Newcastle disease virus (NDV) **System:** Terrestrial

Kingdom	Phylum	Class	Order	Family
Virus				

Common name avian pneumoencephalitis (English), exotic newcastle disease (English), pseudo-fowl pest (English), pseudovogel-pest (English), avian paramyxovirus type 1 (APMV-1) (English), atypical geflugelpest (English), pseudo-poultry plague (English), avian pest (English), avian distemper (English), Ranikhet disease (English), Korean fowl plague (English), Tetelo disease (English)

Synonym *Velogenic Newcastle Disease*
Ranikhet Disease

Similar species

Summary Virulent Newcastle disease (vND) or Newcastle Disease (NDV) is a contagious and fatal strain of Newcastle disease which is carried by numerous wild and domestic bird species. Newcastle disease virus is a paramyxovirus that is contagious and fatal to avian fauna. It is probably one of the most infectious diseases of poultry in the world and death rates of 100 percent can occur in unvaccinated flocks. Many birds die without showing any clinical signs and the virus may even cause mortality in vaccinated flocks. Newcastle virus is easily spread by bird secretions and excretions and once contracted there is no treatment. Current methods of control are aimed at preventing its spread and include restricting the import of live birds from countries where the disease is present and culling infected birds.

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Species Description
The Newcastle pathogen (disease-causing agent) is a RNA virus with a helical capsid and a non-segmented, single-stranded genome of negative-sense RNA strands (Spadbrow 2004; Pringle 1990, in CIDRAP 2003). It is part of the virus family Paramyxoviridae, genus *Rubulavirus* (Beard 1998, in CIDRAP 2003). At least nine known types of avian paramyxoviridae exist and type differences are based on genetic differences in the hemagglutinin. Because of this the hemagglutinin/neuroaminidase (HN) surface protein is important for serologic indentification of the virus (CIDRAP 2003). It is also known that the fusion (F) surface protein is important in pathogenesis of the disease (CIDRAP 2003).
There are no pathognomonic gross lesions seen on necropsy of affected birds. However, some characteristic lesions may be seen. These usually consist of the following: petechial and small ecchymotic hemorrhages on the mucosa of the proventriculus, usually near the base of the papillae around the posterior and anterior orifices; edematous, hemorrhagic, necrotic, and ulcerative areas on Peyer's patches, cecal tonsils, and other aggregations of lymphoid tissue in the gut wall and edematous, hemorrhagic, or degenerated ovaries (Beard 1998, in CIDRAP 2003).\n
Newcastle disease affects the respiratory, nervous and digestive systems of birds. The incubation period of NDV ranges from two to 15 days (CIDRAP 2003) and the following clinical symptoms may be observed in an infected bird or in a bird flock (from CFIA 2003): Respiratory: sneezing, gasping for air, nasal discharge, coughing; Digestive: greenish, watery diarrhea; Nervous: depression, muscular tremors, drooping wings, twisting of head and neck, circling, complete paralysis; Partial to complete drop in egg production; Production of thin-shelled eggs; Swelling of the tissues around the eyes and in the neck; Sudden death; Increased death loss in a flock.\"

Notes
NDV was first identified in 1927 in Tyne, England, near Newcastle, thus the common name of the virus (Alexander 1992). NDV (also known as velogenic viscerotropic Newcastle disease) is one of several types of Newcastle disease - the severity of the disease depends on the type of Newcastle disease virus (CFIA 2003). Note that most virulent or velogenic virus strains will give intracerebral pathogenicity (ICP) index results that approach the maximum score of 2.0, whereas lentogenic (low pathogenic) strains will give values close to 0.0 (ProMED-mail 2005i).

Habitat Description
This virus infects vertebrates (Sander 2002), however, it has the most pronounced effects upon bird species (wild and domestic), particularly chickens. This virus is able to sustain viability between 2 and 12 pH, and for up to 3 hours at 56 degrees centigrade (USDA 2004)

Reproduction
This virus undergoes intercellular reproduction and is self-replicating.

General Impacts
Newcastle disease can affect many species of birds, both domestic and wild, and is of particular concern for poultry flocks. The major concern of an Newcastle disease outbreak is its potential economic impact on the poultry industry (CFIA 2003). Newcastle disease infections have been established in at least 241 species of birds representing 27 of the 50 orders of the class (Alexander *et al.* 2004). Newcastle disease is most severe in chickens, peafowl, guineas, pheasants, quails and pigeons (CIDRAP 2003). It can be found in a more mild form in turkeys ducks and geese and may be carried by finches and canaries, in which it may not cause any clinical symptoms of the disease (Beard 1998, in CIDRAP 2003). Carrier states can also exist in psittacine and other wild birds (OIE: Newcastle disease: Technical disease card database, in CIDRAP 2003). \r\n
Newcastle disease can typically kill up to 80 percent of unprotected poultry in rural areas and is found throughout the developing world making it one of the principal constraints to increasing small-scale poultry production in these regions (Alexander *et al.* 2004). Newcastle disease is one of the most infectious diseases of poultry in the world with extremely high morbidity and mortality rates, especially in chickens (100% and 90%, respectively) (CIDRAP 2003).\r\n
The global economic impact of vND (or NDV) is enormous (Steneroden 2004). No other poultry virus comes close and it may represent a bigger drain on the world's economy than any other animal virus. In developed countries outbreaks of vND are extremely costly, and control measures, including vaccination, are a continuing loss to the industry. Countries free of vND are faced with repeated testing to maintain that status for trade purposes.\r\n
It appears that there are an unusually large number of reported Newcastle disease incidents occurring in the general Eurasian region affected by avian influenza, probably resulting from intensified surveillance for poultry disease in the area (ProMED-mail 2006e). In fact, one of the consequences of the recent world scare of highly pathogenic avian influenza (HPAI) seems to be a general increased rate of reported Newcastle Disease outbreaks. ND is listed as one of the Diseases Notifiable to the OIE. During 2005, Newcastle Disease outbreaks have been reported to the Office International des Epizooties (OIE) (or the World Organisation for Animal Health) from Botswana, Bulgaria, Cyprus, Denmark, Finland, Former Yugoslav Republic of Macedonia, France, Greece, Israel, Japan, Romania, Slovakia, Turkey and UK (Marshall 2005a). Macedonia reported 2 outbreaks in 2004 and 9 in 2003 (ProMED-mail 2005l). In 2004, Greece and Albania reported one outbreak, Cyprus 2, and Russia 12, while Serbia and Montenegro had 16 outbreaks in 2002 (ProMED-mail 2005l). Two outbreaks of NDV occurred in Australia in 1998 and further outbreaks were reported in 1999 and 2000. For regular updates on the occurrance of ND please see Disease Information (OIE).\r\n
Although this virus has some effect on humans it does not pose a serious threat to human health. There have been cases where Newcastle disease has caused conjunctivitis (pink eye) in people exposed to high levels of the virus, such as in lab workers or in people working in the poultry industry who have regular contact with contaminated birds or poultry material (CFIA 2003).

Management Info
As is generally the case in the control of an infectious disease management of NDV occurs on a number of levels. For example, in Canada control of NDV is based on three principles: prevention (restriction of the import of live birds from countries where NDV occurs), local quarantine (where an NDV outbreak is known to occur in the country) and monitoring and surveillance of the disease (in captive, migratory and wild birds) (CFIA 2003). In addition, public and industrial poultry owners are required to report the disease and consult a veterinarian if birds show any of the clinical symptoms (CFIA 2003).\r\n
Prevention measures: The easiest way to prevent the virus is to import birds from disease-free flocks (CIDRAP 2003). Attempts to contain NDV often involve halting regional and international trade in birds and bird products (WPT 2004). Vaccination, although not full-proof, may prevent the spread of Newcastle disease (CIDRAP 2003). Birds are usually vaccinated at 2 to 4 weeks of age when they become susceptible to the virus (CIDRAP 2003). Vaccinations must be continued throughout the life of the bird and may take either a live or inactivated vaccine form (CIDRAP 2003). Live vaccines can be administered via drinking water, whereas inactivated vaccines must be administered individually via injection (CIDRAP 2003).\r\n
Strict local quarantine should be enforced once the virus is identified and may include quarantine measures which centre on improving human hygienic techniques. Strict quarantine and destruction of all birds infected with NDV is necessary to eradicate the virus from an area (CIDRAP 2003). For example, following a major outbreak of the disease in California, USA, from 1971 to 1973 $50 million was spent to destroy nearly 12 million infected birds (CFIA 2003). More recently, from 1999 to 2000, after Newcastle disease swept through northern and central Italy over 13 million birds were culled (CFIA 2003). Because the virus can survive well in some environments, special precautions need to be taken during the destruction of birds. After cleaning and disinfection is complete, no birds should be reintroduced into depopulated facilities for at least 30 days (CIDRAP 2003). Contaminated manure must be safely removed by burying it at least 5 feet deep and composting it (CIDRAP 2003). Any insects or mice that could act as potential vectors need to be destroyed (CIDRAP 2003). Cresylics or phenolic disinfectants should be used after thorough cleaning of all surfaces and equipment (CIDRAP 2003).\r\n
Monitoring: Sample collection and diagnostic tests are important for identification of the disease and for the prevention of its spread (please see CIDRAP 2003 for virus isolation and diagnostic techniques). Because vaccinated birds can be infected with NDV without showing severe clinical signs, infected carriers can be difficult to identify. Two systems are used to detect carrier birds. In the first system, all birds dying during a 24-hour period are collected twice a week. Cloacal swabs are then collected and routine diagnostic procedures conducted. In the second virus detection system, sentinel birds are placed in vaccinated flocks. The sentinel birds have not been vaccinated for Newcastle Disease. If virus is present in the flock, sentinel animals usually die within a week of placement (Beard 1998, in CIDRAP 2003).\r\n
Physical control of the virus should take into account the following principles (from CIDRAP 2003). The virus is inactivated by a 3 hour heat treatment at 56°C or a 30 minute heat treatment at 60°C. It is ether-sensitive and inactivated by formalin, phenol and acid pH (OIE: Newcastle disease: Technical disease card database, in CIDRAP 2003). It survives indefinitely in frozen material. It is destroyed rapidly by dehydration and ultraviolet rays (ISDA/APHIS, in CIDRAP 2003). A minimum core temperature of 80°C for 1 minute will destroy the virus in meat products (Queensland DPI in CIDRAP 2003).

Pathway
The movement and trade of the following products may result in the local or international spread of the virus: live domestic and wild birds, fresh meat and meat products from domestic and wild birds, day-old imported birds and hatching eggs, products of bird origin (Koo and Mattson 2004).

Principal source:

Compiler: National Biological Information Infrastructure (NBII) & IUCN/SSC Invasive Species Specialist Group (ISSG)

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ALIEN RANGE

[1] ALBANIA
[1] AUSTRALIA
[1] BAHRAIN
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[1] GEORGIA
[1] INDIA
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[1] MACEDONIA, THE FORMER YUGOSLAV REPUBLIC OF
[1] MEXICO
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[1] SLOVAKIA
[1] SWEDEN
[1] TURKEY
[9] UNITED STATES

Red List assessed species 1: EX = 1;

Ectopistes migratorius **EX**

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