Public health issues related to poultry and poultry products

Cuestiones de salud pública relacionadas con las aves de corral y los productos avícolas

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Hafez Mohamed Hafez
Prof. Dr. Former Head of the Institute of Poultry Diseases, free University Berlin, Germany
Address. Tutzinger Str. 1, 12309 Berlin, Germany
Hafez.Mohamed@fu-berlin.de

ABSTRACT

Several factors are influencing the poultry production and health such as strong global competition; changes in social, political and consumer perceptions with regard to food safety, animal welfare and environmental protection.

The loss of consumer confidence and trust in the quality and safety of poultry meat and poultry products will remain a continuous major challenge. Many human foodborne infections are linked to poultry. Control and/or elimination of these organisms present a great challenge.

The development of antibiotic resistant bacteria will also be a continuous public health hazard. The future concept of animal health will cover not only the absence of disease in birds, but also the relationship between the health of animals and their welfare. It will also take into account social, economic and ethical considerations, as well as support the achievement of a high level of environmental protection. In general, consumer expectations for high quality products will strongly influence future production methods. This means that farmers, veterinarians, stockholders and all other partners involved in the production chain need to share more responsibilities. The present paper explores these points.

Keywords: poultry, issues, Public health.

RESUMEN

Son varios los factores que influyen en la producción y sanidad avícolas, como la fuerte competencia mundial y los cambios en las percepciones sociales, políticas y de los consumidores respecto a la seguridad alimentaria, el bienestar animal y la protección del medio ambiente.

La pérdida de confianza de los consumidores en la calidad y seguridad de la carne y los productos avícolas seguirá siendo un reto importante. Muchas infecciones humanas transmitidas por los alimentos están relacionadas con las aves de corral. El control y/o la eliminación de estos organismos suponen un gran reto.

El desarrollo de bacterias resistentes a los antibióticos será también un peligro continuo para la salud pública. El concepto futuro de sanidad animal abarcará no sólo la ausencia de enfermedades en las aves, sino también la relación entre la salud de los animales y su bienestar. También tendrá en cuenta consideraciones sociales, económicas y éticas,

además de apoyar la consecución de un alto nivel de protección del medio ambiente. En general, las expectativas de los consumidores de productos de alta calidad influirán mucho en los futuros métodos de producción. Esto significa que agricultores, veterinarios, ganaderos y todos los demás participantes en la cadena de producción deben compartir más responsabilidades. El presente artículo analiza estos puntos.

Palabras clave: aves de corral, problemas, salud pública.

1 INTRODUCTION

The goal of poultry industry worldwide is the production of safe food products, via efficient and goal-oriented health care to prevent the development of disease conditions in poultry. Currently, the poultry industry faces several challenges, such as strong global competition between producing countries, the movement of the large poultry producing companies to other countries with lower production costs, steady increases of feed cost, which it is a major disadvantage for several countries, which should import feed ingredients such soya as a protein source from other countries. In addition, the increase of biofuel and biogas production will reduce the available land for food grains via efficient and goal-oriented health care to prevent the development of disease conditions in poultry. Currently, the poultry industry faces several challenges, such as strong global competition between producing countries, the movement of the large poultry producing companies to other countries with lower production costs, steady increases of feed cost, which it is a major disadvantage for several countries, which should import feed ingredients such soya as a protein source from other countries. In addition, the increase of biofuel and biogas production will reduce the available land for food grains and feed production. Also, climatic changes and limited water resources also need to be seriously considered, as they will have an influence on the cost of production. In addition, changes in social, political and consumer perception and demands as well as the existing several and different legislations related to the food safety between the producing countries as well as the emergence and re-emergency of some diseases (Hafez, 2009; Hafez and El-Adawy, 2019; Hafez and Attia; 2020; Hafez and Shehata, 2021).

Food safety

The two most important and most frequently occurring food borne diseases. transmitted from poultry to humans are **Salmonellosis and Campylobacteriosis**. They are rarely causing disease in infected poultry and but frequently diarrhoea in infected humans. Infections in human with ***S. enterica*** serovars may cause intestinal inflammation

with mucopurulent or bloody diarrhoea, accompanied by fever, vomiting, and abdominal cramps for several days. The incubation period is between less than one day and three days. In countries with intensive poultry production, it has been determined that under current conditions, it would be very difficult to eliminate Salmonella contamination in poultry production. However, the possibility to eliminate host specific serovars and to reduce non-host specific invasive serovars is realistic (Hafez, 2009). In November 2003, the European Parliament Council Regulation **2160/2003/EC** on the control of Salmonella and other specified food-borne zoonotic agents was passed. In addition, the competent authority should sample the flocks also. In June 2008 commission regulation (EC) **No 584/2008** of implementing Regulation (EC) No 2160/2003 of the European Parliament and of the Council as regards a community target for the reduction of the prevalence of *S. enteritidis* and *S. typhimurium* was put into force (EC, 2008). The Community target is the reduction of both Salmonella serovars to the maximum percentage of fattening and breeder flocks remaining positive to 1% or less by 31 December 2012.

Campylobacter is the leading cause of zoonotic enteric infections worldwide Campylobacter infections in humans are mainly transmit by contaminated food. In most countries' prevalence in broiler, layer, and turkey flocks is higher than 50%. ***C. jejuni*** is the predominant species in poultry, while ***C. coli*** is less common, and ***C. lari*** is rare. There is a seasonal variation, since infection rates are higher in spring and fall than in winter and summer. Flocks younger than 3 weeks are rarely affected. Additionally, there is a seasonal variation, since infection rates are higher in spring and fall than in winter and summer. No evidence has been found either for vertical or for horizontal transmission from one flock to the next via persistent house-contamination. However, since the organism has been detected in the intestines of most slaughtered poultry, the major route for campylobacter contamination of poultry appears to be the horizontal transmission from the environment. In human Campylobacteriosis are steadily increasing and have already exceeded the number of salmonellosis cases in some EU countries (EFSA, 2018)

Furthermore, infections with **Avian Influenza (AI)** can cause severe disease in poultry flocks and in human. Transmission from birds to humans occurs only after close contact with infected live. Infection of humans with AI causes disease of the lower respiratory tract, leading to cough, sore throat, breathing problems, and pneumonia. Other flu-like symptoms that may be caused by AI include fever and muscle aches. In atypical cases respiratory symptoms may be absent, and diarrhoea or neurologic signs have been reported in infected humans. The majority of human cases of influenza A (H5N1) and A

(H7N9) virus infection have been associated with direct or indirect contact with infected live or dead poultry (Hafez and Hauck, 2015). To minimize public health risk, quality surveillance in both animal and human populations, thorough investigation of every human infection and risk-based pandemic planning are essential (WHO, 2018)

Antibiotic resistant and associated problems

The development of antibiotic resistant bacteria, which is common in both, animals and humans, will also be a continuous public health hazard. Currently, only a few authorised pharmaceutical veterinary products will be available for the treatment of poultry as food producing animals. The development of antibiotic resistance in bacteria, which are common in both animals and humans, is an emerging public health hazard. Controlling these foodborne organisms requires a broader understanding of how microbial pathogens enter and move through the food chain, as well as the conditions that promote or inhibit growth for each type of organism. It is generally known, that supplementation of poultry feed with antibiotic growth promoters (AGPs) improves performance of live-stock. The effect of AGP on gut flora results in improvement of digestion, better absorption of nutrients, and a more stable balance in the microbial population. As consequence, the prevalence and severity of intestinal disorders are reduced. However, AGPs also can increase the prevalence of drug-resistant bacteria. Based on “Precautionary Principle” and experiences made in some European countries, the EU completely banned the use growth-promoting antibiotics in feed of food producing animals by January 2006 **(EC, 2006).**

Field observations in Europe showed that the poultry industry faced several problems after the ban of AGPs. The impact of the ban has been seen on the performances (body weight and feed conversion rate) as well as on the rearing husbandry (wet litter and ammonia level), animal welfare problem (footpad dermatitis) and general health issues on the birds (enteric disorders due to dysbacteriosis and clostridial infections). Investigations indicate that competitive exclusion, prebiotics, probiotics, enzymes, and acids can impact the incidence and severity of clostridial infections in poultry. El-Adway *et al.* (2012) investigated 76 *Campylobacter jejuni* isolates from 67 epidemiologically unrelated meat turkey flocks in different regions of Germany in between 2010 and 2011. Only one isolate was sensitive to all tested antibiotics. The resistance against sulphamethoxazole/trimethoprim was 58 (76.3%), metronidazole 58 (76.3%), ciprofloxacin 53 (69.7%), naladixic acid 51 (67.1%).and tetracycline 42 (55.3%),

respectively. Multidrug resistance to three or more classes of antimicrobial agents was found and ranged from 3.9% to 40.8%. Similar results were also found by examination of isolates collected from different free-range turkey flocks in Germany (El-Adway et al., 2015).

Richter et al. (2012) investigated **Vancomycin-resistant enterococci** in south Germany in 15 (75%) out 20 investigated turkey Vancomycin-resistant enterococci were detected flocks. In a total of cultivated 68 isolates from birds and dust samples, enterococci bearing van-genes were detected. Furthermore, they investigated the prevalence **of methicillin-resistant Staphylococcus** (MRSA) in 20 fattening turkeys and people living on farms. 18 (90%) of 20 investigated flocks were positive for MRSA.

All female flocks were positive, while 8 male flocks were positive. On 12 of the farms 22 (37.3%) of 59 persons sampled were positive for MRSA. None of them showed clinical symptoms indicative of an MRSA infection.

People with frequent access to the stables were more likely to be positive for MRSA. Recently, Moawad *et al.* (2018) reported the isolation of colistin-tolerant and extended-spectrum β-lactamase-producing *Escherichia coli* from healthy broilers in Egypt. Moreover, other methicillin-resistant Staphylococcus spp. were detected on11 farms and in 8 people working on the farms. Similar results were about MRSA in turkeys were published by El-Adway et al. (2016).

Welfare of Poultry

Currently, there is great concern about the welfare of animals, hygiene, and disease control that may result from great genetic pressure to boost egg and meat production. Indeed, genetic pressure to improve the productive performance of animals adversely affects animals' welfare and natural immunity and thus disease tolerance. However, genetic selection occurs with improved practices of husbandry, disease control, and nutrition manipulation.

The most achievable alterations have been a decrease in the market age of approximately 4 weeks, a better growth rate, greater breast yield, and a higher laying rate and daily egg mass. However, there is a huge unease that the serious welfare of animals and problems of the disease have already been initiated due to the above-mentioned selection pressure. Increasing selection pressures also hinder animals' freedom (Hafez, and Shehata, (2021).

Future expectations

In future improvements in laboratory diagnosis, such as diagnostic micro array and other technologies, will allow faster, more sensitive and more accurate diagnosis of infectious diseases, and early interventions will become a reality. However, only a **few authorised pharmaceutical veterinary products** will be available for the treatment of poultry as food producing animals. Future scientific findings on the pathogenic mechanisms of bacteria will help to improve the treatment of bacterial infections, and instead of non-specific antibiotic therapy, new drugs will be able to target the signalling mechanisms, which are able to disrupt the pathogenic effects of the pathogen bacteria.

Genetic resistance and selective breeding to improve production traits and health is a long-standing goal of the industry. The desire to enhance breeding strategies with the use of molecular techniques (genetic linkage maps) will lead to the characterisation of genome structure and genes that are associated with production traits and disease susceptibility and resistance. This will allow selecting bird lines that are genetically resistant to several pathogens. In addition, **improvement of rearing technology**, **management and nutrition** will help to maintain bird comfort.

Increased feeding cost and raw ingredient prices as well their availability will negatively influence the growth of the industry and consumers' purchasing power, particularly after the COVID-19 pandemic as well as the current situation in Ukraine and Soviet Union. Moreover, increases in **biogas and biofuel** production will decrease the land available for grain production and feed for animal productions. This phenomenon will hinder the strategic vision of some counties, to achieve their future goals. Specifically, there could be a marked increase in the cost of feeding for animal production and elevated product prices. In the future, the feed industry has an obligation to ensure the quality of feedstuffs and that they are free of pathogens and ecologically friendly. Besides, limited water resources and climatic changes are also expected to adversely affect poultry production costs and strategic planning to meet per capita consumption in some countries.

The movement of poultry and poultry products as well as the strong production competition and cost differences from around the world will affect the cost and global movement of poultry and its products. This phenomenon will increase the possibility of disease transmission into places thought to be free from poultry diseases.

Vaccination is regard as one of the most beneficial biopharmaceutical interventions, due to its ability to induce protection against infectious diseases through

targeted activation of the immune system. Many valuable new vaccine production technologies have been developed. The future progressive in vaccine production technologies, such as recombinant, subunit, reverse genetic and nucleic acid vaccines, can significantly reduce the cost of vaccines, ensure better efficacy, and allow easy and rapid intervention to face the steady mutation of the microorganisms. **Furthermore, the development** of efficient vaccines against bacterial infections will lead to a reduction of the use of antibiotics.

However, SARS-CoV-2 is not linked with poultry or its products (Jackwood, 2020) it will likely influence the global poultry trade due to lockdown and restrictions that is applied to control the spread of the virus. Globally, poultry diseases will continue to be the primary issue for the poultry industry and its strategic future. The outbreak of any disease can turn into an epidemic and have an extensive adverse influence on the global trade of poultry products.

2 CONCLUSIONS

In the future, the global cooperation and trade will force the governments to harmonize the existing different legislations related to trade, animal disease control, animal nutrition as well as the licensing of drugs and vaccines for veterinary use. Finally, the consumer expectations for high standards quality of poultry products will strongly influence the production methods. This means that farmers, veterinarians, stockholders and all other partners involved in the production chain will have to share more responsibilities and that cooperation will be intensified.

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