Nanotechnology progress in increasing the production of laying poultries: Meta-analysis of articles published until 2020

Hajjafari A[1*], Borji H[2],Ghafouri SA[3], Ghaniei A[3],Delrobaei M[3], Sadr S[3],Qaemifar N[3], Lotfalizadeh N[3], Atazade AH[3],Faghani Z[3],Komeili N[3], Shafiei M[3]

[1]*Department of Pathobiology, Faculty of Veterinary Medicine, Tehran Azad University of Olum Tahghighat, Tehran, Iran;*[2]*Department of Pathobiology,* [3]*Department of Clinical Science, Faculty of Veterinary Medicine, Ferdowsi University of Mashhad, Mashhad, Iran*

Corresponding author's email:hajjafari2014@gmail.com

Objective: The field of nanotechnology has been developing rapidly since 1974, when it was invented to assemble novel materials with diameters of 1 to 100 nanometers. Nanotechnology and nanoscience have played an increasingly important role in veterinary medicine over the past decade, particularly in diagnosis, prevention and therapy, breeding and reproduction, animal nutrition, and food safety. A growing number of studies are examining the potential for nanomaterials to be used in poultry nutrition. Various nanomaterials could improve poultry and animal products, including quality, processing, packaging, and commercialization. This study aims to investigate the effects of different nanoparticles on the quality and quantity of eggs in laying poultries, which will be mentioned in this article.

Materials & Methods: The applications of nanotechnology in the poultry industry sector vary and are massive. Three databases (Google Scholar, PubMed, and Scopus) were searched for published articles on nanotechnology applications in increasing the production of laying poultries from 2012 to 2022. Twenty related articles with complete abstracts were included in this study. All data were analyzed with R version 4.2.1 artificial intelligence software.

Results & Conclusion: According to the results, the most studied NPs in poultry field research are copper (Cu) NPs, followed by zinc, zinc oxide, selenium, gold, and silver NPs. To a lesser extent comes other NP formulations, such as chromium and chitosan. Rapid and specific disease diagnosis, immuno-stimulation, improvement of production parameters in broilers and layers, microbial inhibition and disinfection are the most common applications of NPs in poultry. According to the analyzed findings, the regular inclusion of nano-supplements to fortify livestock feed is likely soon; however, it will take longer for nanoparticles to fully replace antibiotics in feed as many biocidal candidates must still be tested in vivo before undergoing clinical trials and food safety tests.Current knowledge of the effectiveness of NP against key poultry pathogens provides opportunities for the poultry industry to utilize nano-science to develop healthy, efficient, and safe poultry products. According to previous studies, using different nanoparticles in the diet of laying poultry helps to increase the production and improve the quality characteristics of eggs.

Keywords: Nanotechnology, poultry, layer poultry, Prevention, treatment.