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Corona Virus: Affecting Animals

Sachin Subedi*
B.V.Sc. & A.H, Agriculture & Forestry University, Chitwan, Nepal

***Corresponding author: Sachin Subedi**, B.V.Sc. & A.H, Agriculture & Forestry University, Chitwan, Nepal, Tel: 9779846647714; E-mail: sachinsubedi59@gmail.com

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Abstract

Corona viruses are positive sense RNA virus belonging to the Coronaviridae family, which are further subdivided into four genera, the alpha, beta, gamma, and delta coronaviruses. Infectious bronchitis virus and SARS-CoV belongs to beta group of coronaviridae family. Infectious bronchitis virus causes respiratory and nephritic signs that includes tracheal rales, urate crystals, lethargy and nasal discharge. In livestock and pets, the corona virus infection causes mostly gastrointestinal lesions. This viral infection can be prevented through administration of vaccine. Recently outbreak SARS-CoV-2 also known as COVID-19 also reported in some pets mostly cats. However, there is no any signs of transmission from pets to humans.

Keywords: Coronavirus, nephritic, vaccination, SARS-CoV-2

Introduction

Corona viruses are positive sense RNA virus named for solar corona like appearance (meaning crown) with helical nucleocapsid measuring 80 to 160 nm. It consists of glycoproteins on the surface of envelope appearing as club shaped projections that measure 20 nm in length and 5-11 nm inn width (Chakraborty, 2012).

Coronaviruses (CoVs) are the largest group of viruses belonging to the Nidovirales order, which includes Coronaviridae, Arteriviridae, Mesoniviridae, and Roniviridae families. The Coronavirinae comprise one of two subfamilies in the Coronaviridae family, with the other being the Torovirinae (Groot RJ et.al, 2011).

The Coronavirinae are further subdivided into four genera, the alpha, beta, gamma, and delta coronaviruses. The viruses were initially sorted into these genera based on serology but are now divided by phylogenetic clustering (**Patrick Woo**, et.al, 2010).

Table 1: Coronavirus Groups, Target Tissues, and Diseases.

Genetic Group	Virus	Host	Infection site
Alpha	HCoV-229E	Human	Upper respiratory tract
Alpha	TGEV PRCV PEDV	Pig	Upper respiratory tract, Small intestine, Upper Respiratory tract, lungs, Viremia
Alpha	F1PV	Cat	Upper Respiratory tract, enteric and systemic signs
	FCoV		Small intestine
Alpha	CCoV	Dog	Small Intestine
Alpha	RaCoV	Rabbit	Systemic signs
Beta	HCoV-OC43	Human	Upper respiratory tract
Beta	NUN	Mouse	Hepatitis, CNS, systemic signs
Beta	RcoV	Rat	Salivary glands, eye
Beta	BEV	Piig	Respiratory tract
Beta	BcoV	Cattle	Lungs, colon
Beta	SARS-CoV	Human	Upper respiratory tract, lungs, viraemia, kidney
Beta	Civet cat CoV	Himalayan palm civet	Subclinical?
Beta	Raccoon	Raccoon	Subclinical?
	dogCoV	dog	
Gamma	IBV	Chicken	Upper respiratory tract, lungs,
Gamma	TCoV (TECoV)	Turkey	Small intestine
Delta	HKU12 HKU13	Mammals, Birds, Pigs	Gastrointestinal tract

Materials and Methods

Common disease conditions in animals due to Corona virus
Infectious Bronchitis

Infectious bronchitis is an acute, highly contagious disease of poultry characterized by tracheal rales, coughing and sneezing (Chakrabarti 1993). It is caused by IBV virus, a member of

coronaviridae family which is single stranded RNA virus. This virus has 24 strains which are groupd into Massachusetts, Connecticut or Beaudelt's strain (Chakrabarti A, 2014). Chicken is naturally infected though susceptibility varies among breeds and strain of chicken (Smith et al., 1985). It is horizontally transmitted via aerosol route. The virus may also be transmitted through contaminated feed and equipments (Cunningham 1970). Birds of all ages are susceptible, but chicks of 1-4 weeks of age are most severely affected. Mortality is about 20-90% and secondary infection with Mycoplasma or E.coli is common(Chakrabarti A, 2014). After invasion virus localize in the respiratory system, following which a viremia occurs and the virus is distributed in the body and affect reproductive and urinary system and replicates up to 1-8 days post infection. Incubation period is about 18-30 hours. Symptoms includes respiratory and nephritic form. Common clinical signs are tracheal rales, sneezing, nasal discharge, depression, ruffled feathers, wet droppings and urolithiasis (Cumming, 1969). Post mortem lesions include cloudy air sacs, catarrhal tracheal exudates (Chakrabarti A, 2014). Pneumonia may also be seen.

Kidneys are pale swollen with tubules and ureters are often distended with urates. Diagnosis can be done according to clinical signs, PM lesions, virus isolation in chick embryo (Crinion et.al, 1971) and serological tests. Treatment is non-specific and antimicrobial therapy is recommended. Prevention is done by vaccination of birds with strict isolation procedure for affected birds (Chakrabarti A, 2014). Corona Virus in livestock and pets

It is highly contagious disease of domestic animals, specially of canine and bovine of young age group, characterized by gastroenteritis. It is caused by CoV virus, a member of coronaviridae family which is single stranded RNA virus that has affinity for gastrointestinal tract (Chakrabarti A, 2014). Canine population is the main host of this viral infection causing Canine Corona Virus(CCV) disease. Pig and calves are also found to be affected. Virus may also be isolated from feces of cat (Lewis et.al, 1992). Transmission is mainly through fecal contamination and vomitus. The virus invades the small intestine, damage the intestinal villi resulting in profuse diarrhea (Chakrabarti A, 2014). Virus may also enter the respiratory tract. Clinical signs include depression, anorexia, lethargy, vomiting, prolonged diarrhea (7-10) days with yellow orange colored fecal materials with occasional mucus or blood. Cat may also show vomiting and diarrhea accompanied by fever (Shreding 1994). Death may occur within 24-36 hours. Enteritis is principal lesions. The intestinal villi is atrophied and desquamated. Diagnosis is based on history of immunization, PM lesions, clinical signs. Blood reports shows drops in leucocytes.

Serological tests like AGID, ELISA and PCR can also be done (Calvo & Samarro, 1993). This disease is often confused weigh canine parvo virus due to similar clinical signs. No specific treatment and antibiotics like tetracycline, chloramphenicol may also be administered.

Symptomatic treatment to control diarrhea along with fluid therapy (Chakrabarti A, 2014). Vaccination is most effective method for prevention of this disease.

Discussion

Recent data suggest that SARS CoV may also have a broad host range besides humans. Genetically similar CoVs were isolated from civet cats and raccoon dogs (**Guan et al., 2003**). In experimental studies, the SARS CoV infected and caused disease in macaques and ferrets and infected cats subclinically (Fouchier et al., 2003; Martina et al., 2003. COVID-19 is caused by SARS-CoV-2 (Severe acute respiratory syndrome coronavirus 2. This diseased was first reported in December 2019 in Wuhan, China and has now caused a global pandemic. It was thought to be originated from bats though the intermediate animal sources of virus are still unknown. SARS- CoV-2 replicates poorly in dogs, pigs, chickens, and ducks, but ferrets and cats are permissive to infection (Ruchi Tiwari et.al, 2020). Bats, civets, and camels have been the recent animal carriers of human CoV infections (Cui et al., 2019). Bats (Wu et al. 2020) and pangolins (Zhang et al.

2020) are considered to be the probable sources of origin of SARS-CoV-2 (Andersen et al. 2020). Pets has been tested positive of COVID-19 and showed respiratory symptoms though there is no any evidence of transmitting the infection to humans from pets. (Gorman J, 2020).

Conclusion

Corona virus affects diversified hosts and is one of the important viral pathogens that affects the livestock population and pets causing infectious diseases thereby decreasing the production from livestock as well as degrading the health of pet animals. Being as viral disease, the treatment of the condition is non-specific and antibiotic therapy is done for secondary bacterial infections.

Vaccination of animal is the prophylactic measure for the control and prevention of corona virus. Poultry birds are vaccinated around 2 weeks of age through intraocular route or beak dipping In case of dogs killed vaccine 1 ml via intramuscular route should be given with first dose at 12weeks of age, second shot 3 weeks after the first one and annual revaccination is administered.

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