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# Microbiological and serological monitoring in hooded crow (*Corvus corone cornix*) in the Region Lombardia, Italy

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## ABSTRACT

The health status of 276 hooded crows (*Corvus corone cornix*) from various provinces of Lombardy was monitored for three years. Bacteriological examination detected *E. coli* (76%), *Campylobacter jejuni* (17%), *Salmonella typhimurium* (11.6%), *Yersinia* spp. (6.5%), *Clamydophila abortus* and *C. psittaci* (2.6%); from six birds showing severe prostration *Pasteurella multocida* was isolated. Virological and serological tests were negative for Avian Influenza virus (AIV), West Nile virus (WNV) and only three samples were positive for Newcastle disease virus (NDV) but only at serology (titre 1:16).

*Key words:* Hooded crow, Bacteriological investigation, Virological investigation.

## RIASSUNTO

INDAGINI MICROBIOLOGICHE E SIEROLOGICHE NELLA CORNACCHIA GRIGIA (*CORVUS CORONE CORNIX*) IN LOMBARDIA

*Nell'arco di tre anni è stato effettuato un monitoraggio sanitario su 276 cornacchie in varie province della Lombardia. Gli esami batteriologici hanno messo in evidenza E.coli (76%), Campylobacter jejuni (17%), Salmonella typhimurium (11,6%), Yersinia spp. (6,5%), Clamydophila abortus e C. psittaci (2,6%); da sei uccelli con grave prostrazione fu isolata Pasteurella multocida. Gli esami virologici e sierologici furono negativi per Influenza Aviaria, West Nile Disease e 3 positivi per la malattia di Newcastle, ma solo all'esame sierologico (titolo 1:16).*

*Parole chiave:* Cornacchia grigia, Indagini batteriologiche, Indagini virologiche.

## Introduction

In the last few years the hooded crow population has markedly increased in number, and this species is now widely distributed through-

out Italy. The spread is related to its role as an ubiquitous scavenger in towns and its ability to live in metropolitan areas. In fact, corvids, because of their adaptability, are often considered the group that has reached the highest level

of evolution among avian species (Coombs, 1978).

The species may spread pathogens to domestic animals or to humans, or both, so the authorities encourage the control of these birds. No information exists about the health status of this species in Italy

## Material and methods

### *Birds*

A total of 276 live hooded crows caught in live-trap in Northern Italy were studied from 2003 to 2006. They arrived to our laboratory in boxes and examined clinically, then euthanized and weighed. Blood samples were taken from the jugular vein for serology (AIV, WNV, NDV). The crows were necropsied and a number of laboratory tests were carried out. After gross inspection of the internal organs, portions of brain, lung, liver, kidney and intestinal tract were removed and stored at -80°C for virological examination.

### *Bacteriology*

Swabs of organs and intestinal content were taken for bacteriological examinations using the method described by Sommariva *et al.* (2000) *Chlamydomphila* spp. was checked at the National Reference Center, at the "Istituto Zooprofilattico Sperimentale" in Pavia.

### *Virology*

Samples of respiratory and intestinal tracts were inoculated in 9-11 days old SPF chicken embryonated eggs by allantoic route. Allantoic fluids from eggs with dead embryos as well as from eggs with surviving embryos were collected and analysed for haemagglutination activity and by virological ELISA with a monoclonal antibody to nucleoprotein A (NPA) (Siebinga and De Boer, 1988).

### *Serology*

Serology for AIV was carried out using a Mab-based ELISA to detect anti-NPA antibodies,

as reported by De Boer (1990). The serum was considered positive when the absorbance value was at least 75% less than the control wells (reference value).

Serum samples were also analysed to detect antibodies to NDV, by haemagglutination inhibition (HI) as recommended by OIE. To detect anti-WNV antibody, an in-house competitive ELISA with a neutralizing Mab produced against the reference strain Egyp 1951 was used. Two dilutions (1/10 and 1/20) of each serum were tested. In each plate the positive and negative control sera were added and no sera were put in eight wells, providing a full range of controls. Results were calculated by determining the reduction in absorbance as a percentage of the control wells with no serum (reference value). At least 75% inhibition was considered positive.

## Results and discussion

Two hundred and sixty-three hooded crows (136 males, 85 females and in 70 the sex was not recorded) were examined, 77% of them yearlings. This was determined from their weight, clearly still limited, under-developed gonads and the presence of the bursa of Fabricius. The high frequency of yearlings is explained by the fact that birds were captured mainly in spring, the season when yearlings peak, and are particularly curious and easily captured. This prevalence is a further direct demonstration of the spread of the species. *E. coli* was found in 76%. Between August 1997 and January 1998, a serotype of *E. coli* was isolated in Japan that produced a verotoxin (VTEC), similar to the one causing intestinal infection in humans. We intend to investigate this aspect in future work. *Campylobacter jejuni* was isolated in 17% of the birds. Thermophilic campylobacters have been reported in 62.6% of *C. levallanti* and *C. corone* in Japan (Maruyama *et al.*, 1990) and in 89.8 % of Norwegian crows (Kapperud and Rosef, 1983). *Salmonella typhimurium* (11.6%)

Table 1. Bacteria isolated from the intestine of hooded crows.

Bacteria	Prevalence (%)
<i>E. coli</i>	76
<i>Campylobacter jejuni</i>	17
<i>Salmonella typhimurium</i>	11.6
<i>Yersinia spp.</i>	6.5
<i>Pasteurella multocida</i>	1.08
<i>Clamydophila abortus</i>	20*
<i>Clamydophila psittaci</i>	20*

\* *Clamydophila spp.* research only in 10 birds.

was isolated from the intestine of healthy birds, confirming their role as healthy carriers, as suggested by Willumsen and Hole (1987) and Refsum *et al.* (2002). Five crows were infected with *Salmonella typhimurium* and *Campylobacter jejuni*. The prevalence of *Yersinia spp.* (6.5%) is in line with previously published (Kapperud and Rosef, 1983; Kapperud, 1991). *Pasteurella multocida* was isolated from 1.08% of crows with severe prostration; this infection was probably due to ingestion of domestic geese that had died of fowl cholera in the same area. A similar case was reported in Texas in 1981 (Taylor and Pence, 1981), but the crow's role as a reservoir of *P. multocida* is still uncertain. *Chlamydomphila psittaci* and *C. abortus* were detected in 2 out of 10 birds examined. *C. abortus* is the first species described in an Italian corvid and is a pathogen microorganism that can cause abortion in goats and sheep.

None of the birds had antibody titers for AIV, but three were positive for NDV (titre 1:16). No bird was positive for WNV, though in other countries the crow is considered a reservoir for this virus (Anderson *et al.*, 1999; Steele *et al.*, 2000; Julian *et al.*, 2002; Eidson *et al.*, 2005).

## Conclusions

From these results we can conclude that even in absence of clinical signs, the hooded crow could be a source of infectious agents for humans and other animal species. The finding of *Chlamidophyla abortus* was of particular interest since it suggests that the crow might contribute to spread the microorganism in pastures, which are hard to control even with the biosecurity measures which, however, are applicable in breeding farms.

Viral infections were really only detected in three birds with weak serological titers for NDV, but it would seem advisable to maintain monitoring schemes in order to detect new infections promptly as they arrive on the scene

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