# The Animal Health Status of the Cook Islands

# **By Peter Saville**

The survey of the animal health status of the Cook Islands was carried out between 1993 and 1994 by the Veterinary Officer of the Cook Islands Government supported by the SPC Animal Health Advisor.

The objective of the survey was to confirm the presence or absence of livestock diseases considered to be of significant economic or public health importance. The information obtained during the survey will enable the Cook Islands develop appropriate quarantine protocols to prevent the introduction of diseases not present on the island and to provide an indication of the distribution of diseases which are known to

be present.

#### Location and topography

The 15 islands of the Cook Islands are divided into the Northern and Southern groups. All the islands in the Northern Group, plus three of the smaller islands in the Southern Group are atolls. The main island in the Southern Group and the administrative centre, Rarotonga is a high volcanic island with some fertile lowlands. Aitutaki is part volcanic and part atoll in origin. The remainder of the southern islands are raised coral atolls with some fertile land and swamps in the interior.

Due to the thin layer of soil on the atoll islands, there is little growth other than coconuts, pandanus plus certain salt tolerant species. On the raised atolls the soil fertility is also variable, in some areas supporting cultivation of crops. The central area of Rarotonga is dense rain forest, however the coastal strip and less steep slopes have been cleared to support subsistence and cash crops.

#### Literature

There are no published records on the animal health status of the Cook Islands but a number of unpublished reports exist by previous consultants and visiting veterinarians.

#### Agriculture in the Cook Islands

In the Northern Group the principal crop is coconut. Livestock farming is restricted to the small scale rearing of pigs and poultry. The Southern Group supports the farming of crops for both domestic consumption, processing and for export, primarily to New Zealand.

There are four commercial poultry farm plus a number of small commercial or semi-commercial piggeries. The number of cattle and goats are few.

National livestock numbers at the time of the survey were estimated to be as follows:

Horses	355
Cattle	246
Pigs	16,459
Poultry	44,687
Goats	5,470

# Selection of diseases

Diseases to be investigated were selected on the basis of public health risk, economic significance and regional epidemiological importance with particular reference to the diseases notifiable to the FAO and OIE

Most diseases were investigated through serological testing of a statistically significant sample of the population. OIE recommended diagnostic tests were used as far as possible. In the case of bovine tuberculosis and brucellosis, an attempt was made to test the entire eligible bovine population. Where possible, diseases were also investigated clinically.

Sample sizes were determined using the text "Livestock Disease Surveys: A Field Manual for Veterinarians" by Cannon and Roe. In some cases it was not practical to collect a statistically significant sample.

Where earlier or subsequent investigations have confirmed the presence of a disease these are reported.

## Materials and Methods

The initial survey was limited to the island of Rarotonga. A subsequent survey of the island of Mangaia was carried out by Ostrich Farms (Cook Islands) Ltd.

Blood samples were collected by vacutainer from all species included in the survey. After being allowed to clot overnight, the sera was separated and stored at -20°C. If necessary, the sera was centrifuged at 2000rpm for 10 minutes.

Samples were collected from all female cattle over the age of 12 months and all males capable of or being retained for breeding for brucellosis testing. Sufficient samples were selected at random for diseases under investigation and submitted for laboratory analysis to ensure a minimum level of confidence of 99% of detecting a diseased animal assuming that the disease would be present in 5% of the population.

All cattle on Rarotonga and Mangaia were subjected to the intra-dermal caudal fold tuberculin test, using 0.1ml Bovine PPD 2mg (100,000 units) per ml. Reaction is evaluated by palpation of the injection site at 72 hours. Due to certain difficulties, it was not possible to test all eligible cattle in the Cook Islands in the anticipated time.

Sufficient blood samples were collected at random from the pig population to ensure a minimum level of confidence of 95% of detecting a diseased animal assuming that the disease would be present in 5% of the population.

Similarly, sufficient blood samples were also collected at random from the goat population to ensure a minimum level of confidence of 95% of detecting a diseased animal assuming that the disease would be present in 5% of the population.

The number of samples collected are not statistically significant at the national level, however they do serve to confirm the presence of certain diseases.

Blood sample size - Rarotonga - (Total population in brackets) :

Horses 35 (239)

Cattle	48 (165)
Pigs	60 (7,527)
Poultry	54 (13,047)
Goats	60 (1,823)

Faecal samples were also collected and formalised however the laboratory made the comment that there appeared to have been some delay between the collection of the samples and the addition of the formalin. In some samples dead larvae were seen but no eggs, which suggests that all the eggs had hatched and the larvae were subsequently killed.

No ectoparasites were received. All reports suggest that there are no ticks present on the Cook Islands.

Serum samples were stored at -20°C in Suva prior to shipment to the co-operating laboratories.

1ml aliquots of sera were shipped in duplicated microtitre tubes to the Central Animal Health Laboratory, Wallaceville, New Zealand and in eppendorfs to the Veterinary Pathology Laboratory, Koronivia, Fiji; Laboratoire Territorial de Diagnostique VÈtÈrinaire, Nouvelle-Caledonie and to the Elizabeth Macarthur Agricultural Institute, New South Wales, Australia

Serum samples collected from Mangaia were as follows - (Total population in brackets) :

Horses	7 (45)
Cattle	1(1)
Pigs	97 (1,740)
Poultry	104 (4,122)
Other avian	63 (?)
Goats	55 (853)

Cloacal swabs, faecal swabs and faecal samples were also collected.

Samples were shipped to the Australian Animal Health Laboratory, Geelong and to the Batchelar Laboratories, New Zealand.

## RESULTS

## DISEASES OF EQUINES

35 equine serum samples were collected from Rarotonga and submitted to LTDV and PIF. Samples collected from Mangaia were submitted to AAHL. Faecal samples were examined at KRS and BAHL.

OIE List A Diseases

Vesicular Stomatitis - Virus New Jersey and Virus Indiana (AAHL) - 7 samples collected by De Vere on Mangaia tested for the presence of antibody by SNT and were negative. There is no evidence to indicate that Vesicular Stomatitis Virus is present in the Cook Islands or elsewhere in the region.

## OIE List B Diseases

Equine infectious anaemia (LTDV) - All samples were examined by AGIT for equine infectious anaemia (EIA) and all were negative. The Cook Islands is probably free of EIA.

Equine rhinopneumonitis (PIF) - All samples were tested for equine rhinopneumonitis and were negative. There is no evidence that equine rhinopneumonitis is a significant diseases of equines in the Cook Islands at the present time.

Equine Influenza A (LTDV) - All samples were tested for Equine Influenza (A) by HIT and were negative. Equine Influenza has not been recorded elsewhere in the region and is probably not present in the Cook Islands.

List C and other diseases

Clostridial diseases - Clinical cases of tetanus have been recorded.

Endoparasites (BAHL):

Strongylus vulgaris Strongylus edentatus Strongylus equinus Cyathastomum sp. Strongyloides

All samples which were examined for endoparasites by KRS were negative.

# DISEASES OF BOVINES

OIE List A diseases

Bluetongue (EMAI) - All samples from Rarotonga were reported to be negative in the AGIT test for Bluetongue. It is unlikely that pathogenic forms of Bluetongue are present in the Cook Islands.

Foot and Mouth disease (AAHL) - One sample from Mangaia was tested by LP ELISA for the presence of antibody to FMDV types O, A, C and Asia 1 and was negative.

Vesicular Stomatitis - Virus New Jersey and Virus Indiana (AAHL) - 1 sample collected by De Vere on Mangaia tested for the presence of antibody by SNT and was negative. There is no evidence to indicate that Vesicular Stomatitis Virus is present in the Cook Islands or elsewhere in the region.

## OIE List B diseases

Anaplasmosis (LTDV) - all samples tested negative with the card test for anaplasmosis. The Cook Islands are probably free of anaplasmosis.

Babesiosis (LTDV) - all samples tested negative for Babesia bovis by IFAT. There is no evidence that babesiosis is present in the Cook Islands

Leptospirosis (LTDV) - All samples were tested by the Leptospiral MAT for the following serogroups represented by the named serotypes.

SEROGROUP	SEROTYPE	No. Positive
Australis	L. australis	-
Autumnalis	L. autumnalis	-
Ballum	L. castellonis	-
Canicola	L. canicola	-
Hebdomadis	L. hebdomadis	-
Icterohaemorrhagiae	L. copenhageni	-
Pomona	L. pomona	2
Sejroe	L. sejroe	-
Sejroe	L. hardjo	-
Tarassovi	L. tarassovi	1

Total positives 3 (6.25%)

Leptospirosis appears to be present at a low level on Rarotonga and may not represent a significant problem at the moment. Due to the public health implications, the leptospiral status of the cattle population should continue to be monitored.

Paratuberculosis (CAHL) - all samples from Rarotonga were tested for paratuberculosis by CFT. 9 samples gave a significant reaction of which 8 animals were considered positive and one animal was suspicious. One sample from Mangaia was negative on AGID. Paratuberculosis (Johne's Disease) is present in the Cook Islands however there are no records of clinical disease in bovines.

Bovine brucellosis (KRS & CAHL) - all samples were tested by RBCT at the Veterinary Pathology Laboratory, Koronivia. 1 samples was positive, however subsequent testing by CFT failed to demonstrate the presence of Brucella in the Cook Islands.

Enzootic Bovine Leukosis (LTDV) - all samples were subjected to the ELISA for Enzootic Bovine Leukosis and were negative. It is unlikely that EBL is present in the Cook Islands.

IBR/IPV (CAHL) - all samples were negative by ELISA for Infectious Bovine Rhino-tracheitis. IBR may be absent from the Cook Islands.

Theileriasis (LTDV) - All samples were tested for *Theileria buffeli* by IFAT and were negative. *Theileria buffeli* is probably not present in the Cook Islands.

### List B - Clinical/Abattoir investigations

Bovine malignant catarrh - There are no clinical reports of BMC having occurred in the Cook Islands None of the natural hosts for this disease are present in the Cooks. (It is accepted that outbreaks can occur in the absence of natural hosts).

Echinococcosis/hydatidosis - There are no reports which suggest that Echinococcosis / hydatidosis is present in the Cook Islands.

Bovine tuberculosis - All bovines on Rarotonga and Mangaia were subjected to the intradermal caudal fold tuberculin test with negative results. Sadler (1980-86) also carried out tuberculin testing of cattle with negative results.

Cysticercosis - There are no reports to indicate that cysticercosis occurs in the Cook Islands.

Dermatophilus - there are no reports of clinical cases of dermatophilus in bovines although the disease has been recorded in goats.

List C and other diseases

Bovine Ephemeral Fever (EMAI) - all samples were negative to the virus neutralisation test for Bovine Ephemeral Fever. There is no evidence to indicate that BEF is present in the Cook Islands. The vector status for BEF in the Cooks is unknown.

Akabane virus (EMAI) - all samples were negative to the virus neutralisation test for Akabane virus. Akabane virus is probably not present in the Cook Islands.

Simbu serogroup (EMAI) - using the ELISA, there is no serological evidence to indicate that viruses of the Simbu serogroup may be present in the Cook Islands.

Mucosal disease/BVD (CAHL) - 3 samples were positive with a further 5 samples showing a weak positive reaction for Mucosal disease/BVD by ELISA. Mucosal disease/BVD appears to be endemic at a low level in the Cook Islands.

# Diseases of Goats

#### **OIE List A Diseases**

There is no clinical evidence to indicate that any exotic OIE List A diseases may be present in goats in the Cook Islands at this time, however as there has been serological evidence of the presence of certain bluetongue serotypes elsewhere in the region, samples were examined for bluetongue. Samples collected by Ostrich Farms (Cook Islands) from Mangaia were also examined for FMDV.

Bluetongue (LTDV) - 60 samples taken from Rarotonga were negative for bluetongue by AGDT. Of 55 samples collected on Mangaia, 54 were negative by CELISA with 1 sample recommended for re-testing. The samples from Mangaia were also tested by CELISA for Epizootic Haemorrhagic Disease Virus and were negative. The Cook Islands are probably free from Bluetongue.

Foot and Mouth Disease Virus (AAHL) - 55 serum samples from Mangaia was tested by LP ELISA for the presence of antibody to FMDV types O, A, C and Asia 1 and were negative.

Vesicular Stomatitis - Virus New Jersey and Virus Indiana (AAHL) - 55 samples collected by De Vere on Mangaia tested for the presence of antibody by SNT and were negative. There is no evidence to indicate that Vesicular Stomatitis Virus is present in the Cook Islands or elsewhere in the region.

**OIE List B Diseases** 

'Q' fever (LTDV) - Testing by CFT was unable to demonstrate any serological evidence of 'Q' fever in the 60 goats that were sampled on Rarotonga. No evidence of specific antibody to 'Q' fever was detected in 56 sera from Mangaia.

Paratuberculosis (AAHL) - It was also reported that 55 goat sera from Mangaia were also negative in the AGID for paratuberculosis / Johne's disease.

Caprine arthritis/encephalitis (CAHL) - All samples subjected to the ELISA test failed to demonstrate any serological evidence of caprine arthritis / encephalitis in the Cook Islands.

Caprine brucellosis (KRS) - all samples from Rarotonga tested negative on RBCT for brucellosis. Serum samples from 55 goats obtained from Mangaia were also negative on ELISA (AAHL).

Tuberculosis - 16 goats on Mangaia were tested for evidence of exposure to *Mycobacterium tuberculii* and were negative.

Dermatophilus - reports of caprine dermatophilus have been recorded (1989).

List C and other diseases

Toxoplasmosis (LTDV) - 38 (63%) samples had serological evidence of toxoplasmosis. Toxoplasmosis may be considered to be endemic in the Cook Islands.

Clostridial diseases - reports of unspecified clostridial diseases in caprines were recorded in 1989. Clinical cases of tetanus have also been recorded.

Listeriosis - is reported to have been suspected in 1989 but not confirmed.

Ectoparasites

There have been no reports of ectoparasites on goats in the Cook Islands

Endoparasites (BAHL & KRS) :

Haemonchus sp. Trichostrongylus sp. Ostertagia sp. Oesophagostomum/Chabertia sp. Muellerius sp. Strongyloides sp. Eimeria alijevi Eimeria arloingi Eimeria caprovina Eimeria christenseni Eimeria hirci Eimeria jolchijevi Eimeria ninakohlyakimovae

# Pig diseases

## **OIE List A Diseases**

Foot and Mouth Disease Virus (AAHL) - 97 serum samples from Mangaia was tested by LP ELISA for the presence of antibody to FMDV types O, A, C and Asia 1 and were negative.

Vesicular Stomatitis - Virus New Jersey and Virus Indiana (AAHL) - 97 samples collected by De Vere on Mangaia tested for the presence of antibody by SNT and were negative. There is no evidence to indicate that Vesicular Stomatitis Virus is present in the Cook Islands or elsewhere in the region.

## OIE List B Diseases

Leptospirosis (CAHL) - 60 samples were tested by the Leptospiral MAT for the following serogroups represented by the named serotypes.

SEROTYPE	Positive	Inconclusive
L. bratislava	-	-
L. ballum	-	-
L. canicola	-	-
L. grippotyphosa	-	-
L. copenhageni	1 (1.6%)	6 (10%)
L. pomona	-	-
L. hardjo	-	-
L. tarassovi	-	-
	SEROTYPE L. bratislava L. ballum L. canicola L. grippotyphosa L. copenhageni L. pomona L. hardjo L. tarassovi	SEROTYPEPositiveL. bratislava-L. ballum-L. canicola-L. grippotyphosa-L. copenhageni1 (1.6%)L. pomona-L. hardjo-L. tarassovi-

From the results it would appear that leptospirosis caused by the serogroup *Icterohaemorrhagiae* could be of particular concern in pigs on certain farms and porcine leptospirosis could also represent a significant public health and economic problem in pigs in the Cook Islands.

Aujeszky's Disease (CAHL) - all samples from Rarotonga were subjected to the ELISA test for Aujeszky's disease and were negative. 97 samples from Mangaia were tested for AFV antibodies by LAT and were negative. Aujeszky's disease is probably not present in the Cook Islands.

Porcine brucellosis (CAHL) - all samples obtained from Rarotonga were negative for porcine brucellosis on RBCT. All samples from Mangaia were also negative on ELISA for brucellosis. Porcine brucellosis is probably not present in the Cook Islands.

Trichinellosis (LTDV) - 59 samples were tested by ELISA for trichinellosis and 15 (25%) were found to be positive. There is a need for further investigation of the trichinellosis status of the Cook Islands.

Atrophic rhinitis of sows - There is no clinical evidence of the presence of atrophic rhinitis.

Cysticercosis (*C. cellulosae*) - There are no reports to indicate that cysticercosis occurs in the Cook Islands.

Echinococcus / hydatidosis - There are no reports which suggest that Echinococcosis / hydatidosis is present in the Cooks.

Enterovirus encephalomyelitis - deaths associated with encephalomyelitis and encephalomyocarditis have been recorded. Further investigations are required to ascertain the precise cause.

List C and additional diseases

Clostridial diseases - Clinical cases of tetanus have been reported.

Porcine parvovirus - 5 samples out of a total of 20 (25%) collected on Rarotonga were positive by ELISA for porcine parvovirus. PPV may be assumed to be endemic in the Cook Islands.

Ectoparasites :

Sarcoptes scabeii Haematopinus suis

Endoparasites (BAHL & KRS) :

Stephanurus dentatus Oesophagostomum sp. Eimeria cerdonis Eimeria neodebliecki Eimeria porci

Poultry

**OIE List A Diseases** 

Newcastle Disease (CAHL) - 34 samples (63%) were positive by ELISA for Newcastle Disease. Newcastle disease has not been recognised clinically and it would appear that a lentogenic strain is present in the Cook Islands. This is consistent with the importation of day-old chicks from countries where lentogenic strains are known to be present.

All samples (168) from various avian species on Mangaia were tested for Newcastle Disease Virus by HIT (AAHL) and were negative. There is no evidence to suggest that pathogenic Newcastle Disease is present in the Cook Islands.

Fowl Plague (CAHL) - All samples (54) were negative for avian influenza by AGPT.

168 samples obtained from various avian species on Mangaia were tested by CELISA (AAHL) and 16 were doubtful. There is no clinical evidence or historical reports to indicate that avian influenza may be present. Fowl plague is not reported elsewhere in the region and is unlikely to be present and remain undetected in the Cook Islands.

OIE List B DiseasesList B Diseases

Avian infectious laryngotracheitis (CAHL) - 8 sample (14.8%) were positive by the ELISA test for ILT. Although present in the group, ILT has not been recognised as a significant problem.

Pullorum-Typhoid disease (CAHL) - 24 samples were positive (44%) by the agglutination test for *Salmonella pullorum* and *Salmonella gallinarum*. Results from the slide agglutination test on stored sera are questionable, particularly as the serum quality in this case was reported to be poor. Further investigations are required.

Avian infectious bronchitis (CAHL) - 13 samples were positive for IB on ELISA (24%). IB can be assumed to be endemic in the Cook Islands.

Infectious bursal disease (CAHL) - 41 samples were positive (75.9%) by ELISA for IBD. Positive cases were distributed widely. Similarly of 167 samples from various species from Mangaia, 41 were positive on ELISA and CELISA with a further 16 exhibiting a doubtful reaction. A strain of IBD with low pathogenicity is known to be present in most countries in the region and in the absence of clinical signs

it would appear that the same strain of IBD is endemic in the Cook Islands.

Mareks disease (CAHL) - 14 sample were positive (25.9%) to the AGIT for Mareks disease. Mareks disease is endemic in the Cook Islands.

*Mycoplasma gallisepticum* (CAHL) - 42 (77.7%) samples were positive by the agglutination test for *M.gallisepticum*. Results from the slide agglutination test on stored sera are reported to be questionable however post mortem investigations have confirmed that deaths from the chronic respiratory disease complex are common. It appears that *M.gallisepticum* is a significant cause of losses in poultry in the Cook Islands.

*Mycoplasma synoviae*(CAHL) - 43 (79.6%) samples were positive by the agglutination test for *M.synoviae*. As with *Mycoplasma gallisepticum*, results from the slide agglutination test on stored sera are questionable.

Fowl pox - fowl pox is reported to be widespread in the Cook Islands.

List C and other diseases

Avian encephalomyelitis (CAHL) - 27 samples (50%) showed serological evidence of exposure to avian encephalomyelitis.

Infectious coryza - there are no clinical reports to indicate that infectious coryza is a problem in the Cook Islands.

Endoparasites (BAHL & KRS) :

Heterakis sp. Ascaridia galli Syngamus sp. Capillaria sp. Eimeria acervulina Eimeria maxima Eimeria mivati Isospora sp.

# **DISEASES OF CANINES & FELINES**

Dogs and cats were not included in the serological survey however where it has been possible to establish that a disease is present in the Cooks, that disease is reported.

Dogs

Ectoparasites

Sarcoptes scabeii Demodex canis Ctenocephalides sp.

## Endoparasites

Dirofilaria immitus Dipylidium caninum

Cats

Ectoparasites

Notoedres cati Sarcoptes scabeii Ctenocephalides sp.

Endoparasites

Dirofilaria immitus Dipylidium caninum

Ciguatura poisoning - reports indicate that ciguatura poisoning is a significant cause of death in cats in the Cook Islands.

# **Conclusions**

The Cook Islands would appear to be free of all the major exotic diseases of livestock. There is no clinical or serological evidence to suggest that any of the OIE List A diseases or rabies are present. Future importation policies should seek to maintain this situation.

Diseases which are known to be present elsewhere in the region such as bovine brucellosis, bovine tuberculosis, porcine brucellosis and Aujeszky's disease appear to be absent or exist at a very low level. Surveillance for these diseases should be maintained until it can be confirmed that the diseases are not present.

A number of diseases of public health importance are widespread and consideration should be given to instituting control measures. Of particular concern from the public health viewpoint is the presence of porcine leptospirosis, the presence of toxoplasmosis, and the possible presence of trichinellosis (which requires further investigation).

Reports suggest that certain diseases of economic importance are present and cause production losses namely Mycoplasmosis in cases of chronic respiratory disease and an undiagnosed syndrome in pigs which exhibits neurological signs. Further investigation are required to accurately diagnose the causal agents, establish the significance of the diseases and to institute appropriate control measures.

# References

Jones, J. B., Personal Communication

De Vere, C.. Personal communication

FAO-WHO-OIE Animal Health Yearbook 1989

Sadler R., Report on Veterinary Services to the Cook Islands 1980 - 1986. Unpublished report.

Cannon, R.M., and Roe, R.T., (1982) Livestock Disease Surveys: A Field Manual for Veterinarians, Australian Bureau of Animal Health, Canberra.

# ACRONYMS

AAHL	Australian Animal Health Laboratory, Geelong, Australia
AGID	Agar Gel Immuno-diffusion test
AGIT	Agar Gel Immunofluoresence Test
AGPT	Agar Gel Precipitin Test
BAHL	Batchelar Laboratories, New Zealand.
CAHL	Central Animal Health Laboratory, Wallaceville, New Zealand
CFT	Complement Fixation Test
ELISA	Enzyme Linked Immuno- sorbent Assay
EMAI	Elizabeth Macarthur Agricultural Institute, New South Wales.
FAO	Food and Agriculture Organisation of the United Nations
GDT	Gel Diffusion Test
HIT	Haemagglutination Inhibition Test
IFAT	Indirect Fluorescent Antibody Test
KRS	Koronivia Research Station, Fiji
LAT	Latex Agglutination Test
LTDV	Laboratoire Territorial de Diagnostique VÈtÈrinaire, Nouvelle Caledonie
MAT	Microscopic Agglutination Test
OIE	Office International des Epizooties
PIF	Pasteur Institute, France
RBCT	Rose Bengal Card Test
SAT	Serum Agglutination Test