

## Chapter 17

# Inclusion Body Disease of Cranes

### Synonym

*Crane herpes*

### Cause

In March 1978, a previously unidentified herpesvirus was isolated at the National Wildlife Health Center (NWHC) from a die-off of captive cranes housed at the International Crane Foundation (ICF) in Baraboo, Wisconsin. Serological testing of this virus against other previously isolated avian herpesviruses does not result in cross-reactions, thereby supporting this agent's status as a distinctly new virus. The NWHC assigned the descriptive name, "inclusion body disease of cranes" (IBDC) to this disease when reporting the outbreak in the scientific literature, because the disease is characterized by microscopic inclusions in cell nuclei throughout the liver and spleen.

Very little is known about how this disease is transmitted. As with duck plague and avian cholera, outbreaks are thought to be initiated by disease carriers within a population of birds. The disease likely spreads by direct contact between infected birds and other susceptible birds and by contact with a virus-contaminated environment. Findings of antibody in sera of cranes bled nearly 3 years before the deaths at ICF indicates that the IBDC virus can be maintained in a captive crane population for at least 2 years and 8 months without causing mortality. The IBDC virus has been isolated from the cloaca of antibody-positive cranes, which indicates the potential for fecal shedding of the virus.

### Species Affected

Spontaneous infections have developed in several species of captive cranes whose ages ranged from immature to adult (Fig. 17.1). Laboratory-induced infections and death occurred in adult cranes and in white Pekin ducklings between 3–17-days old, but not in 64-day-old Muscovy ducks. Adult coot were also susceptible, but white leghorn chicks were not (Fig. 17.2). These findings demonstrate that at least several species of cranes may become infected by this virus (virus replication develops in the bird following exposure), but the occurrence of illness and death is highly variable among different crane species. Too little is known about IBDC to assess other species' susceptibility to it based solely on the experimental infection of ducklings and adult coot. However, those findings need to be considered as a potential for this disease to involve more species than cranes. Further studies are needed to determine the true significance of IBDC as a threat to waterbirds.

### Distribution

Herpesviruses have been associated with captive crane die-offs in several countries. Die-offs have occurred in Austria (1973), the United States (1978), France (1982), China (1982), the Commonwealth of Independent States [formerly the Soviet Union (1985)], and Japan (1992).

The relation between the herpesviruses from these die-offs has not been determined; however, the lesions and general pathological findings are similar. Serologic data indicates that captive cranes in the Commonwealth of Inde-

Cranes	Response	
	Mortality	Antibody
Stanley	●	○
Sandhill	●	●
Manchurian	●	●
Hooded	●	●
Sarus	○	●
Common	○	●
White-naped	○	○
Demoiselle	○	●
Brolga	○	○
East African crowned	○	●

Positive response ●

Negative response ○








**Figure 17.1** Results of natural exposure to IBDC at the International Crane Foundation, Baraboo, Wisconsin.

pendent States and Japan have been exposed to the IBDC virus or to a very closely related herpesvirus.

Since the ICF die-off, many zoological collections have submitted crane sera for testing by the NWHC. Nine collections in the United States contained cranes that were found to have been exposed to the virus because they tested positive for antibodies to it. Testing of endangered species of cranes that were imported into the United States detected four additional exposed cranes. All of the antibody positive cranes came from Asia. Serological testing by the NWHC has found the antibody to the IBDC virus in 11.3 percent of 452 samples from 14 species of captive cranes in the United States. Results from other laboratories are not available; however, it is known that some antibody-positive cranes have been detected in United States zoological collections in addition to samples tested by the NWHC.

There is no evidence that wild North American crane populations have been exposed to IBDC. None of 95 sandhill crane sera collected in Wisconsin and Indiana during 1976 and 1977 had antibody to this virus. Additional testing would provide more information about the status of IBDC in wild cranes.

Type of bird	Mortality	
<b>Ducks</b>		
 White Pekin 3-days old	●	
	17-days old	●
 Muscovy 64-days old	○	
<b>Coot</b>		
 Adults	●	
<b>Cranes</b>		
 Sandhill crane	●	
	Common crane	●
	Red-crowned crane	●
<b>Chicken</b>		
 White Leghorn 17-days old	○	

Mortality occurred ●  
Mortality did not occur ○

**Figure 17.2** Known susceptibility of avian species to experimental infection of IBDC.

## Seasonality

There have not been enough known outbreaks of IBDC to indicate whether or not the disease has seasonal trends. The outbreak of IBDC in Wisconsin happened in March. The other herpesvirus-associated die-offs in Austria, the Commonwealth of Independent States, and Japan happened in December. There is not enough information currently available to determine the season of the die-off in China.

## Field Signs

During the ICF die-off, signs such as lethargy and loss of appetite persisted for 48 hours, with occasionally bloody diarrhea just before death. Critically ill cranes often died when they were handled.

## Gross Lesions

Cranes that died from IBDC at the ICF had swollen livers and spleens. These organs contained many pinpoint-to-pinhead-size lesions that appeared as yellow-white spots throughout the tissue (Fig. 17.3). Other notable gross lesions included hemorrhages in the thymus gland and intestines. The acute nature of the disease was evident by abundant subcutaneous fat in the carcasses that were examined.

## Diagnosis

A presumptive diagnosis can be made on the basis of gross lesions in the liver and spleen (Fig. 17.3). However, laboratory confirmation of this diagnosis is essential and it requires virus isolation from affected tissues. Submit whole carcasses to a disease diagnostic laboratory (see Chapter 3, Specimen Shipment). When this is not possible, remove the liver and spleen (see Chapter 2, Specimen Collection and Preservation), place them in separate plastic bags, and ship them frozen. Because this disease causes characteristic intranuclear inclusion bodies in the liver and spleen, it is also useful to place a piece of the liver and spleen in 10 percent buffered formalin when whole carcasses cannot be submitted. Care must be taken not to contaminate tissue samples being taken for virus isolation when taking a portion of these tissues for formalin fixation.

## Control

Any outbreak of IBDC in North America should be considered a serious event requiring the immediate involvement of disease control specialists; destroying the infected flock and decontaminating the site of the outbreak currently are the only means of controlling the disease. This extreme response is complicated because endangered species of cranes may be involved and it may be difficult to sacrifice them for the benefit of other species. Nevertheless, failure to take aggressive action could result in IBDC being established as a significant cause of mortality in free-living North American cranes, jeopardize captive breeding programs for endangered

species of cranes, and result in this disease becoming a serious mortality factor among zoological collections.

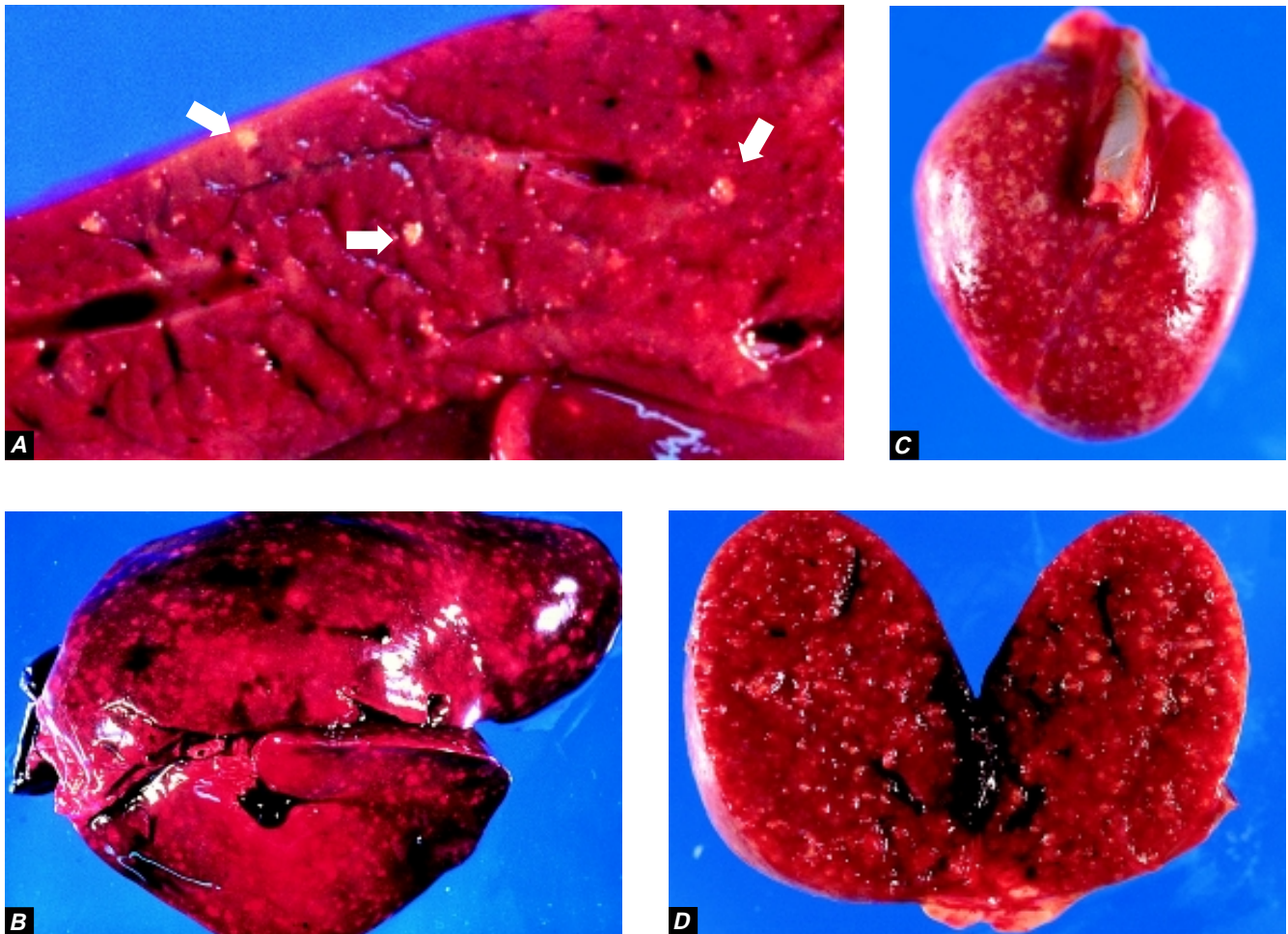
When captive infected flocks cannot be destroyed, it is important to make every effort to permanently isolate the survivors from other birds. Birds that survive infection can become carriers of the virus and infect other birds by intermittently discharging virus into the environment. Care must also be taken to prevent spread of the virus to susceptible birds by contact with potentially contaminated materials such as litter, water, feed, and feces from the confinement area. Clothes and body surfaces of personnel who were in contact with diseased birds are other potential sources of contamination.

There is no evidence that the IBDC virus can be transmitted through the egg. However, until more is known about this disease, eggs from birds surviving infection should be disinfected and hatched elsewhere. Young from these eggs

should be reared at a facility free of IBDC, tested, and found free of exposure to IBDC before they are allowed to have contact with other birds.

Infection with the IBDC virus elicits an antibody response that persists for several years. This is a useful indicator of exposure to this virus. All captive cranes that are being transferred to other facilities or released into the wild should be tested for exposure to the IBDC virus. Birds found to have antibodies to IBDC should be considered potential carriers of this virus and either be destroyed or confined under the conditions specified above.

Good husbandry practices are important for reducing the potential for transmitting IBDC and for minimizing conditions favorable to virus shedding. Crowding, inclement weather, interspecies interactions, and poor sanitation were all possible contributing factors to the die-off at the ICF. IBDC has not reappeared at the ICF since corrective actions



Photos by James Runnigen

**Figure 17.3** Gross lesions of IBDC: (A) small, yellow-white spots throughout the cut surface of the liver; (B) abundance of spots create mottled appearance of the liver surface; (C) external surface of the spleen; (D) cut surface of the spleen.

were taken, which include isolating the survivors of the die-off and initiating and maintaining an aggressive flock health-surveillance program.

## **Human Health Considerations**

None known.

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## **Supplementary Reading**

- Docherty, D.E., and Henning, D.J., 1980, The isolation of a herpesvirus from captive cranes with an inclusion body disease: *Avian Diseases*, v. 24, p. 278–283.
- Docherty, D.E., and Romaine, R.I., 1983, Inclusion body disease of cranes: a serological follow-up to the 1978 die-off: *Avian Diseases*, v. 27, p. 830–835.
- Schuh, J.C.L., and Yuill, T.M., 1985, Persistence of inclusion body disease of cranes virus: *Journal of Wildlife Disease*, v. 21, p. III–II9.
- Schuh, J.C.L., Sileo, L., Siegfried, L.M., and Yuill, T.M., 1986, Inclusion body disease of cranes: Comparison of pathologic findings in cranes with acquired versus experimentally induced disease: *Journal of American Veterinary Medical Association*, v. 189, p. 993–996.