

Short Communication

Idiopathic intranuclear inclusion bodies in the renal tubular epithelia of Japanese quail (*Coturnix coturnix japonica*)

Seung-Hyeok Seok, Jong-Hwan Park, Sun-A Cho, Jae-Hak Park*

Department of Laboratory Animal Medicine, College of Veterinary Medicine, Seoul National University, Seoul 151-742, Korea

We report idiopathic intranuclear inclusion bodies in the renal tubular epithelia of two cases of among the 960 Japanese quail (*Coturnix coturnix japonica*) in the course of the acute oral toxicity and dietary toxicity test. Basophilic inclusion bodies were seen only in the nuclei of renal tubular epithelia. We could not classify our case into any adenovirus infection by clinical signs and lesions. The inclusion bodies were only identified as adenovirus-like particles based upon the electronmicroscopical features.

Key words: Adenovirus-like particles, Japanese quail (*Coturnix coturnix japonica*), Inclusion body

Intranuclear inclusion bodies in the renal epithelium of birds are usually caused by viruses; inclusion body hepatitis virus (avian adenovirus-1) or haemorrhagic enteritis virus (avian adenovirus-2) [5,7]. Here, we found two cases of idiopathic intranuclear inclusion bodies in the renal tubular epithelia among the 960 Japanese quail (*Coturnix coturnix japonica*) in the course of the acute oral toxicity and dietary toxicity test. Although we could not classify present case into virus infections by clinical signs and lesions, we report the characteristic features of the idiopathic intranuclear inclusion bodies.

Nine hundred and sixty male and female 6-week-old Japanese quail (*Coturnix coturnix japonica*) weighing 130–150 g were obtained from a local supplier (Suwon-Ezo, Suwon, Korea). All animal experiments were performed under protocols approved by Institutional Animal Care and Use Committee of Seoul National University. The quail were kept at room temperature of $22 \pm 2^\circ\text{C}$ and $55 \pm 10\%$ relative humidity, and received 8/16 h of light/darkness with light intensity of 300 lux. Air changes per hour were kept constant (15X). The birds received standard layer feed (Samyang, Korea) and tap water *ad libitum*.

The brain, liver, kidney, thymus, lung, spleen, trachea, intestine, testis, and ovary were fixed in 10% neutral formalin at least for 24 h when the acute and dietary toxicity tests were finished, dehydrated in alcohol xylene series, and embedded in paraffin wax. From each block, 2 mm-thick sections were prepared, and stained with haematoxylin and eosin for histopathological examination. Haematoxylin and eosin stained kidney containing number of inclusion body was selected for transmission electron microscopic evaluation. The selected portion was post-fixed in 1% OsO_4 , and rinsed with 0.1 M sodium cacodylate buffer (pH 7.2) for 30 min *in situ*. After dehydration in a series of alcohol-propylene oxide, the sections were embedded in an epon mixture (Quetol 812, DDSA, MNA, DMP 30) at 60°C . Ultrathin sections were double-stained with 1% uranyl acetate and 1% lead citrate, and examined with an electron microscope (JEM 100CX, JEOL, Japan) at an accelerating voltage of 80 KV.

The intranuclear inclusion bodies were detected in the tubular epithelia of two cases of among the 960 quail examined. These quail were from control group and showed no general clinical signs of disease throughout the course of the experiment. The inclusions were homogenous and basophilic (Fig. 1). The dimensions of the inclusion bodies were $19.1 \pm 2.2 \mu\text{m}$ (range 16.2 to $22.5 \mu\text{m}$; $n = 30$). Inclusion bodies were not found in the cytoplasm, but were only observed in the renal cortex. Ultrastructurally, the inclusion bodies were consisted with electron-dense particles (Fig. 2). The particles were nonenveloped hexagonal outline and assembled in the nucleus. The diameter of the particles was 70 nm in regular size.

Electronmicroscopically, the idiopathic intranuclear inclusions were thought as adenovirus-like particles based upon the morphology and size. These inclusion bodies were seen only in the renal tubular epithelia. Singh *et al.* inoculated experimentally with inclusion body hepatitis virus (avian adenovirus-1) derived from quail to Japanese quail and reported large basophilic intranuclear inclusion bodies were seen in hepatocytes and occasionally in the renal epithelium. Lesions were most frequently encountered

*Corresponding author
Tel.: +82-2-880-1256; Fax: +82-2-880-1256
E-mail: pjhak@snu.ac.kr

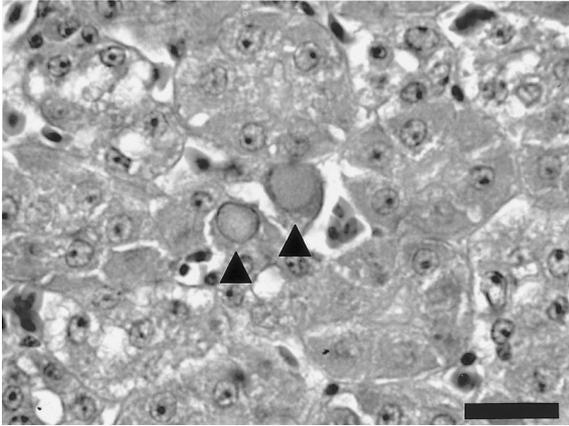


Fig. 1. Intranuclear inclusion bodies in the renal epithelium of a Japanese quail (Arrowheads). H&E stain; bar = 25 μ m.

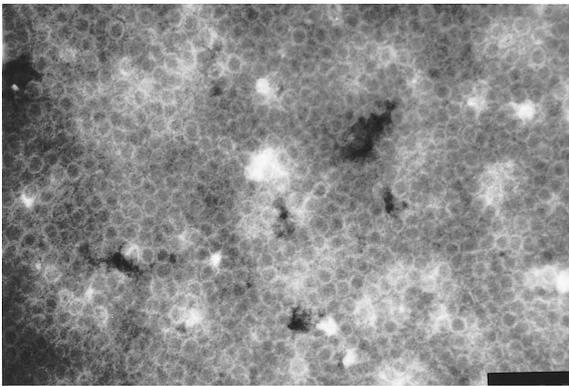


Fig. 2. The haematoxylin and eosin stained tissue sections were prepared for electron microscopy *in situ*. The inclusion bodies were identified as assembly of adenovirus-like particles; bar = 350 nm.

in the liver, kidneys and lungs. Pale, swollen and mottled liver, swollen nephritic kidneys, and congestion and pneumonia lungs were included in lesions [7]. However, it was distinguished from our report by the lesions; the inclusion bodies were observed only in the kidney, not in the liver. In addition, no clinical signs were observed in our case.

Turkey, pheasants, and chickens were only known to be a natural host to adenovirus-2 infection. It is now suspected that guinea fowl [1,4] and psittacines [3] may also be naturally infected with adenovirus-2. To our knowledge,

there was no reported case of natural adenovirus-2 infection in quail up to present. Also the clinical signs of haemorrhagic enteritis, marble spleen disease, and related infections are different from our report [2,6].

Spontaneous idiopathic intranuclear inclusion bodies in the renal tubular epithelia were rarely reported and we hardly classify our case into any adenovirus group. The characteristic features of the inclusion bodies reported here are their intranuclear location, basophilic, homogeneity in size and occurrence only in the renal cortical epithelium.

Acknowledgments

This work was supported by the Brain Korea 21 Project, Korea.

References

1. Cowen BS, Rothenbacher H, Schwartz LD, Braune MO, Owen RL. A case of acute pulmonary edema, splenomegaly, and ascities in guinea fowl. *Avian Dis* 1988, **32**, 151-156.
2. Domermuth CH, Gross WB. Hemorrhagic enteritis and related infections. In: Hofstad MS, Barnes HJ, Calnek BW, Reid WM, Yoder HW Jr (eds.). *Diseases of Poultry*. 8th ed. pp. 511-516, Iowa State University Press, Ames, 1984.
3. Gomez-Villamandos JC, Martin de las Mulas JM, Hervas J, Chancon-M de Lara F, Perez J, Mozos E. Spleno-enteritis caused by adenovirus in psittacine birds: A pathological study. *Avian Pathol* 1995, **24**, 553-563.
4. Massi P, Gelmett D, Sironi G, Dottori M, Lavazza A, Pascucci S. Adenovirus-associated haemorrhagic disease in guinea fowl. *Avian Pathol* 1995, **24**, 227-237.
5. Meteyer CU, Mohammed HO, Chin RP, Bickford AA, Trampel DW, Klein PN. Relationship between age of flock seroconversion to hemorrhagic enteritis virus and appearance of adenoviral inclusions in the spleen and renal tubule epithelia of turkeys. *Avian Dis* 1992, **36**, 88-96.
6. Pierson FW, Barta VD, Boyd D, Thompson WS. The association between exposure to multiple infectious agents and the development of colibacillosis in turkey. *J Appl Poultry Res* 1996, **5**, 347-357.
7. Singh A, Oberoi MS, Singh B. Pathogenicity of quails inclusion body hepatitis virus (avian adenovirus-1) for Japanese quails and broiler chicks. *Vet Res Commun* 1995, **19**, 545-551.