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The Harm from Antibiotic Usage

Abstract:

Despite the very important usage of antibiotics in livestock production, there are severe consequences arising on human health and the environment due to antibiotic overconsumption, as well as effects on the economy. The issue comes from the businesses that want a greater profit, as it is cheaper for them to give antibiotics to livestock rather than improve the animal shelter. This creates bacteria resistance that leads to deaths, sickness, and antibiotic pollution that might lead to epidemics. Antibiotics and their traces transfer from different “paths” to get into our bodies and environment, from factory waste to antibiotic-treated chicken in the market. Therefore, solutions from simple human awareness to government regulations are needed despite the possible short and long-term consequences, like the price change of livestock products, in order to solve the problem.

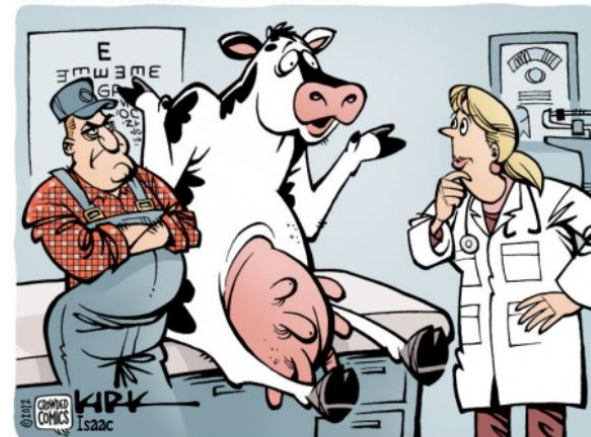
Introduction:

Antibiotics, like Penicillin and Tylosin, are an important medicine that is being used to cure humans and animals from severe and long-lasting infections like mastitis, arthritis, and respiratory disease (Arsene et al.). Besides its useful function “[t]he global consumption of antibiotics in animals is almost twice that of humans” (Arsene et al.), which is dangerous because due to almost everyday meat consumption, bacteria become resistant to pathogens, which makes it harder to cure and affects animals, human health, environment, and economic state, which will be reviewed in the upcoming sections. According to the CDC, “[a]ntimicrobial resistance is an urgent global public health threat, killing at least 1.27 million people worldwide and associated with nearly 5 million deaths in 2019”. Therefore, antibiotic usage should be reduced to improve health and environmental standards as its consequences bring concern. Solutions to the issue will be discussed below.

Antibiotic Usage and Its Impact:

“[A]pproximately 80%” of antibiotics “are sold for use in animal agriculture” in the United States (Martin et al.) so, it is well known that antibiotics are being used in farms (mostly for pigs and chicken) to prevent and treat animals’ diseases, increase their growth, production (as can be seen in Figure 1), and reproduction. For example, antibiotics like penicillin “kills bacteria by destroying the bacterial cell wall” (“How Do Antibiotics Work?”), which is how the process works. Usually,

April 11, 2012 | US News | Isaac
 FDA Seeks to Limit Antibiotic Use in Livestock



I guess it was after I started abusing antibiotics that I noticed my four extra teats...

Figure 1: A joke that represents the consequences of antibiotic usage.

Source: (Lunetta et al.).

antibiotics are given to animals via injection and in a tablet that can be given through the food to cure animals. Besides the positive effects of antibiotics (that are mostly beneficial for humans since they can get more profit), animals are also getting negative effects that influence their well-being. For example, as mentioned above, penicillin is being used to treat animal infections, which is being used not only in agriculture but also in pets (e.g. dogs). In case of constant or overuse of that antibiotic, dogs might face death, diarrhea, vomiting, etc. (Ross). Now, we can apply this knowledge to the constant overuse of penicillin in farm animals that get exposed to it regularly. This indicates that animals on farms might face similar symptoms that aren't being mentioned on the internet and other sources. Furthermore, due to the constant evolution of microbes, it is harder to treat farm animals because they can become resistant to pathogens. The process happens like this: because of the constant antibiotic usage, it always presents in livestock bodies, and it becomes their new "substance". Therefore, bacteria get the same environment every time an animal becomes sick and therefore can easily mutate. This antibiotic becomes less useful for those bacteria and new treatment is required. So, antibiotics have adverse effects that lead to the creation of public health concerns along with the influence on animal well-being.

Antibiotic "pathway" Transfer:

The way that antibiotics transfer to humans is through animal meat and products, which means that we indirectly consume these antibiotic substances/traces and become less resistant to diseases. This means that common medicine won't be able to treat those infections, which increases health concerns and requires the creation of a new treatment. Some consequences for human health after an excessive amount of antibiotics "may cause allergic reactions and digestive problems in humans" not only by getting in contact with the resistive bacteria and meat but also by interacting with feathers and infected people (Sneeringer et al.). For example, there

are cases where humans had allergic reactions like skin rashes after the consumption of milk (Arsene et al.). Overdose of antibiotics (which is an accumulative process derived from antibiotic transfer) not only impacts human welfare but also causes higher medical costs, risk of death, or longer times to stay at the hospital, which changes people's daily routine that might decrease their emotional state and lead to depression. In fact, China has the highest level of antibiotic resistance compared to other countries. It causes around 600 thousand deaths/year (Zhang et al.). To add, antibiotic flow not only comes from agriculture but also from other sources like clinics, where inappropriate usage is in place. This means that besides everyday consumption of animal products, there are many other exposures of antibiotics for humans. This leads to a global problem because once antibiotics stop curing infections and "bad" bacteria, another pandemic might occur. New treatments will be required for situation control. One of the solutions to decrease the consumption of antibiotics from livestock products is to involve a higher attention from the consumers on the intended buying products, where careful label reading and meat appearance observation are required to avoid unhealthy meat consumption. Overall, it is important to decrease the amount of antibiotics usage where possible and the agriculture sector is a good place to start with, since there is no need for that amount of animal products, as there is in production. For example, in the USA milk is being dumped due to lower demand for it and insufficient amount of storage ("Milk dumping likely to stop as dairy prices rise"). This wasteful process continues to happen in all parts of the world. Basically, an overproduction that exceeds the need for milk might be caused by the usage of antibiotics since it leads to an increase in production. So, normally, cows don't produce those amounts of milk, especially when they aren't pregnant all the time. Therefore, it is essential to not produce more than needed.

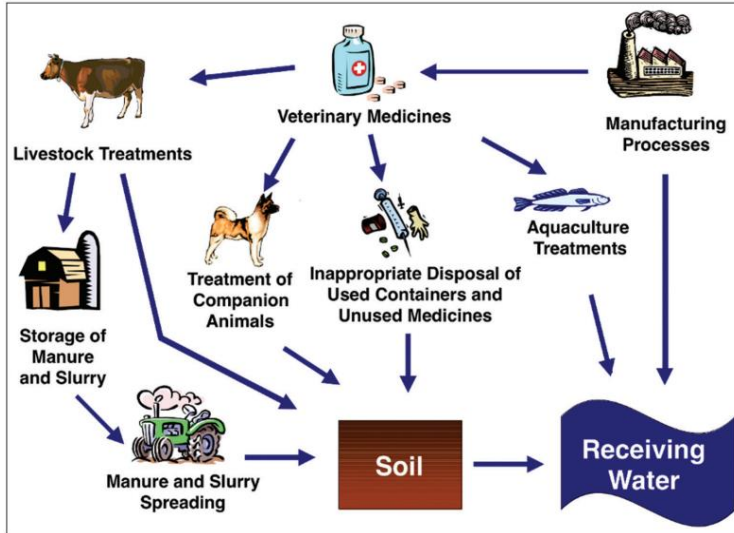


Figure 2: Possible sources of antibiotics to reach soil and water.

Source: (Arsène et al.).

The excessive use of antibiotics also harms the environment as “75% of antibiotics are not absorbed by animals but are excreted as waste” (Arsène et al.). This means that because animals contain too much substance in their bodies, their excrement contains it too and antibiotics are being absorbed into the soil, which causes antibiotic pollution. That is why antibiotics not only access human bodies from meat but also other sources like

water and vegetables. For example, one of the paths, that can be seen in Figure 2, is direct wastage from the manufacturing processes into the water or manure from an antibiotic-exposed animal that is being used in agriculture which, therefore, absorbs into the soil and transfers to the water. This causes greater “training” for the bacteria, so it constantly mutates. Therefore, wild animals are being influenced as well since they are a part of the ecosystem. Another way wild animals can get antibiotic contact is by hunting farm chickens or eating the same livestock food. This creates an even bigger problem because the bacteria resistance is being transferred everywhere by animals like cockroaches and fish. Furthermore, since antibiotics influence animal growth and reproduction, they require more space. This means that more infrastructure will be needed, which increases the risks of deforestation and leads to wild animals’ migrations and air pollution.

Effect on the Economy:

The usage of antibiotics directly affects the economy. First, livestock with antibiotics will “gain the same amount of weight with less feed” (Sneeringer et al.). This means that it is less costly for the farmers to feed the animals because less food is required. Markets might get more revenue by selling livestock meat with antibiotics as it adds weight to it, which results in greater prices. In addition, antibiotic usage also increases animal reproduction, which is beneficial because more animals would be on the farm, which results in greater production. In addition, there will be less incentive to buy animals, which allows them to control their growth and monitor their life conditions, as they affect animals’ health. If alternatives are going to be used, then such industries will need to change their production practices, such as regarding equipment and housing (Sneeringer et al.). This will lead to higher prices due to cost-push inflation (because of the increased cost of production). As stated by the USDA, management practices might help to increase animal immunity by reducing the stress of the animals and providing them with better conditions like improving ventilation or increasing space (the limited space for one of the pig farms, can be seen in Figure 3), which will reduce the need to use antibiotics (Sneeringer et al.). To add, food could also contain more nutrition along with the increased implementation of vaccination in order to decrease risks of animal sickness. Of course, there would be high prices in the short-run but in the long-run cost of production will be low, for example, the veterinary costs will go down as well as the labor costs once the immune systems of the animals are improved, which will reduce sick cases. In short, antibiotic usage



Figure 3: Insufficient amount of space for animals in farms and their sanitation

Source: (“Inhumane Practices on Factory Farms”).

helps with the diversification of products as if there is a lot of milk then it could be used in the production of cheese or other dairy products. Also, because of the direct link with the economy, the decrease in antibiotic usage might cause some product shortages and huge investment but in the long-run, this method would be beneficial not only for the companies but also for people.

Possible Solutions:

Some of the solutions against antibiotic overdose involve regulations that will reduce antibiotic usage. For example, such regulation was seen in 2013 by the FDA (Sneeringer et al.) or a complete ban of antibiotics from agriculture that was seen after the EU implemented (Martin et al.). This might be the most impactful solution since it is a law and usually farms are under government control, so the rules are highly guaranteed to be met. However, it will be time consuming to implement the law and appropriate actions. Another possible solution is the usage of alternative substances like “probiotics, plant extracts, enzymes,” that can replace antibiotics. This is because they not only contain similar functions as antibiotics like increase of animal productivity but also maintain the health of the human population because of nutrients and natural meat. (Kamboh et al.). This will allow us to naturally improve animals’ immunity and produce more environmentally friendly products. To add, selective breeding and bio-security measures (Sneeringer et al.) can help to improve the animals’ offspring to be healthier, which will also improve animal well-being. On the other hand, it might be costly and impact prices by increasing them. However, it might be more efficient to pay for natural products than medicine after the consumption of low-quality products. Also, simple follow of cooking guidelines can help to reduce the antibiotic traces in meat since high temperatures will destroy it. This method might be more effective because of the mass action. Overall, both consumers and producers

should be responsible and ethical in antibiotic usage by understanding the amount consumed and used in animals, not to simply get profit but to think about serious consequences (Martin et al.).

Conclusion:

In conclusion, long-term and unethical antibiotic usage is causing issues like health problems, antibiotic pollution, and economic activity effects. Therefore, solutions (e.g. the empowerment of laws and regulations or alternative products) are required to solve/soften the situation or more severe consequences will occur. Along with the other consequences that might appear like global warming, decrease in the wild animal population, etc.; it is important to understand the degree of the problem as everyone is being affected and to redirect antibiotic usage to other sectors like medicine. Antibiotics are a serious treatment and shouldn't be used regularly or human, wild/farm and even pets' health might be negatively affected.

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