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Contents

Newcastle Disease (ND)

Introduction

Newcastle Disease (ND) is a highly contagious and often severe viral disease found worldwide that affects birds including domestic poultry. It is also called Ranikhet, Pseudo fowl pest and Avian pneumo encephalitis.

The disease appears in three forms: lentogenic or mild, mesogenic or moderate and velogenic or very virulent, also called exotic Newcastle disease. The lentogenic strains are very widespread, but cause few disease outbreaks. Newcastle disease usually presents as a respiratory disease, but depression, nervous manifestations, or diarrhoea may be the predominant clinical form. Newcastle disease, in its highly pathogenic form is a listed disease by the World Organisation of Animal Health (OIE) and must be notified as an obligation as transparency in disease information for global disease control programmes.

Disease distribution

Newcastle disease was discovered in Indonesia in 1926, but is named after Newcastle-on-Tyne, England, where it occurred in 1927. Since its recognition in 1926, ND is regarded as being endemic in many countries and found throughout the world, it has been currently controlled in Canada, the United States and some western European countries. It continues in parts of Africa, Asia and South America. However, since wild birds can sometimes carry the virus without becoming ill, outbreaks can occur anywhere poultry is raised.

Causative Virus

Newcastle disease is caused by specified viruses of the avian paramyxovirus type 1 (APMV-1) serotype of the genus Avulavirus belonging to the subfamily Paramyxovirinae, family Paramyxoviridae. The paramyxoviruses isolated from poultry have been classified by serological testing into nine serotypes designated APMV-1 to APMV-9; ND virus (NDV) has been designated as APMV-1.

One of the most characteristic properties of different strains of NDV has been their great variation in pathogenicity for chickens. Strains of NDV have been grouped into five pathotypes on the basis of the clinical signs seen in

infected chickens. These are Viscerotropic Velogenic (highly pathogenic form in which haemorrhagic intestinal lesions are frequently seen); Neurotropic Velogenic (high mortality, usually following respiratory and nervous signs); Mesogenic (respiratory signs, occasional nervous signs, but low mortality); Lentogenic or respiratory (mild or subclinical respiratory infection); Asymptomatic enteric (usually consists of a subclinical enteric infection). Pathotype groupings are rarely clear-cut, considerable overlapping may be seen. In addition, exacerbation of the clinical signs induced by the milder strains may occur when infections by other organisms are superimposed or when adverse environmental conditions are present.

Disease transmission and spread

ND is transmitted most often by direct contact with disease or carrier birds. Infected birds may shed the virus in their faeces, contaminating the environment. Transmission can then occur by direct contact with faeces and respiratory discharges or by contaminated food, water, equipment and human clothing. NDV can survive for several weeks in the environment, especially in cool weather.

Generally virus is shed during the incubation period and for a short time during recovery. Birds in the pigeon family can shed the virus intermittently for a year or more. Other wild birds such as comorants have also been shown to have caused outbreaks in domestic poultry.

The virus is present in all parts of the carcass of an infected bird. The disease is very contagious. When the virus is introduced into a susceptible flock, virtually all the birds will be infected within two to six days.

Clinical signs

The clinical signs vary widely and dependent on factors such as: the strain of the virus, the species of bird infected, the age of the host, (young birds are the most susceptible), concurrent infection with other organisms, environmental stress and immune status. In some circumstances infection with the extremely virulent virus strains can result in high numbers of birds found dead with comparatively few clinical signs. The disease has a rapid onset with symptoms appearing between two and twelve days after exposure, and spreads rapidly through the flock.

Some virus strains attack the nervous system, others the respiratory, or digestive systems. Clinical signs include respiratory signs (gasping, coughing, sneezing, and rales); Nervous signs (tremors, paralyzed wings and legs, twisted necks, circling, spasms and paralysis); Digestive signs (diarrhoea). A partial or complete drop in egg production may occur. Eggs may be abnormal in colour, shape, or surface, and have watery albumen. Mortality is variable but can be as high as 100%.

Diagnosis

ND can present a clinical picture very similar to avian influenza, so laboratory testing is important to confirm the diagnosis. The preferred method of diagnosis is virus isolation and subsequent characteriztion. When investigations of ND are the result of severe disease and high mortality in poultry flocks, it is usual to attempt virus isolation from recently dead birds or moribund birds that have been killed humanely. Samples from dead birds should consist of oro-nasal swabs, as well as samples collected from lung, kidney, intestine (including contents), spleen, brain, liver and heart tissues. These may be collected separately or as a pool, although intestinal samples are usually processed separately from other samples. The samples should be placed in isotonic phosphate buffered saline (PBS), pH 7.0–7.4, containing antibiotics. Haemagglutination (HA) and Haemagglutination inhibition (HI) tests are used to confirm the presence of NDV.

Control and Prevention

Prophylactic vaccination is practised in all but in a few of the countries that produce poultry on a commercial scale. Due to the constant threat of introduction of the virus from wild birds, bio-security in poultry establishments is essential.

In order for a country to demonstrate that it is free of ND, surveillance is necessary following the OIE guidelines stipulated in the Terrestrial Animal Health Code. Thereafter poultry producers must implement effective bio-security procedures to prevent incursion of the disease. When the disease appears in a previously disease free area, a stamping out policy is practised in most countries. This includes strict isolation or quarantine of outbreaks; humane destruction of all infected and exposed birds; thorough cleaning and disinfection of premises; proper carcass disposal; pest control in flocks; depopulation followed by 21 days without poultry before restocking; avoidance of contact with birds of unknown health status and control of access to poultry farms.

Public Health Importance

Newcastle disease is a minor zoonosis (disease of animals that can also infect humans) and can cause conjunctivitis in humans, but the condition is generally very mild and self limiting.

Since the ND virus reproduces more quickly in human cancer cells than in most normal human cells, and because it can kill these host cells, ND virus has been experimentally used as a treatment for cancer.

OIE definition for reporting an outbreak of ND

Newcastle disease is defined as an infection of birds caused by a virus of avian paramyxovirus serotype 1 (APMV-1) that meets one of the following criteria for virulence:

- Virus has an intra-cerebral pathogenicity index (ICPI) in day-old chicks (Gallus gallus) of 0.7 or greater. OR
- Multiple basic amino acids have been demonstrated in the virus (either directly or by deduction) at

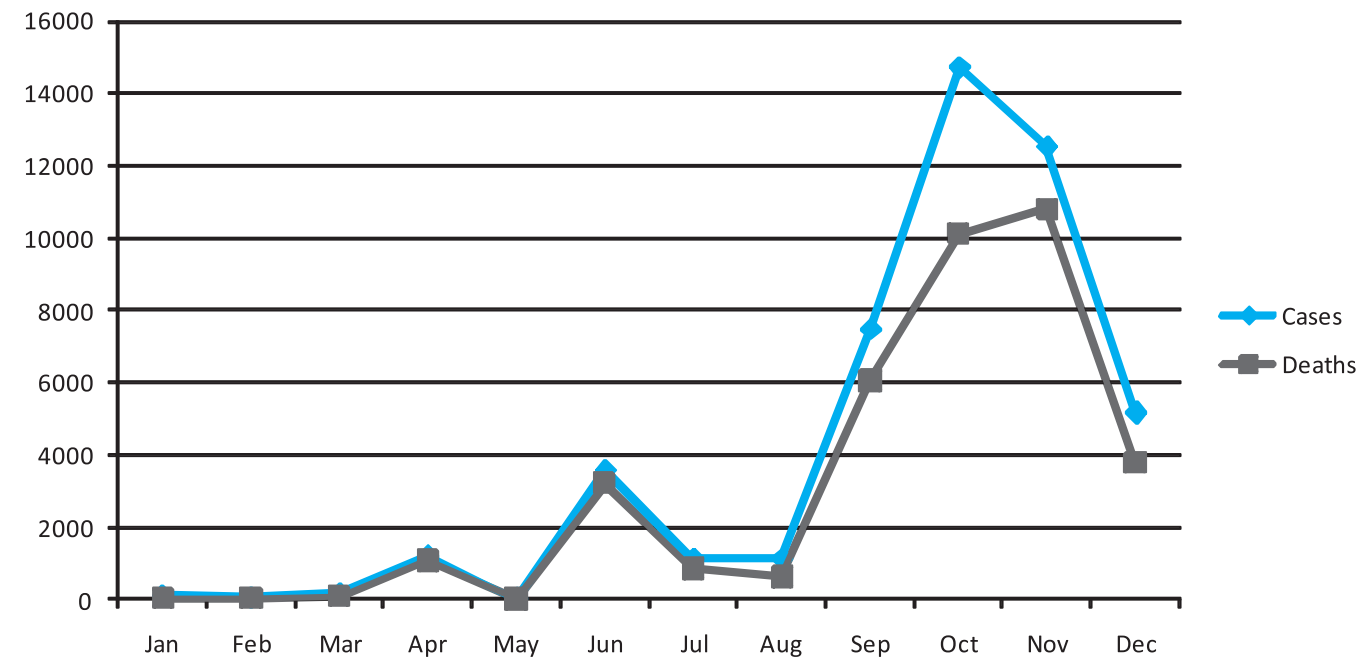
the C-terminus of the F2 protein and phenylalanine at residue 117, which is the N-terminus of the F1 protein. The term 'multiple basic amino acids' refers to at least three arginine or lysine residues between residues 113 and 116. Failure to demonstrate the characteristic pattern of amino acid residues as described above would require characterization of the isolated virus by an ICPI test. Amino acid residues are numbered from the N-terminus of the amino acid sequence deduced from the nucleotide sequence of the F0 gene, 113–116 corresponds to residues –4 to –1 from the cleavage site.'

2.1.1 Reported Cases of Newcastle Disease : July – December 2010

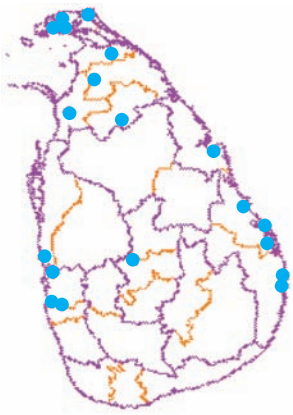
Newcastle disease is an endemic disease among poultry population of Sri Lanka for several decades. However, an unusually high occurrence pattern of this disease was noticed in year 2010 affecting backyard and commercial birds in the country. This unusual event which began in June turned into an epidemic form in September leading to a peak in October. Though vaccination against Newcastle disease is a commonly anticipated programme in the country, its application in the field especially among backyard population appears to be seldom practised. Furthermore, most of the commercial operations usually do not strictly adhere to the recommended vaccination schedule to ensure protection of birds throughout their lifespan. In addition to these characteristics, non-availability of adequate amount vaccine and uncontrolled movement of infected birds contributed to the development of an epidemic in the country which demanded recommencement of vaccine production locally.

In overall 47,309 cases of Newcastle disease was reported in the country during the year 2010 with 78% overall case-fatality rate.

Figure 1: Temporal Occurrence of Newcastle Disease in 2010

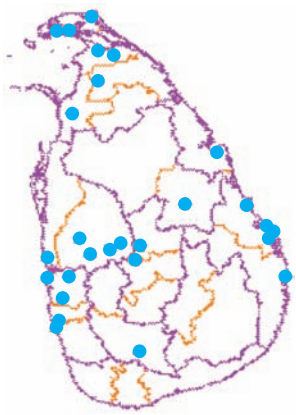


Spatial Distribution of Newcastle Disease Outbreaks : July – December 2010



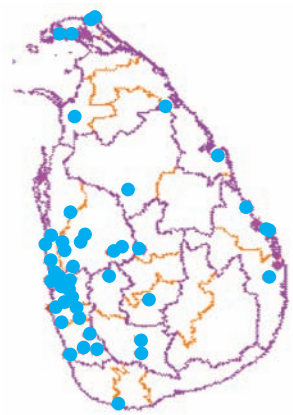
July

1129 cases
851 deaths



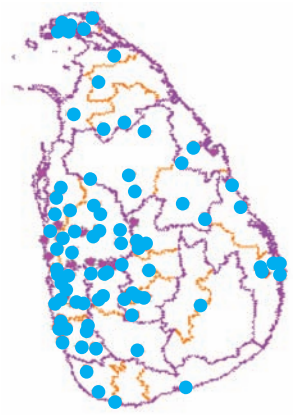
August

1133 cases
622 deaths



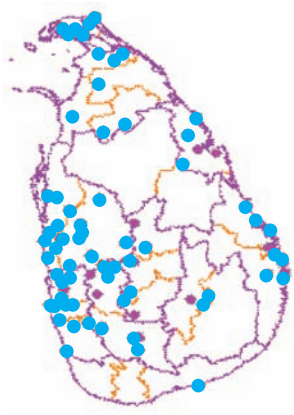
September

7484 cases
6056 deaths



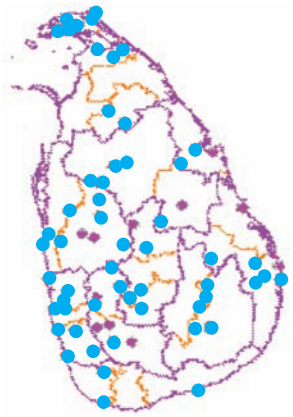
October

14720 cases
10123 deaths



November

12534 cases
10816 deaths

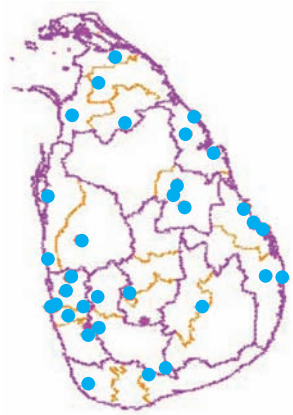


December

5169 cases
3783 deaths

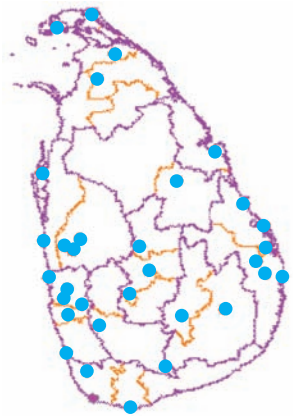
2.1.2 Reported Cases of Fowl Pox : July – December 2010

Fowl pox broke out in all the districts in the island during the second half of the year 2010. A total of 3989 cases have been recorded with the overall case-fatality rate of 34.69% during this period. Monthly distribution of these cases varied from 1396 in July to 208 in December.



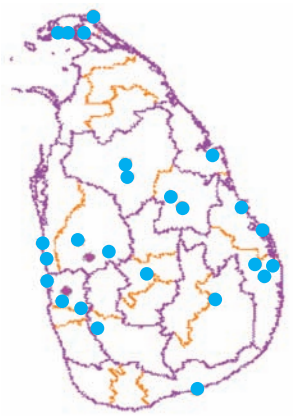
July

1396 cases
749 deaths



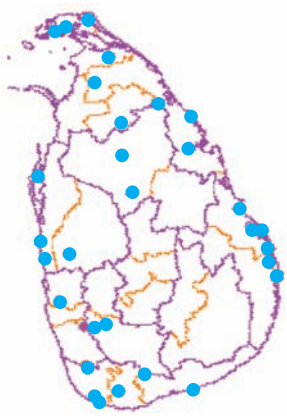
August

393 cases
60 deaths



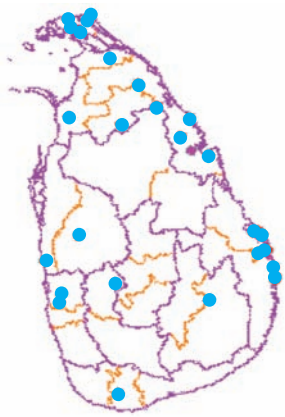
September

1000 cases
250 deaths



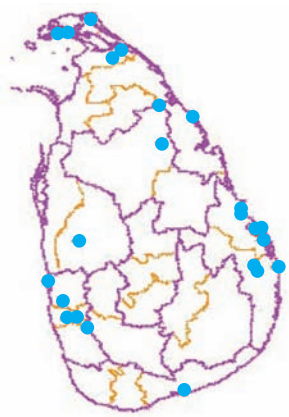
October

613 cases
168 deaths



November

379 cases
130 deaths

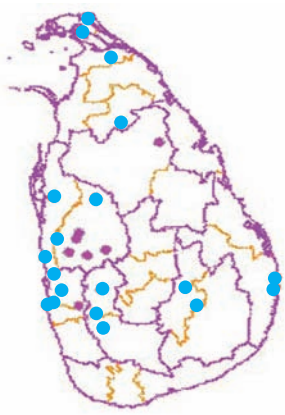


December

208 cases
27 deaths

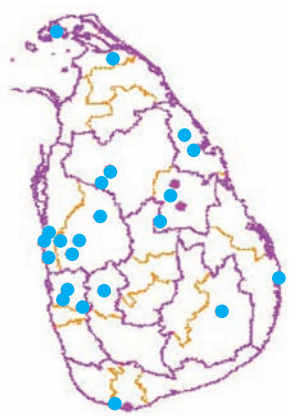
2.1.3 Reported Cases of Infectious Bursal Disease : July – December 2010

Infectious Bursal Disease (IBD) is endemic in Sri Lanka; the highest number of clinical cases among poultry has been reported due to Gumboro infection during the past several years. However, the unusual occurrence of Newcastle disease in an epidemic form during the second half of the year 2010, has exceeded the recorded number of cases due to Infectious Bursal Disease during this period.



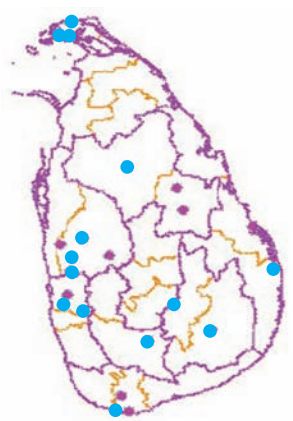
July

1678 cases
954 deaths



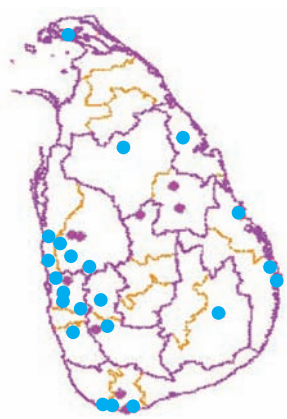
August

995 cases
317 deaths



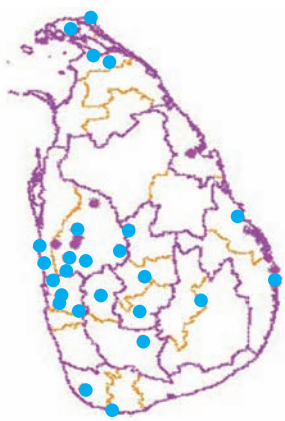
September

2688 cases
515 deaths



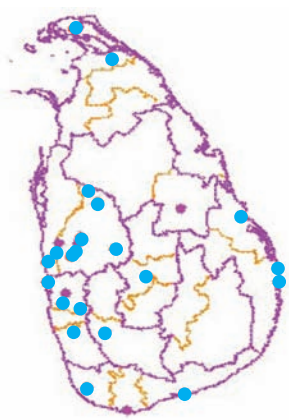
October

3553 cases
966 deaths



November

3370 cases
2610 deaths

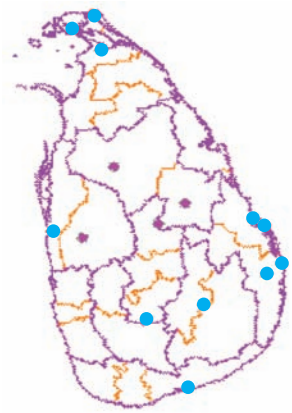


December

1614 cases
950 deaths

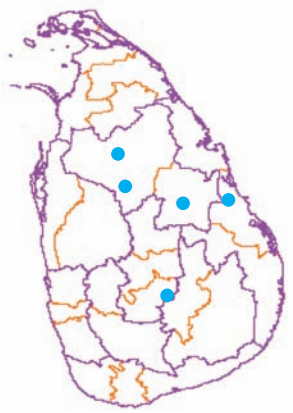
2.1.4 Reported Cases of Avian Salmonellosis : July - December 2010

A total number of 2,315 cases of Avian salmonellosis was recorded during the second half of the year 2010. They were confined to eleven districts namely Kurunegala, Puttalam, Anuradhapura, Polonnaruwa, Jaffna, Matale, Nuwara Eliya, Hambantota, Badulla, Batticaloa and Ampara.



Month	Cases	Deaths	Veterinary Range
July	1477	1098	Karaveddy, Nintavur, Batticaloa, Nachchaduwa, Polonnaruwa, Elahera, Panduwasnuwara
August	205	168	Bogowantalawa, Sammanturai, Karaveddy, Panduwasnuwara, Batticaloa, Ambalantota
September	352	296	Paduwasnuwara, Arachchikattuwa, Jaffna, Karaveddy, Eravur Pattu
October	67	45	Karaveddy, Jaffna, Passara, Chenkalady, Batticaloa
November	38	23	Earvur Pattu, Nallur, Karaveddy
December	176	141	Panduwasnuwara, Karaveddy, Nallur
Total	**2315**	**1771**	

2.2.1 Reported Cases of Foot and Mouth Disease : July - December 2010



Cases of FMD were detected among cattle at Punanai Veterinary range in Batticaloa district and Ragala Veterinary range in Nuwara Eliya district during the month of July 2010. Later on, an outbreak among buffaloes at Polonnaruwa Veterinary range in November resulted in 50 clinical cases. Furthermore, two outbreaks were encountered in December at Anuradhapura district; Central Nuwara GamPalatha Veterinary range among cattle population (11cases and 4 deaths) and at Ipalogama Veterinary range among buffalo population (12 cases).

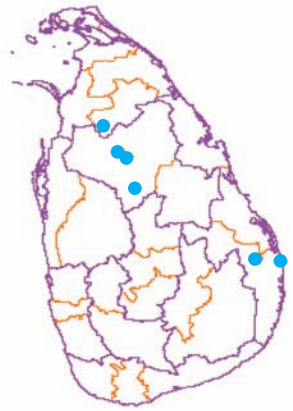
Month	District	VS Range	Cases	Deaths
July	Batticaloa	Punanai	18	
	Nuwara Eliya	Ragala	02	
November	Polonnaruwa	Polonnaruwa	50	
December	Anuradhapura	Anuradhapura-CNP	11	4
		Ipalogama	12	
	4 District	**5VS Ranges**	**93**	**4**

2.2.1 Reported Cases of Foot and Mouth Disease : July - December 2010

Black Quarter remained as the important fatal notifiable disease affecting among cattle population in the country. Sporadic outbreaks were recorded at Hambantota (Ambalanthota Veterinary range), Anuradhapura (Kekirawa, Padaviya and Palagala Veterinary ranges), Ampara (Uhana Veterinary range) and Vavuniya (Vavuniya Veterinary range) districts during the second half of the year 2010. The overall case-fatality rate was found to be 65%.

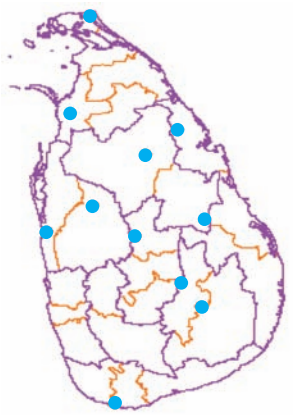
District	VS Range	Cases	Death
Hambantota	Ambalanthota	06	01
Anuradhapura	Kekirawa	01	01
	Padaviya	02	02
	Palagala	07	04
Ampara	Uhana	20	15
Vavuniya	Vavuniya	04	03
4 District	**6VS Ranges**	**40**	**26**

2.2.3 Reported Cases of Brucellosis : July - December 2010



Cases of Bovine Brucellosis was detected at Kekirawa, Mihintale and Central Nuwara GamPalatha Veterinary ranges in Anuradhapura district; Nintavur and Uhana Veterinary ranges at Ampara district; and Cheddikulam Veterinary range at Vavuniya district during the second half of the year 2010. Furthermore, clinical cases were noticed among both bovine and buffalo population at Kekirawa Veterinary range, whereas the cases were confined to only cattle at other locations. Vaccination against Brucellosis has been carried out in identified locations through two Veterinary Investigation Centers (VICC). VICC at Anuradhapura, Polonnaruwa, Pannala and Badulla have been engaged in Brucella vaccination in the field. A total of 2837 vaccinations have been carried out during the year 2010.

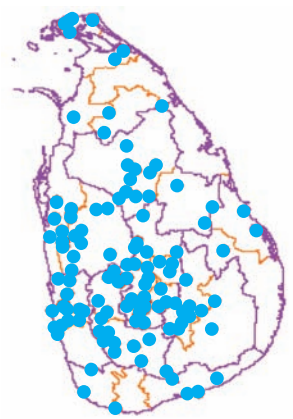
2.2.4 Reported Cases of Leptospirosis : July - December 2010



District	VS Range	Cases	Deaths
Kurunegala	Ambanpola	01	
Puttalam	Arachchikattuwa	02	
Polonnaruwa	Dimbulagala	01	01
Trincomalee	Gomarankadawala	01	
Anuradhapura	Kahatagasdigiliya	01	
Badulla	Kandekatiya	01	
	Passara	01	
Jaffna	Karaveddy	14	
Mannar	Nanaddam	06	
Matale	Pallepola	03	
Matara	Weligama	01	
10 District	**11 VS Ranges**	**32**	**01**

Cases of leptospirosis were recorded at ten districts in the country. Most of these cases were reported from the Northern Province (Jaffna and Mannar districts). However, there had been no evidence of zoonotic nature of this infection in spite of active surveillance among the human population.

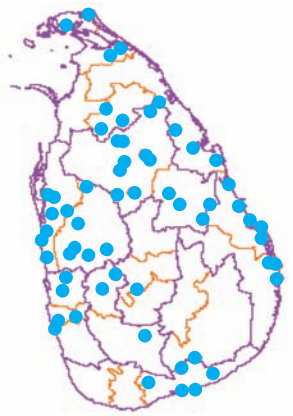
2.2.5 Reported Cases of Bovine Babesiosis : July - December 2010



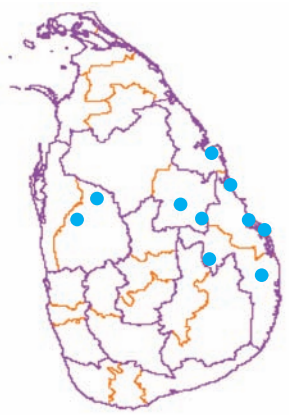
Month	Cases	Deaths
July	186	04
August	134	03
September	122	02
October	141	12
November	122	03
December	124	04
	829	**28**

Bovine babesiosis appears to be steadily increasing in the country and remaining as an endemic disease detected throughout the year without any temporal pattern. Moreover it has been reported from all the districts in the country except for Kilinochchci and Mullaitivu perhaps due to unsettlement of livestock yet after being severely affected by the civil war in these two districts. Over 120 cases have been reported month monthly which has gone up to 186 in the month of July. Though the curative medicament is expensive, it has been highly successful in most of the cases. Twenty eight animals have had poor prognosis leading to death during the second half of year 2010. The preventive programme of pre-immunization has not been implemented at field level due to various limitations and therefore its application has been limited to only very few farms in the up-country.

2.3.1 Reported Cases of Contagious Pustular Dermatitis : July - December 2010



Caprine

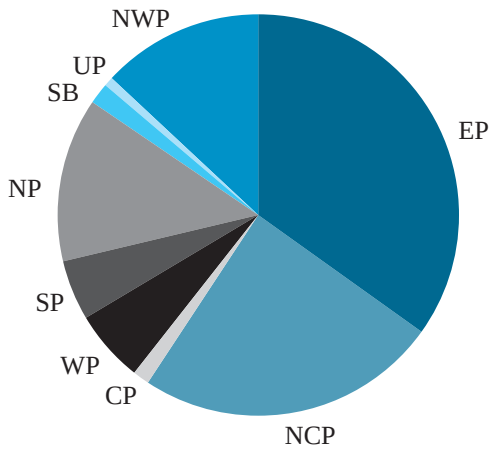


Ovine

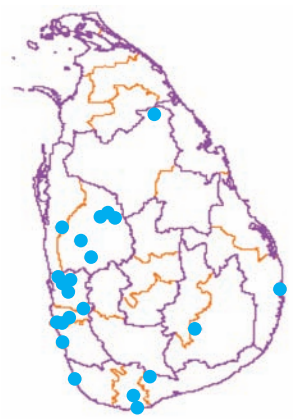
Cases of Contagious Pustular Dermatitis (CPD) were observed predominantly among sheep and goat population at Eastern and North-Central Provinces; followed by Northern and North-Western Provinces. Spatial distribution pattern of the occurrence of CPD has been found to have direct correlation to the population of these animal species at different locations. Auto vaccine against this infection has been produced at district level Veterinary Investigation Centers and has been contributed in preventing the spread of this infection.

Province	Cases	Deaths	Infected	
			Species	VS Range
Eastern Province	257	06	Cprine Ovine	Ampara, Batticaloa, Trincomalee
North Central Province	180	05	Cprine Ovine	Anuradhapura, Polonnaruwa
Northern Province	98	02	Caprine	Jaffna, Kilinochchi, Mannar, Vavuniya
North Western Province	96	02	Cprine Ovine	Kurunagala, Puttalam
Western Province	44	-	Caprine	Kalutara, Colombo, Gampaha
Southern Province	35	-	Caprine	Hambanthota
Sabaragamuwa Province	13	-	Caprine	Kegalle, Ratnapura
Central Province	10	-	Caprine	Kandy
Uva Province	05	-	Caprine	Monaragala

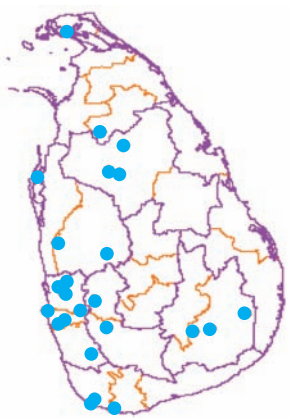
Provincial Distribution of CPD Cases



2.4.1 Reported Cases of Rabies : July - December 2010



Bovine



Canine

Caprine

Swine

Rabies remains as an important zoonotic disease prevalent in the country in spite of several programmes carried out in order to minimize the load of infection especially among the canine population which plays the key role in the urban cycle in the epidemiology of rabies. Animal health surveillance has been strengthened in order to notify the suspected cases among other domestic species such as cattle, goats and pigs; subsequently these cases have been proven to be rabies by the laboratory confirmation carried out at Medical Research Institute, Colombo.

Species	Cases
Bovine	42
Canine	55
Caprine	6
Swine	1
Total	**104**

3.1 Early History of Rinderpest in Sri Lanka

The first recorded occurrence of rinderpest in Ceylon dates to 1888 which lasted in epizootic proportions until 1890. Thereafter it appeared every year until 1934. The inactivated spleen pulp vaccine was introduced in 1931 and 55,295 immunizations were done until 1933

Rinderpest was re-introduced in 1943 with Indian goats which were imported together with sheep in order to feed the garrison of troops stationed in Ceylon during the Second World War. Initially the infected animals were gun down. However, subsequently caprinized rinderpest vaccine was prepared on the spot and was used on a large scale.

The disease was eradicated in 1946 and the country regained the rinderpest free status in September 1946.

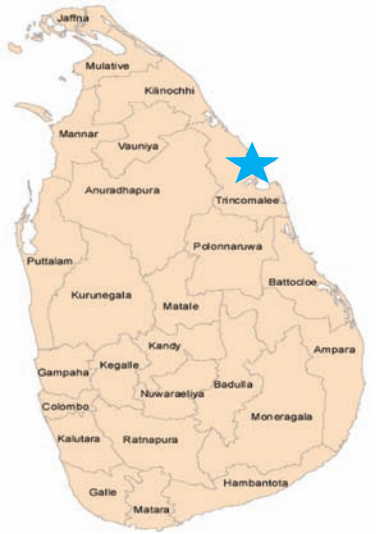
3.2 The Last Episode in Sri Lanka

Rinderpest reappeared in 1987 disrupting the disease free status enjoyed by the country over 40 years. The source of infection was again the Indian goats which were imported without any quarantine measures, for feeding the Indian Peace Keeping Forces (IPKF) stationed in the northern and eastern parts of the country. The first outbreak was reported from Batticaloa in the Eastern Province in October 1987. The index case was detected among cattle in a village called 'Sinna Urani' in the peninsula area of Batticaloa district. The disease was confirmed at Animal Virus Research Institute (AVRI), Pirbright. Subsequently, rinderpest cases were found in all three Districts namely Batticalo, Trincomalee and Ampara in the Eastern Province and all five districts namely Vavuniya, Mullaitivu, Jaffna, Mannar, Kilinochchi in the Northern Province. As such the disease was found in the two Provinces namely Northern Province and Eastern Province where the IPKF camps were located. Subsequently the disease moved into other Provinces and infected the entire country. The cases were confined to cattle and buffalo population except for few goats in the Eastern Province in early outbreaks mainly in areas surrounding the IPKF Camps.

Vaccination against rinderpest was introduced in Sri Lanka in 1987 with the re-introduction of disease into the country after 40 years of 'Rinderpest free status'. Initially Immunization of susceptible cattle and buffaloes in the neighbourhood surrounding the infected zone commenced concurrently with the slaughter operation. Thereafter mass-scale vaccination was launched in areas which were identified to be high-risk of being infected. Rinderpest in Sri Lanka was confined to Northern and Eastern Provinces after 1992. The last outbreak in the other parts of the country was observed at Welikanda in the North-Central Province in 1992. Since then, the vaccination too was curtailed in these areas, whereas the vaccination in the Northern and Eastern Provinces continued until 1997. In total 1.45 million vaccinations were performed since 1987 in the country while a total of 1,825,000 doses of rindepest vaccine was imported into the country. The last case of rinderpest was noticed in Trincomalee district in the eastern part of the country in February 1994. In total 3,430 cattle and buffaloes together with 113 goats were slaughtered in the rinderpest episode which lasted for more than six years in the country.

The first outbreak of Rinderpest in 1987

The last outbreak of Rinderpest in 1994



3.3 Declaration of Rinderpest free status in Sri Lanka

Since the requirements under the OIE Terrestrial code were fulfilled satisfactorily with the evidence obtained via 'Rinderpest sero-surveillance programme' initiated and implemented at national level under the international project (TCP/INT/3204) in 2010, Sri Lanka qualified to obtain the Rinderpest free status. The accreditation dossier to support the national application to the OIE was prepared by the National Consultant under the same Project.

The Government of Sri Lanka submitted this dossier via the OIE delegate for recognition as a country free from Rinderpest on December 06, 2010. The Dossier was accepted by the OIE Scientific Commission and Sri Lanka obtained the official Rinderpest free status in December 2010. The certificate will be awarded to the OIE delegate of Sri Lanka at the 79th General Session of the OIE to be held at OIE Head Quarters at Paris in May 2011.

3.4 The Odyssey of Rinderpest Eradication

1924 and 2011 represent two milestones, both related to the global fight against rinderpest, one of the most dreaded animal diseases in history.

In 1924, following a new incursion of the rinderpest virus in Europe, via the port of Antwerp in Belgium, a group of visionary veterinarians decided to found an international organisation that could inform its Member Countries of epizootics and provide them with the scientific information they needed to improve their animal disease control measures. Nearly 90 years later, the Office International des Epizooties (OIE) has grown from the 28 signatory countries of the 25 January 1924 International Agreement to 178 Member Countries, and is now the World Organisation for Animal Health, whilst keeping its historic acronym.

The OIE's first steps in rinderpest control, aimed in particular at Asia, Africa and the Middle East, consisted in the establishment of scientific cooperation with existing national research institutes in order to detect the most efficient methods for fighting the spread of rinderpest, including the production and standardisation of safe and effective vaccines, and to achieve a strategic consensus on the scientific bases of the organisation's actions aiming at controlling and preventing rinderpest in the Member Countries.

As early as the 1960s, mass vaccination campaigns in the Member Countries concerned, accompanied by conventional control measures, led to a substantial decline in the disease, which however made a devastating reappearance on the African continent 20 years later, in the 1980s. The international response to this resurgence of the disease was once again supported by the OIE's action, in particular the publication of recommended standards for the establishment of rinderpest epidemiological surveillance systems. This contained what was called the "OIE Procedure" for eligible Member Countries to be officially recognised as enjoying rinderpest-free status, which was adopted by the General Assembly of national delegates and which set out three steps that each infected country had to take in order to obtain such recognition by the OIE.

In parallel, the United Nations became very actively involved through the GREP – Global Rinderpest Eradication Programme – coordinated by the FAO in collaboration with the OIE and the UN International Atomic Energy Agency (IAEA) as of the 1990s, and with massive support to eligible countries from donors such as the European Union, with the aim of obtaining, by 2011 at the very latest, an official declaration of world rinderpest eradication, to be jointly proclaimed by the FAO and the OIE.

Today, 198 countries have been recognised as rinderpest-free by the OIE, with permanent support from the FAO, which represents all countries that have animals susceptible to the disease.

This painstaking work was accomplished by OIE experts and officers in charge of recommending rinderpest-free recognition, who systematically verified the absence of rinderpest viral circulation in all countries concerned. This constitutes a major breakthrough, not only in the scientific field, but also for the policies of cooperation and coordination amongst international organisations and between those and the international community as a whole. It is, however, above all a success for veterinary services and the entire veterinary profession, especially since the scarcity of resources available to veterinary services in many infected countries constituted a major obstacle to the implementation of effective control strategies.

In 2011, the official proclamation by the FAO and the OIE of planetary rinderpest eradication is a cause for celebration, and coincides with the 250th anniversary of the official creation of the veterinary profession. This is the first animal disease that has been eradicated in the world, just as smallpox is the only human disease that has so far been eradicated by the medical profession.

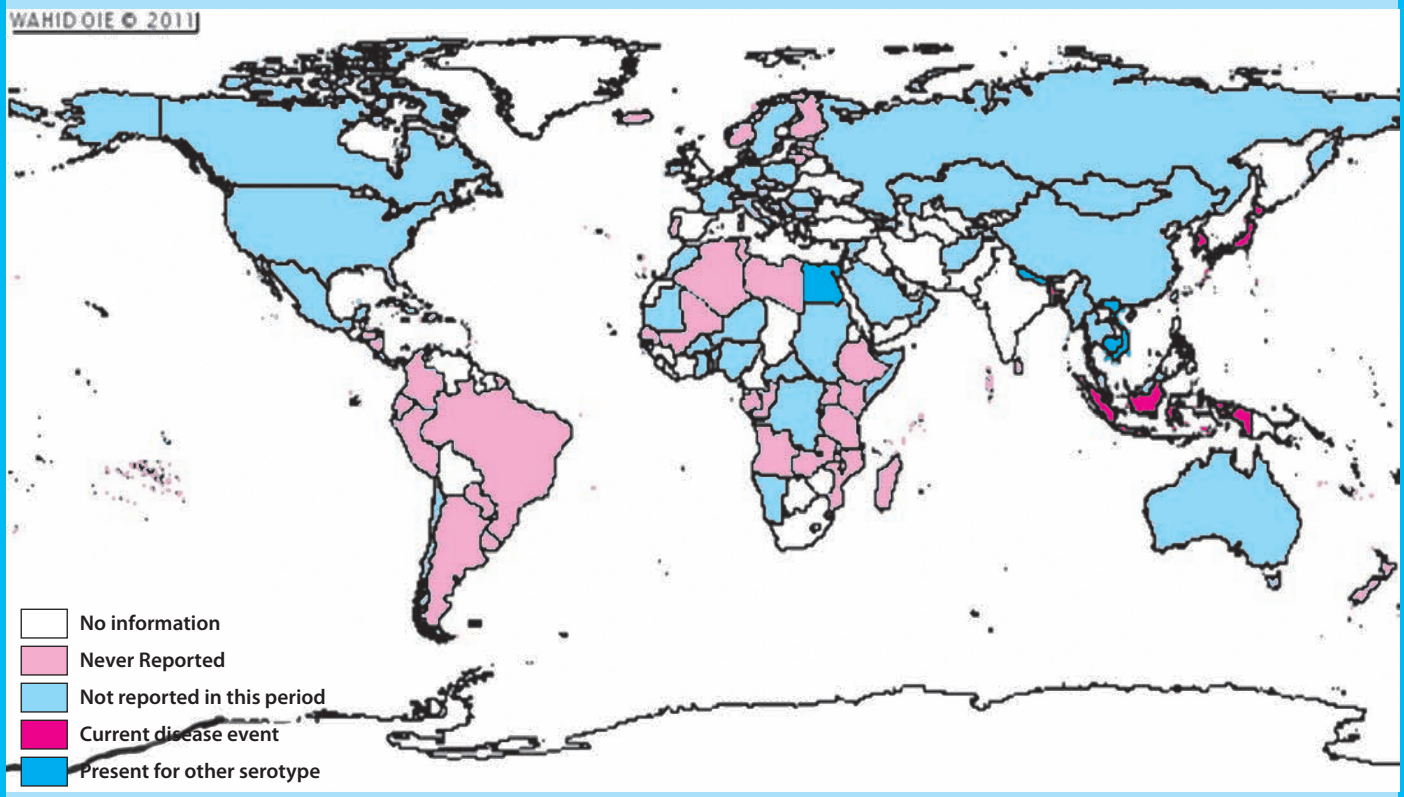
4. Highly Pathogenic Avian Influenza

HAPI Surveillance Programme in Sri Lanka - 2010

Active surveillance against Highly Pathogenic Avian Influenza in the country during the year 2010 included the sero surveillance and surveillance on migratory birds and backyard poultry. Four thousand one hundred and forty (4140) serum samples were collected representing all the districts except for Kilinochchi and Mullaitivu during this period. However, only 53% of the collected samples were tested by ELISA. Positive reactors were encountered at eight districts namely Colombo, Gampaha. Kandy, Matara, Puttalam, Anuradhapura, Badulla and Rathnapura. Further laboratory investigations revealed that all these samples were negative for H5, H7 and H9 by HI. Moreover cloacal swabs (851 samples) and fresh droppings (1319 samples) were also examined and found to be negative for AI virus.

Districts	Serum samples				cloacal swabs / fresh droppings	
	ELISA Test for AI			HI for H5,H7,H9		
	No. collected	No. tested	No. (+)ve Reactors	Test Results	Migratory Birds	Backyard Poultry
Colombo	586	397	4	(-ve)	180	39
Gampaha	617	309	8	(-ve)	340	0
Kandy	196	136	6	(-ve)	0	0
Matara	150	90	3	(-ve)	0	68
Puttalam	646	388	17	(-ve)	80	110
Anuradhapura	270	210	11	(-ve)	11	95
Badulla	45	15	2	(-ve)	34	37
Rathnapura	238	148	9	(-ve)	19	105

Highly Pathogenic Avian Influenza - World Situation : July – Dec 2010



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