The Impact Of Antimicrobial Use In Veterinary Medicine On Resistance Development

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Abstract:
The use of antimicrobial in veterinary medicine is a double edged sword: while it is essential for the health and welfare of animals, it also raises the risk of antimicrobial resistance (AMR). The impact of antimicrobial use in veterinary care on the emergence and spread of resistance is thoroughly examined in this review. It sheds light on the different aspects of antimicrobial resistance (AMR), such as the kind and frequency of antibiotic use, livestock management techniques, and the relationships between human and animal health. This review focuses on the genetic pathways that transmit resistance, highlighting the mechanisms by which drug-resistant bacteria proliferate and emerge. It also looks at the effects of veterinary antimicrobial use on public health, specifically the possibility of zoonotic transmission of pathogens resistant to drugs. This review offers a critical evaluation of the management initiatives and regulatory frameworks currently in place to mitigate antimicrobial resistance (AMR), as well as strategies for sustained antimicrobial use. The attempts to provide an in-depth awareness of the complexity of veterinary antimicrobial use and its crucial role in influencing the global antimicrobial resistance landscape by synthesizing recent research findings.

Keywords: Antimicrobial, Veterinary Medicine, Resistance Development, zoonotic transmission.

Introduction:

The American College of Veterinary Internal Medicine Board of Directors commissioned a special committee to develop this position statement on the use of antimicrobial drugs in veterinary medicine because of the significance of antimicrobial resistance and the need for veterinarians to contribute to preserving the usefulness of antimicrobial drugs in animals and humans. The committee feels that veterinarians have a duty to weigh the needs of the animals under their care against those of other animals and the general public's health. Consequently, if an animal is receiving veterinary care in a suitable veterinary-client-patient relationship and it can be reasonably expected that the animal's health status will improve with antimicrobial therapy, veterinarians are required to offer this treatment option to their patients. Additionally, veterinarians have a duty to actively promote disease prevention, practice conservative medicine, and educate animal owners and managers about the possible side effects of antimicrobial therapy, such as the potential to encourage the evolution of resistant bacteria. From the standpoint of public or population health, however, the outcomes of an antimicrobial medication used as a last resort not working on an infection caused by a resistant bacterium in a human or animal may not be acceptable.

Veterinarians may therefore have to make the difficult decision to treat an animal with a medication that is unlikely to be effective and may cause a prolonged or more severe illness in order to safeguard the public interest. The committee suggests that in order to reduce any potential negative effects on the health of humans or animals, the veterinary profession take voluntary steps to promote the conservative use of antimicrobials. To help veterinarians better balance their ethical responsibilities with regard to perceived patient benefits and public health risks, the veterinary profession must endeavor to educate all veterinarians about conservative antimicrobial use and antimicrobial resistance. The veterinary profession can help with the stewardship of this valuable resource in a number of ways, which are presented and discussed in this document.

The extent to which antibiotic resistance impacts the health of humans and animals is unknown. If drug resistance in bacteria is allowed to spread unchecked, there is fear that many important drugs' effectiveness may become unpredictable and that certain bacterial infections may become incurable. Further research is required to substantiate the risks of antibiotic resistance in humans and animals, despite the intense debate surrounding this topic, as the majority of scientifically reliable information is unavailable (Phillips et al. 2004, Isaacson RE et al., 2004). National Academies Press, Washington, DC, 2004 But there's a growing global need to lessen selection pressures that cause bacterial resistance to emerge in order to preserve both new and existing antibiotics. Not only is there a great deal of pressure to act, but many areas also place a strong emphasis on acting right away. This has the regrettable effect of occasionally forcing authoritative figures to make decisions in the absence of reliable scientific evidence. (American Association of Veterinary Medicine, 2004). Programs to lessen the emergence of antibiotic resistance and antimicrobial use are actively being developed by the World Health Organization (WHO), the US Centers for Disease Control and Prevention (CDC), the US Food and Drug Administration (FDA), the US Department of Agriculture (USDA), and many other agencies involved in promoting and regulating global health activities (US General Accounting Office, 2004). Washington, DC: National Academy Press 2004), but a good portion—if not all—of the reviews have concentrated on the application of antibiotics for the treatment or prevention of disease in animals.

The American College of Veterinary Internal Medicine (ACVIM) acknowledges the significance of this matter and the necessity for veterinarians to monitor and support the use of antimicrobial agents in veterinary medicine in order to maintain the effectiveness of these agents in both humans and animals. The medication is used with little harm to people's health. As a result, the ACVIM Board of Directors authorized the formation of a special committee and assigned it the responsibility of formulating an opinion regarding the application of antibiotics in veterinary medicine. To help with this goal, experts with a range of subject matter expertise have been identified. ACVIM diplomates, additional veterinarians with clinical experience with small animals, horses, and food animals, as well as seasoned specialists in the field of food animal production, comprise the committee.

Along with infectious disease experts, the group included microbiologists, pharmacologists, epidemiologists, and others with extensive research backgrounds in the areas of antimicrobial drug action, animal treatment with antibiotics, and the ecology, surveillance, and epidemiology of antimicrobial resistance. These professionals are employed by the federal government, in private veterinary practices, and as officers and members of over 20 professional organizations that deal with animal health and veterinary medicine. This Committee prepared a draft of this document through lengthy discussions, which was posted for public comment on a website and presented at the 2003 ACVIM Forum. After taking into account feedback, the final draft was submitted to the ACVIM Board of Regents for evaluation and approval prior to publication. This review affecting to the views of careful antimicrobial drug use in veterinary medicine have previously been published and supported by a number of veterinary organizations (AVMA). The Committee did not intend to replicate or take the place of these earlier initiatives when drafting this statement. The Committee's objective was to broaden the scope of earlier endeavors by delving deeper into the challenges encountered by veterinary practitioners in implementing guidelines for prudent application in routine clinical settings. While this document focuses on the use of antibiotics by individual practicing veterinarians, its recommendations may also apply to larger-scale solutions implemented by the ACVIM, the veterinary community, the US government, or other regulatory agencies. This statement focuses exclusively on the use of antibiotics to treat and prevent disease in animals, and its recommendations are not meant to be applied to other situations. There is insufficient attention paid to the use of antimicrobial medications to increase production efficiency. Antimicrobial resistance is a complicated problem with implications that go beyond the scope of this study, as acknowledged by the ACVIM.

Those with vast research experience in the effects of antimicrobial agents, their use in animal therapy, and the ecology, surveillance, and epidemiology of antimicrobial resistance were also included in the group, along with pharmacologists, epidemiologists, microbiologists, and infectious disease specialists. These experts are employed by the federal government, in private veterinary practices, and as officers and members of over 20 veterinary and animal health-related professional associations. Following a lengthy debate, the committee produced a draft of the document, which was made available for review on the website and presented at the 2003 ACVIM Forum. After considering the feedback, the final draft was forwarded to the ACVIM Board of Directors for approval prior to publication. Documents on the Principles of the Judicious Use of Antimicrobial Agents in Veterinary Medicine (AVMA) have been published and endorsed by a number of veterinary organizations in the past. The committee did not create this statement to be a copy of or a substitute for earlier work. Instead, the committee aimed to build on earlier work by offering a more thorough analysis of the challenges veterinarians face when attempting to apply the guidelines to routine practice scenarios. While this document focuses on the use of antimicrobial agents by individual practicing veterinarians, its recommendations may also apply to the veterinary profession, the U.S. government, other regulatory agencies, or the ACVIM, which is a larger health care organization. The recommendations made in this document are not meant to be applied to other situations; rather, this statement focuses exclusively on the use of antimicrobial agents for the treatment and prevention of animal disease. Antimicrobial agents are not taken into consideration when trying to increase production efficiency. Antimicrobial resistance is acknowledged by the ACVIM as a complicated problem with ramifications that go beyond the scope of this article.

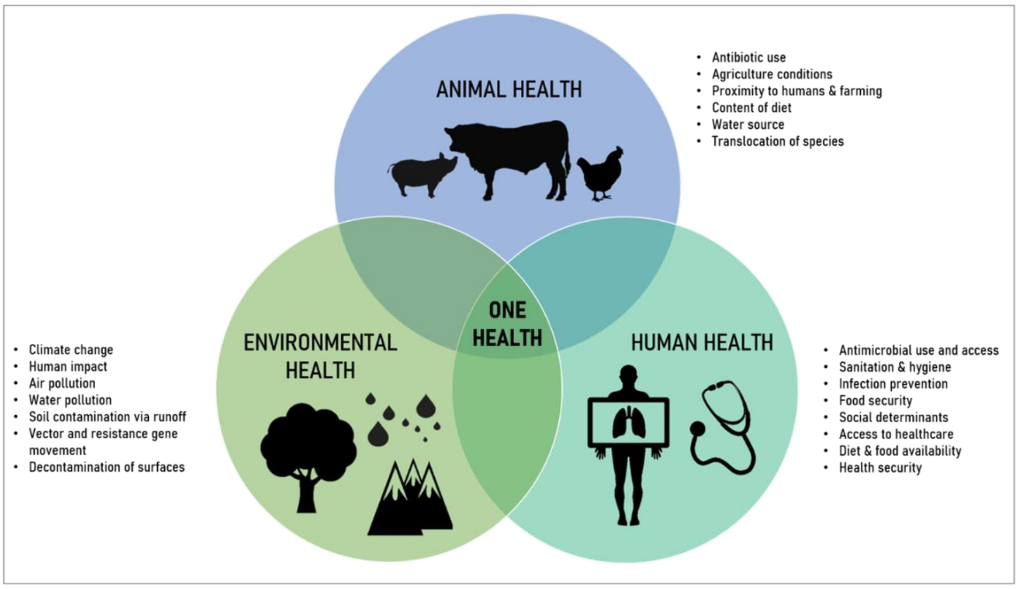

Figure 1: "The One Health Approach: Integrating Animal, Human, and Environmental Health to Combat Antimicrobial Resistance"

The One Health approach is exemplified by this figure, which emphasizes how human, animal, and environmental health are interdependent in the fight against antimicrobial resistance (AMR). Antimicrobial use in veterinary medicine can cause animals to develop resistant bacteria, which can subsequently be consumed by humans through food, environmental contamination, or direct contact. The environment is also important because it acts as a reservoir and a conduit for the air, soil, and water that carry resistance genes. In order to effectively manage antimicrobial resistance, this integrated perspective emphasizes the necessity of coordinated efforts across these sectors. To sustain the efficacy of currently available antimicrobial drugs and safeguard public health, strategies including encouraging the prudent use of antimicrobial drugs, improving surveillance, and creating alternative therapies are required (Marshall & Levy, 2011; McEwen & Fedoras-Cray, 2002; Robinson et al.

Chemical substances that organisms produce, known as antibiotics, stop other organisms from growing. Antimicrobial drugs encompass both synthetic and semisynthetic compounds with the same effect as antibiotics. Antimicrobial medications affect bacterial survival and growth in a number of ways, such as by inhibiting the synthesis of cell walls (penicillin's and cephalosporins), proteins (tetracyclines, macrolides, phenols, and aminoglycosides), and DNA function (sulfonamides and quinoflavins). Bacteriostatic and bactericidal medications are two categories of antimicrobial medications. Bacteriocidal antimicrobials have minimum inhibitory concentrations (MIC) and minimum bactericidal concentrations (MBC) that differ by a small number of dilutions when tested in a laboratory. Bacteriostatic antimicrobials generally need much higher concentrations to inhibit visible growth in culture; they merely impede or stop growth, not actually killing the bacteria. (MIC).

Origins of Antimicrobial Resistance

We can draw reasonable conclusions about why bacteria become resistant to antibiotics, but it is impossible to pinpoint how or when antimicrobial resistance arises. Since survival and reproduction are the only goals that motivate bacterial populations, it is likely that the molecular makeup of the cell contains resistance mechanisms by default. The insertion of resistance genes into a chromosome or plasmid is necessary for the acquisition of resistance, despite the claims of some that all resistance is acquired to some extent. It follows that these insertion sites have either evolved or been programmed over time to accommodate molecular additions. When penicillin was extensively used during World War II, antimicrobial resistance was initially identified. Resistance was later identified following the introduction of each new antimicrobial agent, which prompted the creation of new antimicrobial agents. However, since the early 1990s, a crisis has arisen as a result of pharmaceutical companies' significant reduction or cessation of efforts to develop new antimicrobial drugs and the paucity of new antimicrobial drugs developed for human use. Simultaneously, new pathways for bacterial resistance acquisition were found. A few decades ago, this result would have been unimaginable. However, the combined effect is a decrease in the ability to treat some bacterial diseases effectively. Rather than in animals, treatment failures linked to antibiotic resistance may be more common in humans.

Spread of drug-resistant bacteria

Animal populations can develop resistance for additional reasons relating to interactions at different levels of the ecosystem. Among these are the translocation of carrier animals (between herds, whether local, national, or even worldwide), handling of animals in a manner that raises the risk of transmission, exposure through food and water, through the environment (such as contaminated soil and buildings), through direct or indirect contact with infected individuals, and through the movement and transmission of vectors, such as insects, birds, and wild animals. There have been studies on how management and media affect the movement of bacteria (Phillips I et al. 2004). Animal waste, for instance, can potentially cause bacterial contamination of soil, water, and crops when it is used as fertilizer for crops or in water storage ponds. These sources are thought to pose a risk of exposing humans to bacteria resistant to antibiotics. Animals are not the only source of this pollution, though, as both treated and untreated human waste are frequently dispersed throughout the ecosystem in a similar manner. It is crucial to keep in mind that bacteria are present throughout our ecosystems, making it difficult or impossible to identify a single possible source—such as food animals—as the exclusive or main source of resistant bacteria that are significant for veterinary or public health.

Governments all over the world acknowledge that systemic risk analysis is the most rational foundation for evaluating the advantages, disadvantages, and effects of various issues on society as well as for promoting and weighing more sensible policy and regulatory decisions based on science (FAO/WHO, 2020). Authority for European Food Safety, 2019 The process of risk analysis should ideally yield quantitative data that tries to measure the seriousness of unfavorable outcomes that impact the health of people or animals, such as antibiotic resistance. The adverse event severity multiplied by FAO/WHO, 2020; European Medicines Agency, 2018 is the main metric used to quantify this risk.

Even with a moderate or low probability of the event occurring, there may be a high risk to the population from a societal standpoint if the consequences are extremely severe. Put differently, even in cases where the likelihood of a negative event occurring is low, corrective or mitigating actions may still be necessary if the consequences are severe. When applying the so-called "precautionary principle," which is an extremely risk-averse approach, to policy decisions regarding antimicrobial resistance and other public health issues, this is the justification offered by numerous agencies (Codex Alimentarius Commission, 2021; WHO, 2017). Antimicrobial use in animals may or may not have a negative impact on human health, but there is no denying that antimicrobials may have some selective effects, and those effects are probably not zero. Anyway, it would be extremely detrimental to the welfare of both humans and animals if resistance to crucial antimicrobials spreads (CDC, 2022; WHO, 2017).

Expanded resistance to antibiotics among significant pathogens would result in higher infection-related morbidity and mortality rates as well as higher treatment expenses. Apart from the pain brought on by these infections, a number of other negative outcomes would also happen. The availability and price of animal products will have an impact on consumers, producers' livelihoods will be impacted by adverse effects on production costs, and there may be implications for global trade (UK Department of Health and Social Care, 2021; EMA, 2018). Even if animal bacteria are the only ones with resistance, the possibility of human infection could lead to regulations limiting the use of specific antibiotics and lowering the number of resistant bacteria that come into contact with people. Quantitative risk assessments should ideally enable objective benefits and harms comparisons, resulting in rationally sound decisions (FAO/WHO, 2020; EFSA, 2019). But the model's assumptions determine how valid the results of the risk assessment process are. At the moment, one of the main problems impeding the broader adoption of risk analysis models is the lack of data regarding the use of antibiotics and antibiotic resistance (CDC, 2022; FDA, 2020). It would seem appropriate for all medical professionals—including veterinarians—to actively support reasonable efforts aimed at maintaining the efficacy of these medications in the absence of data. Just as there are unquestionably some antimicrobial use practices that have less of an impact, there is also no doubt that some use practices are more likely to encourage the emergence of resistance. Where appropriate, information from objective, scientifically valid studies should take precedence over the precautionary principle, even though caution is still warranted in the absence of data (World Health Organization, 2017; World Organization for Animal Health, 2020).

Livestock can become infected with a variety of microorganisms, such as viruses, bacteria, fungi, and parasites. Salmonella, Staphylococcus aureus, and Escherichia coli are prominent bacterial pathogens. Animal infections caused by Escherichia coli include sepsis in newborn calves and urinary tract infections in dogs (Fairbrother & Nadeau, 2019). Dairy cow mastitis is frequently caused by Staphylococcus aureus, which causes the dairy industry to suffer large financial losses as a result of decreased milk production and quality (Pyorala, 2002). Numerous animals, such as pigs, cattle, and poultry, are susceptible to salmonella infections, which usually cause sepsis and enteritis (Hur et al., 2012). Humans are at risk of contracting zoonotic diseases from these bacterial infections, particularly if they come into close contact with infected animals or eat animal products. These infections also have an adverse effect on animal health and productivity. Viral infections are a significant factor in livestock infections as well. Canine parvovirus (CPV), feline leukemia virus (FeLV), and foot-and-mouth disease virus (FMDV) are notable examples of viral pathogens. Dogs that contract CPV often have severe gastroenteritis, which is marked by vomiting, diarrhea, and a high fatality rate, particularly in puppies (Decaro & Buonavoglia, 2012). FeLV is a retrovirus that affects even-toed ungulates, such as cattle, sheep, and pigs; it causes fever, blisters, and lameness. Trade restrictions and culling policies can have serious economic repercussions. FeLV causes immunosuppression, anemia, and lymphoma in cats, resulting in a significant reduction in their lifespan (Hartmann, 2012). Reducing the impact of these viral infections on animal health and agriculture requires the implementation of effective control and prevention strategies, including vaccination and biosecurity measures.

Literature Review:

A significant global health concern that affects both human and animal populations is antimicrobial resistance (AMR). The use of antimicrobial agents in veterinary medicine has been linked to the development and spread of antibiotic resistance. Examining the implications for both public and animal health, this literature review investigates the connection between the use of antibiotics in veterinary settings and the subsequent emergence of resistance.

Antibiotics in veterinary medicine

In veterinary medicine, antibiotics are frequently used for prevention, treatment, and growth promotion. Antibiotics can be used therapeutically to treat bacterial infections in animals and enhance well-being and output. In high-risk situations like surgery or intensive agricultural practices, prophylactic use can help prevent infection (McEwen & Fedorka-Cray, 2002). The goal of growth promoters, despite their contentious and sometimes illegal use, is to accelerate livestock growth and feed efficiency (Laxminarayan et al., 2015).

But the extensive application of antibiotics in veterinary care has resulted in the selection of resistant strains. Studies reveal a link between the use of antibiotics in animals and the rise of antibiotic-resistant bacteria, which includes zoonotic pathogens that can infect humans by direct contact, environmental contamination, or animal product consumption (Marshall & Levy, 2011). Concerned about the overuse and abuse of antibiotics in animals, the World Health Organization (WHO) and other international organizations have pushed for strict regulations and antimicrobial surveillance programs (WHO, 2017).

Mechanisms of development of drug resistance

The main cause of the bacterial populations' development of antimicrobial resistance is the selective pressure brought on by the use of antibiotics. Numerous processes, such as mutation, horizontal gene transfer, and selection of pre-existing resistant strains, can lead to the acquisition of resistance in bacteria. The transmission of resistance genes between distinct bacterial species is facilitated by horizontal gene transfer, which is the exchange of genetic material via plasmids, transposons, and integrons (Davies & Davies, 2010).

In veterinary medicine, the use of broad-spectrum antibiotics is a significant problem. Antimicrobials have the ability to attack a diverse array of bacteria, including advantageous commensals, resulting in dysbiosis and the spread of strains resistant to antibiotics. Additionally, by fostering an environment where bacteria are subject to selective pressure and cannot be totally eliminated, subtherapeutic doses used to promote growth may further promote resistance (Van Boeckel et al., 2015).

Impact on animals and public health

The health of animals is severely impacted by the emergence of antimicrobial resistance. Antimicrobial-resistant infections are more challenging to treat and frequently call for the use of stronger medications with potentially more negative side effects or larger dosages of antimicrobials. As a result, there is a rise in animal population morbidity and mortality as well as financial losses from lower productivity and higher veterinary expenses (Tang et al. 2017).

The effects of emerging antimicrobial resistance in veterinary medicine on public health are also cause for concern. Humans can contract infections from zoonotic pathogens like E. coli, Campylobacter, and Salmonella that are hard to cure because of drug resistance. Food safety and hygiene practices are crucial because consuming tainted meat and animal products is a common mode of transmission (Foley & Lynne, 2008).

Strategies for Mitigating Resistance Development

A number of strategies have been put forth to slow the emergence of antibiotic resistance. These include the implementation of antimicrobial surveillance programs, careful utilization of antibiotics in veterinary medicine, and improved monitoring and surveillance of resistance patterns. Using antimicrobials sparingly, choosing suitable medications based on susceptibility testing, and following recommended dosage and course of therapy are all examples of judicious use (Weese et al., 2013).

Programs for antimicrobial stewardship use policies, guidelines, and education to encourage the responsible use of antibiotics. These initiatives can minimize the selection pressure for resistant bacteria, optimize treatment outcomes, and cut down on the needless use of antibiotics. Furthermore, improved surveillance and monitoring can yield useful information on patterns of resistance, choices made for policy, and methods for intervention (Dyar et al., 2017).

Discussion:

One of the most important health issues of the twenty-first century is antimicrobial resistance (AMR). The overuse and misuse of antimicrobials in veterinary medicine has led to the emergence and spread of resistant strains of bacteria, despite the fact that they are essential for enhancing the health of both humans and animals. The multifaceted effects of antibiotic use in veterinary care on resistance development are examined in this discussion, along with the effects on animal and human health and the necessary mitigation measures for this expanding issue.

The role of veterinary antimicrobial use in the development of resistance

Antimicrobial medications are crucial in veterinary medicine for treating bacterial infections, stopping the spread of disease, and encouraging livestock growth. But because of their widespread use, resistant bacteria are under a selective pressure to survive and grow (Marshall & Levy, 2011). According to Davies and Davies (2010), resistant strains can arise from spontaneous mutations or from horizontal gene transfer mechanisms like integron and transposon integration and plasmid exchange that result in the formation of resistance genes.

Frequently used in veterinary settings, broad-spectrum antibiotics disturb animals' natural microbiota, eradicate sensitive bacteria, and encourage the growth of resistant bacteria (Van Boeckel et al., 2015). Because these resistant bacteria can spread through the environment, through direct contact with animals, and through the food supply chain, this has an impact not only on farmed animals but also on broader ecological implications (Tang et al., 2017).effects on the health of animals

Impact on animal health

Treatment for infections brought on by resistant bacteria is more challenging and frequently calls for higher antimicrobial dosages or alternative—and occasionally more toxic—drugs. This may result in more expensive medical care and extended illness, which would be detrimental to the productivity and welfare of the animals. For instance, Staphylococcus aureus-induced mastitis in dairy cows can result in considerable financial losses because of decreased milk output and quality (Pyorala, 2002). Furthermore, resistant infections might necessitate more frequent veterinary care, raising farmers' and livestock producers' operating expenses.

Furthermore, the development of resistance jeopardizes the efficacy of important antimicrobials used in veterinary medicine. The difficulty of developing novel veterinary antimicrobials is made worse by the high costs and stringent regulations involved (Laxminarayan et al., 2015). As a result, careful use is required to preserve the antimicrobials that are currently in use.

Public Health Concerns

The public's health is seriously affected by the veterinary industry's development of antibiotic resistance. Zoonotic pathogens, which can infect both humans and animals, like Salmonella, Campylobacter, and Escherichia coli, are of special concern. Through direct contact, environmental exposure, or ingestion of contaminated animal products, these bacteria can acquire resistance genes from their animal hosts and subsequently infect humans (Foley & Lynne, 2008).

For instance, Salmonella and Campylobacter are significant contributors to human foodborne illness. Animal products containing resistant strains of these bacteria may cause infections that are difficult to treat, increasing morbidity, mortality, and medical expenses (Marshall & Levy, 2011). Moreover, resistant bacteria in animal excrement can contaminate agricultural fields and water sources, which promotes the spread of resistance genes and allows the bacteria to spread to humans through the environment (McEwen & Fedorka-Cray, 2002).

One of the primary principles of the One Health approach is the connection between animal and human health, which is highlighted by the spread of resistant bacteria from animals to people. In order to address the complex issue of AMR holistically, this approach promotes collaborative efforts across sectors, including human health, animal health, and the environment (Robinson et al., 2016).

Strategies to Reduce Antimicrobial Resistance

A variety of strategies must be used by veterinary practices in order to stop the emergence and spread of AMR. Promoting careful consumption of antimicrobials is one important strategy. These include using antibiotics only when they are medically necessary, refraining from using them to promote growth, and observing recommended dosage and treatment duration guidelines (Weese et al., 2013). It is possible to lessen the selection constraints that result in resistance by using fewer antibiotics than necessary.

Programs for antimicrobial surveillance are yet another crucial element in the fight against AMR. These initiatives aim to provide guidelines and policies to support the responsible use of antimicrobials by veterinary professionals and animal producers (Dyar et al., 2017). Good stewardship initiatives minimize the risk of resistance development, enhance treatment outcomes, and maximize the benefits of antibiotic therapy.

Surveillance and monitoring are also essential for identifying patterns of resistance and guiding policy choices. According to Tang et al. (2017), integrated surveillance systems can give information on the frequency of resistant bacteria in animal populations, observe trends over time, and evaluate the effectiveness of interventions. This data is critical for assessing the efficacy of current interventions and for creating focused strategies for dealing with antimicrobial resistance.

To lessen dependency on antibiotics, alternative approaches to disease prevention and treatment should be investigated. According to Giguère et al. (2013), this includes the creation of probiotics, vaccines, and cutting-edge treatments like bacteriophages and antimicrobial peptides. Enhancing farm biosecurity protocols can also lessen the need for antibiotic treatment by preventing the entry and spread of infectious diseases (Weese et al., 2013).

Antimicrobial resistance has significant consequences for both public and animal health, and it has been mainly promoted by the use of antibiotics in veterinary medicine. A comprehensive strategy is needed to address this issue, one that involves encouraging careful consumption of antibiotics, putting in place efficient surveillance programs, stepping up monitoring and surveillance, and looking into alternate approaches to disease management. By doing these things, we can prevent the spread of antibiotic-resistant infections, preserve the efficacy of currently available antimicrobial medications, and protect animal and public health from harm.

Conclusion:

The global health community faces a significant threat from antimicrobial resistance (AMR), which has deep roots in both veterinary and human medicine. Antimicrobials are essential in veterinary medicine for managing bacterial infections, preventing illness, and encouraging growth, but they have unintentionally contributed to the spread and selection of resistant strains. This phenomenon not only has an impact on the health of animals, making treatment choices more difficult and expensive, but it also poses a significant risk to public health because drug-resistant pathogens can infect humans in a variety of ways. The significance of adopting a "One Health" strategy to combat antimicrobial resistance is highlighted by the connections between the health of humans and animals. To achieve this, a thorough plan must be created, one that encourages careful consumption of antibiotics, puts in place effective antimicrobial surveillance programs, strengthens monitoring and surveillance systems, and looks into alternative approaches to illness prevention and treatment. Reducing the emergence and spread of resistance requires training veterinarians and animal farmers in the responsible use of antimicrobial agents as well as creating policies to support these practices. Furthermore, new approaches and technology, like the creation of probiotics, vaccines, and novel therapies in addition to enhanced biosecurity protocols, can lessen the need for antimicrobials while preserving their efficacy. To create and execute policies that safeguard human and animal health from the escalating threat of antibiotic resistance, cross-sector cooperation is essential. A comprehensive and proactive strategy is needed to address the effect of veterinary antimicrobial use on resistance. We can lower the risks related to antimicrobial resistance, guarantee the ongoing efficacy of currently available antimicrobial medications, and safeguard the health and welfare of both humans and animals by putting into practice efficient strategies and encouraging international cooperation. Because of how urgent this problem is, action must be taken both now and in the future to guarantee everyone's health.

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