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Pigeon Pox Virus Associated with Skin Lesions Isolated from Pigeons in Greece

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ABSTRACT

Pigeon breeders in Central and Northern Greece often report pox-like skin lesions in their flocks. However, these reports have not been scientifically validated, and no investigation has determined the presence or prevalence of pigeon pox virus in Greek avian populations. The present study aimed to report the detection of pigeon pox in a flock of pigeons in Karditsa, Greece, confirmed by polymerase chain reaction (PCR) analysis. Following a comprehensive review of the existing scientific literature, the present study provided the first documented confirmation of pigeon pox virus in Greece. In September 2025, a breeder from Karditsa, Greece, reported cutaneous and respiratory signs in 40 of 250 juvenile pigeons in a loft of 450 pigeons. The flock was vaccinated only against paramyxovirus, not against pigeon pox. Lesions on the skin, beak, and legs persisted for 4-8 weeks, with no mortality. The breeder administered doxycycline, enrofloxacin, and local treatment for trichomoniasis and treatment with ganciclovir; however, the treatment was unsuccessful. Wart-like lesions from the beak, skin, legs, and eyelids were collected for molecular analysis by PCR targeting *Avipoxvirus*-specific genomic regions, confirming the diagnosis of pigeon pox virus infection. The clinical history, physical examination, and necropsy findings, along with the PCR results, confirmed the poxvirus infection. The present study confirmed the presence of pigeon pox virus in Greece and emphasized the importance of raising awareness and conducting additional epidemiological surveillance of Avipoxvirus infections in domestic pigeons.

Keywords: *Avipoxvirus*, Lesion, PCR, Pigeon pox, Skin, Virus

INTRODUCTION

Avian pox is a disease caused by different strains of the genus *Avipoxvirus* (APV; Mohamed et al., 2024). According to the International Committee on Taxonomy of Viruses (ICTV), APV comprises twelve species, including fowlpox, pigeonpox, canarypox, flamingopox, penguinpox, quailpox, and turkeypox (ICTV, 2025). *Avipoxvirus* infects more than 370 species of wild and domesticated birds (Williams et al., 2021) and can be transmitted via water, feed, eggs, and direct contact through skin abrasions (Abbiw et al., 2025). Mosquitoes and other insects may also contribute to the mechanical transmission of the virus (Abbiw et al., 2025). Avian wildlife may serve as reservoirs or vectors for the transmission of APV (Bertelloni et al., 2022). In Europe, poxvirus has been identified in different bird species since 1850 (Bolte et al., 2010). Additionally, APV infections can cause significant economic losses in commercial poultry (Minhas et al., 2023).

Two common clinical manifestations of pigeon pox are the diphtheritic and cutaneous forms. The cutaneous form of pigeon pox is the most frequently documented form (Abbiw et al., 2025). In affected pigeons, nodular lesions are observed on the skin and feathers, as well as on the beak, legs, and non-feathered regions (Mohamed et al., 2024). Nodules located around the ocular area and beak can impair vision, feeding, and breathing. In addition, viremia may occur; however, gross internal pox lesions are rarely observed in pigeons (Tudor, 1978). Pigeon pox is generally a self-limiting disease; however, it may result in more severe disease in young or immunocompromised

pigeons (Hibl et al., 2019). Disease in pigeons can be mitigated by administering a commercially available live pigeon pox virus (PPV) vaccine via the wing web or by injection.

Recently, APV (including PPV) infection has been documented in Central Italy (Bertelloni et al., 2022), and specific PPV cases have been reported in Croatia and Egypt (Prukner-Radovcic et al., 2006; Mohamed et al., 2024; Helal et al., 2025). However, no investigation has confirmed the presence or prevalence of PPV within Greek avian populations, particularly in Central and Northern Greece, which frequently report pox-like skin lesions in their flocks. Therefore, the present study aimed to provide the first molecular confirmation of PPV in Greece through polymerase chain reaction (PCR) analysis of samples from a backyard flock in Karditsa.

CASE PRESENTATION

Ethical approval

Ethical approval under European Commission (2010) EU Directive 2010/63/EU was not required for this study, as the pigeons were euthanized as part of the diagnostic procedure to identify the flock disease and direct treatment for the remaining animals, which constitutes standard veterinary practice in flock health management. Under Article 1, Section 5(a) of EU Directive 2010/63/EU, non-experimental agricultural or clinical veterinary practices are explicitly excluded from the definition of an animal experiment. Informed consent to collect samples from pigeons and to use the results and animal data was obtained from the farmer.

History

On September 26, 2025, a breeder from Karditsa, Thessaly, Greece, presented a loft of 450 racing pigeons (*Columba livia*) to the Department of Poultry Diseases at the Faculty of Veterinary Medicine, University of Thessaly, Greece. The breeder reported skin lesions and respiratory signs in several juvenile pigeons. All sampling procedures were conducted in accordance with the highest principles of veterinary care. Initially, a visit to the pigeon breeding facility was conducted to inspect the loft and obtain history. The loft appeared crowded, housing 30 canaries, 20 goldfinches, 70 backyard chickens, nearby dogs and cats, and an ammonia odor was noticeable. In addition, no signs of pigeon pox were observed in the neighboring avian species. Pigeons were fed a commercial pigeon diet, vaccinated only with Pigeon Paramyxovirus Type 1 (Pharmagal-Bio, Slovakia) at four weeks of age, according to the company's recommendation, and left unvaccinated for PPV. The breeder reported that 40 out of the 250 juveniles from the summer hatching period exhibited cutaneous lesions accompanied by respiratory signs. The signs persisted for approximately 4 to 8 weeks before resolving, with no mortality reported. Antibiotic treatment with doxycycline and enrofloxacin, as well as treatment for trichomoniasis and local ganciclovir, was administered by the breeder; however, the treatment failed without therapeutic effect. Additionally, similar pathogenicity was reported to have reemerged annually during the same season (summer to early fall) over the past three to four years.

Clinical examination and necropsy

Four pigeons aged 1-2 months, displaying the most noticeable clinical signs, were taken to the Clinic for Poultry at the Faculty of Veterinary Science, University of Thessaly, in Karditsa, Greece, for further evaluation. The observed signs included conjunctivitis, abscesses near the Harderian gland, and wart-like lesions on the beak, skin, legs, and eyelids (Figure 1). Following the clinical examination, the pigeons were euthanized by cervical dislocation (Leary et al., 2020). A postmortem examination was conducted, during which caseous material within the lesions and bile in the ventriculus (muscular stomach) were found, indicating anorexia (Figure 2). Wart-like lesions on the beak, skin, legs, and eyelids were collected for PCR analysis. Lesions from the four pigeons were pooled into a single sample for PCR, as all pigeons had the same lesions (Abbiw et al., 2025).

Swabs from the collected lesions were vigorously vortexed in 1 mL of phosphate-buffered saline (PBS) at room temperature (20-25°C) and then centrifuged at 10,000 × g for five minutes. Viral nucleic acid was extracted from the supernatant using the MagMAX Express 24 Magnetic Particle Processor (Thermo Fisher Scientific, Waltham, MA, USA) with the IndiMag Pathogen kit (cat. no. SP947257, Indical Bioscience, Leipzig, Germany) according to the manufacturer's instructions. Briefly, 200 µL of the sample was mixed with 20 µL Proteinase K solution and 500 µL of lysis buffer containing 1 µL carrier RNA (1 µg/µL), 25 µL magnetic beads, 400 µL buffer ACB, and 100 µL buffer VXL. After lysis, samples were washed twice with 700 µL of each wash buffer 1 and 2, then eluted with 100 µL of elution buffer. *Avipoxvirus* was detected by real-time PCR on a Rotor-Gene Q thermocycler using the KYLT fowlpox virus qPCR kit (SAN Group Biotech Germany GmbH, Germany). Briefly, 10 µL of 2x qPCR-mix and 6 µL of

primer-probe-mix were combined with 4 µL of extracted DNA, then incubated at 95°C for 10 minutes, followed by 42 cycles of 95°C for 15 seconds and 60°C for 1 minute. Fluorescence was observed during the annealing and extension step at 60°C for 1 minute on the 6-carboxyfluorescein (FAM, green) channel. The qPCR assay yielded a cycle threshold of 20.56, indicating a relatively high viral load in the initial sample.

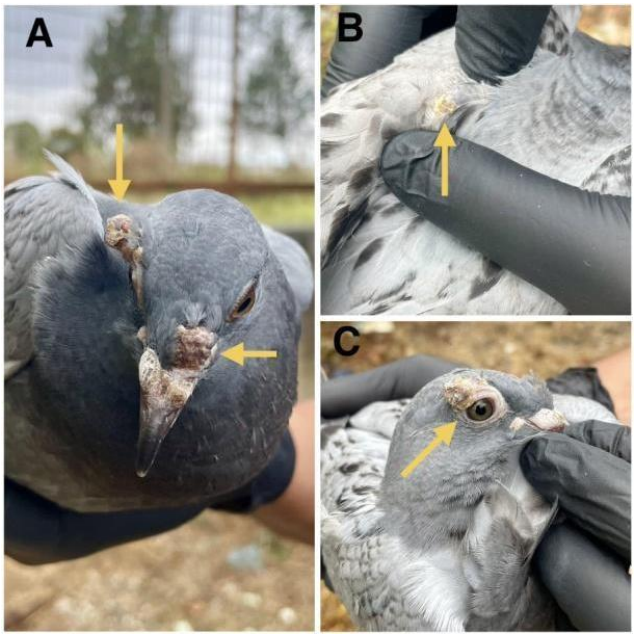

Figure 1. Wart-like lesions in pigeons infected with pigeon pox virus. **A**: Lesions on the beak and upper eyelid, **B**: Lesions on the feather, **C**: Lesions on the upper eyelid.

Figure 2. Postmortem examination of a pigeon infected with pigeon pox virus. **A**: Bile inside the empty ventriculus, **B**: Lesions on the legs, **C**: Conjunctivitis, **D**: Caseous material within the lesions.

Treatment

Topical therapy consisting of tobramycin (0.1% w/v) and dexamethasone (0.3% w/v; Tobradex, Novartis Hellas, Greece) was administered as a drop per eye once daily for 5 days to all 40 affected pigeons. As there is no gold standard treatment for pigeonpox, this is an empirically selected treatment based on the clinical experience. Reducing inflammation was essential for the pigeons' well-being and recovery from anorexia; therefore, dexamethasone was combined with tobramycin to prevent secondary bacterial infections and enhance the host's response to viral infections (Gopinath et al., 2018). Post-treatment evaluation revealed no signs of conjunctivitis or cutaneous lesions, and the appetite was improved.

DISCUSSION

Following a comprehensive review of the published studies, the present study reported the first laboratory-confirmed detection of PPV in Greece, as no prior confirmed cases had been identified. The initial clinical suspicion was based on the cutaneous and respiratory manifestations observed, while the definitive diagnosis was confirmed by PCR analysis. The clinical signs observed in the present study, characterized by prominent wart-like lesions on the beak, eyelids, and legs, conjunctivitis, and severe anorexia, closely aligned with the classical pathology of APV infections (Hibl et al., 2019). The gross pathological findings observed during necropsy were consistent with lesions described in recently confirmed cases of pigeon pox reported in Croatia and Egypt (Prukner-Radovcic et al., 2006; Mohamed et al., 2024; Helal et al., 2025). Additionally, the detection of APV in asymptomatic wild birds in Central Italy underscores the virus's potential to persist in the environment (Bertelloni et al., 2022). Mohamed et al. (2024) detected APV in 16 of 50 Egyptian backyard flocks and reported 91% nucleotide similarity between PPV and fowlpox virus, which was consistent with the phylogenetic difference observed in the present study.

The occurrence of APV during the warmer months (summer through fall) might be epidemiologically notable. Elevated temperatures promote the proliferation of insect vectors, particularly mosquitoes, which are identified as mechanical transmitters of APV (Mohamed et al, 2024). Peak insect population densities during summer may increase the likelihood of PPV transmission (Mohamed et

al., 2024). The seasonal pattern of APV transmission was consistent with the current study and those of Mohamed et al. (2024), who reported a high rate of APV infections in pigeons and chickens throughout the summer. Furthermore, management-related factors such as high stocking density and elevated ammonia levels may predispose poultry to skin abrasions, thereby facilitating viral entry through compromised skin barriers, consistent with the present observations in the loft. Although mortality was not observed in the present study, pigeon pox can cause severe disease, particularly in young or immunocompromised pigeons (Abbiw et al., 2025).

The presence of skin lesions can strongly suggest PPV infection; however, definitive confirmation requires molecular diagnostic techniques such as PCR. Although histopathological examination was not performed in the current study, Abbiw et al. (2025) indicated that such analysis could help confirm APV by identifying eosinophilic intracytoplasmic inclusion bodies (Bollinger bodies), which are characteristic features of poxvirus infections.

Currently, there is no specific antiviral treatment for poxvirus infections in pigeons. Supportive therapy was administered to prevent secondary bacterial infections and decrease inflammation. Previous studies suggested that topical administration of aminoglycosides could improve host responses to viral infections (Gopinath et al., 2018). Several studies have indicated that azithromycin, as well as the combination of oral acyclovir, azithromycin, Vitamin A, neem leaves, and turmeric paste, were effective in treating pigeon pox (Sudhakara Reddy and Sivajothi, 2018; Somasundaram et al., 2020). However, these combinations were not used in the present study. In the current study, topical treatment was chosen to attain higher local medicine concentrations, thereby potentially enhancing lesion management and clinical outcomes.

CONCLUSION

The present study reported the first laboratory-confirmed case of PPV infection in a domestic pigeon flock in Karditsa, Greece, characterized by cutaneous and diphtheritic clinical signs of PPV. The clinical signs included wart-like lesions on the beak, eyelids, and legs, as well as conjunctivitis and severe anorexia, closely aligned with the classical pathology of APV infections. Moreover, the absence of pigeon pox vaccination in the affected flock likely contributed to the recurrent outbreaks observed over consecutive summers. The present study highlighted the need for increased awareness regarding PPV infection among pigeon breeders and veterinarians in Greece. Future studies should emphasize systematic surveillance and epidemiological studies to assess the prevalence and distribution of PPV in Greece.

DECLARATIONS

Authors' contributions

Zoi Prentza and Konstantinos Koutoulis conceptualized the study and supervised the study. Argyrios Aslanidis, Zoi Mavraki, and Loukas Chochtoulas visited the pigeon loft, collected the samples, and conducted the postmortem examination. Renáta Varga-Kugler performed the PCR examination, and Evangelos Minos analyzed the data. All authors contributed to the writing and editing of the manuscript. All authors read and approved the final edition of the manuscript.

Availability of data and materials

The data are available upon reasonable request from the corresponding author.

Competing interests

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical considerations

This study has been submitted to this journal for the first time and has not been submitted elsewhere. The authors declare that the present study has been checked for plagiarism, data fabrication, and duplication to ensure scientific integrity. No AI tools/apps were used in preparing any part of the present study. All authors take full responsibility for the originality of the data prior to submission and throughout the peer review process.

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