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Herbal Interventions in Poultry Production: Addressing Disease Risks and Antibiotic Resistance

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Different pathogens can have a significant impact on the health and productivity of poultry, which in turn affects their welfare and the efficiency of production. This can lead to reduced profits and increased usage of antimicrobial drugs. This is concerning for food safety as it increases the risk of poultry products being contaminated with pathogens that can be transmitted to humans. Additionally, there is a growing demand for organic poultry from consumers. Some pathogens, such as *Salmonella* spp. and *Campylobacter* spp., worsen the situation by forming biofilms, which contribute to the severity of poultry diseases and promote resistance to antimicrobial drugs. These biofilms are complex structures made up of bacterial cells and the substances they produce, creating a protective barrier that makes eradication efforts more challenging (1, 2).

The poultry industry relies heavily on the use of synthetic antimicrobial agents, which are commonly administered through feed or drinking water. While this practice has contributed to the industry's success, there is a significant risk associated with prolonged use of antibiotics at low levels. This can lead to the emergence of drug-resistant pathogens, which can have negative consequences for human, animal, and environmental health (3). Additionally, the overreliance on antimicrobials for disease prevention and control in the poultry industry poses financial sustainability risks, as it promotes the growth of bacterial reservoirs that are resistant to treatment. Thus, it is essential to practice proper antimicrobial stewardship and reduce the use of antimicrobials in animals' feed, particularly for preventative purposes, in order to mitigate the impact of antimicrobial resistance on human health (2).

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The poultry industry is becoming increasingly concerned about the rise in Salmonella outbreaks related to poultry products, highlighting the heightened risk of Salmonella contamination in these foods. Salmonella is a common foodborne pathogen that causes a significant number of illnesses, hospitalizations, and deaths globally each year. To ensure profitability in livestock production and prioritize public health, it is vital to explore alternatives to the use of preventative antibiotics. One potential solution is the use of phytogenic additives, which are plant-derived and considered non-antibiotic antimicrobials. These additives show promise as feed supplements for promoting growth and preventing diseases in poultry.

The rise of antibiotic-resistant bacteria in food, including *Campylobacter jejuni*, *Bacillus cereus*, *Escherichia coli*, and *Staphylococcus aureus*, necessitates a deeper understanding of their pathogenesis. Plant-derived natural antimicrobial compounds offer potential in controlling both susceptible and resistant pathogens, minimizing their presence in the food chain and improving microbial food safety (3).

Traditional medicinal plants, known for their antimicrobial properties, are being explored as alternatives to antibiotics in livestock. For instance, plants like *Alchornea laxiflora* exhibit potent antibacterial and antifungal properties, offering potential solutions to combat infections. Additionally, herbs like garlic (*Allium sativum*) have shown immunostimulatory, antioxidant, and antimicrobial properties, benefiting both human and animal health. Thymol, an herbal food additive, has demonstrated properties such as antimicrobial, immunomodulatory, and antioxidant effects, enhancing livestock health and performance (4-6).

In the context of poultry production, traditional herbal medicine is gaining attention due to its cost-effectiveness, availability, absence of residual effects, and avoidance of antibiotic resistance. Many herbs exhibit success in treating various diseases in animals, promoting poultry growth, combating infections caused by microbes and parasites, and aiding in antioxidant use for organic egg and meat production.

Avian coccidiosis, an expensive infectious poultry disease, has been controlled through chemoprophylaxis and anticoccidial feed additives. However, drug-resistant strains and complications with vaccines have surfaced (7). Antioxidant-rich plant products show promise in controlling Eimeria infections, offering a natural alternative to chemotherapeutics. Compounds like vitamin A, vitamin E, zinc, selenium, and botanical antioxidants present potential in combating avian coccidiosis.

In essence, exploring natural alternatives derived from plants and herbs presents a viable avenue in poultry production to combat diseases, improve health, and ensure food safety while reducing reliance on antibiotics and chemical interventions.

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