

Inclusive Review on Common Emerging Viral Infections Affecting Quail

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Abstract

Nowadays, the quails are documented as alternative species over other poultry species. The rapid growth rate, low feed necessities, high nutritional value of meat & eggs, and short production periods are all advantages of the quail. Quail are being held in greater numbers and varieties for food production, research, and other purposes. However, there are some challenges facing quail industry as quails are susceptible to some viral diseases that have harmfully affects as quail bronchitis, avian influenza, Newcastle disease, coronavirus infection, avian encephalomyelitis, Marek's disease, lymphoid leukosis, reticuloendotheliosis tumors, and avian pox. These viral diseases are causing significant financial losses due to poor feed conversion, decreased hatchability, and increased mortality in the quail industry, and so on. Therefore, the aim of the existing manuscript is intended to present a review about the extremely vital emergent viral infections upsetting quails all over world accompanied by information on their prevention and control.

Keywords: quail; Newcastle disease virus; avian pox virus; avian influenza virus; Adenoviruses.

Introduction

The Japanese quails which considered domestic birds since 14th century and has been grown commercially since the 16th century (Arya *et al.*, 2018). Up to date, the quail industry has been broadly spread in numerous countries all over the world (Redoy *et al.*, 2017). Since quails are easy to handle and can be raised in a limited amount of

space, quail farming is becoming increasingly popular (Edris *et al.*, 2004). Other advantages of quail include their rapid growth rate, low feed requirements, high nutritional value of meat and eggs, and short generation intervals. (Yambayamba and Chileshe, 2019). Several viral infections affecting quails are like those in chickens especially that reared under intensive production system (Paulillo,

1989). Among these viral diseases that affect quail are quail bronchitis, avian influenza, Newcastle disease, coronavirus infection, avian encephalomyelitis, Marek's disease, lymphoid leukosis, reticuloendotheliosis tumors, and avian pox. So, the most significant viral diseases affecting quail species around the world were highlighted in this review.

VIRAL DISEASES

Newcastle disease virus

Newcastle disease (ND) is a devastating disease that affects poultry worldwide and is caused by the Newcastle disease virus (NDV). NDV is a member of the *Orthoavulavirus* genus, which is part of the *Avulavirinae* subfamily, family *Paramyxoviridae*, and order *Mononegavirales* (Amarasinghe et al., 2019). Experimental infection of three to six-week-old Japanese quail with velogenic strain of NDV caused various mortality percentages depending on the route of inoculation (Usman et al., 2008; El Tarabili et al., 2009; Sharawi et al., 2015; Mohamed and Abdel Hafez, 2016). Mazlan et al. (2017) proved that the Japanese quail is extremely susceptible to NDV infection in an experimental setting (genotype VII). In addition to, Susta et al. (2018) reported that

two-week-old Japanese quails were experimentally infected with four virulent NDV strains through the oculo-nasal route showed the mortality rate ranged from 28% to less than 10%. Moreover, the virus replication was mild to moderate in contact birds and inoculated birds, respectively. Effective NDV regulation in quails requires both live and inactivated vaccines (Lima et al., 2004; Paulillo et al., 2009).

Adenoviruses

Adenoviruses induce quail bronchitis (Olsen, 1950), inclusion body hepatitis (Jack et al., 1987) and Egg Drop Syndrome-76 (Kataria et al., 1991). Quail bronchitis (QB) is a highly contagious acute upper respiratory infection caused by type I avian adenoviruses (DuBose et al., 1958). Quail bronchitis occurs primarily in captive bobwhite quail and less commonly in Japanese quail (Chew-Lin, 1980). Quail bronchitis is most serious in young quail under 21 days of age, causing 100% morbidity and 50% mortality, respectively (Jack and Reed, 1990). Inclusion Body Hepatitis (IBH), caused by avian adenovirus 1, happens in quails at 5-week-old of age (Singh et al., 1995). However, an IBH outbreak in adult Japanese quail has been reported (Grewal et al., 1994). Egg Drop Syndrome-76

(EDS-76), caused by avian adenovirus-3, with the isolated virus in quail being serologically distinct from that in chickens (*Dash and Pradhan, 1992*). There is no treatment for adenovirus infection (*Singh et al., 2016*).

Lymphoproliferative viral diseases

Lymphoproliferative diseases have also been found to occur naturally in quail but are not common except in quail that are reared intensively (*Kobayashi et al., 1986*). In quails, the **MD Virus (MDV)** is the cause of tumor disease (*Adedeji et al., 2019*). MDV is aetiologically involved in the outbreaks of lymphoproliferative disease in eight Japanese quail's flocks. (*Imai et al., 1990*). MD features included low MDV antibody detection and a low frequency of lymphoproliferation in the nervous system. Nerves are more often affected in quail with Marek's disease, but the incidence of lesions is less than that seen in affected chickens (*Khare et al., 1975*). In Japanese quails, the **Avian Leukosis Virus (ALV)** could cause tumors (*Wight, 1963*), and quails with antibodies against ALV subgroup A had lymphoproliferative disease (*Schat et al., 1976*). In natural infection, malignant tumor approximating reticuloendotheliosis was

registered in quails (*Carlson et al., 1974*). In Japanese quail, the avian myeloblastosis virus could cause a wide range of neoplasms like those found in chickens (*Moscovici and Macintyre, 1966*).

Avian pox virus

Avian pox is an acute contagious viral disease caused by *Avipoxvirus* genus within *Poxviridae* family (*Bolte et al., 1999*). Avian pox in quail is a serious disease that may result in very high mortality especially diphtheritic form in the respiratory tract (*Tripathy and Reed, 1997*). Avian pox virus disease is seasonal, being most prevalent during the warmer episodes of the year when arthropods are most abundant (*Shane, 1985*). Avipoxvirus infection is rare in quails (*Poonacha and Wilson, 1981*). Pigeons and fowl Pox vaccines are thought to be effective in preventing poxvirus infection (*Promkuntod et al., 2003*).

Avian Influenza virus

Avian Influenza (AI) is a zoonotic viral disease that causes high morbidity and mortality in avian species and is characterized by respiratory, gastrointestinal, and nervous manifestations (*Jordan, 1996*). The causative agent of the AI is influenza A virus belonging to *Orthomyxoviridae* family. For the first time in 1966–1968, avian influenza virus with

respiratory symptoms and high mortality was detected in quail less than 3 months of age in Italy (Nardelli et al., 1970). Many AIV subtypes outbreaks have been revealed in quail flocks in several countries (Arya et al., 2018). Influenza viruses of various subtypes (H7N2, H5N2, H9N2, H7N3, and H10N8) have been isolated sporadically from quail in Europe, North America, and Asia (Saito et al., 1993; Suarez et al., 1999; Guo et al., 2000). Japanese quail is thought to be a reservoir for AIV strains, offering a way to develop new variant strains that can infect various poultry species by crossing species barriers (Perez et al., 2003; Wan and Perez, 2006; Wang et al., 2008). The highly pathogenic AIV H5N1 infection was found to be highly pathogenic. Furthermore, highly pathogenic AIV H5N1 strains isolated from geese can infect quails, with virus shedding lasting longer than in chickens (Webster et al., 2002; Saito et al., 2009). On the other hand, it was found that Japanese quails are resistant to HPAIV H5N3 (Tashiro et al., 1987). A research on quails in Egypt showed that vaccination with inactivated AI vaccines at the age of eight days resulted in appropriate titers by the third week after vaccination, with the highest titers reported at the

fourth and fifth weeks after vaccination (Saad et al., 2010). Furthermore, the H5N8 strain was isolated from two wild quail samples in addition to domestic Egyptian quail (Shehata et al., 2019). In chickens and quails, AIV H9N2 outbreaks showed stable lineages (Naeem et al., 1999). The key method of avoiding avian influenza infection in quails is vaccination combined with biosecurity measures.

Infectious bronchitis virus

Infectious bronchitis virus (IBV) infection is characterized by excessive oculo-nasal secretion, as well as, a decrease in weight gain and feed competence (Grgic et al., 2008). Also, IBV disrupts kidney and reproductive tract, resulting in renal failure and decreased egg production, respectively (Cavanagh, 2007). The potential vulnerability of native domesticated quails to IBV can be tested using experimental IBV inoculation in quail.

Conclusion

It's important to pay attention to quail production because it could be used as a replacement for chicken meat or eggs. To boost production and immunity, proper management, prevention, and control of serious viral diseases affecting quails are essential.

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مراجعة شاملة للعدوى الفيروسيّة الشائعة الناشئة التي تصيب السمان

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الملخص العربي

في الوقت الحاضر، تم توثيق السمان كأنواع بديلة عن أنواع الدواجن الأخرى، كما يعد معدل النمو السريع وانخفاض مستلزمات الأعلاف والقيمة الغذائية العالية للحوم والبيض وقصر فترات الإنتاج من مزايا تربية السمان. يتم الاحتفاظ بأعداد متزايدة ومتنوعة منه لإنتاج الغذاء والاستخدام التجريبي وما إلى ذلك. ولكن هناك بعض التحديات تواجه صناعة السمان حيث أن السمان عرضة لبعض الأمراض الفيروسيّة التي يمكن أن تؤثر عليه بشكل ضار مثل التهاب الشعب الهوائية وإنفلونزا الطيور ومرض النيوكاسل وعدوى فيروس كورونا و التهاب الدماغ والنخاع الطيرى ومرض الماريك وسرطان الدم الليمفاوي وأورام الظهارة الشبكية وجذري الطيور. لذلك قد تتسبب هذه الأمراض الفيروسيّة في خسائر اقتصادية فادحة في صناعة السمان بسبب سوء التحويل الغذائي، وانخفاض معدل الفقس، وزيادة معدل الوفيات، وما إلى ذلك. فإن الهدف من هذه المخطوطة الحالية هو استعراض لأهم الأمراض الفيروسيّة الناشئة التي تصيب السمان في جميع أنحاء العالم مصحوبة بمعلومات عن الوقاية والسيطرة.