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Chapter 18: Food crimes, harms, and carnist technologies

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Abstract

This chapter explores some of the ways in which technologies designed to meet human demand for animal based foods, which this chapter terms *carnist technologies*, facilitate or remedy food crimes and harms. First-generation carnist technologies designed to achieve increased efficiency in animal rearing, as well as second-generation technologies for 'happy meat', cellular agriculture, and plant-based analogues of animal products as are all considered. The latter two technologies hold promise for reducing some of the key harms tied to demand for animal products, but leave other harms unaddressed. None of the technologies are found to fully challenge carnism, and may also perpetuate or even compound more systemic food crimes given the extent to which developers and promoters have embraced neoliberal principles. The benefits of these technologies should be recognized, but advocates must acknowledge the limitations of a techno-fix approach to what is ultimately a social problem requiring more significant reforms.

Keywords: Carnism, Cellular agriculture, Technological fix, Meat substitutes, Food systems

Introduction

The number of animals raised for food increased dramatically over the past half-century. In the US alone, almost nine billion chickens were slaughtered for food in 2015, an increase of over 100 million from just the year before (USDA, 2016). The weight of farmed animals at the time of slaughter also grew, with the average weight of cows and buffalo in developed nations increasing by over 100kg per animal between the 1960s and mid-2000s (Alexandratos and Bruinsma, 2012). Thanks to the development and adoption of novel agricultural and food technologies, the world produces more food from non-human animals (hereafter 'animals') than ever before. Unfortunately, this comes at the expense of the health of animals, humans, and the environment. This chapter explores some of the key ways in which technologies designed to meet human demand for animal based foods, which this chapter terms *carnist technologies*, serve to facilitate or remedy food crimes in the twenty-first century.

Carnism is the largely invisible normative belief system in which the consumption of certain animals is viewed as customary and ethically sound, representing a counter-point to vegetarian and vegan beliefs about the role of animals (Joy, 2011). Accordingly, carnist technologies are technologies that facilitate, enact, or reinforce the normative belief that animals are a source of food. The term highlights the ideological underpinning of these technologies. Carnism also results in a policy environment in which most of the harms caused to animals by the application of technology are not only legal, but recognized as an inherent part of 'legitimate food production' (Nurse, 2016: 36).

In conjunction with carnism, neoliberalism must also be recognized as a dominant ideology shaping the modern Western food system. As per Croall's (2013) foundational work on food crime, the current economic context of the food system is criminogenic since it creates a culture where profits are prioritized to the extent of normalizing deviant corporate behaviours. Harms become seen as part of the cost of doing business. In short, government policies are unlikely to address even the human and environmental harms from carnist technologies, and many practices remain 'lawful but awful' (Passas, 2005; Gray and Hinch, 2015; Gray, 2018). A legalistic definition of crime is thus likely to overlook many of the ways these technologies cause serious harms to the marginalized and powerless, particularly when those harms are caused by corporations or governments (Passas, 2005; Dorling et al., 2008). With this in mind, it is important to embrace the field's emphasis on 'negative or harmful consequences on a variety of both human and nonhuman victims', regardless of formal legality (Gray and Hinch, 2015: 97).

What follows is an exploration of the licit and illicit harms caused by carnist technologies, including both first-generation technologies focused on industrializing animal agriculture to maximize efficiency and agribusiness profits and second-generation technologies that were developed in response to the growing recognition of harms from industrial animal agriculture. Within this, we also consider the extent to which these newer technologies may alleviate the problems posed by first-generation carnist technologies.

Technologies for the industrialisation of animal agriculture

Humans have raised animals for food for thousands of years, but industrial techniques for animal farming first gained widespread popularity in the 1930s (Walker et al, 2005). Cheap grain prices from green revolution technologies and crop subsidies, the expansion of transportation systems, and novel animal rearing technologies all contributed to large efficiency gains in animal agriculture (Pew Commission, 2008). Paired with growing demand for animal based foods, farmers had clear incentives to expand operations. Some of these technological innovations included animal feed with added antibiotics and hormones and the use of selective breeding to increase production (Pew Commission, 2008). In the name of efficiency and profit, animals now grow faster and larger in increasingly small allotments of space, while farms are increasingly consolidated and mechanized (Fitzgerald, 2015). The application of these technologies to facilitate industrial animal agriculture creates a broad spectrum of harms and food crimes. While a full consideration is beyond the scope of this chapter and covered in existing literature, a brief review of key harms from first-generation carnist technologies is offered.

Most harms to animals are not technically illegal due to animals' status as agricultural commodities used for food production. This is particularly true in the US, where only the transportation and slaughter of animals are regulated with welfare in mind at the federal level (Pew Commission, 2008; see also Fitzgerald and Tourangeu, 2018), although such policies remain ineffective. Harms, however, are exceptionally common. Close confinement leads to the spread of infectious disease and prevents animals from engaging in natural behaviours, resulting in intentional mutilation by farmers to prevent negative behaviours associated with stress (Pew Commission, 2008). The increased growth rate of animals has been linked to physical ailments and chronic pain, while the rapid pace of slaughter lines has occasionally resulted in animals having their throats cut or being boiled while still conscious (McLeod-Kilmurray, 2012). These harms are often not inflicted out of ill will, but rather for farmers to survive in a competitive market. It is also important to note that these technologies have facilitated increased animal consumption, resulting in billions of animal lives being taken each year.

Environmental harms and crimes are also common despite ostensibly being regulated by environmental protection agencies. Production practices facilitated by first-generation carnist technologies contribute to climate change, increased water and land use, and water and air pollution (Pew Commission, 2008). Managing the large volume of manure created by thousands of animals in a single location is a particular challenge, resulting in the spread of nutrient and chemical contaminants, as well as pathogens (Walker et al, 2005). An increasingly pressing concern is the spread of antibiotic resistant bacteria from the use of sub-therapeutic levels of antibiotics to prevent disease and promote growth (Pew Commission, 2008). Farmworkers and communities surrounding facilities are all put at risk (Walker et al, 2005). Consumers also suffer from the risk of foodborne illness from food contaminated with pathogens from manure (Pew Commission, 2008). Almost all of the costs of these externalities are borne by the public rather than by producers, serving as a subsidy for animal products.

Since these facilities are frequently located in marginalized communities, industrial animal agriculture also contributes to environmental injustices (Mirabelli et al, 2006). Slaughterhouse work, a dangerous and emotionally taxing profession, has long suffered from similar justice concerns (Sinclair, 1906). Many facilities have moved to states with fewer protections for workers and are known to hire undocumented individuals with limited labour rights (Nibert, 2014). Large animal agriculture corporations have also been known to take advantage of smaller farmers who raise their animals, offering exploitative contracts that may not pay enough to cover operating and clean-up expenses. Having taken out large loans to pay for equipment and land, farmers become trapped in unfavourable arrangements until they can pay off their loans (Pew Commission, 2008).

Despite evidence of serious food crimes and harms, major corporations continue to cast the expansion of efficiency focused first-generation carnist technologies as the solution for meeting the needs of a growing global population. The industrial agriculture lobby also routinely applies political pressure in defense of its current practices. For example, several US states have passed or attempted to pass 'ag-gag' laws that ban undercover photography or filming of animal farms and worked to block reforms recommended by public health advocates (Kim et al, 2013). While fines are occasionally brought against corporations and farms for poor behaviour, these have little impact on overall operations. Multinational animal processor Tyson Foods, for example, has been fined by multiple US agencies for environmental and labour violations (some of which included human fatalities) (US EPA, 2013), but continues to operate and engage in new violations each year. The legal protection of industrial agriculture and first-generation carnist technologies represents a clear example of governments and businesses working together to promote profits at the expense of the wellbeing of animals, humans, and the environment (Gray and Hinch, 2015).

'Humane' technologies

Given growing public concern with the harms experienced by animals, a whole discipline of animal welfare science has emerged to advocate for 'humane farming'. Many of these efforts take a techno-fix model where rearing and slaughtering processes, as well as *animals themselves,* are re-engineered in an attempt to minimize pain and suffering. The idea of humanely farmed 'happy-meat' falls soundly within the realm of carnist technologies by failing to question the practice of consuming animals (Cole and Morgan, 2013: 205), only the fact that pain and suffering is inflicted upon them in the process.

Humane technologies receive significant popular support, particularly in Europe. For example, Compassion in World Farming (2013: 9-10), which defines itself as 'not a vegetarian organisation' (instead aiming to end factory farming), lists European Union bans on first-generation carnist technologies used to keep calves, pigs, and hens amongst its campaigning successes. In each case, the aim of these legal developments was to replace first-generation technologies with either more humane existing technologies, such as extensive farming systems, or novel second-generation technologies. An example of the latter is the use of the so-called 'enriched cages', supported by European Council Directive 1999/74/EC. In these cages, chickens have slightly more space to move around, litter for pecking and scratching, perches that allow at least 15 cm per hen, and claw-shortening devices. Slaughterhouses have also been re-engineered to cause animals less stress. In the US, many slaughterhouses integrated principles developed by Temple Grandin. Among other techniques, she developed a restrainer system to hold cows and bulls during stunning in order to provide 'more efficient and humane systems for rapidly handling large numbers of' animals (Grandin, 1988: 327). She also sought to reduce prodding of animals by removing visual and sound distractors, air drafts, inappropriate lighting arrangements, and slick floors.

An alternative approach to 'humane technologies' is to change the animals themselves. Farmers have long sought to obtain welfare benefits through the internal transformation of animals, for example, by using selective breeding. In recent years, scientists have engaged in the genetic engineering of animals for the same purpose. While only one modified animal had been approved as food in the US at the time of writing – the 'AquAdvantage salmon' (US FDA, 2015) – work in this area continues to grow and push regulatory boundaries. In the US, genetically modified animals are regulated primarily under provisions for new animal drugs, requiring human safety to be taken into account. European Union law takes a similarly shallow anthropocentric focus, for example in Directive 2001/18/EC, which is concerned primarily about human safety in relation to the release of new products into the environment.

One example of such a technology is a new variety of pigs created to contain bovine α-lactalbumin in the mammary gland which boosts milk production and results in fewer deaths among piglets (Wheeler et al, 2001). Recent developments in gene editing are also likely to result in significant growth in this sector. At present, scientists and research firms are pushing back against applying current US regulations to animals modified using more precise gene editing techniques. For example, the start-up company Recombinetics (2016) argues that its painless 'genetic dehorning' of cows raised for dairy production should be exempt from regulations for other modified animals since 'genome editing can be used to produce precise analogues of the naturally occurring mutations we routinely consume'. In light of growing consumer interest in 'happy-meat', they also tout that their productivity and welfare enhancing traits 'could be rapidly commercialized'.

While animal welfare might be improved through the insertion of new genes, scientists can also select against the inclusion of genes that might negatively affect animal welfare. This is why the topic of 'animal disenhancement', which aims to enhance animal welfare by the removal of a basic trait, has come to the fore in recent years. Early discussion on this topic stems from the accidental creation of a blind strain of chickens who might be less aggressive with each other in close confinement, which is what led some to suggest that it might be a good idea to replace conventional strains with this blind alternative (Varner, 2012: 277-278). Strict animal welfarists might argue that this technique ought to be embraced as it reduces harm. A similar argument could be made for supporting 'genetic dehorning', to avoid the widely practised disbudding and

dehorning of animals. It is of note that the problems these technologies seek to address are almost entirely human-created and driven by first-generation carnist technologies that confine large numbers of animals to increasingly small spaces.

Taking the engineering of animals for welfare to its logical conclusion, farmed animals with reduced capacities to feel pain and suffering might also be created. Shriver (2009: 118), for example, commented on research where scientists were able to genetically 'knock out' enzymes in mice to reduce their capacity to suffer and suggested that it might be possible to replicate this in other mammals. Similarly, it might one day be possible to create micro-encephalic animals with just enough consciousness to be alive (Streiffer and Basl, 2014), but not enough to feel much pain or suffering.

Clearly, these technologies are limited in that they work only to address one specific set of harms from animal production. However, they fall short even on the measure of reducing harms to animals. Modifying animal rearing and slaughter may reduce trauma experienced by animals, but does nothing to address their status as objects for human consumption and the moral harms that follow from casually making such a judgement (Deckers, 2016). The engineering of animals causes even further harm by reinforcing carnist norms. Through such projects, people not only objectify animals by using them as food, but also through re-designing them from within to be nothing but food.

Cultured meat and cellular agriculture technologies

Another approach to addressing the broader spectrum of harms and food crimes arising from animal production is to instead engineer animals out of the production process. Starting from a biopsy of cells from an animal, scientists are now able to produce animal muscle tissue in a lab setting (Datar and Betti, 2010). While the process continues to be improved upon in order to scale up production and bring down costs, it builds on the culturing of cells in bioreactors containing a growth medium (Datar and Betti, 2010). The resulting product, known as cultured meat, in-vitro meat, or more recently, clean meat, is essentially identical to tissue from conventionally raised animals at the cellular level. While work by Mark Post at Maastricht University is perhaps the best-known effort to date, start-ups such as Memphis Meats are also working to develop and eventually commercialize cultured meat. Others, such as Clara Foods and Perfect Day Foods, are focusing on the creation and commercialization of cultured eggs and milk. To create these, scientists reprogram yeast by inserting genes for milk or egg proteins rather than relying on animal cells. Collectively, both of these production methods have become known as cellular agriculture (New Harvest, 2016). At the time of writing, none of these products are available for purchase by the general public, but estimates suggest that milk from cellular agriculture will be commercially available in late 2017 and cultured meat sometime within the next two decades (Bonny et al, 2015; Hocquette, 2016; Perfect Day Foods, 2016).

By largely breaking the link between living animals and foods derived from animals, cultured products should hypothetically reduce consumer demand for farmed animals without necessitating public willingness to change diets. This is one of the key benefits of reframing social problems as technological problems (Scott, 2010), and of cultured products in particular. The more people who switch from conventional to cultured products, the greater the potential for reducing some of the harms and food crimes tied to producing animal based foods. Since these products are not yet available, benefits remain purely speculative, but have been predicted to include the following:

- Reduction in the number of animals raised for food, which would also eliminate issues tied to manure handling and labour concerns associated with animal rearing and slaughter.
- Reduction in water and land use as compared to conventional production, as well as reduced global warming potential as compared to ruminants (Tuomisto and Teixeira de Mattos, 2011; Mattick et al, 2015).
- Reduction in the incidence of epidemic zoonoses due to fewer interactions between farmed animals and humans (Datar and Betti, 2010).
- Reduction in foodborne illnesses due to the use of aseptic techniques (Datar and Betti, 2010).
- Improved nutritional profile and fewer allergens relative to conventional animal products due to the ability to precisely engineer outputs (Datar and Betti, 2010; Perfect Day Foods, 2016).

Cultured meat, however, leaves the idea that animal flesh is appropriate for human consumption unchallenged and, arguably, validated. The Good Food Institute, a non-profit focused on promoting alternatives to animal products, notes that cultured meat is '100-percent real meat' (Good Food Institute, 2016). This is a pragmatic asset, but also one that may complicate efforts seeking to reshape the social role of animals (Milburn, 2016). Cellular agriculture for the production of animal products can then be cast as a second-generation carnist technology, albeit one that abandons first-generation technologies and may eliminate direct harms to animals.

However, cultured products currently fail to challenge the food system's neoliberal ideology. In and of itself, the technology does not impact overall labour relations or food justice, and many of the initial cultured animal product start-ups are funded by venture capitalists who will expect businesses to maximize return on their investments (Kolodny, 2017). Cultured animal products also hold the potential for creating new harms. Effects remain entirely speculative at this point, and unanticipated harms can potentially arise from any complex technology, but predictions include harmful epigenetic modifications that could arise in the production process (Bonny et al, 2015). Some raise concerns that cultured products would further strengthen the power of the large food corporations at the expense of low-income consumers, farmers, and developing nations (Laestadius and Caldwell, 2015; Hocquette, 2016). Additionally, a recent anticipatory lifecycle analysis indicates that cultured meat may have a higher global warming potential than the rearing of some animals due to the high volume of industrial energy needed for production (Mattick et al, 2015).

With regard to the regulatory environment and the potential for formal food crimes, these technologies are so novel that regulatory frameworks have yet to catch up. Regulation of animal based foods is currently designed with animal rearing and slaughter in focus. This makes current regulations for the production of animal products almost entirely irrelevant to cultured products. This chapter does not allow for an exploration of the complex set of regulatory structures that may or may not come into play once products are ready for commercialization, but there is a lot of uncertainty at present, particularly for cultured meat. For egg and milk products, it seems more likely that the FDA will waive pre-market review and allow the products to come to market as Generally Recognized as Safe (GRAS), since outputs would be deemed substantially equivalent to egg white and milk proteins already considered to be safe (Devitt, 2016). This would be consistent with the FDA's approach to genetically modified plant foods, which focuses

on objective food characteristics rather than the methods by which they were produced (US FDA, 1992).

Given the potential for benefits from cultured products, it is also important to consider the extent to which current policies may hamper their development and perpetuate existing food crimes. One of the primary barriers to the development of cultured products has been the lack of funding for research on cellular agriculture (Datar, 2013). Additionally, government subsidization of first-generation carnist technologies through price supports and allowing environmental externalities to go unaddressed will make it difficult for cultured products to compete based on price (Bonny et al, 2015). Rethinking these subsidies and increasing government research support would greatly increase the viability of cultured products (Bonny et al, 2015). A clearer regulatory framework, both to protect the public from harms and to build public trust, is also essential for successful commercialization (Laestadius and Caldwell, 2015).

Technologies for transforming plants into analogues of animal products

Modifying animals, the slaughter process, and the relationship between animals and animal products all take a harm reduction approach to the consumption of animal based foods. An alternative approach is to not improve the profile of animal products, but instead to bring innovation to plants with the hope that they can take the place of animals. While not a new development, a novel high-tech approach to analogues emerged within the past decade. For example, Hampton Creek worked to develop a database of 'botanical, molecular, and functional data across more than 100,000 plant species and varieties' in their efforts to create plant based alternatives to dairy and egg ingredients (Tetrick, 2015), while Impossible Foods developed a veggie burger that contains plant derived heme to recreate 'the precise flavors, textures, aromas, and nutrition of ground beef' (Impossible Foods, 2016).

These companies aspire to make analogues appeal both to ethically minded consumers and everyday consumers (Pacelle, 2016). Unlike cultured products, analogues are already available to consumers and represent markets worth billions of dollars (Nkwocha, 2016). While technically not promoting animal consumption, some argue that replicating foods from animals may be ethically questionable due to a lack of reverence for animals or because it would represent the enjoyment of something harmful, even if by proxy (Fischer and Ozturk, 2016). For example, Beyond Meat's newest product, the Beast Burger, is engineered to bleed beet juice (Chamlee, 2016). Additionally, in at least once instance, the effort to engineer foods that offer 'the sensory experience meat lovers crave' has involved animal testing (Impossible Foods, 2017). Others suggest that while analogues are not morally wrong, they perpetuate the normative nature of animal consumption and the notion that 'a diet of vegetables, fruits, grain, beans, and nuts/seeds' is in some way insufficient (Milburn, 2016). To the extent that analogues try to mimic animal products and to the extent that they are sought out because of it, this may be correct. Accordingly, analogue technologies are grouped together with second-generation carnist technologies, but may fall into something of a grey area given that they are often made entirely of plants despite resembling animal products.

The widespread adoption of analogues would significantly reduce the number of animals raised for food, yielding reductions in many animal, environmental, and human health harms. Initial estimates suggest that analogues have smaller environmental footprints than cultured products (Smetana et al, 2015). As with cultured products, however, analogues function primarily as a techno-fix reliant on free market logic. By engineering plant based foods to taste, feel, and look like animal products, the hope is to seamlessly fit products into mainstream

Western diets and ideologies. As long as consumers can be swayed by desire and taste, firms profit and consumers are never inconvenienced by ethical obligations (Pacelle, 2016). The techno-fix avoids 'the troubling problem of trying to make people morally better' (Scott, 2010,: 223). This holds appeal from both a pragmatic and profit driven perspective, and analogues have received significant funding from venture capitalists (Pacelle, 2016). Yet relying on the profit motive to create positive change inevitably runs into the issue that 'doing good' is not always profitable. More specifically, using plants rather than animals does not make companies immune from causing harms or engaging in food crimes in other areas.

Since analogues are already available, one can take a more concrete look at some of the food crimes and harms associated with them. While it is possible that analogues may create novel harms, there is little evidence of this to date with the exception of allergies to mycoprotein based analogues (Limbach, 2010). To date, the most tangible food crime specific to analogues relates to product labelling. While courts dismissed similar cases in the past, advocates of conventional animal products continue to point out that plant based milks do not technically meet the U.S. identity standard for milk, which is defined as the 'lacteal secretion' obtained from milking a cow (Watson, 2016b). Additionally, the FDA threatened to 'revoke [Hampton Creek's] use of the term "mayo"' for its Just Mayo product on account of not using eggs (Pacelle, 2016). This was eventually resolved through minor changes to the product's label, but the suggestion that conventional carnist labels cannot be used to name alternatives, or even to criminalize such labels, appears to be another instance of food policy working to preserve the status quo at the expense of harm reducing technologies.

More problematic are the harms and food crimes arising from current business practices. Hampton Creek, for example, was probed by the US Securities and Exchange Commission in 2016 for possible 'securities violations and criminal fraud' in a scheme in which the company is accused of sending undercover contractors into stores to buy back its own products (Zaleski et al, 2016). The company has also been accused of misleading investors and recently settled a lawsuit in which it was accused of violating the Fair Labor Standards Act and the New York Labor Law by misclassifying employees as contractors (Watson, 2016a). All of these developments offer support for the notion that the neoliberal context of the food system is inherently criminogenic, no matter how well intentioned companies aim to be (Croall, 2013).

Hampton Creek was also recently celebrated by many animal advocates for getting its products into Walmart stores (Pacelle, 2016). While Hampton Creek's push against 'food elitism' is laudable (Kaye, 2015), working with a company known to be a repeat offender of crimes against workers does not necessarily speak toward a commitment to food justice. The growing number of analogue companies purchased by major corporations, such as Gardein and Silk, also raises questions about the trade-offs between expanding market access and pushing for more significant food systems reform. Tyson Foods, the largest processor of animal flesh in the world and a repeat offender of crimes against workers, animals, and the environment, recently purchased a 5% stake in Beyond Meat (Strom, 2016). Analogues may eliminate many of the harms of animal production, but they still fall squarely within the confines of the current criminogenic food system. Similar to cultured products, the underlying technologies of analogue products are valuable, but in and of themselves they are not sufficient for creating a just food system.

Conclusion

In this chapter, some of the known harms associated with first-generation carnist technologies are documented and the stage is set for needed discussion about the role of second-generation carnist technologies in addressing these harms and crimes. These novel technologies include 'humane' technologies, cellular agriculture technologies, and plant-based analogues. While some of these technologies may stem from unease with carnism, and may, on balance, reduce its harms, none fully challenge carnist ideology. Give the manner in which they have been developed and promoted, all three second-generation technologies also fail to question neoliberal thinking in which consumers can theoretically buy their way to a better world despite economic actors prioritizing the acquisition of money rather than the promotion of 'physical, mental, social, and planetary wellbeing' (Hastings, 2012).

There may well be an important role for these technologies in addressing harms from the large-scale rearing of animals for food. Indeed, it would be foolish to reject them for failing to solve *all* possible harms and food crimes. However, it is also clear that these technologies alone are insufficient to address the full scope of harms tied to demand for animal-based foods, and may perpetuate or even compound more systemic food crimes. Given growing public interest in the food system, the opportunity for even greater changes may be present and should not be overlooked. At a minimum, firms using these technologies must still be held accountable if they exploit workers or work against food justice. To create meaningful change, technological solutions must be accompanied by concrete social policies informed by critical thinking about both current and novel harms experienced by the full range of actors in the food system.

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