

## The Common Good – Benefits of Antibiotics for Animals and People

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In many parts of the world, it is hard to imagine today what life was like before the introduction of antibiotics. In those days, a trivial injury could lead to serious infections which could not be controlled. It could allow bacteria to enter the body that could overwhelm its natural defences. People also lived in fear of infectious diseases like tuberculosis, typhoid and diphtheria which could spread rapidly through the population, particularly in those living in overcrowded and unsanitary conditions. In some parts of the world it is still like that today.

Today's generation mostly can expect to live longer and healthier lives than ever before due to better control of these diseases. While better nutrition, clean water and improved disease prevention including through best use of vaccination have undoubtedly played a part in this success story, the availability of antibiotics has been essential. Antibiotics have had similar effects on animal health. Our pets are living much longer than they were decades ago, and livestock are raised much more successfully through our ability to control infectious diseases. As the world population continues to grow, keeping farm animals healthy and thereby sustaining the supply of highly nutritious animal protein is becoming ever more important.

### **Disease cannot always be eradicated – antibiotics for animals are necessary**

So in what situations is it really necessary to give antibiotics to animals? It is essential to treat an animal when it is diagnosed with a bacterial infection. However, it may also be necessary to treat other animals in the group at the same time if the disease is contagious. These animals may not yet be showing signs of illness but by the time the disease is spotted in the first animal, they will also have been infected and are likely to develop the same condition unless the veterinarian acts quickly with appropriate treatment. It is very akin to the spreading of a cold when people group together or of infectious diarrhoea in a restaurant or airplane.

Farmers do their best to prevent disease occurring in their herds and flocks. Keeping their animals well fed, physically comfortable, ensuring good husbandry and stringent hygiene practices, and giving all necessary vaccinations will hold many problems in check. Because bacteria and other microbes are found everywhere in the environment it is virtually impossible to prevent animals coming into contact with organisms that can cause disease. This is true whatever management system is used, whether it is sheep and cattle kept on open ranges, or pigs and poultry housed indoors. As a result, there will always be situations where best management practices alone will not prevent disease, and at that point it is vital that veterinarians have immediate access to the necessary medicines.

For example, dairy farmers in the UK have used a five-point disease management plan for controlling mastitis (udder infections) in their cows for over 50 years. This plan carefully integrates the proper use of management practices, strategic use of disinfectants, and specific targeted use of antibiotics to control this disease. Dairies using this plan have been able to dramatically reduce mastitis in their herd, which not only ensures animal welfare but also a safe, nutritious milk supply.

Some people may think that traditional farming practices are best - but that isn't necessarily so for the animal. In the damp upland areas of North West Europe, for example, about one in ten sheep kept on the

open grassland are infected with the extremely painful, contagious condition foot rot. Because it is so painful, affected animals stop eating, lose weight and produce less milk and wool, so in addition to the pain it causes the animal, the disease is also economically damaging for farmers.

Therefore, veterinarians are called in by shepherds in hill areas to prescribe antibiotics to treat their flocks just as they do on farms where broiler chickens are raised in large sheds. It is usually easier to keep chickens (or other livestock) healthy indoors than in a free-range system. The sources of many diseases are often found in soil or elsewhere in the environment, such as parasitic gut worms, external parasites like lice and mites which feed on skin, hair and feathers or suck blood, or bacteria and viruses causing infections. The salmonella bacterium, for example, is often transmitted to poultry through contact with rats and mice – and it is more practical to keep vermin out of a well-maintained indoor unit than an outdoor run.

In other words, when it comes to bacteria and all efforts at preventing animals from getting sick fail, then it becomes necessary for ethical as well as animal and human health reasons to use antibiotics.

## Securing food for the future – with help from innovation

Ever since people first engaged in agriculture to make their food supply less dependent on what was freely offered by nature, we have sought out ways to make food production more efficient. The second half of the 20th century saw the development of significant innovations which made our life easier. A period of rapidly increasing mechanisation and technological developments in agriculture occurred more or less at the same time and coincided with the first introduction of antibiotics. The first antibiotics, such as penicillin, in pharmaceutical preparations for human use were developed during the 1940s and for animals in the mid-fifties. However, not all bacterial infections can be treated with penicillin. In order to ensure the treatment of the different types of infections in the variety of animal species, a wide range of veterinary antibiotics have been developed. Billions of animals have been cured because of these and this has allowed them to keep on delivering wholesome food.

Nowadays, fewer people are employed in farming in countries with good access to technological developments but they are responsible for feeding many more people. In the US, for example, the productivity in the livestock industry more than doubled during the second half of the 20th century and some of this is due to the availability of antibiotics for animals. The World Organisation for Animal Health estimates that even today more than 20% of global animal production is lost due to disease<sup>1</sup>.

By keeping animals healthy, antibiotics contribute to providing people with safe and nutritious food: recent data analysis indicates the direct relation between animal health and food safety<sup>2</sup>. Antibiotics are but one tool that veterinarians can use to maintain animal health. By the middle of this century the global population is expected to grow to more than 9 billion. That is the equivalent of a city of 4.4 million people being added every month between now and then. And most of this growth is urban. By 2050 the UN's Food and Agriculture Organisation (FAO) estimates that to ensure there is enough food, and to meet the demand for food from animals in particular (meat, fish, milk and eggs), we will require an 80% increase in productivity<sup>3</sup>. Since there is limited additional arable land available, an estimated 70% of this increase will have to come from improved efficiency and new technologies. To put this into perspective: we need to produce as much milk in the next forty years as has been produced from the time man first began to milk cows.

The increasing global population and rising incomes are leading, especially in developing countries, to an increased demand for safe food of animal origin. Resulting increases in animal populations elevate the importance of disease prevention. Furthermore, ongoing research is necessary to ensure that veterinary antibiotics remain effective in the future.

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<sup>1</sup> Editorial by B. Vallat, Director General of the World Organisation for Animal Health (OIE), 30 April 2009 at <http://www.oie.int/for-the-media/editorials/detail/article/one-world-one-health/>

<sup>2</sup> Council for Agricultural Science and Technology, CAST Commentary of May 2012: The Direct Relationship between Animal Health and Food Safety Outcomes, available at: [http://www.cast-science.org/publications/?the\\_direct\\_relationship\\_between\\_animal\\_health\\_and\\_food\\_safety\\_outcomes&show=product&productID=155971](http://www.cast-science.org/publications/?the_direct_relationship_between_animal_health_and_food_safety_outcomes&show=product&productID=155971)

<sup>3</sup> Looking ahead in world food and agriculture: Perspectives to 2050, FAO 2011 (foreword, p. 272, p. 525)

## Responsible use of antibiotics – beyond animal health and welfare

For more than a billion people around the world, livestock are their most precious possession. They are dependent on cattle, sheep and goats and poultry for most of their daily needs, food, clothing, transport, traction, even fertiliser for their arable crops. While livestock health in the developed world continues to improve as common endemic diseases are brought under control, the situation is actually getting worse in many parts of the developing world. So effective and properly targeted use of antibiotics will be an essential part of any strategy to turn back this tide of infectious disease and help millions of people out of poverty. In this context, the role of other treatment options such as the use of vaccines in preventing disease is important and goes hand in hand with the use of antibiotics in the control of disease outbreaks.

Going beyond the economic arguments for using all available tools for controlling disease, there is a strong ethical dimension to the issue. Inflammatory conditions like mastitis and lameness are extremely painful for the animal concerned and farmers have a moral duty to avoid causing suffering.

Meanwhile, antibiotics are not just important in protecting the welfare of farm livestock – about 40% of the total global spending on veterinary medicines is for pet animals. Antibiotics help control a range of common and often painful bacterial conditions in dogs and cats and other domestic pets such as ear, skin, respiratory and bladder infections, some of which can also present a danger to people.

There has been little interest until recently in beneficial health and social effects of keeping pets. However, increasing evidence shows that they are measurable and genuine. Contact with a pet animal will lower heart rate and blood pressure<sup>4</sup> and can increase the owner's sense of well-being. That in turn produces clear benefits for the broader society as pet owners have less need to visit their doctor and cope better with the effects of chronic diseases. Antibiotics can play a vital part in maintaining this healthy partnership between people and animals.

## Environmental protection and natural resource conservation

We all depend on animals to provide us with food and fibre, companionship and care, transportation and therapy. Their value to society is extensive. Maintaining their health, especially when it comes to food-producing animals is vital, also from the environmental and natural resources conservation point of view. A recent report from the FAO<sup>5</sup> indicated that one way to decrease the environmental impact of food-producing animals is to manage the loss of animal productivity due to illness and death. Sick animals eat less and the calories they consume are used to fight the disease and to maintain the body. At the same time their production to support people in their daily lives is much lower to non-existent so they use up feed, energy, land, water etc. without benefit in return. It means that veterinary medicines, by helping to restore or maintain the animals' health, reduce the environmental impact of animals, and antibiotics play a part in this.

## Antibiotics – the resistance issue

The capacity of bacteria to select for resistance to antibiotics exists within their genetic makeup and has been there for thousands of years. The discovery and application of antibiotics in medicine has only occurred in the last 70 years. There are some people who will argue that the use of antibiotics is too high in agriculture. Their arguments are based on claims that giving these medicines to animals is affecting our ability to treat human diseases. The emergence of strains of bacteria that are resistant to many commonly available antibiotics is certainly an important health issue and the more that these medicines are used, the more likely resistance will develop, both in human and veterinary medicine. However, it is yet to be understood how much of this problem is due to resistant strains found in animals and transferred to humans or vice versa.

Research has consistently shown that it is transfer from people to people rather than with animals that is the source of most infections with resistant bacteria – more than 96% of cases according to a study published in 2000<sup>6</sup>.

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<sup>4</sup> Vormbrock, Julia; Grossman, John M. (1988). "Cardiovascular Effects of Human-pet Dog Interactions". *Journal of Behavioral Medicine* 11 (5): 509–517.

<sup>5</sup> FAO World Livestock 2011: Livestock in food security (e.g. p.83)

<sup>6</sup> Bywater, R.J. and Casewell, M, (2000) *Journal of Antimicrobial Chemotherapy*, 46, 643-645

Since then antibiotic resistance has remained a concern but there is limited evidence that use of antibiotics to treat animals is the primary cause. In the EU each year there are about 25,000 deaths resulting from antibiotic resistance<sup>7</sup>. Meanwhile, in 2009 there were 270 deaths due to the type of bacteria that can be directly linked to food or animals such as Salmonella, Campylobacter or Listeria – and this, independently whether these bacteria were resistant or not.

## Conclusions

Antibiotics not only cure bacterial diseases in people, they also cure bacterial diseases in animals. In doing so, they help us fulfil our moral obligation to the animals in our care. At the same time, for food-producing animals, antibiotics, by ensuring the animals' health, contribute to efficient use of limited resources and help provide a safe supply of food from healthy animals. For pets they ensure a long and healthy human-animal partnership.

Antibiotics should always be used responsibly, with the utmost care, and only when necessary. They are powerful tools and their benefits need to be preserved for future generations. Consequently, they should always be handled in such a way that limits their potential for stimulating the development of resistant bacterial strains.

By themselves, antibiotics are not a panacea for dealing with health problems in man or animal. Veterinarians, farmers and pet owners must appreciate that effective disease control does not rely on one class of medicines alone. It requires a balanced approach involving careful attention to good hygiene, nutrition and the use of other preventive measures such as vaccination.

We have always lived with bacteria and always will. We need to study them, learn more about them and see how we can control their dissemination, while at the same time manage our use of antibiotics, vaccines and all veterinary medicines in order to maintain their efficacy for the future for the sake of human and animal health.

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<sup>7</sup> EU Summary Report on Trends and Sources of Zoonoses, Zoonotic Agents and Food-borne Outbreaks in 2009 (2011) EFSA Journal 9(3) 2090