Veterinary antibiotics (VAs) are used in concentrated animal feeding operations (CAFOs) for the purpose of protecting animal health and as a feed supplement to improve animal growth rate. Livestock producers in the United States use more than 5,000 tons of VAs annually. However, they are also considered emerging contaminants of concern. Either as manure piles in the CAFOs, or as manure applied to the agricultural field, VAs pose a threat to the ecosystem—in soil, groundwater, and surface water—and, ultimately, to humans. The major concern with VAs is that harmful pathogens exposed to them gain resistance with time. Therefore, in the long run, antibiotics lose their potential to treat diseases caused by these resistant pathogens. Other concerns are based on toxicological effects on human health, aquatic organisms, and plants.

Among the VAs commonly used in the livestock industry are the tetracycline group of antibiotics, e.g., tetracycline (TTC), oxytetracycline (OTC), and chlortetracycline (CTC). This group of VAs rank second in production and usage worldwide, with OTC being the most popular for cattle in the United States. Reconnaissance studies conducted in recent times have frequently detected these antibiotics and other aquatic bodies, including soils. Tetracyclines are complex organic compounds with unique characteristics and behavior. Their structures contain ring systems with multiple ionizable functional groups. The high polarity, and consequently, high aqueous solubility of tetracyclines, portends that they could be highly mobile in soils. Thus, effective means of immobilizing these antibiotics in soils need to be employed to reduce potential hazards that could result from their presence in the environment, and consequently, in surface and ground water.

Application of chemical amendments is a common practice in in situ environmental remediation of soils.

A Green Sorbent to Remove Antibiotics in the Environment


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