Harm to Others: The Social Cost of Antibiotics in Agriculture

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ABSTRACT It has become increasingly clear that the use of antibiotics in conventionally raised livestock contributes to the emergence and diffusion of antibiotic-resistant bacteria. In this paper, I argue that the harm principle of classical liberalism should guide agricultural policy in general, and the regulation of antibiotics in livestock in particular. After developing an interpretation of the harm principle, and framing the choice to produce and consume animals treated with antibiotics as a classic prisoner's dilemma, I consider some policy responses to the problem, including a ban on the non-therapeutic use of antibiotics.

Keywords: Harm principle, Antibiotic-resistance, Pigovian tax, Food labeling

American agricultural policy treats organic food as a luxury good on a par with diamond watches and BMWs—something that finicky, high income consumers prefer to their conventional counterparts. Organic producers pay special certification fees, which raises the cost of production, while factory farmers receive subsidies and price supports for producing staple crops deemed desirable by policymakers. This gives producers incentive to douse crops with pesticides, to cram farm animals into cages, and to medicate livestock with unnecessary antibiotics. But the social costs of these practices—including air and water pollution, and the evolution of antibiotic-resistant organisms—are paid by others.

I will argue that agricultural policy should instead be guided by the Harm Principle of classical liberalism. On this conception, the primary goal of agricultural policy should not be to maximize economic efficiency or to increase national food production; instead, policymakers should permit farmers to act like any other profit-seeking firm in a market economy, provided that they pay the full private and social costs of their activities. Whether this approach would lead to the extinction or expansion of traditional family farms should not be the primary concern of a government guided by liberal principles. The concern should instead be to protect the rights of individual producers and consumers by preventing people from acting in ways that harm others.

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The paper is structured as follows. In the first section, I introduce the Harm Principle (HP) and establish a framework for determining whether an action or practice produces harms significant enough to license government intervention. In section two, I provide a brief overview of the evolution of bacterial resistance, and I model the decisions to produce and consume conventional animal products as a multi-person prisoner's dilemma. I use the cumulative risks imposed by the widespread use of antibiotics in livestock as a case study for applying the Harm Principle to agricultural policy. In section three, I consider several different proposals for regulating the use of antibiotics in animals in accordance with the Harm Principle.

Harm

Classical liberalism of the sort espoused by John Stuart Mill is characterized first by a presumption in favor of individual liberty, and second, by the principle that only harm to others can justify state interference with liberty. According to Mill, "the only purpose for which power can be rightfully exercised over any member of a civilized community, against his will, is to prevent harm to others."[1]

The Harm Principle may seem too vague to be useful as a foundation for public policy. In order to deflate this criticism, I will begin by considering some vexing problems with defining harm, and then settle on what I consider to be a clear and plausible formulation of the HP.

It seems analytically true that for A to be harmed by B, B must act in a way that decreases A's welfare. A cannot be harmed by B unless A is made worse off as a consequence of B's action. But what does it mean to be made ''worse off'' and how much worse off must we be in order to justify state coercion? A person's actions can make us worse off in many ways. A dentist can make us worse off by subjecting us to insipid music in his waiting room. A serial killer can make us worse off by dismembering us with a pocket knife. In the first case, we suffer psychological damage; in the second, physical damage. In the first case, the harm is a predictable (though regrettable) consequence of our choice to see a dentist; in the second, the harm is essentially unexpected.

The distinction between psychological and physical harm can be useful, but it is rarely sharp or morally significant. It is a familiar fact that psychological trauma can cause physical injury (especially via stress hormones), and that physical injury can create psychological trauma.

Predictability may be a more salient criterion for distinguishing morally significant harms from harms that are morally benign. For example, before it was known that arsenic could induce neurological disorders in children, it is hard to argue that those who produced arsenic-tainted paint should have been punished by the state. But it is plausible to argue that, given our current information, the coercive power of the state should be used to regulate the use of arsenic in paint, since it is a predictable consequence of its use that children will be exposed to its neurotoxic and carcinogenic contents, and that many of those exposed will develop significant health problems.

Another way of distinguishing morally significant harms from innocuous injuries turns on the presence or absence of consent by the victim. Welfare reductions that result from actions to which we have consented do not seem to merit the use of state power to correct or prevent. If I bet on a losing team, the money I lose renders me worse off than I was before I made the bet. But when I hand over the cash I have not been unduly harmed (some might say I have not been harmed at all) by the person with whom I made a bet, provided that we placed our bets willingly.

[1] Mill (2002, p. 11)

But consent does not settle the issue. Suppose I have been made worse off by an action to which I have not consented, and my reduction in welfare was foreseeable by the person who harmed me. Does the Harm Principle allow the use of state power to curtail the harmful activity? Before answering this question, consider an example adapted from Amartya Sen.[2]

Lewd enjoys reading racy novels which his puritanical neighbor, Prude, abhors. Prude discovers Lewd reading Lolita on a bench at a public beach. Prude does not consent to Lewd's reading the book, and Lewd knows that Prude would be shocked by the fact that he is reading the book in public. Lewd may even get a smug sense of satisfaction from Prude's reaction. Is Prude harmed in a way that licenses state intervention? Not necessarily: the presence of predictability and the absence of consent by a victim of harm are certainly important preconditions for state intervention. But we need to introduce another distinction to support the intuition that Lewd should not be punished for offending Prude.

Consider the difference between harmful actions that undermine our basic interests and those that interfere with our particular desires or goals. This is easier said than done. What are our basic interests? According to Joel Feinberg, we all have an interest "in conditions that are generalized means to a great variety of possible goals and whose joint realization…is necessary for the achievement of more ultimate aims."[3] On Feinberg's view, these interests include bodily integrity and physical health, emotional and psychological stability, and the capacity to engage in social relations and develop friendships.[4] To Feinberg's list we should add that we all have an interest in maintaining enough social liberty to explore new ideas and different ways of living.[5] These interests are universal because, whatever we end up believing and desiring, we cannot justify our beliefs and desires, or fully develop our creative and intellectual powers, unless we are free to consider alternatives.

Although we might disagree about precisely what our basic interests are, any plausible formulation of the Harm Principle must distinguish harms that merely reduce our welfare from those that undermine our interests. To return to the previous example, if Prude prevents Lewd from exploring new ideas (say, by setting fire to his copy of Lolita), the Harm Principle seems to permit the use of state power to prevent Prude's action, or to punish Prude for arson. This is not because the state should take sides in disputes over controversial values, but rather because the justification for preventing some people from interfering with the liberty of others is much stronger when basic interests are at stake.

For the purposes of this paper, then, I will assume that in cases involving harm, government intervention may be justified when the following conditions are met: Agent A acts in a way that reduces B's welfare (especially by setting back B's interests), B does not consent to A's action, and harm to B is a predictable consequence of A's action.[6] This formulation is not an ethical algorithm, but rather a framework for thinking about a central class of actions for which the Harm Principle licenses coercive intervention.[7] Moreover, because these are necessary rather than sufficient conditions for government intervention, the burden of justification still falls on those who argue that government intervention is the best (or only) way of preventing some people from harming others.

[2] Sen (1970).

[3] Feinberg (1987, p. 37).

[4] To say we have a basic interest in these things is not to say we have a basic need for them. While needs reflect the preconditions for bare survival, interests reflect the preconditions for living a distinctively human life.

[5] This is, of course, Mill's central concern in On Liberty. See also Lyons (1997, pp. 129–30).

[6] The "predictability'" clause generates enough problems for an entire book. The best general interpretation is that the consequences of an action are predictable if they can be foreseen on the basis of information that is widely available and easily interpreted.

Externalities of Antibiotics

In order to simplify the discussion of the harmful effects, or social costs, of conventional agriculture, I will focus on the use of antibiotics to promote growth and prevent infections in livestock. Similar problems arise in response to the use of pesticides on crops, so the argument could be applied mutatis mutandis to pesticides.[8] For example, both antibiotics and pesticides lower the cost of production and therefore lower the price consumers pay for food. But they also spur the evolution of organisms that harbor the ability to resist antibiotics and pesticides, and, in different ways, threaten human health.

The Biology of Resistance

The Union of Concerned Scientists recently estimated that 70 percent of all antibiotics used in the United States are administered to livestock in order to speed growth and prevent premature death and disease.[9] Precisely how antibiotics promote growth in livestock is not well understood, and it seems to vary considerably between species.[10] Some experts think antibiotics given to neonates prevent certain species of bacteria that compete with their host for nutrients from establishing an early foothold in the animal's gut. Others speculate that antibacterial agents increase the rate of growth by activating hormones that affect the immune system of the host or alter the metabolic activity of gut bacteria that affect nutrient synthesis or absorption. Whatever the mechanism, the effects are relatively small (they seem mostly to allow animals to be crowded together in what would otherwise be intolerable conditions),[11] but the price of antibiotics is evidently low enough to make it profitable to routinely add them to animal feed.

It is widely recognized that the use of antibiotics spurs the evolution of antibiotic-resistant bacteria. This is an inevitable consequence of evolution by natural selection, and it has long occurred between organisms that secrete antibacterial agents and bacteria that develop resistance as an adaptation. What is particularly disturbing about the current evolutionary arms race between pathogenic bacteria and the drugs we invent to destroy them is that it appears to be escalating in response to the widespread and often unregulated use of antibiotics.[12] This is due in part to the rapid replication of bacteria, which allows favorable mutations in a local population to spread quickly, but also to the unique ways in which bacteria can adapt to hostile conditions. Most bacteria contain plasmids—strands of DNA that exist inside the cell wall of a bacterium, but unconnected to its chromosome—which serve a function analogous to sexual reproduction in an otherwise asexual organism.

[7] For a more detailed discussion and careful treatment of the conditions under which harm generates a prima facie case for government intervention, see Gaus (1999, pp. 153–4). For skepticism about the project of devising a set of clear and uncontroversial conditions for applying the harm principle, see Holtug (2001, 2002).

[8] One crucial difference, which I shall only ignore for the sake of brevity, is that of animal welfare. There are costs and benefits to farm animals of using antibiotics, which obviously do not apply to pesticides. Preemptive antibiotics allow farmers to cram animals together in uncomfortable conditions, thus increasing animal suffering. But they also tend to prevent the suffering that might be brought on by bacterial infections.

[9] The Union of Concerned Scientists (2001).

[10] McEwan and Fedorka-Cray (2002).

[11] See foot note 10.

[12] In Mexico antibiotics are available to people without prescription; in the USA antibiotics must be prescribed for people, but not for animals.

Plasmids enable bacteria to express traits that their chromosomal DNA may not express, including resistance to antibiotics. More importantly, plasmids allow bacteria to swap genes with other bacteria, through a process called ''conjugation.'' This means that if a plasmid confers on its bacterial host the ability to persist in an environment that is lethal to other bacteria (for example, a human body during a course of antibiotics), the bacterium will thrive and spread its resistance to other bacteria.[13]

The spread of antibiotic-resistant bacterial infections has recently gained national attention as the annual death toll in America from one particular strain, MRSA, has surpassed the annual death toll from AIDS,[14] and international attention as new strains of extensively drug resistant tuberculosis, XDR-TB, have spread across the globe.[15] The problem is due in part to crowded living quarters (such as jail cells and hospitals), as well as the reckless prescription and consumption of antibiotics, especially cases in which the wrong kind of antibiotic is prescribed for an infection. This happens because patients pressure physicians to prescribe, and because it is cheaper and less time consuming for physicians to prescribe a general course of antibiotics than it is to run the relevant tests for specific bacterial infections.[16] But few nonscientists understand how antibiotics given to farm animals might also contribute to the problem.

Transmission of resistance from animal to human can occur in a number of ways. First, in spite of our best efforts to sterilize animal products, some bacteria persist in the meat and milk we consume. In this case, there is a direct transfer of resistant bacteria from animal to human via meat that is not fully cooked or sterilized, or from slaughterhouse workers who unwittingly transfer bacteria from animals to produce.[17] The best known pathogens among the general public include E. coli and salmonella, since these are common causes of food poisoning. A less direct way that pathogenic bacteria can be transferred to humans is from the lagoons of waste that typically surround animal farms, from which resistant microbes can find their way into drinking water,[18] or be picked up by rodents and insects, which then serve as vectors for spreading bacteria to people.[19] Animal waste with resistant microbes is also used to fertilize food crops, which are then consumed by meat eaters and vegetarians alike.[20] An even more subtle method of transmission occurs when bacteria hosted by livestock develop resistance to certain classes of antibiotics, are transferred to humans, and do not directly harm us, but instead transfer their resistance genes to other bacteria that can harm us.

[13] For an overview of this process, see Levy (2002, ch. 4). Another important aspect of resistance is the operation of transposons within bacteria—genetic sequences that can be shuffled around quickly in response to an environmental stimulus, such as an antibiotic, until a new sequence is reached that encodes for proteins that effectively render the bacterium immune to the antibiotic. Plasmids and transposons can cooperate to produce the rapid transmission and persistence of resistance genes, even after antibiotics are withdrawn. On this process, see Salyers and Amabile-Cuevas (1997).

[14] http://www.washingtonpost.com/wp-dyn/content/article/2007/10/16/AR2007101601392_pf.html. Accessed December 15, 2008.

[15] Shah et al. (2007).

[16] Kades (2005, p. 626).

[17] This is most likely what caused a recent outbreak of E. coli on Spinach grown in California. LosAngeles Times (2007-03-24). http://articles.latimes.com/2007/mar/24/local/me-spinach24. Accessed December 15, 2008.

[18] Osterberg and Wallinga (2004, pp. 10–11); Salyers and Amabile-Cuevas (1997, p. 2325).

[19] McEwan and Fedorka-Cray (2002, p. S99).

[20] Levy (2002, p. 159), Sachs (2008).

According to a recent editorial in the New England Journal of Medicine, a serious concern is "the horizontal spread of the resistance genes from bacteria in food animals to commensal strains in the intestinal microflora of humans. Extensive transfer of antimicrobial resistance genes has been demonstrated among enteric bacteria, bacteroides, and gram-positive bacteria in the human colon. These organisms serve as a reservoir of resistance genes that can be transferred to other members of the microflora or to pathogenic bacteria."[21]

Modeling the Use of Antibiotics

Because the efficacy of antibiotics declines as microbes evolve resistance, the preservation of antibiotics for high value use constitutes a public good (the benefits of which spill across borders, and across generations).[22] However, since the benefits of using antibiotics are concentrated, while the costs of using antibiotics are spread among current and future people, there is little incentive for individual actors—even those with a concern for distant others—to use antibiotics prudently. In the absence of regulation, the prudent use of antibiotics by farmers (or prudent prescription by doctors) generates a collective action problem with a prisoner's dilemma structure. Faced with a choice to treat livestock with growth-promoting antibiotics, or to unilaterally refrain from doing so, each farmer will opt to use antibiotics, as long as the individual benefits of treatment exceed the individual costs.[23] This is not to say that it is irrational for a concerned farmer to decline to use antibiotics to fatten his farm animals. But in a competitive market, it is likely that most producers who choose the morally preferable option will be driven out of business by unscrupulous competitors.

A similar problem emerges when consumers face the choice between buying organic meat (derived from animals not given non-therapeutic antibiotics), and buying meat from conventionally raised animals. While some of us choose the more expensive organic option, many do not, recognizing (if they recognize the problem at all) that their individual contribution to the problem of resistance is insignificant, and that their risk of contracting an antibiotic-resistant infection as a result of their consumption decisions is also small.

It may be morally desirable for consumers to buy organic meat, but this can hardly be expected if the higher cost is borne by the consumer, and the expected benefits go mainly to others. The decisions to consume and produce conventional meat thus generate a negative externality—the presence of resistant bacteria (or bacteria with resistant genes) in the environment, and ultimately in the bodies of other animals and people. Does this negative externality constitute harm? More specifically, does the indirect threat posed by the imprudent use of antibiotics constitute harm significant enough to justify government regulation?

Indirect Harm

The harms produced as a side effect of antibiotics use have unique characteristics. First, they are probabilistic. When a farmer adds growth-promoting antibiotics to his animal feed, it is not necessarily true that this will yield resistant bacteria that will eventually sicken or kill someone.

[21] Gorbach (2001).

[22] A good is public if it provides benefits from which no one can be excluded, and which each person can enjoy equally. Examples include clean air and disease eradication.

[23] This is true as long as the monetary benefits of growth-promotion exceed the costs of purchasing antibiotics, and the niche market for organic meat (which forbids non-therapeutic antibiotics) is small.

Second, the harm is indirect and diffuse. It may be that a current farmer's actions set off a chain of events that harm someone much later. For example, suppose bacteria set up residence in the body of an American farmer's livestock, evolve resistance genes in response to antibiotics given to the livestock, and eventually find their way into a human host. Suppose further that the bacteria do not cause the American to get sick, but are transferred to another person during a business trip to China. The Chinese person eventually contracts a different kind of bacterial illness for which he is prescribed antibiotics. Some of the bacteria picked up from the American then swap genes with the bacteria already contracted by the Chinese businessman before he met the American, the gene swap confers resistance to the antibiotics prescribed for the illness he has contracted, and he dies of the infection some years later.[24] Does the fact that a future Chinese businessman is harmed by a current American farmer's activity justify regulating that activity?

Not necessarily. It is not the fact that one person is eventually harmed by the actions of another person that justifies us in interfering with the first person's liberty through ex ante regulation or ex post punishment. On the formulation developed above, harm must also result from an action to which the victim does not consent, must reduce the victim's welfare in a way that sets back his interests, and must be a foreseeable consequence of the actions of the person who caused it. I believe that all of these conditions are met, and that the harm is significant and extensive enough to justify government intervention.

Some liberals will demur, citing the many indirect ways in which our current actions affect future people.[25] Others might argue that future harm is not a predictable or foreseeable consequence of the current action of our American farmer. Indeed, liberal principles (including the Harm Principle) have been criticized because they tend to focus on discrete transgressions of one particular person against another person.[26] Rules against harm often proscribe actions that produce actual damage to a person's body or property, not probable damage to future people. Yet this is nothing like the connection between the use of antibiotics and the harmful effects of bacterial resistance. The overuse of antibiotics is not like first degree murder; it is instead like the emission of greenhouse gasses that cause global warming, which is likely to result in the suffering of many current and future people.

In both cases many of those who suffer harm from current activities cannot trace that harm to a specific person's actions. And in both cases the person who acts in a way that eventually results in harm cannot predict precisely who will be harmed. But does our inability to foresee the specific people our current activities end up harming make a moral difference? I doubt it. Although our moral intuitions and legal institutions undoubtedly evolved to handle simple cases in which there are readily identifiable victims and violators,[27] we should extend our principles beyond this narrow range of cases. Harm to others, in the relevant sense, does not occur only if we know who the victims are. It occurs as long as we can foresee that there will, with a high probability, be victims. Some call this an "identity-independent" conception of harm, since it accepts the idea that harms can be borne by people who do not yet exist.[28]

[24] This example is not unrealistic. According to Salyers and Cuevas, ''there is a growing body of evidence that the horizontal transfer of resistance genes between bacteria of different species and genera occurs easily and frequently in nature, even between bacteria that normally reside in different sites'' (1997, p. 2322).

[25] Driving a car, for example, increases the likelihood that bicyclists and pedestrians will be killed, yet few think we should ban driving. One important difference between these cases is that while pedestrians and bicyclists can avoid drivers, it is nearly impossible to take such simple precautions to avoid infection by an invisible pathogen.

[26] Fishkin (1992).

[27] Sinnott-Armstrong (2005, p. 289).

[28] Fishkin (1992, p. 63), Parfit (1984, ch. 16).

If the identity-independent conception of harm is plausible, then it looks like the HP would allow us to regulate antibiotics in agriculture (and perhaps in hospitals) in order to prevent harm. However, since the HP is only a necessary condition for government intervention, we need to supplement it with a stronger, more precise principle to justify the regulation of antibiotics.[29] Many environmental and public health threats are created by large numbers of people acting in ways that are individually harmless, but collectively harmful. Adding greenhouse gasses to our atmosphere is a clear example. Each of us exhales greenhouse gasses from our lungs and most of us use electricity from sources that emit greenhouse gasses. But no one person has an appreciable impact on global warming or ocean acidification. Yet we recognize that we all bear some responsibility for the problem and that we should pay our fair share of the cost of reducing the problem, provided others do so as well. We thus implicitly endorse what Gerald Gaus calls The Public Harm Principle:

> If (1) an accumulation of X-ing sets back other people's welfare interests, and if (2) the harm is serious enough such that its prevention warrants limiting the liberty to X (either by regulating or prohibiting X-ing), then (3) everyone should carry their fair share of the burden…, and (4) everyone who Xs is responsible for a share of the harm done.[30]

In the case of greenhouse gas emissions, the Public Harm Principle might justify regulations ranging from emission taxes to cap-and-trade mechanisms for reducing the risks associated with global warming. Similarly, the Public Harm Principle seems to justify regulating the use of antibiotics in agriculture.

Policy Options

Assuming the forgoing analysis of the harms imposed by our current use of antibiotics is correct, how might we improve our current policy?[31] I will briefly explore three options, noting some of the trade-offs associated with each approach.

Some have argued that using labels to increase information about the content and origin of food will increase consumer choice and lead to more ethically favorable outcomes. Indeed, government intervention in the market is often thought to be justified when there is a market failure for information; this occurs when markets fail to allocate goods efficiently because there is too little information on the basis of which consumers and producers can make mutually advantageous exchanges. In the market for food, many governments require manufacturers to list the contents of products they sell in order to inform consumers of ingredients that might make them sick or unhealthy. This is done because producers generally lack incentives to disclose some of the ingredients, and consumers lack the time and resources to analyze the chemical content of everything they buy. On this interpretation, the purpose of mandatory labeling is to increase consumer choice or, stated negatively, to overcome the market failure for information which leads to uninformed choice.

[29] Meijboom et al. (2009).

[30] Gaus (1999, p. 197).

[31] To some extent, we already do this in theory, since the FDA established a "reasonable certainty of no harm" standard in 1998. In practice, however, the FDA has not responded by restricting most antibiotics already in use. McEwan and Fedorka-Cray (2002, p. 96).

Perhaps, then, we can avert the harms generated by the use of antibiotics in livestock by warning consumers that they are purchasing products that were produced in a way that may adversely affect the welfare of many people. In addition to permitting companies that comply with certain standards to advertise their products as "certified organic" or "certified humane," we might compel those who raise their livestock in an unhealthy or inhumane way to carry the label "inhumanely raised" or "certified harmful."

Aside from being politically infeasible, this solution would probably be ineffective. First, given the prisoner's dilemma structure of the problem, informed consumers have just as much reason to buy conventionally raised meat as uninformed consumers. The reason is that as long as the benefits of cheap food go to them, and the expected costs of the production of their food falls mainly on others, they have an incentive to free ride the purchasing habits of others (or avoid being a sucker in a world of free riders). Recognizing the free rider problem, a panel of food labeling experts recently concluded that "mandatory food-labeling requirements are best suited to alleviating problems of asymmetric information and are rarely effective in redressing environmental or other spillovers associated with food production and consumption."[32] More concisely, David Conner argues that "when the risk and benefits are borne by the same person (e.g., medicine), information is called for; when different people bear it (e.g., pollution), regulation is needed."[33] Increasing informed choice through mandatory labeling is unlikely to solve the problem, even if it encourages some of those with enough money and moral conviction to buy organic meat. In addition to being ineffective, the mandatory labeling solution unfairly allows at least some producers and consumers to act in ways that cause predictable harm to others.

A more promising option for preventing harm is to impose a Pigovian tax on the use of antibiotics in livestock.[34] The idea of a Pigovian tax, named after welfare economist Arthur Pigou, is to force producers and consumers to internalize the externalities of their behavior.[35] This is achieved by taxing negative externalities like pollution at a rate that would offset the social costs of the activities that generate the externality, and then (ideally) using the revenues from the tax to fund socially useful projects. While a Pigovian tax is usually thought of as a way to increase economic efficiency, or maximize social utility, it can also be thought of as a way of minimizing harmful activities. So, for example, if we tax activities or resources that produce greenhouse gasses, and use the revenue to fund alternative energy research, we give drivers and energy firms an incentive to produce energy in a less harmful way.

The imposition of a Pigovian tax on the use of antibiotics (at least, antibiotics used in livestock) could have other desirable effects. For one, it might obviate the need for an outright ban, since it would presumably make the costs of using non-therapeutic antibiotics prohibitive, and would encourage alternative ways of accomplishing similar ends. For example, preliminary studies suggest that adding probiotics—healthy bacteria that help stave off infection by pathogenic bacteria—to animal feed is just as effective at speeding growth as adding antibiotics.[36] Todd Callaway has suggested that the only reason more farmers haven't adopted probiotics is that they currently cost several times as much as antibiotics.[37]

[32] Golan et al. (2001, p. 119).

[33] Conner (2004, p. 29).

[34] Rudholm (2002) has established a framework for calculating a dynamic Pigovian tax on antibiotics.

[35] A comprehensive overview of agricultural pollution taxes in Europe can be found in Pretty et al. (2001).

[36] Sachs (2007, pp. 212–216).

[37] ibid, p. 212.

A Pigovian tax on antibiotics could make the switch to probiotics individually rational. Another beneficial side effect of an antibiotics tax is that it may lead to an improvement in animal welfare, since farmers understand that animals kept in cramped conditions are much more susceptible to infectious diseases. Finally, while this option would permit the use of antibiotics by those who pay the tax, the government could (ideally) use the tax revenue to fund research into the development of new antibiotics, and new technology to more quickly and accurately diagnose bacterial infections so that treatments of infections could be made more effective.[38]

Perhaps the most effective way of preventing harm from the use of antibiotics in livestock is an outright ban on non-therapeutic antibiotics. This would bring about the desirable effects of a Pigovian tax, and would avoid the difficulties associated with a government agency trying to calculate and calibrate a precise tax. It may also be more consistent with the liberal idea of preventing harm, rather than merely minimizing harm in the interest of preventing a precipitous rise in the price of meat. The European Union banned the use of non-therapeutic antibiotics in livestock in 2005, and many physicians and scientists have urged the United States' government to follow suit.[39] The Preservation of Antibiotics for Medical Treatment Act (PAMTA) was recently introduced in Congress, though its future is uncertain. PAMTA would ban seven classes of antibiotics from use for non-therapeutic purposes in livestock.[40] Although this is a good start, the ban should be much more comprehensive. In the short run, this would probably lead to higher meat prices and more infections in livestock, and thus welfare losses for people and animals. In the long run, farmers would likely adapt by replacing antibiotics with probiotics or simply giving their livestock more roaming space to avoid infections caused by crowding, and perhaps prices would eventually decline.[41] But price is not the primary issue, since the current price of conventional meat fails to include the threat of harm to others.[42]

Conclusion

The argument that we should regulate certain practices associated with conventional agriculture is a rather uncontroversial consequence of the Harm Principle together with the Public Harm Principle. Many of us already accept something like the HP as the moral foundation for laws governing social liberty and private property. The primary difference between using the HP to regulate, say, free speech and the use of antibiotics in animal feed, is that the harms from antibiotics are indirect, probabilistic, and diffuse. In the case of painting obnoxious political slogans on your neighbor's porch, the harm is direct and the victims are easily identifiable. But I have argued that the indirect harms to current and future people generated by the overuse of antibiotics are no less real, and probably more palpable than pedestrian harms to people's property. Because this harm is an external cost of conventional livestock production, the HP combined with the Public Harm Principle justifies the use of state coercion to force producers (and ultimately consumers) to internalize these costs in order to prevent harm to others.

[38] Kades (2005, pp. 639–641).

[39] Gorbach (2001), Union of Concerned Scientists (2001).

[40] www.keepantibioticsworking.com. Accessed December 15, 2008.

[41] If livestock producers did not adapt in this way, it might be necessary to tax antibiotics used for therapeutic purposes, so that producers would have less incentive to keep livestock in crowded conditions that foster the need for antibiotics. Moreover, we would need to apply similar taxes or bans on imports of meat from countries that permit the non-therapeutic use of antibiotics.

[42] It might be argued that if regulating antibiotics would increase the cost of meat, this would disproportionately affect the poor, since they spend a higher percentage of their income on food. Although this is true, the poor do not need meat for a nutritionally adequate diet. Consequently, there is no parity between the welfare loss associated with paying a slightly higher price for meat and the significant setback to the interests of those threatened with infection by resistant pathogens.

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