

Coincidence between a human-poultry zoonotic infection and antibiotic resistance: a public health challenge with *Pseudomonas aeruginosa* (Review)

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**Introduction:** According to global statistics, more than ۳ million human deaths are caused by infections transmitted from animals to humans. *Pseudomonas aeruginosa* is a pathogen with high mortality in poultry, which has the ability to transmit and cause disease in humans. Chicken embryos infected with *P. aeruginosa* die before hatching and chicks show respiratory and intestinal symptoms and septicemia with severe mortality. Pulmonary damage such as cystic lung fibrosis and bronchiectasis seen in humans infected with *P. aeruginosa*, especially in cases of immunodeficiency. *P. aeruginosa* is transmitted to humans through contaminated poultry carcasses and its products. In recent years, high antibiotic resistance has been reported to *P. aeruginosa*, which can be attributed to the transfer of antibiotic resistance genes from poultry products to humans. These reasons have caused that despite the importance of this zoonotic pathogen in public health, its treatment is very difficult and complicated. Therefore, there is an urgent need to replace antibiotics with a suitable antimicrobial agent to overcome widespread bacterial resistance. Currently, many studies are being conducted on various alternative therapies. This article deals with the study of *P. aeruginosa* in poultry and how it is transmitted and causes infection in humans, followed by antibiotic resistance issues.

**Methods:** In order to review the studies conducted in the field of the importance of *P. aeruginosa* as a common pathogen between humans and poultry and the subsequent development of disease and antibiotic resistance issues and the challenges of its treatment, Google Scholar, PubMed and Scopus databases with keywords "*Pseudomonas aeruginosa*", "zoonosis", "public health", "poultry", "antibiotic resistance", and "alternative" were searched between ۲۰۱۴ and ۲۰۲۴. Finally, articles related to our topic were discussed and reviewed to write this article.

**Results:** *P. aeruginosa*, having different virulence factors such as *fliC*, *pslA* and *toxA* genes, plays a role in inhibiting protein biosynthesis and microorganism colonization and cell penetration along with inducing necrosis and tissue death. This Gram-negative, aerobic, and rod-shaped bacterium is present everywhere as an opportunistic agent and becomes pathogenic under conditions of stress and immunodeficiency. *P. aeruginosa* can infect humans through occupational contact with contaminated poultry carcasses and their products. Especially, due to the formation of biofilm and its high resistance in unfavorable conditions, it is abundantly present in products that are subject to spoilage and carcass waste. This high resistance is one of the important reasons for non-response to antibiotic treatment. Indiscriminate and uncontrolled use of antibiotics in industrial poultry breeding

chains and their products has also been reported as one of the main causes of antibiotic resistance in the treatment of *P. aeruginosa*. A high variation of antibiotic sensitivity of *P. aeruginosa* strains to different classes of antibiotics has been reported. Many alternatives are known for the treatment of various bacterial infections, some of which are more effective for the treatment of *P. aeruginosa*. According to existing reports, the use of selected bacteriophage viruses is useful as an alternative or in combination with antibiotics. Biodiversity and the ubiquity of phages in nature, as well as the easy isolation process of phages, are factors that can make them suitable alternatives for a long time. Using nanoparticles is another way to deal with resistance to antibiotics. According to previous studies, nanoparticles, due to their smaller size and unique curative properties, can cause disruption, penetrate the cell and induce the production of reactive oxygen species and free radicals through binding to the cytoplasmic membrane and cell wall of microorganisms. All the mentioned cases are still being studied and investigated and researchers are constantly expanding and discovering new cases in this field to achieve the best combinations.

**Conclusion:** According to the researches, *P. aeruginosa* is an important pathogenic and opportunistic bacterium in poultry and humans. Resistance to various antibiotics is common among *P. aeruginosa* strains, both in poultry and in humans. Accordingly, strict monitoring and enforcement of laws to control the use of antibiotics in the food chain at safe levels, as well as more research to discover and prepare appropriate alternatives to antibiotics against this bacteria should be carried out.

**Keywords:** *Pseudomonas aeruginosa*, zoonosis, poultry, public health, antibiotic resistance