Meat: A Future Slaughter-Free Harvest.' *Comprehensive Reviews in Food Science and Food Safety*, vol. 18, no. 4, July 2019, pp. 1192-208.
- Bhat, Zuhaib Fayaz, et al. 'In Vitro Meat: A Future Animal-Free Harvest.' *Critical Reviews in Food Science and Nutrition*, vol. 57, no. 4, Mar. 2017, pp. 782-89. *Taylor and Francis+NEJM*, <https://doi.org/10.1080/10408398.2014.924899>.
- BlueNalu. 'Why Eat Blue™?' *BlueNalu, Inc.*, <https://www.bluenalu.com/why-1>. Accessed 3 Oct. 2022.
- Brown, Ethan. 'Beyond Meat.' *The Future of Meat Without Animals*, edited by Brianne Donaldson and Christopher Carter, Rowman & Littlefield International, 2016, pp. 3-5.
- Canada. *Food and Drugs Act*. 20 June 2017, http://laws-lois.justice.gc.ca/eng/regulations/C.R.C.,_c._870/FullText.html#h-144).
- CABI. 'About.' *Canadian Agri-Food Policy Institute*, 2022, <https://capi-icpa.ca/about/>.

- Chatterjee, Sushmita, and Banu Subramaniam. *Meat! A Transnational Analysis*. Duke University Press, 2021. read.dukeupress.edu, <https://doi.org/10.1215/9781478012481>.
- Clare, Eli. *Brilliant Imperfection: Grappling with Cure*. Duke University Press, 2017.
- Clarke, Adele E. 'Reflections on the Reproductive Sciences in Agriculture in the UK and US, ca. 1900-2000+.' *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences*, vol. 38, no. 2, 2007, pp. 316-39. *CrossRef*, <https://doi.org/10.1016/j.shpsc.2007.03.003>.
- Cohen, Mathilde. 'Animal Colonialism: The Case of Milk.' *AJIL Unbound*, vol. 111, 2017, pp. 267-71. *Cambridge Core*, <https://doi.org/10.1017/aju.2017.66>.
- Cole, Matthew, and Karen Morgan. 'Engineering Freedom? A Critique of Biotechnological Routes to Animal Liberation.' *Configurations*, vol. 21, no. 2, 2013, pp. 201-29. *Project MUSE*, <https://doi.org/10.1353/con.2013.0015>.
- Coppin, Dawn. 'Foucauldian Hog Futures: The Birth of Mega-Hog Farms.' *The Sociological Quarterly*, vol. 44, no. 4, 2003, pp. 597-616.
- Coulthard, Glen Sean. *Red Skin, White Masks: Rejecting the Colonial Politics of Recognition*. University Of Minnesota Press, 2014.
- Cuomo, Chris J. *Feminism and Ecological Communities: An Ethic of Flourishing*. 1st edition, Routledge, 1998.
- Datar, Isha, et al. 'New Harvest: Building the Cellular Agriculture Economy.' *The Future of Meat Without Animals*, edited by Brianne Donaldson and Christopher Carter, Rowman & Littlefield International, 2016, pp. 121-31.
- Deckha, Maneesha. *Animals as Legal Beings: Contesting Anthropocentric Legal Orders*. University of Toronto Press, 2021.
- Dennis, Simone J., and Alison M. Witchard. 'We Have Never Been Meat (but We Could Be).' *Animals in the Anthropocene: Critical Perspectives on Non-Human Futures*, edited by the Human Animal Research Network, vol. 4, Sydney University Press, 2015, pp. 151-64. *JSTOR*, <http://www.jstor.org/stable/j.ctt1bh4b7h>.

- Derrida, Jacques. *Points . . . : Interviews, 1974-1994*. Stanford University Press, 1995.
- . *The Animal That Therefore I Am*. 3 edition, Fordham University Press, 2008.
- Donovan, Josephine, and Carol J. Adams, editors. *Beyond Animal Rights: A Feminist Caring Ethic for the Treatment of Animals*. Continuum, 1996.
- Duggan, Tara. 'Impossible Foods Gets Heat from Environmentalists over Safety.' *San Francisco Chronicle*, 10 Aug. 2017, <http://www.sfchronicle.com/food/article/Impossible-Foods-responds-to-safety-questions-11748530.php>.
- Fiddes, Nick. *Meat: A Natural Symbol*. 1st edition, Routledge, 1991.
- Fitzgerald, Amy J., Linda Kalof and Thomas Dietz. 'Slaughterhouses and Increased Crime Rates: An Empirical Analysis of the Spillover from "The Jungle" into the Surrounding Community'. *Organization & Environment*, vol. 22, no. 2, 2009, pp. 158-84. *CrossRef*, <https://doi.org/10.1177/1086026609338164>.
- Food & Drug Administration and United States Department of Agriculture. *Formal Agreement Between FDA and USDA Regarding Oversight of Human Food Produced Using Animal Cell Technology Derived from Cell Lines of USDA-Amenable Species*. U.S. Food & Drug Administration, 7 Mar. 2019. www.fda.gov, <https://www.fda.gov/food/domestic-interagency-agreements-food/formal-agreement-between-fda-and-usda-regarding-oversight-human-food-produced-using-animal-cell>.
- Food and Drug Law at Keller and Heckman. *FSIS Responds to Petitions on 'Meat' Labeling*. 23 Sep. 2021, <https://www.natlawreview.com/article/fsis-responds-to-petitions-meat-labeling>.
- Food Safety and Inspection Service. *Labeling of Meat or Poultry Products Comprised of or Containing Cultured Animal Cells*. United States Department of Agriculture, 3 Sep. 2021. *Federal Register Vol. 86, No. 169/Proposed Rules*, https://www.fsis.usda.gov/sites/default/files/media_file/2021-09/FSIS-2020-0036.pdf.

- Fraiman, Susan. 'Pussy Panic versus Liking Animals: Tracking Gender in Animal Studies.' *Critical Inquiry*, vol. 39, no. 1, 2012, pp. 89-115.
- Gaard, Greta. 'Vegetarian Ecofeminism: A Review Essay.' *Frontiers: A Journal of Women Studies*, vol. 23, no. 3, 2002, pp. 117-46.
- Good Food Institute. 'Cultivated Meat.' *Good Food Institute*, 4 Jan. 2021, <https://gfi.org/cultivated/>.
- Grimshaw, Jean. *Philosophy and Feminist Thinking*. University of Minnesota Press, 1986.
- Guenther, Lisa. *Solitary Confinement*. University of Minnesota Press, 2013. www.upress.umn.edu, <https://www.upress.umn.edu/book-division/books/solitary-confinement>.
- Gunnarsdottir, Kristrun, et al. *Reporting on the Case Study of Synthetic Meat: Summary of Findings and Policy Considerations*. Lancaster University, 2015. *Google Scholar*, <http://eprints.lancs.ac.uk/74255/>.
- Hall, Kim Q. 'Toward a Queer Crip Feminist Politics of Food.' *PhiloSOPHIA*, vol. 4, no. 2, 2014, pp. 177-96.
- Hamblin, James. 'How Agriculture Controls Nutrition Guidelines.' *The Atlantic*, 8 Oct. 2015, <https://www.theatlantic.com/health/archive/2015/10/ag-v-nutrition/409390/>.
- Harding, Sandra, and Merrill B. Hintikka, editors. *Discovering Reality: Feminist Perspectives on Epistemology*. Kluwer Academic Publishers, 1983. www.springer.com, <http://www.springer.com/gp/book/9789027715388>.
- Hoek, Annet C., et al. 'Replacement of Meat by Meat Substitutes. A Survey on Person- and Product-Related Factors in Consumer Acceptance'. *Appetite*, vol. 56, no. 3, 2011, pp. 662-73. *PubMed*, <https://doi.org/10.1016/j.appet.2011.02.001>.
- Hopkins, Patrick D., and Austin Dacey. 'Vegetarian Meat: Could Technology Save Animals and Satisfy Meat Eaters?' *Journal of Agricultural and Environmental Ethics; Dordrecht*, vol. 21, no. 6, 2008, pp. 579-96. *ProQuest*, <http://dx.doi.org.myaccess.library.utoronto.ca/10.1007/s10806-008-9110-0>.

- Intergovernmental Panel on Climate Change. *Climate Change 2022: Mitigation of Climate Change*. Working Group III, 2022, https://report.ipcc.ch/ar6wg3/pdf/IPCC_AR6_WGIII_FinalDraft_FullReport.pdf.
- . *Climate Change and Land*. Intergovernmental Panel on Climate Change, Aug. 2019, <https://www.ipcc.ch/report/srccl/>.
- International Agency for Research on Cancer. *Q&A on the Carcinogenicity of the Consumption of Red Meat and Processed Meat*. World Health Organization, 2015, http://www.iarc.fr/en/media-centre/iarcnews/pdf/Monographs-Q&A_Vol114.pdf.
- Jha, Alok. 'First Lab-Grown Hamburger Gets Full Marks for "Mouth Feel".' *The Guardian*, 6 Aug. 2013, <https://www.theguardian.com/science/2013/aug/05/world-first-synthetic-hamburger-mouth-feel>.
- Kim, Claire Jean. *Dangerous Crossings: Race, Species, and Nature in a Multicultural Age*. Cambridge University Press, 2015.
- Ko, Aph. *Racism as Zoological Witchcraft: A Guide to Getting Out*. Lantern Books, 2019.
- Lange, Lynda, and Lorenne Clark, editors. *The Sexism of Social and Political Theory: Women and Reproduction from Plato to Nietzsche*. University of Toronto Press, 1979, <https://www.abebooks.com/9780802054593/Sexism-social-political-theory-Women-0802054595/plp>.
- Lloyd, Genevieve. *The Man of Reason: 'Male' and 'Female' in Western Philosophy*. Routledge, 1984.
- Lucas, Amelia. 'Singapore Issues First Regulatory Approval for Lab-Grown Meat to Eat Just.' *CNBC*, 2 Dec. 2020, <https://www.cnn.com/2020/12/01/singapore-issues-first-regulatory-approval-for-lab-grown-meat-to-eat-just.html>.
- Mallory, Chaone. 'Locating Ecofeminism in Encounters with Food and Place.' *Journal of Agricultural and Environmental Ethics*, vol. 26, no. 1, Feb. 2013, pp. 171-89. *CrossRef*, <https://doi.org/10.1007/s10806-011-9373-8>.

- Marder, Michael. 'Meat without Flesh.' *The Future of Meat Without Animals*, edited by Brianne Donaldson and Christopher Carter, Rowman & Littlefield International, 2016, pp. 101-10.
- McHugh, Susan. 'Real Artificial: Tissue-Cultured Meat, Genetically Modified Farm Animals, and Fictions.' *Configurations*, vol. 18, no. 1-2, 2010, pp. 181-97. *CrossRef*, <https://doi.org/10.1353/con.2010.0006>.
- Miller, John. 'In Vitro Meat: Power, Authenticity and Vegetarianism.' *Journal for Critical Animal Studies*, vol. 10, no. 4, 2012, pp. 41-63.
- Okin, Susan Moller. *Women in Western Political Thought*. Princeton University Press, 1979.
- Oxfam America. *Lives on the Line: The Human Cost of Cheap Chicken*. Oxfam America, 2015, https://www.oxfamamerica.org/static/media/files/Lives_on_the_Line_Full_Report_Final.pdf.
- Parry, Jovian. 'Oryx and Crake and the New Nostalgia for Meat.' *Society & Animals*, vol. 17, no. 3, June 2009, pp. 241–56. *CrossRef*, <https://doi.org/10.1163/156853009X445406>.
- Petetin, Ludivine. 'Frankenburgers, Risks and Approval.' *European Journal of Risk Regulation: EJRR; Berlin*, vol. 5, no. 2, 2014, pp. 168-86.
- Plant Based Foods Association. 'New Lawsuit Challenges Unconstitutional Oklahoma Plant-Based Foods Labeling Law Supported by the Meat Lobby.' *Plant Based Foods Association*, 16 Sep. 2020, <https://www.plantbasedfoods.org/pbfa-sues-ok-over-unconstitutional-plant-based-labeling-law/>.
- Plumwood, Val. *Environmental Culture: The Ecological Crisis of Reason*. 1st edition, Routledge, 2002.
- . *Feminism and the Mastery of Nature*. Routledge, 1993.
- . 'Integrating Ethical Frameworks for Animals, Humans, and Nature: A Critical Feminist Eco-Socialist Analysis.' *Ethics and the Environment*, vol. 5, no. 2, 2000, pp. 285-322.

- . 'Nature, Self, and Gender: Feminism, Environmental Philosophy, and the Critique of Rationalism.' *Hypatia*, vol. 6, no. 1, 1991, pp. 3-27. *JSTOR*, <https://doi.org/10.2307/3810030>.
- . 'Tasteless: Towards a Food-Based Approach to Death.' *Environmental Values*, vol. 17, no. 3, 2008, pp. 323-30.
- Pollan, Michael. *Food Rules: An Eater's Manual*. Penguin, 2009.
- Robinson, Margaret. 'Veganism and Mi'kmaq Legends.' *The Canadian Journal of Native Studies*, vol. 33, no. 1, 2013, pp. 189–96.
- Schaefer, G. Owen, and Julian Savulescu. 'The Ethics of Producing In Vitro Meat.' *Journal of Applied Philosophy*, vol. 31, no. 2, May 2014, pp. 188–202. *PubMed Central*, <https://doi.org/10.1111/japp.12056>.
- Schauzu, Marianna. 'The Concept of Substantial Equivalence in Safety Assessment of Foods Derived from Genetically Modified Organisms.' *AgBiotechNet*, vol. 2, no. 044, 2000, pp. 1-4.
- Sebo, Jeff. 'The Ethics and Politics of Plant-Based and Cultured Meat.' *Les Ateliers de l'Éthique*, vol. 13, no. 1, 2018, pp. 159–83. *DOI.org (Crossref)*, <https://doi.org/10.7202/1055123ar>.
- . *The Future of Meat*. forthcoming.
- Shukin, Nicole. *Animal Capital: Rendering Life in Biopolitical Times*. University Of Minnesota Press, 2009.
- Stănescu, James. 'Beyond Biopolitics: Animal Studies, Factory Farms, and the Advent of Deading Life.' *PhaenEx*, vol. 8, no. 2, 2013, pp. 135-60.
- Stănescu, Vasile. *A Bull Market: The Failure of Capitalism to Solve for Climate Change, Species Extinction, and Animal Liberation*. North American Association for Critical Animal Studies Meeting, 10-12 Aug. 2022, Toronto.

---. "White Power Milk": Milk, Dietary Racism, and the "Alt-Right".' *Animal Studies Journal*, vol. 7, no. 2, 2018, pp. 103-28.

---. 'Why "Loving" Animals Is Not Enough: A Response to Kathy Rudy, Locavorism, and the Marketing of "Humane" Meat.' *The Journal of American Culture*, vol. 36, no. 2, 2013, pp. 100-10.

Steinfeld, Henning, et al. *Livestock's Long Shadow*. Food and Agriculture Organization of the United Nations, 2006. www.fao.org,
<http://www.fao.org/docrep/010/a0701e/a0701e00.HTM>.

Stephens, Neil. 'Growing Meat in Laboratories: The Promise, Ontology, and Ethical Boundary-Work of Using Muscle Cells to Make Food.' *Configurations*, vol. 21, no. 2, 2013, pp. 159-81. *Project MUSE*, <https://doi.org/10.1353/con.2013.0013>.

---. 'Invitro Meat is a Promise.' *What Is in Vitro Meat? Food Phreaking Issue 2*, edited by Neil Stephens, Cathrine Kramer, Zack Denfeld and Roger Strand, The Center for Genomic Gastronomy, 2015, pp. 22-30.
http://www.foodphreaking.com/FP02_WhatIsInVitroMeat.pdf

Struthers Montford, Kelly. 'Coda: Toward an Analytic of Agricultural Power.' *Coda: Toward an Analytic of Agricultural Power*, Fordham University Press, 2019, pp. 223-32.
www.degruyter.com, <https://doi.org/10.1515/9780823283675-015>.

---. 'Milk and Law in the Anthropocene: Colonialism's Dietary Interventions.' *Journal of Food Law & Policy*, vol. 16, no. 1, 2020, pp. 48-77.

---. 'The "Present Referent": Nonhuman Animal Sacrifice and the Constitution of Dominant Albertan Identity.' *PhaenEx*, vol. 8, no. 2, 2013, pp. 105-34.

Struthers Montford, Kelly, and Chloë Taylor. 'Beyond Edibility: Towards a Nonspeciesist, Decolonial Food Ontology.' *Colonialism and Animality*, edited by Kelly Struthers Montford and Chloë Taylor, Routledge, 2020, pp. 129-56. www.taylorfrancis.com,
<https://doi.org/10.4324/9781003013891-6>.

- Suresh, Shishira. *'Friend' or 'Fiend': In Vitro Lab Meat and How Canada Might Regulate Its Production and Sale*. CAPI - The Canadian Agri-Food Policy Institute, Oct. 2018, p. 42. Zotero, https://capi-icpa.ca/wp-content/uploads/2019/06/2018-10-23-CAPI-in-vitro-meat-technology_Paper_SureshShishira_WEB.pdf.
- TallBear, Kim. *An Indigenous Approach to Critical Animal Studies, Interspecies Thinking, and the New Materialisms*. 2013.
- . 'Beyond the Life/Not-Life Binary: A Feminist-Indigenous Reading of Cryopreservation, Interspecies Thinking, and the New Materialisms.' *Cryopolitics*, edited by Joanna Radin and Emma Kowal, The MIT Press, 2017.
- Taylor, Chloë. 'Foucault and Critical Animal Studies: Genealogies of Agricultural Power.' *Philosophy Compass*, vol. 8, no. 6, 2013, pp. 539-51. *Wiley Online Library*, <https://doi.org/10.1111/phc3.12046>.
- Taylor, Sunaura. *Beasts of Burden: Animal and Disability Liberation*. The New Press, 2017, <http://thenewpress.com/books/beasts-of-burden>.
- The Future of Meat by Co-Founder of Memphis Meats*. Directed by Memphis Meats, 2016, <https://www.youtube.com/watch?v=2A5tgSAHDvg&t=6s>.
- Thompson, Megan, et al. 'California Startups Are Growing Meat from Animal Cells.' *PBS NewsHour*, 13 July 2019, <https://www.pbs.org/newshour/show/california-startups-are-growing-meat-from-animal-cells>.
- Twigg, Julia. 'Vegetarianism and the Meanings of Meat.' *The Sociology of Food and Eating: Essays on the Sociological Significance of Food*, edited by Anne Murcott, Aldershot, 1983, pp. 18-30.
- Upside Foods. 'Our Foods'. *UPSIDE Foods*, 2022, <https://upsidefoods.com/our-foods/>.
- Valeti, Uma. 'BREAKING: World's First Chicken and Duck Produced without the Animal'. *Memphis Meats*, 15 Mar. 2017, <http://www.memphismeats.com/blog/2017/3/15/breaking-worlds-first-chicken-produced-without-the-animal>.

- Wadiwel, Dinesh J. 'Cows and Sovereignty: Biopower and Animal Life.' *Borderlands*, vol. 1, no. 2, 2002, http://www.borderlands.net.au/vol1no2_2002/wadiwel_cows.html.
- . 'Do Fish Resist?' *Cultural Studies Review*, vol. 22, no. 1, 2016, pp. 196–242.
- . *The War Against Animals*. Rodopi, 2015.
- Warren, Karen J. 'The Power and the Promise of Ecological Feminism.' *Environmental Ethics*, vol. 12, no. 2, 1990, pp. 125-46.
- Wolfe, Cary. *Before the Law: Humans and Other Animals in a Biopolitical Frame*. University of Chicago Press, 2013. [press.uchicago.edu](http://www.press.uchicago.edu), <http://www.press.uchicago.edu/ucp/books/book/chicago/B/bo14171850.html>.
- Zaleski, Andrew. 'The Hottest Tech in Silicon Valley Made This Meatball.' *Fortune*, 25 Apr. 2016, <http://fortune.com/2016/04/25/memphis-meats-lab-grown-meat/>.

Acknowledgements

My thanks to Johanna Oksala and Chloë Taylor for their pivotal insights as I developed these ideas, to Selingul Yalcin for the stellar research support, and to the peer reviewers for their generous feedback.