



## **Significant development of nanotechnology in improving the treatment of poultries bacterial infections: Meta-Analysis of published articles till 2022**

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**Objective:** The ideas that seeded nanotechnology were first mentioned in 1959 by renowned physicist Richard Feynman. Nanotechnology is a rising era with great capacity and numerous applications in human health, agriculture, and animal nutrition packages. The improvement of nanoparticles (NPs), particularly liposomes, polymeric nanoparticles, solid lipid nanoparticles, Nano gels, and inorganic nanoparticles, are gaining traction and terrific tools for overcoming the medicinal issue followed by bacteria. Dietary supplementation with nanoparticles plays a regulatory role in maintaining growth performance, feed conversion ratio (FCR), antioxidant defense, and microbial control. Moreover, potential applications and various aspects of using nano-trace minerals in different poultry species with possible effects on the performance and health of birds are discussed. Therefore, in this Meta-Analysis, nanoparticles' current progress and challenges in enhancing bacterial therapy are focused stepwise. The present study highlights the growth performance, antioxidant defense, and anti-bacterial potentiality of NPs in poultry and provides insight into their significance in the poultry industry.

**Materials & Methods:** Three databases (Google Scholar, PubMed, and Scopus) were searched for published articles on nanotechnology applications on growth promoter, antioxidant and anti-bacterial potentials in the productivity of poultry from 2015 to 2022. Eighteen related articles with complete abstracts were included in this study.

**Results & Conclusion:** Based on the results, there are many studied NPs in poultry field research, such as copper (Cu) NPs, followed by zinc, zinc oxide, selenium, gold, and silver NPs. The supplementation of animal diet with elements such as copper, silver, zinc, gold, selenium, chromium, or calcium in nano-form positively affects livestock and poultry performance, productivity, and health. Our results concluded that The dietary supplementation of ZnO NPs can reduce bacterial-induced negative effects of FPD in broilers. Since silver compounds are known for their antimicrobial properties, silver nanoparticles are a potential antimicrobial feed additive. Silver nanoparticles show inhibitory effects on various species of bacteria, including *Escherichia coli* and *Staphylococcus aureus*. The importance of Cu in the animal diet physicochemical and biological properties of Cu NPs (nutritional and physiological characteristics, antibacterial activity, immunological and toxicological effects) were described in reviews. The antimicrobial effect against key pathogens of concern to the poultry industry indicates that there are opportunities for the poultry industry to benefit from nanoscience. Continuing research and development into Nano-enabled control strategies will undoubtedly provide opportunities for the poultry industry to benefit from nanoscience.

**Keywords:** Antibacterial, Nanotechnology, Nanoparticles, Poultry, Treatment.