PREVALENCE AND PATHOGENIC SIGNIFICANCE OF CIRCOVIRUS-LIKE INFECTIONS IN RACING PIGEONS (COLUMBA LIVIA)

P. Tavernier, P. De Herdt, H. Thoonen, R. Ducatelle

Department of Pathology, Bacteriology and Poultry Diseases
Faculty of Veterinary Medicine, Ghent University
Salisburylaan 133, B-9820 Merelbeke, Belgium

ABSTRACT

The prevalence of circovirosis in 158 young racing pigeons necropsied in the Avian Diseases Clinic of Ghent University (Belgium) between January and August 1999 was 19%. The highest incidence was observed between March and May. The frequency and nature of concurrent infections, lesions and clinical signs were identical in pigeons that were positive and pigeons that were negative for circovirus infection, though mortality was significantly higher in the former. Findings indicate that circovirosis is an infection that is frequently associated with mortality in young pigeons. Clinical indications for the immunosuppressive effects of circovirus were not found.

SAMENVATTING

De prevalentie van circovirosis bij 158 jonge reisduiven die gelijkschouwd werden tussen januari en augustus 1999 bedroeg 19%. De hoogste incidentie werd waargenomen tussen maart en mei. De frequentie en aard van concurrente infecties, letsels en klinische symptomen waren gelijk bij circovirus positieve en negatieve dieren, maar de mortaliteit was significant hoger in de eerstgenoemde groep. De bevindingen duiden erop dat circovirosis een veel voorkomende infectie is, die geassocieerd kan worden met mortaliteit van jonge duiven. Klinische indicaties voor immunosuppressieve effecten werden niet gevonden.

Keywords: Epidemiology – Significance – Circovirus – Pigeon

INTRODUCTION

Circovirus infections in pigeons were first described in 1993 (Woods *et al.*, 1993) and have since then been reported in the USA, Canada, Australia and various European countries (Duchatel *et al.*, 1998 ; Shivaprasad *et al.*, 1994; Smyth and Carroll, 1995; Gough and Drury, 1996; Tavernier *et al.*, 1999). The virus can be demonstrated in multiple lymphatic organs, with the bursa Fabricii probably being the predilection site of multiplication. Histology of the latter organ offers a rapid diagnosis since viral inclusion bodies with a rather typical aspect are abundantly present. The infections are observed only in pigeons that are less than 1 year old and occur predominantly in pigeons younger then 4 months of age. This is probably related to the regression of the bursa in older pigeons.

All descriptions of pigeon circovirosis that have appeared in the literature to date are case reports limited to the description of disease histories in affected lofts and lesions in infected birds. No information is available on the prevalence of circovirus infections in pigeon populations. Furthermore, the significance of the infections is not clear. Due to the interference of frequently concurrent infections, all authors fail to describe the clinical signs and the primary lesions associated with circovirosis in pigeons. The occurrence of concurrent infections led most authors to suggest immunosuppresive effects of this circovirus (Woods *et al.*, 1993; Smyth and Carroll, 1995). The aim of the present study is to examine the prevalence and significance of pigeon circovirus infections and to correlate the presence of this virus with clinical and postmortem findings.

OWN OBSERVATIONS

From January to August 1999, 158 pigeons aged between 1 and 8 months, all from different owners, were presented for necropsy. These pigeons had died spontaneously or suffered from clinical disease. Gross pathological inspection, cytology, bacteriology, histology and virology were used to establish a diagnosis. Histology of the bursa

(HE stain) was performed routinely in all birds to detect circovirus inclusion bodies. The monthly incidence of circovirosis was calculated to detect seasonal variation in the occurrence of the infections. The results of the studies were analysed in order to establish a causative relationship between the circovirus infections, on the one hand, and the clinical signs, lesions, and concurrent infections resulting from possible circoviral immunosuppression, on the other. For this purpose, the clinical signs and lesions and the nature and frequency of concurrent infections were compared between pigeons that were found positive and pigeons that were found negative for the presence of circovirus inclusions. Yates' corrected Chi square test was used for statistical analysis.

In thirty of the 158 pigeons examined (= 19%), inclusion bodies with a morphology consistent with that of circovirus were observed in the cells lining the bursa Fabricii. On the basis of this histological feature, the presumptive diagnosis of circovirosis was made in 0/16, 2/23, 10/32, 6/18, 5/20, 5/26, 0/8 and 2/14 pigeons necropsied in January, February, March, April, May, June, July and August, respectively (Fig. 1). At these moments, the maximum ages of the birds were 1, 2, 3, 4, 5, 6, 7 and 8 months, respectively. The agents causing the concurrent infections diagnosed in 24/30 (= 83%) of the circovirus-infected pigeons included adenovirus, paramyxovirus, herpesvirus, *Salmonella* serotype Typhimurium, *Streptococcus gallolyticus*, *Escherichia coli*, *Chlamydophila psittaci*, *Staphylococcus intermedius*, *Pelistega europaea*, *Aspergillus fumigatus*, *Candida albicans*, *Trichomonas gallinae*, *Eimeria*, *Ascaridia* and *Capillaria*. The same infections were also observed in 93/128 (= 73%) of the pigeons that were negative for circovirosis. The differences in the incidence and nature of concurrent infections between groups of pigeons that were positive and groups that were negative for the presence of circovirus were not significant ($P > 0.05$ in all calculations). The clinical history of circovirus infected pigeons was very diverse and included mortality, dullness, crop dilatation, anorexia, vomiting, diarrhoea, polyuria, dyspnoea and poor racing performance. Mortality was noted significantly more often in the case histories of circovirus-infected pigeons compared to histories of birds and lofts that were negative for the presence of this agent ($P = 0.0009$). None of the other signs mentioned could be typically related to the infections with circovirus. Furthermore, no significant differences were observed in the gross or histologic lesions in pigeons that were positive or negative for circovirosis. Even bursal changes were not specific. Histology revealed lymphoid depletion in 20% of the circovirus infected bursae but also in 13% of the non-infected ones.

In this study, inclusion bodies resembling those of circovirus were observed in the bursa of approximately 20% of 0 – 8 month old pigeons examined between January and August. This indicates a high prevalence of circovirosis in pigeons. The highest incidence of these infections was observed during the months of March to May. This apparent seasonal variation may be explained by the high prevalence of pigeons of the most susceptible age, which is generally accepted to be between 6 weeks and 4 months (Shivaprasad, 1994; Smyth and Carroll, 1995). Since the majority of Belgian pigeons are born between the end of December and the end of February, they predominantly reach this age between March and May.

In 83% of the circovirus-infected pigeons, concurrent infections were diagnosed. Similar observations were made by other authors (Woods *et al.*, 1993-94; Shivaprasad, 1994), who suggested these to be secondary infections resulting from immunosuppressive effects of the circovirus. However, the present studies demonstrate that the nature and frequency of concurrent infections is similar in pigeons that are positive and pigeons that are negative for circovirus infections. This may indicate that there is no interaction between circovirus and other infectious agents. However, the testing of immune functions is necessary to determine eventual immunosuppressive properties of pigeon circovirus.

In the clinical case histories, mortality is mentioned significantly more often in pigeons suffering from circovirosis than in pigeons not suffering from circovirosis. This may indicate that circovirus infections can be lethal in pigeons. Experimental infections are necessary, however, to confirm this hypothesis.

A weak point inherent in field studies of this type, is the possible occurrence of false negatives. The sensitivity of the histological screening is unknown, and unknown numbers of infected birds may be overlooked.

Despite this fact, it can be concluded that although the clinical signs and lesions associated with circovirus infection are non-specific, the presence of the virus is associated with significant mortality in young pigeons. This increased mortality cannot be explained by enhanced concurrent infections due to possible virus-related immunosuppression. Experimental infections and immunological studies are to be conducted, however, in order to verify this contention. It should be noted that immunosuppression is a very significant feature of other circovirus infections in birds, such as CAA in chickens and psittacine beak and feather disease (Shivaprasad et al., 1994).

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I. — *Oorspronkelijke bijdragen.*