

A review of domestic animal diseases within the Pacific Islands region

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Graphical abstract

Summary:

Knowledge of terrestrial animal diseases in Pacific Island countries and territories is scarce and obsolete. These islands constitute a significant tropical region of the world and the livestock populations on these islands are potential hot spot for emerging diseases.

Pictogramme:



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Highlights:

- Current information on animal diseases in Pacific Island countries and territories (PICTs) is scarce and no longer up to date.
- References retrieved from the peer-reviewed and gray literature over the last 20 years provide information on 116 diseases of domestic animals in 17 PICTs.
- 16 diseases or pathogens included in surveillance studies were not detected or reported as not present over 20 years of reporting by PICTs.

- There is a need for more up-to-date studies on animal disease prevalence distribution to be carried out.

ABSTRACT

The Pacific Island countries and territories (PICTs) are reported to be free of the most serious infectious livestock diseases which are prevalent in other parts of the globe, such as Highly Pathogenic Avian Influenza, Foot and Mouth Disease or Rabies. Yet there is a lack of scientifically based evidence to confirm this animal health status. This paper reviews what has been published on diseases of domestic animals in the Pacific Islands region with a particular focus on data from the last 20 years (1992-2012). Relevant published papers were identified by a computerized literature search of two electronic databases (PubMed and Web of Knowledge). The latest reports on the animal health situation submitted by the PICTs to the World Organisation for Animal Health (OIE) were accessed on the World Animal Health Information Database (WAHID) interface and included in this review. Additionally, paper searches of resources were undertaken at the library of the Secretariat of the Pacific Community (SPC) in Fiji to retrieve any relevant gray literature for this review. The study eligibility criteria included qualitative or quantitative information on any disease (bacterial, viral, parasitic and other health disorders) affecting domestic terrestrial animals (mammals, reptiles, birds and bees) in any of the 22 PICTs members of the SPC. A total of 158 eligible references were retrieved of which only 77 (48.7%) were published since 1992 and analysed in more details. One hundred and one diseases and pathogens were reported on for bee, bird, carabao, cat, cattle, crocodile, deer, dog, donkey, goat, horse, pig, pigeon, poultry and sheep in the Oceania region and in 17 PICTs in particular. The paper gives information about known animal diseases, their reported prevalence and diseases not reported within the Pacific Islands region. The study found retrieved literature on animal diseases in PICTs was scarce and no longer up to date. There is a need to improve the published knowledge on the current animal disease status in the region.

Keywords:

Pacific island; Domestic animal; Animal disease; Literature review.

1. Introduction

Emerging infectious diseases pose a major concern for animal health and have significant economic impact on the global livestock industry. These emerging diseases usually have no country boundaries and if they originate in a developing country could quickly spread to industrialized countries and other developing countries, and vice versa, mainly due to translocation of people and animals or through trade ([Gummow, 2010](#)). The tropical environment of Pacific Island Countries and Territories (PICTs), coupled with a close human, wild animal and domestic animal interface and the inter-island movement of people between PICTs all create situations that are conducive to the emergence of diseases ([Gummow, 2010](#); [Jones et al., 2008](#)). However little has been published on what diseases of domestic animals occur within these islands or their prevalence.

The PICTs are said to be free of the most serious infectious livestock diseases which are prevalent in other parts of the world such as Highly Pathogenic Avian Influenza (HPAI), Classical Swine Fever (CSF), Foot and Mouth Disease (FMD) and Rabies ([Angus, 1986](#);

Newman and McKenzie, 1991; Secretariat of the Pacific Community, 2009b; Yarrow, 2008). But there appears to be a lack of scientifically based evidence to confirm this status. To date, the only known work which compiled information on animal diseases in Oceania is an annotated bibliography on animal husbandry and diseases in the Pacific area dating back 45 years (Pacific Science Information Center Bernice P. Bishop Museum Honolulu, 1966). Therefore a systematic review of papers compiling information on any diseases affecting domestic animals is warranted.

The objective of this study was to systematically review the current knowledge about the disease status of domestic animals in the Pacific Islands region, with a view to highlighting the gaps in knowledge and identifying the potential needs in terms of animal disease surveillance in this region.

2. Methods

A review was carried out on what has been published on diseases of domestic animals in the Pacific Islands region with a particular focus on data from the last 20 years (1992-2012). The review included relevant published papers identified by a computerized literature search of two electronic databases (PubMed and Web of Knowledge), reports on the animal health situation submitted by the PICTs to the World Organisation for Animal Health (OIE) and paper searches of resources at the library of the Secretariat of the Pacific Community (SPC) in Fiji. The SPC is an international organisation working in various domains, including agriculture and in particular animal health and production, to help Pacific Island people achieve sustainable development.

2.1 Search strategy

2.1.1 PubMed and Web of Knowledge databases

Peer-reviewed studies were sought in January 2013 on the PubMed and ISI Web of Knowledge databases using the following search strategy:

Search 1: (animal* OR livestock* OR herd* OR farm* OR cattle* OR bovine OR pig* OR swine OR sheep* OR ovine OR goat* OR caprine OR horse* OR equine OR chick* OR duck* OR bird* OR poultry OR bee OR bees OR apiculture* OR dog* OR cat* OR canine OR crocodile*)

Search 2: (health OR infection* OR sick* OR disease* OR zoono* OR outbreak* OR bacteria* OR virus* OR parasite* OR prevention OR control OR surveillance)

Search 3: (“Pacific” OR “Oceania” OR “Micronesia” OR “Melanesia” OR “Polynesia” OR “American Samoa” OR “Cook Island” OR “Federated States of Micronesia” OR “Fiji” OR “French Polynesia” OR “Guam” OR “Kiribati” OR “Marshall Islands” OR “Nauru” OR “New Caledonia” OR “Niue” OR “Northern Mariana Islands” OR “Palau” OR “Papua New Guinea” OR “Pitcairn Islands” OR “Samoa” OR “Solomon Islands” OR “Tokelau” OR “Tonga” OR “Tuvalu” OR “Vanuatu” OR “Wallis” OR “Futuna”)

Search 1 AND Search 2 AND Search 3

The “all fields” option in PubMed and “Topic” option in Web of Knowledge were used to allow retrieval of publications in which the search terms appeared in the titles or the abstracts or the keywords.

2.1.2 Secretariat of the Pacific Community local database

The gray literature (i.e. print and electronic formats that have not been formally published by commercial publishers) were reviewed by scrutinising the SPC library database and the electronic documents archived in the shared-drive of the Animal Health and Production team from the Land and Resources Division.

2.1.3 WAHID interface

All official animal health reports submitted by countries from Oceania to the World Organisation for Animal Health (OIE) were reviewed via the World Animal Health Information Database (WAHID) interface ([OIE](#)). However, few PICTs are currently OIE member countries and/or report their animal health status. Hence data is only available on this database for Fiji, Federate States of Micronesia (FSM), New Caledonia, Papua New Guinea (PNG), Samoa, Tonga and Vanuatu. Moreover, some of these countries do not report consistently to OIE (some yearly reports are missing for some of the PICTs).

2.2 Eligibility criteria

2.2.2 Inclusion criteria

A publication was considered eligible for this review if it included qualitative or quantitative information on any disease (bacterial, viral, parasitic and fungal) affecting domestic terrestrial animals in any of the PICTs. Following the OIE definition, domestic terrestrial animals (mammals, birds and bees) are animals with “a phenotype selected by humans” and that “live under supervision or control by humans” ([OIE, 2011b](#)). The selection of the countries and territories to be included in this review is based on the official list of 22 PICTs members of the SPC and included American Samoa, Cook Islands, FSM, Fiji, French Polynesia, Guam, Kiribati, Marshall Islands, Nauru, New Caledonia, Niue, Northern Mariana Islands, Palau, PNG, Pitcairn Islands, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu, and Wallis and Futuna.

2.2.3 Exclusion criteria

Experimental studies and studies on aquatic species were systematically excluded. Studies investigating zoonotic diseases in humans were included whenever data was also provided for domestic animals (even if the study focused on humans). Since this paper focused on domestic animals, references on wild animals were excluded unless the data was collected from captive native animals (birds in particular). Publications focusing on crocodile, deer and pigeon health were included as these animals are being farmed in PNG and New Caledonia.

When more than one reference was retrieved for the same study or related work between the different databases under different formats (publications, project reports, conference presentation), only one reference was kept (the most compressive one) to avoid duplication.

The inclusion and exclusion criteria were applied to the title and abstract of all retrieved references. Considering the general literature search applied, the access to various databases of particular relevance for animal diseases in the Pacific Islands region and the ability of the author to review articles written in English and in French, which are the 2 most widely used languages in the studied area, this literature review probably includes most of the accessible references on the subject in the public domain.

2.3 Data collection process

The data collection process was undertaken in 2 steps. First, basic information was collected from all retrieved articles in order to assess which diseases have been reported in which PICTs. For this basic analysis, the following information was systematically recorded: the publication date, the country, the species, the disease, the type of causative agent (bacteria, virus, parasite, alga, toxins, tumour, fungi, rickettsiae), if the reference focus was on a zoonotic disease or not, and the type of study (case report, case series, review or survey). In a second step, considering that the objective of this review was to obtain a better understanding of the current animal disease situation in PICTs, only documents published or written in the last 20 years were selected to focus on the most recent information. A more detailed analysis of the key findings from these references was then performed by collecting additional data. When quantitative data was available, the time of the study, the number of animals tested and number of positive analyses were recorded to calculate the apparent prevalence of the disease. For references without quantitative data, the status of the disease was recorded using qualitative terminology (enzootic, present, clinical disease, outbreak notification etc).

3 Results

3.1 Selected references

The search strategy retrieved 6,336 publications on PubMed of which only 107 were considered relevant when applying the inclusion and exclusion criteria. Similarly, 3,585 publications were obtained initially from Web of Knowledge, and after discarding the overlapping references with PubMed, 12 extra references were selected making a list of 119 references selected from these two scientific literature databases. Additionally, a further 47 references were identified from the SPC local database and the OIE database for the Oceania region. This database combines all the reports submitted by the PICTs between 2005 and 2011. For eight references, abstracts were not available and the full text document could not be retrieved. Moreover, one publication was written in German and had no abstract available in English. These references (see table 1) were thus excluded. A final list of 158 references was identified as matching the inclusion criteria from which only 77 (48.7%) were published within the last 20 years (from 1992 to 2012) and were processed further.

Table 1

References excluded from the literature review.

1. Anonymous (1946). CONTROL of infectious animal diseases in the South-West Pacific area. *Vet. Rec.* 58: 165.
2. Aslanian and Cheliadinova (1970). Current nosoareal of The distribution of brucellosis in the countries of Africa, Oceania. *Zh. Mikrobiol. Epidemiol. Immunobiol.* 47(5): 72-77.
3. Jones (1976). The role of pigs in the dissemination of hookworm infections in Papua New Guinea. *P. N. G. Med.* 153-155.
4. Steele (1977). The zoonoses in the South Pacific and their significance. *Int. J. Zoonoses* 4(1): 1-20.
5. Fleury et al. (1985). Antibodies against paramyxoviruses 2 and 6 in birds from New Caledonia. *Vet. Rec.* 117(20): 530.
6. Hellyar (1985). The introduction of brucellosis into the Trans. R. Soc. Trop. Med. Hyg. 79(4): 567-568.
7. Wernery and Schmidt (1985). Occurrence of enzootic Papua New Guinea. *Dtsch. Tierarztl. Wochenschr.* 92(5): 170-172.
8. Thevenon et al. (1989). Survey of contagious-diseases in apiaries. *Recl. Med. Vet.* 165(11): 899-903.
9. Bergin (1996). Parker Ranch: Pacific pioneer in animal health. *Vet.*

3.2 Study characteristics

As shown in Fig. 1, the number of references decreased over the years since the 1980's. Most of the references consist of surveys (65%) and case series or case reports (20%). Only one reference classified as a "review" was dedicated specifically to Papua New Guinea ([Hide, 2003](#)) while the remaining reviews are generally papers looking at a particular disease worldwide with little data provided for the Pacific Islands region. Among the 22 PICTs included in the eligibility criteria for this literature review, half of the references were providing data for PNG and for New Caledonia, with 35% and 24% of papers retrieved respectively for these 2 countries (Fig. 1). A quarter (25%) of the references provided data on diseases for more than two animal species (coded as "multi species"), 18% reported on diseases of cattle and 15% on pigs (Fig. 2). When looking at the agent involved in the diseases studied, almost half of the references (46% with n= 235) reported on parasitic diseases, one quarter on bacterial diseases (25%) and another quarter on viral diseases (24%) (Fig.3). About 59 % of the references (93/158) provided data on at least one zoonotic disease. The number of references published annually is very irregular. Peaks of publications were observed in 2004 and 2011(Fig.4).

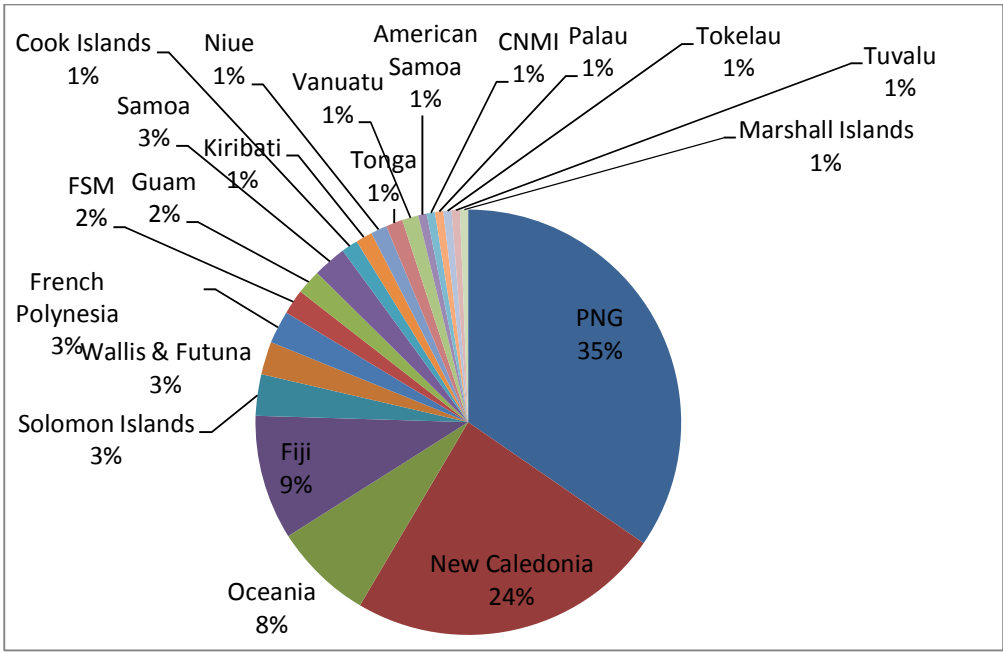


Fig. 1. Distribution of references sited per country in the Pacific Island countries and territories between 1992 and 2012 (n=159)

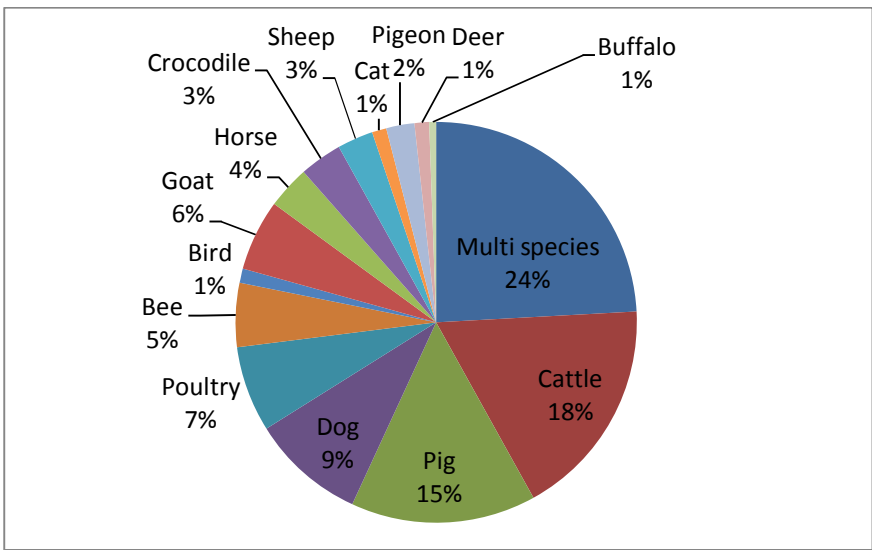


Fig. 2. Distribution of references sited per species in the Pacific Island countries and territories between 1992 and 2012 (n=174)

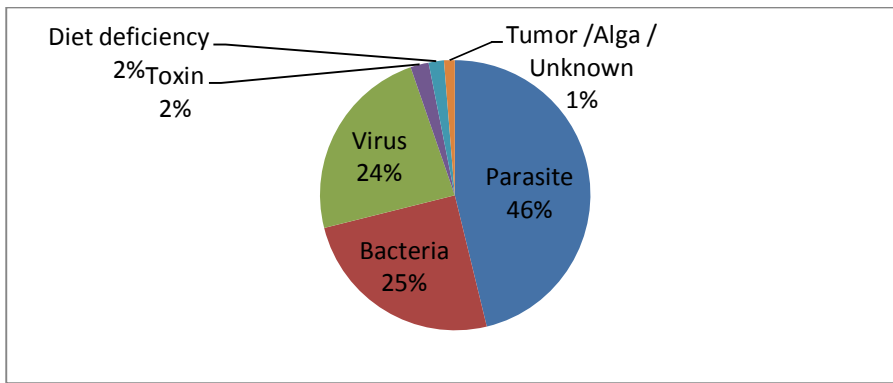


Fig. 3. Distribution of references cited per agent in the Pacific Island countries and territories between 1992 and 2012 (n=225)

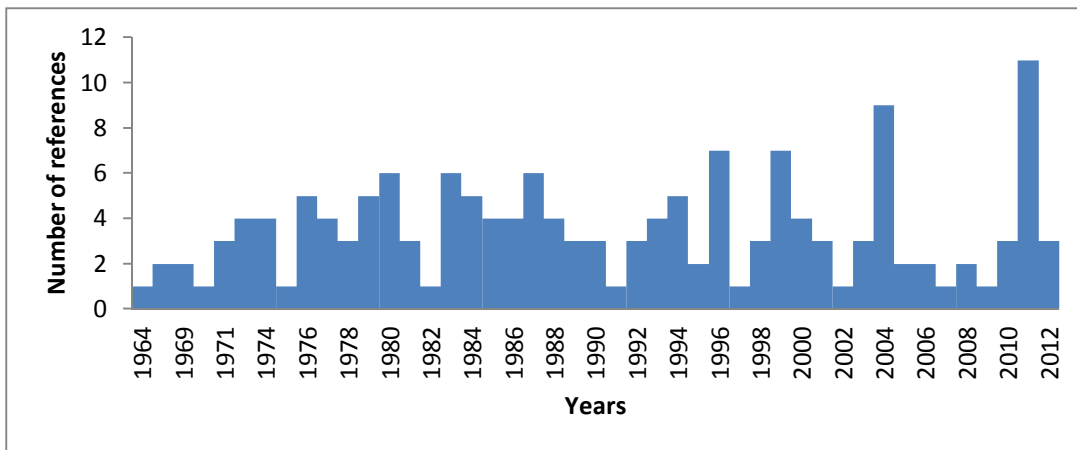


Fig.4. Distribution of references cited per year in the Pacific Island countries and territories between 1992 and 2012 (n=158)

3.3 Results of individual studies from 1992 to 2012

All the data on domestic animal diseases compiled from the 77 references between 1992 and 2012 for the Pacific Islands region are presented in Table 2 and Table 3. Table 2 shows a summary of data for diseases detected through surveys or reported as present. Table 3 gives the list of diseases not detected (based on negative laboratory results) or reported as not present (based on the absence of any clinical case observed) in the region. The dates presented in Tables 1 and 2 are the dates when the study was conducted, when this information was provided and the date of publication of the reference. The term “Oceania” is used for data provided for the Pacific Islands region in general without detailed specification of the affected countries.

The disease lists are presented with two categories of data: Quantitative data with the estimated prevalence of the studied animal disease and qualitative data with a description of the status of the animal disease in the specific PICTs. Categories of qualitative data include disease declared as not present or undetected (-); disease reported as present or detected (+);

Table 2

Animal diseases detected or reported as present in the Pacific Islands region based on the selected references from 1992 to 2012

Disease	Species	Country	Date	Key result ^a	Reference	
BACTERIAL DISEASES						
Actinomycosis	Multi species	French Polynesia	2010	+	(OIE)	
American foulbrood	Bee	Cook Islands	1990	5.3	(SPC, 2004a)	
	Bee	Fiji	2001	+	(SPC, 2004b)	
	Bee	Fiji	2011	+	(OIE)	
	Bee	French Polynesia	2005-2007,2011	+	(OIE)	
	Bee	New Caledonia	2005-2007,2011	+	(OIE)	
	Bee	Niue	1998	+	(SPC, 2004c)	
	Bee	Tonga	1991	+	(SPC, 2004e)	
Anaplasmosis	Carabao	Guam	1999	14.3	(Duguies et al., 2000)	
	Cattle	Guam	1999	21.7	(Duguies et al., 2000)	
	Cattle	Niue	1992	1.5	(Saville, 1996b)	
	Cattle	Samoa	1997	3.2	(Martin, 1999a)	
	Cattle	Solomon Islands	1998	2.2	(Martin and Epstein, 1999)	
	Dog	Samoa	2010-2011	6.1	(Carslake et al., 2012)	
Anthrax	Multi species	PNG	2011	+	(OIE)	
Avian encephalomyelitis	Poultry	Cook Islands	1993-1994	50.0	(Saville, 1994)	
	Poultry	Fiji	2008	+	(OIE)	
	Poultry	French Polynesia	2010	+	(OIE)	
	Poultry	Guam	1999	91.2	(Duguies et al., 2000)	
	Poultry	Kiribati	1992-1994	18.5	(Saville, 1996a)	
	Poultry	Palau	1996	22.0	(Saville, 1999)	
	Poultry	Samoa	1997	70.0	(Martin, 1999a)	
	Poultry	Solomon Islands	1998	35.9	(Martin and Epstein, 1999)	
	Poultry	Tokelau	1998	2.2	(Martin, 1999b)	
	Poultry	Tonga	1992-1994	42.9	(Saville, 1996c)	
	Poultry	Wallis & Futuna	1997-1998	36.9	(Martin, 1999c)	
	Bartonellosis	Cat	New Caledonia	2009	+	(Mediannikov et al., 2011)
		Cattle	New Caledonia	2009	+	(Mediannikov et al., 2011)
Deer		New Caledonia	2009	31.0	(Mediannikov et al., 2011)	
Blackleg	Multi species	Fiji	2008	+	(OIE)	
Botulism	Multi species	New Caledonia	2009	+	(OIE)	
	Multi species	French Polynesia	2010	+	(OIE)	
	Multi species	New Caledonia	2010	+	(OIE)	
Bov. genital campylobacteriosis	Poultry	Kiribati	1992-1994	+	(Saville, 1996a)	
	Cattle	New Caledonia	2005-2007,2011	+	(OIE)	
	Cattle	Vanuatu	2005-2007,2011	+	(OIE)	
Brucellosis	Cattle	Samoa	1997	3.5	(Martin, 1999a)	
	Multi species	Fiji	2011	+	(OIE)	
	Multi species	French Polynesia	2006, 2010	+	(OIE)	
	Multi species	Tonga	2011	+?	(OIE)	
	Pig	French Polynesia	2005, 2007, 2011	+	(OIE)	
	Pig	FSM	2009	+	(OIE)	
	Pig	PNG	2011	+?	(OIE)	
	Pig	Tonga	2011	+?	(OIE)	
	Pig	Tonga	1992-1994	22.5	(Saville, 1996c)	
	Pig	Wallis & Futuna	2004	7.1	(SPC, 2004f)	
	Pig	Wallis & Futuna	2007	+	(OIE)	
	Pig	Wallis & Futuna	2011	34.0	(Antras and Garin-Bastuij, 2011)	
	Campylobacter contamination	Poultry	New Caledonia	2005-2006	96.7	(Garin et al., 2012)
Chlamydiosis	Crocodile	PNG	2008	+	(Huchzermeyer et al., 2008)	
	Pigeon	New Caledonia	1992	7.4	(Thevenon et al., 1992)	
	Poultry	New Caledonia	2005-2007,2011	+	(OIE)	
	Poultry	Tonga	2010	+?	(OIE)	
	Sheep	New Caledonia	2005-2008	+	(OIE)	
	Goat	Guam	1999	+	(Duguies et al., 2000)	
Clostridial infections	Goat	Kiribati	1992-1994	+	(Saville, 1996a)	
	Poultry	Fiji	2008	+	(OIE)	
	Poultry	French Polynesia	2010	+	(OIE)	
	Poultry	New Caledonia	2010	+	(OIE)	
	Commensal & opportunistic bacteria	Bird	Guam	1982-86	54.7	(Savidge et al., 1992)
	Dermatophilosis	Multi species	French Polynesia	2005	+	(OIE)
Multi species		New Caledonia	2005	+	(OIE)	
Enterotoxaemia	Multi species	Fiji	2008	+	(OIE)	
	Multi species	New Caledonia	2010	+	(OIE)	
Enzootic pneumonia	Pig	Samoa	1997	+	(Martin, 1999a)	
	Pig	Solomon Islands	1998	+	(Martin and Epstein, 1999)	
European foulbrood	Bee	French Polynesia	2005-2007	+	(OIE)	

Disease	Species	Country	Date	Key result ^a	Reference	
Foot-rot	Bee	New Caledonia	2005-2007,2011	+	(OIE)	
	Multi species	Fiji	2008	+	(OIE)	
Fowl cholera	Poultry	New Caledonia	2005-2007,2010	+	(OIE)	
	Poultry	Samoa	2005, 2008	+	(OIE)	
Disease	Species	Country	Date	Key result^a	Reference	
Fowl typhoid	Poultry	Kiribati	2011	+	(OIE)	
Infectious coryza	Poultry	Fiji	2008	+	(OIE)	
Leptospirosis	Poultry	Tonga	1992-1994	+	(Saville, 1996c)	
	Cattle	Cook Islands	1993-1994	6.1	(Saville, 1994)	
	Cattle	Fiji	2002	69.6	(Lupo, 2003)	
	Cattle	French Polynesia	1997	15.0	(Desvars et al., 2011)	
	Cattle	Palau	1994	40.0	(Saville, 1999)	
	Cattle	Palau	1996	50.0	(Saville, 1999)	
	Cattle	PNG	2001	+	(Reid et al., 2001)	
	Cattle	Samoa	1997	39.6	(Martin, 1999a)	
	Cattle	Solomon Islands	1998	83.2	(Martin and Epstein, 1999)	
	Cattle	Tonga	1992-1994	6.2	(Saville, 1996c)	
	Dog	Fiji	2002	55.9	(Lupo, 2003)	
	Dog	FSM	1998	53.5	(Simms, 1998)	
	Dog	New Caledonia	1997	+++	(Desvars et al., 2011)	
	Dog	PNG	2006	4.5	(Wai'in, 2007)	
	Dog	Wallis & Futuna	1997-1998	20.0	(Martin, 1999c)	
	Donkey	New Caledonia	1999	97.4	(Desvars et al., 2011)	
	Goat	Fiji	2002	38.5	(Lupo, 2003)	
	Goat	Palau	1996	42.9	(Saville, 1999)	
	Goat	Solomon Islands	1998	15.9	(Martin and Epstein, 1999)	
	Horse	Fiji	2002	82.6	(Lupo, 2003)	
	Horse	New Caledonia	1999	+++	(Desvars et al., 2011)	
	Horse	Samoa	1997	44.4	(Martin, 1999a)	
	Horse	Solomon Islands	1998	71.0	(Martin and Epstein, 1999)	
	Horse	Wallis & Futuna	1997-1998	50.0	(Martin, 1999c)	
	Multi species	French Polynesia	2005-2007,2011	+	(OIE)	
	Multi species	FSM	2011	+	(OIE)	
	Multi species	Kiribati	2011	+	(OIE)	
	Multi species	New Caledonia	2005-2007,2011	+	(OIE)	
	Multi species	PNG	2001	+	(Reid et al., 2001)	
	Multi species	PNG	2011	+	(OIE)	
	Multi species	Samoa	2010	+	(OIE)	
	Multi species	Tonga	2011	+?	(OIE)	
	Multi species	Wallis & Futuna	2007	+?	(OIE)	
Pig	Cook Islands	1993-1994	1.7	(Saville, 1994)		
Pig	Fiji	2002	16.9	(Lupo, 2003)		
Pig	FSM	1998	33.5	(Simms, 1998)		
Pig	Niue	1992	25.0	(Saville, 1996b)		
Pig	Palau	1996	40.0	(Saville, 1999)		
Pig	PNG	2001	+	(Reid et al., 2001)		
Pig	PNG	2006	2.9	(Wai'in, 2007)		
Pig	Samoa	1997	23.0	(Martin, 1999a)		
Pig	Solomon Islands	1998	12.4	(Martin and Epstein, 1999)		
Pig	Tokelau	1998	3.4	(Martin, 1999b)		
Pig	Tonga	1992-1994	3.1	(Saville, 1996c)		
Pig	Wallis & Futuna	1997-1998	20.2	(Martin, 1999c)		
Melioidosis	Multi species	New Caledonia	2008	+	(OIE)	
Mycoplasmosis	Goat	Guam	1999	+	(Duguies et al., 2000)	
	Poultry	Cook Islands	1993-1994	78.7	(Saville, 1994)	
	Poultry	French Polynesia	2005-2008,2011	+	(OIE)	
	Poultry	Guam	1999	55.8	(Duguies et al., 2000)	
	Poultry	Kiribati	1992-1994	71.9	(Saville, 1996a)	
	Poultry	Kiribati	2011	+	(OIE)	
	Poultry	New Caledonia	2005-2007,2011	+	(OIE)	
	Poultry	Tonga	1992-1994	87.0	(Saville, 1996c)	
	Poultry	Tonga	2010	+?	(OIE)	
	Ovine epididymitis	Sheep	New Caledonia	2007, 2011	+	(OIE)
	Paratuberculosis (Johne's disease)	Cattle	Cook Islands	1993-1994	16.3	(Saville, 1994)
		Cattle	New Caledonia	2005-2007,2011	+	(OIE)
		Cattle	Palau	1994	10.0	(Saville, 1999)
		Cattle	Solomon Islands	1998	3.1	(Martin and Epstein, 1999)
		Cattle	Tonga	2010	+?	(OIE)
Cattle		Tonga	1992-1994	2.9	(Saville, 1996c)	
Pasteurelloses	Goat	Guam	1999	+	(Duguies et al., 2000)	
	Poultry	Fiji	2008	+	(OIE)	

	Poultry	French Polynesia	2010	+	(OIE)
	Poultry	New Caledonia	2010	+	(OIE)
Salmonellosis	Poultry	Cook Islands	1993-1994	44.4	(Saville, 1994)
	Poultry	Fiji	2008	+	(OIE)
	Poultry	French Polynesia	2010	+	(OIE)
	Poultry	Kiribati	1992-1994	69.1	(Saville, 1996a)
	Poultry	New Caledonia	2010	+	(OIE)
	Poultry	Tonga	1992-1994	40.3	(Saville, 1996c)
	Poultry	Tonga	2010	+?	(OIE)
Disease	Species	Country	Date	Key result^a	Reference
Salmonellosis (Cont')	Sheep	New Caledonia	2005-2007,2011	+	(OIE)
Serpulina pilosicoli	Dog	PNG	1997	5.3	(Trott et al., 1997)
	Dog	PNG	1998	+	(Trott et al., 1998)
	Pig	PNG	1997	17.0	(Trott et al., 1997)
Streptococcus suis type 2	Poultry	PNG	1997	50.0	(Trott et al., 1997)
Swine erysipelas	Pig	PNG	1993	47.5	(Paterson et al., 1993)
	Pig	Fiji	2008	+	(OIE)
	Pig	New Caledonia	2010	+	(OIE)
	Pig	Samoa	1997	+	(Martin, 1999a)
	Pig	Solomon Islands	1998	+	(Martin and Epstein, 1999)
	Pig	Wallis & Futuna	1997-1998	+	(Martin, 1999c)
Tetanus	Goat	Cook Islands	1993-1994	+	(Saville, 1994)
	Pig	Cook Islands	1993-1994	+	(Saville, 1994)
	Pig	Samoa	1997	+	(Martin, 1999a)
Tuberculosis	Cattle	Fiji	2007, 2011	+	(OIE)
	Cattle	Samoa	1997	1.4	(Martin, 1999a)
	Cattle	Tonga	2011	+?	(OIE)
	Poultry	Guam	1999	28.6	(Duguies et al., 2000)
Vibrionic dysentery	Pig	New Caledonia	2010	+	(OIE)
VIRAL DISEASES					
Akabane virus	Cattle	Palau	1995	30.0	(Saville, 1999)
Aujeszky's disease (Pseudorabies)	Dog	Tonga	1992-1994	+	(Saville, 1996c)
	Pig	Samoa	1997	22.9	(Martin, 1999a)
	Pig	Tokelau	1998	86.4	(Martin, 1999b)
	Pig	Tonga	1992-1994	50.0	(Saville, 1996c)
	Pig	Tonga	2011	+?	(OIE)
	Pig	Wallis & Futuna	1997-1998	8.5	(Martin, 1999c)
Avian infectious bronchitis	Poultry	Cook Islands	1993-1994	24.1	(Saville, 1994)
	Poultry	French Polynesia	2005-2007,2011	+	(OIE)
	Poultry	Guam	1999	49.3	(Duguies et al., 2000)
	Poultry	Kiribati	1992-1994	38.8	(Saville, 1996a)
	Poultry	New Caledonia	2005-2007,2011	+	(OIE)
	Poultry	Niue	1991-93	38.9	(Saville, 1996b)
	Poultry	Palau	1996	90.2	(Saville, 1999)
	Poultry	Samoa	1997	96.7	(Martin, 1999a)
	Poultry	Samoa	2005	+?	(OIE)
	Poultry	Solomon Islands	1998	98.3	(Martin and Epstein, 1999)
	Poultry	Tokelau	1998	100.0	(Martin, 1999b)
	Poultry	Tonga	1992-1994	7.8	(Saville, 1996c)
	Poultry	Wallis & Futuna	1997-1998	88.7	(Martin, 1999c)
Avian infectious laryngotracheitis	Poultry	Cook Islands	1993-1994	14.8	(Saville, 1994)
	Poultry	French Polynesia	2007, 2011	+	(OIE)
	Poultry	Guam	1999	52.5	(Duguies et al., 2000)
	Poultry	Kiribati	2011	+	(OIE)
	Poultry	New Caledonia	2005-2008	+	(OIE)
	Poultry	Palau	1996	2.4	(Saville, 1999)
	Poultry	Samoa	1997	7.7	(Martin, 1999a)
	Poultry	Samoa	2005	+?	(OIE)
	Poultry	Solomon Islands	1998	50.0	(Martin and Epstein, 1999)
	Poultry	Tokelau	1998	92.2	(Martin, 1999b)
	Poultry	Tonga	1992-1994	3.9	(Saville, 1996c)
	Poultry	Tonga	2010	+?	(OIE)
	Poultry	Wallis & Futuna	1997-1998	27.5	(Martin, 1999c)
Avian leukosis	Poultry	Kiribati	1992-1994	+	(Saville, 1996a)
Black queen cell virus	Bee	Niue	1992, 1994	+++	(Saville, 1996b)
	Bee	Solomon Islands	1993	2.0	(Reid and Van Eaton, 1993)
Bluetongue	Cattle	Guam	1999	8.3	(Duguies et al., 2000)
	Cattle	Solomon Islands	1998	4.2	(Martin and Epstein, 1999)
	Multi species	PNG	2011	+?	(OIE)
Bovine virus diarrhea	Cattle	Cook Islands	1993-1994	16.3	(Saville, 1994)
	Cattle	French Polynesia	2006-2007,2011	+	(OIE)

	Cattle	New Caledonia	2006-2007,2011	+	(OIE)
	Cattle	Samoa	1997	45.3	(Martin, 1999a)
	Cattle	Tonga	1992-1994	8.2	(Saville, 1996c)
	Cattle	Tonga	2011	+?	(OIE)
Caprine arthritis encephalitis	Goat	Palau	1996	16.7	(Saville, 1999)
Chronic paralysis virus	Bee	Niue	1992, 1994	+	(Saville, 1996b)
	Bee	Samoa	1996	+	(SPC, 2004d)
	Bee	Solomon Islands	1993	+++	(Reid and Van Eaton, 1993)
Enterovirus encephalomyelitis	Pig	Cook Islands	1993-1994	+	(Saville, 1994)
Enzootic bovine leukosis	Cattle	French Polynesia	2005-2007, 2011	+	(OIE)
	Cattle	Guam	1999	11.8	(Duguies et al., 2000)
	Cattle	Palau	1994	44.4	(Saville, 1999)
	Cattle	Solomon Islands	1998	2.7	(Martin and Epstein, 1999)
	Cattle	Tonga	1992-1994	1.2	(Saville, 1996c)
Disease	Species	Country	Date	Key result^a	Reference
Enzootic bovine leukosis (Cont')	Cattle	Tonga	2010	+?	(OIE)
	Cattle	Vanuatu	2005	+?	(OIE)
Equine influenza	Horse	Guam	1999	25.2	(Duguies et al., 2000)
Equine rhinopneumonitis	Horse	Guam	1999	67.9	(Duguies et al., 2000)
	Horse	New Caledonia	2005-2007,2011	+	(OIE)
	Horse	Samoa	1997	36.5	(Martin, 1999a)
	Horse	Samoa	2005	+	(OIE)
	Horse	Solomon Islands	1998	71.0	(Martin and Epstein, 1999)
	Horse	Tonga	1992-1994	1.1	(Saville, 1996c)
	Horse	Tonga	2010	+?	(OIE)
	Horse	Wallis & Futuna	1997-1998	16.7	(Martin, 1999c)
Fowl pox	Poultry	Cook Islands	1993-1994	+	(Saville, 1994)
	Poultry	French Polynesia	2005	+	(OIE)
	Poultry	Kiribati	1992-1994	+++	(Saville, 1996a)
	Poultry	New Caledonia	2005	+	(OIE)
	Poultry	Palau	1996	+	(Saville, 1999)
	Poultry	Samoa	1997	+	(Martin, 1999a)
	Poultry	Samoa	2005	+	(OIE)
	Poultry	Tonga	1992-1994	+++	(Saville, 1996c)
Getah virus	Horse	Oceania	2000	+++	(Fukunaga et al., 2000)
Hepatitis E virus	Pig	New Caledonia	2011	6.5	(Kaba et al., 2011)
Infectious bovine rhinotracheitis	Cattle	French Polynesia	2005-2007,2011	+	(OIE)
	Cattle	Guam	1999	2.8	(Duguies et al., 2000)
	Cattle	New Caledonia	1991	45.8	(Vilain et al., 1994)
	Cattle	New Caledonia	2005-2007,2011	+	(OIE)
	Cattle	Palau	1994	50.0	(Saville, 1999)
	Cattle	Samoa	1997	68.7	(Martin, 1999a)
	Cattle	Solomon Islands	1998	52.7	(Martin and Epstein, 1999)
	Cattle	Tonga	1992-1994	18.1	(Saville, 1996c)
	Cattle	Tonga	2010	+?	(OIE)
	Cattle	Vanuatu	2005	+?	(OIE)
Infectious Bursal Disease (Gumboro)	Poultry	Cook Islands	1993-1994	37.1	(Saville, 1994)
	Poultry	Fiji	2007	+?	(OIE)
	Poultry	Fiji	2008	+	(OIE)
	Poultry	French Polynesia	2005-2007,2011	+	(OIE)
	Poultry	Guam	1999	73.9	(Duguies et al., 2000)
	Poultry	Kiribati	1992-1994	67.4	(Saville, 1996a)
	Poultry	Kiribati	2011	+	(OIE)
	Poultry	New Caledonia	2005-2007,2011	+	(OIE)
	Poultry	Niue	1991-93	15.0	(Saville, 1996b)
	Poultry	Palau	1996	12.2	(Saville, 1999)
	Poultry	PNG	2011	+?	(OIE)
	Poultry	Samoa	1997	22.5	(Martin, 1999a)
	Poultry	Solomon Islands	1998	2.7	(Martin and Epstein, 1999)
	Poultry	Tokelau	1998	72.2	(Martin, 1999b)
	Poultry	Tonga	1992-1994	45.5	(Saville, 1996c)
	Poultry	Tonga	2010	+?	(OIE)
	Poultry	Wallis & Futuna	1997-1998	92.9	(Martin, 1999c)
Japanese encephalitis virus	Horse	Samoa	1997	10.2	(Martin, 1999a)
	Multi species	PNG	2011	+?	(OIE)
Kashmir bee virus	Bee	Solomon Islands	1993	13.9	(Reid and Van Eaton, 1993)
Low pathogenic avian influenza	Poultry	PNG	2011	+?	(OIE)
Malignant catarrhal fever	Cattle	New Caledonia	2005-2006	+	(OIE)
Marek's disease	Poultry	Cook Islands	1993-1994	25.9	(Saville, 1994)
	Poultry	French Polynesia	2005-2007,2011	+	(OIE)
	Poultry	Guam	1999	44.1	(Duguies et al., 2000)

	Poultry	Kiribati	1992-1994	3.9	(Saville, 1996a)
	Poultry	New Caledonia	2005-2007,2011	+	(OIE)
	Poultry	Niue	1991-93	5.0	(Saville, 1996b)
	Poultry	Palau	1996	46.3	(Saville, 1999)
	Poultry	Samoa	1997	39.6	(Martin, 1999a)
	Poultry	Solomon Islands	1998	54.0	(Martin and Epstein, 1999)
	Poultry	Tokelau	1998	11.2	(Martin, 1999b)
	Poultry	Tonga	1992-1994	36.4	(Saville, 1996c)
	Poultry	Tonga	2010	+?	(OIE)
	Poultry	Wallis & Futuna	1997-1998	5.7	(Martin, 1999c)
Murray valley encephalitis virus	Poultry	PNG	2011	+++	(Schuster et al., 2011)
Newcastle disease	Poultry	Cook Islands	1993-1994	15.4	(Saville, 1994)
	Poultry	Kiribati	1992-1994	56.2	(Saville, 1996a)
	Poultry	Tonga	1992-1994	41.6	(Saville, 1996c)
	Poultry	Tonga	2010	+?	(OIE)
Parvovirus	Dog	Kiribati	1992-1994	+	(Saville, 1996a)
	Dog	Samoa	1997	80.0	(Martin, 1999a)
	Dog	Tonga	1992-1994	+	(Saville, 1996c)
	Dog	Wallis & Futuna	1997-1998	25.0	(Martin, 1999c)
Disease	Species	Country	Date	Key result^a	Reference
Parvovirus (Cont')	Pig	Cook Islands	1993-1994	25.0	(Saville, 1994)
	Pig	Guam	1999	50.0	(Duguies et al., 2000)
	Pig	Kiribati	1992-1994	10.0	(Saville, 1996a)
	Pig	Tokelau	1998	97.7	(Martin, 1999b)
	Pig	Wallis & Futuna	1997-1998	+	(Martin, 1999c)
Porcine respiratory and reproductive syndrome	Pig	French Polynesia	2006-2007,2011	+	(OIE)
Q fever	Cattle	Guam	1999	1.4	(Duguies et al., 2000)
	Goat	Guam	1998	8.6	(Duguies et al., 2000)
	Goat	Solomon Islands	1998	3.1	(Martin and Epstein, 1999)
	Multi species	Vanuatu	2011	+?	(OIE)
Ross River virus	Multi species	Oceania	1995	+++	(Sammels et al., 1995)
	Multi species	PNG	2001	+++	(Harley et al., 2001)
Rotavirus	Pig	Solomon Islands	1998	71.4	(Martin and Epstein, 1999)
Sacbrood virus	Bee	Niue	1992, 1994	+	(Saville, 1996b)
	Bee	Samoa	1996	+	(SPC, 2004d)
	Bee	Solomon Islands	1993	7.9	(Reid and Van Eaton, 1993)
Transmissible gastroenteritis	Pig	French Polynesia	2011	+	(OIE)
Turkey rhinotracheitis	Poultry	French Polynesia	2006-2007	+	(OIE)
PARASITIC DISEASES					
Amoeba disease	Bee	Niue	1992, 1994	+	(Saville, 1996b)
Ancylostomiasis	Cat	New Caledonia	1993	+	(Beugnet and Gadat, 1993)
	Dog	New Caledonia	1993	+	(Beugnet and Gadat, 1993)
Babesiosis	Cattle	French Polynesia	2005-2007,2011	+	(OIE)
	Cattle	New Caledonia	2007	+	(Barre et al., 2011)
	Cattle	New Caledonia	2008	+	(Martin, 2009)
	Cattle	New Caledonia	2011	+	(OIE)
	Cattle	Samoa	1997	8.5	(Martin, 1999a)
	Cattle	Samoa	2008	+	(OIE)
	Cattle	Solomon Islands	1998	6.9	(Martin and Epstein, 1999)
	Cattle	Tonga	1992-1994	0.6	(Saville, 1996c)
Capillariasis	Dog	Samoa	2010-2011	2.0	(Carslake et al., 2012)
Coccidiosis	Poultry	Fiji	2008	+	(OIE)
	Poultry	French Polynesia	2010	+	(OIE)
	Poultry	New Caledonia	2010	+	(OIE)
Contagious pustular dermatitis	Multi species	New Caledonia	2009	+	(OIE)
Crocodylocapillaria longiovata	Crocodile	PNG	1998	+	(Moravec and Spratt, 1998)
Dermatophilosis	Cattle	Guam	1999	+	(Duguies et al., 2000)
	Goat	Cook Islands	1993-1994	+	(Saville, 1994)
	Goat	Kiribati	1992-1994	100.0	(Saville, 1996a)
Dipylidiasis	Dog	Samoa	2010-2011	4.4	(Carslake et al., 2012)
	Dog	New Caledonia	1993	57.0	(Beugnet et al., 1993)
	Dog	New Caledonia	1994	50.3	(Beugnet et al., 1994)
	Dog	New Caledonia	2009	22.4	(Watier-Grillot et al., 2011)
	Dog	Samoa	1980	+++	(Samarawickrema et al., 1992)
	Dog	Samoa	2010-2011	46.8	(Carslake et al., 2012)
Ehrlichiosis	Dog	Samoa	1997	60.0	(Martin, 1999a)
	Dog	Wallis & Futuna	1997-1998	71.4	(Martin, 1999c)
Fasciolosis	Cattle	Samoa	1997	+	(Martin, 1999a)
Filariosis	Multi species	French Polynesia	2010	+	(OIE)
	Multi species	New Caledonia	2010	+	(OIE)
Fleas	Dog	Samoa	2010-2011	83.7	(Carslake et al., 2012)

Gastrointestinal parasites	Goat	Fiji	1996	+	(Manueli, 1996)	
	Goat	PNG	2011	89.1	(Koinari et al., 2012)	
	Sheep	Fiji	1996	+	(Manueli, 1996)	
	Sheep	PNG	2011	71.8	(Koinari et al., 2012)	
	Giardiasis	Dog	Samoa	2010-2011	14.6	(Carslake et al., 2012)
	Hippoboscidae	Pigeon	New Caledonia	1996	+	(Beugnet et al., 1996)
	Hookworm	Dog	Samoa	2010-2011	90.7	(Carslake et al., 2012)
	Leishmaniosis	Dog	New Caledonia	2011	+	(OIE)
	Lice	Dog	Samoa	2010-2011	8.1	(Carslake et al., 2012)
	Mallophaga lice species	Pigeon	New Caledonia	1997	+	(Beugnet et al., 1996)
Mammomonogamus spp.	Cat	CNMI	2008	+	(Tudor et al., 2008)	
Mange	Sheep	New Caledonia	2008	+	(OIE)	
Mites	Bee	Niue	1998	+	(SPC, 2004c)	
	Bee	Samoa	1996	+	(SPC, 2004d)	
Nematophagous fungi	Goat	Fiji	1999	+	(Manueli et al., 1999)	
	Sheep	Fiji	1999	+	(Manueli et al., 1999)	
Nosemosis	Bee	Fiji	2008	+	(OIE)	
	Bee	New Caledonia	2010	+	(OIE)	
	Bee	Niue	1992, 1994	+++	(Saville, 1996b)	
	Bee	Samoa	1996	+	(SPC, 2004d)	
	Bee	Solomon Islands	1993	31.0	(Reid and Van Eaton, 1993)	
Pentastomid parasites	Crocodile	Oceania	2006	+	(Junker and Boomker, 2006)	
Rhipicephalus spp.	Cattle	French Polynesia	2010	+	(Barre and Uilenberg, 2010)	
	Cattle	New Caledonia	1995	+++	(Beugnet and Chardonnet, 1995)	
Disease	Species	Country	Date	Key result^a	Reference	
Rhipicephalus spp. (Cont')	Cattle	New Caledonia	2010	+	(Barre and Uilenberg, 2010)	
	Cattle	New Caledonia	2010	+	(De Meeus et al., 2010)	
	Cattle	PNG	2010	+	(Barre and Uilenberg, 2010)	
Rickettsia africae	Bird	New Caledonia	2001-2007	+	(Eldin et al., 2011)	
Screwworm (C. Bezziana)	Multi species	PNG	2011	+	(OIE)	
Subcutaneous filarial worm	Pigeon	New Caledonia	1996	+	(Beugnet et al., 1996)	
	Theileriosis	Cattle	New Caledonia	2011	+	(OIE)
		Cattle	Palau	1994	22.2	(Saville, 1999)
		Cattle	Samoa	1997	82.6	(Martin, 1999a)
		Cattle	Samoa	2008	+	(OIE)
		Cattle	Solomon Islands	1998	16.5	(Martin and Epstein, 1999)
		Cattle	Tonga	1992-1994	29.8	(Saville, 1996c)
		Cattle	Tonga	2010	333.0	(OIE)
	Ticks	Dog	Samoa	2010-2011	42.1	(Carslake et al., 2012)
	Toxocariasis	Cat	New Caledonia	1993	+	(Beugnet and Gadat, 1993)
Dog		New Caledonia	1993	+	(Beugnet and Gadat, 1993)	
Dog		Samoa	2010-2011	3.4	(Carslake et al., 2012)	
Toxoplasmosis	Cat	New Caledonia	2009	50.0	(Roqueplo et al., 2011)	
	Cattle	New Caledonia	2009	3.3	(Roqueplo et al., 2011)	
	Deer	New Caledonia	2009	13.8	(Roqueplo et al., 2011)	
	Dog	New Caledonia	2009	32.8	(Roqueplo et al., 2011)	
	Goat	Cook Islands	1993-1994	63.3	(Saville, 1994)	
	Goat	Guam	1998	51.6	(Duguies et al., 2000)	
	Goat	Kiribati	1992-1994	100.0	(Saville, 1996a)	
	Goat	Niue	1992, 1994	87.5	(Saville, 1996b)	
	Goat	Palau	1996	100.0	(Saville, 1999)	
	Goat	Solomon Islands	1998	84.4	(Martin and Epstein, 1999)	
	Goat	Tonga	1992-1994	52.0	(Saville, 1996c)	
	Horse	New Caledonia	2009	16.0	(Roqueplo et al., 2011)	
	Multi species	Fiji	2008	+	(OIE)	
	Multi species	New Caledonia	2008	+	(OIE)	
	Pig	New Caledonia	2009	2.0	(Roqueplo et al., 2011)	
Trichinellosis	Crocodile	PNG	2004	11.1	(Pozio et al., 2004)	
	Crocodile	PNG	2005	21.2	(Pozio et al., 2005)	
	Pig	Cook Islands	1993-1994	25.4	(Saville, 1994)	
	Pig	Fiji	2001	+	(Reid et al., 2001)	
	Pig	Kiribati	2001	+	(Reid et al., 2001)	
	Pig	Kiribati	2011	+	(OIE)	
	Pig	Kiribati	1992-1994	44.7	(Saville, 1996a)	
	Pig	Palau	1996	1.7	(Saville, 1999)	
	Pig	PNG	1988-1998	+	(Pozio et al., 1999)	
	Pig	PNG	2000	+	(Owen et al., 2000)	
	Pig	PNG	2001	+++	(Reid et al., 2001)	
	Pig	PNG	2005	12.3	(Pozio et al., 2005)	
	Pig	PNG	2011	+	(OIE)	
	Pig	Samoa	1997	6.7	(Martin, 1999a)	

	Pig	Solomon Islands	1998	1.6	(Martin and Epstein, 1999)
	Pig	Tonga	2010	333.0	(OIE)
	Pig	Wallis & Futuna	1997-1998	0.6	(Martin, 1999c)
Trichomonosis	Multi species	New Caledonia	2005-2007,2011	+	(OIE)
Trichophyton verrucosum	Deer	New Caledonia	1994	+++	(Lebel and Beugnet, 1994)
Trichuris spp.	Dog	Samoa	2010-2011	6.9	(Carslake et al., 2012)
Tropilaelaps infestation	Bee	PNG	2011	+	(OIE)
Trypanosomosis	Dog	PNG	1998	+	(Reid and Copeman, 2003)
	Goat	PNG	1998	+	(Reid and Copeman, 2003)
	Horse	PNG	1998	+	(Reid and Copeman, 2003)
	Pig	PNG	1998	+	(Reid and Copeman, 2003)
Varroasis	Bee	PNG	2011	+	(OIE)
OTHER DISEASES					
Chalkbrood	Bee	Samoa	1996	+	(SPC, 2004d)
	Bee	Tonga	1991	+	(SPC, 2004e)
Equine leucoencephalomalacia	Horse	New Caledonia	1996	+	(Le Bars and Le Bars, 1996)
Half moon disorder	Bee	Samoa	1996	+	(SPC, 2004d)
	Bee	Solomon Islands	1993	+	(Reid and Van Eaton, 1993)
Heat-stable enterotoxin II-producing E. coli	Pig	New Caledonia	1994	+	(Germani et al., 1994)
Shiga-like toxin I-producing E. Coli	Cattle	New Caledonia	1994	+	(Germani et al., 1994)
Wax moth	Bee	Niue	1992, 1994	+	(Saville, 1996b)
	Bee	Samoa	1996	+	(SPC, 2004d)
	Bee	Solomon Islands	1993	+	(Reid and Van Eaton, 1993)

^a Key result: Estimated prevalence in %
 +: Disease clinically observed, detected or reported as present
 +++: Disease enzootic or very common
 +?: Disease suspected to be present

disease said to be common, very common or enzootic (+++); diseases being suspected but not confirmed (+?).

A comparison of diseases or pathogens listed in Table 2 and 3 shows that 16 diseases were sought but could not be found using the described methodology, in the Pacific Islands region. These diseases included borreliosis, psittacosis, bovine ephemeral fever, canine distemper virus, classical swine fever, equine infectious anaemia, equine viral arteritis, foot and mouth disease, porcine rotavirus, simbu serogroup, swine influenza, vesicular stomatitis, *Amblyomma* spp., avian malaria, cryptosporidiosis and cysticercosis (however, since this literature review focuses exclusively on domestic animals, it cannot be ruled out that some may occur in wildlife reservoirs). Two recent literature reviews on parasitic zoonoses and parasites of animals recorded at the National Veterinary Laboratory in PNG were retrieved but the extensive lists of parasites presented in these papers could not be included in the Table 2 (Owen, 2005, 2011). No references were retrieved between 1992 and 2012 for five of the 22 PICTs included in this review, namely: American Samoa, Marshall Islands, Nauru, Pitcairn Islands and Tuvalu. Among the 77 references from 1992 to 2012, 31 (40.3%) were from the gray literature retrieved from the SPC local database.

4 Discussion

4.1 Data and language limitations

While the original objective of our work was to conduct a meta analysis, we found that too few up-to-date studies were available to do so. Therefore, the work presented in this paper resulted in being a descriptive review of the data available on domestic animal diseases in the Pacific Islands region. The only similar kind of work performed is an annotated

Table 3

Animal diseases not detected or reported as not present in the Pacific Islands region based on the selected references from 1992 to 2012

Animal diseases	Cook Islands ^a	Fiji ^b	Guam ^c	Kiribati ^d	New Caledonia ^e	Niue ^f	Oceania ^g	Palau ^h	PNG ⁱ	Samoa ^j	Solomon Islands ^k	Tokelau ^l	Tonga ^m	Vanuatu ⁿ	Wallis & Futuna ^o
Bacterial diseases															
Anaplasmosis															
Cattle	1993							1995					1992		
Avian encephalomyelitis															
Poultry						1991									
Bartonellosis															
Dog					2009										
Horse					2009										
Borreliosis															
Dog										2010					
Brucellosis															
Carabao			1999												
Cattle	1993		1999			1992		1994			1998		1992		
Dog										1997					1997
Goat	1993		1998			1992		1996			1998		1992		1997
Pig	1993		1999	1992		1994		1996		1997	1998	1998			1997
Enzootic pneumonia															
Pig			1999												
European foulbrood															
Bee											1993				
Leptospirosis															
Cat		2002													
Cattle			1999			1992			2006						1997
Goat															
Horse									2006						
Pig			1999	1992											
Paratuberculosis (Johne's disease)															
Cattle			1999			1992				1997					
Goat	1993										1998				1997
Psittacosis															
Poultry						1991									
Salmonellosis															
Poultry						1991									
Tuberculosis															
Carabao			1999												
Cattle	1993		1999			1992		1994			1998		1992		
Goat	1993		1998												
Viral diseases															
Akabane virus															
Cattle	1993												1992		
Aujeszký's disease (Pseudorabies)															
Pig	1993		1999	1992		1994		1996			1998				
Avian infectious laryngotracheitis															
Poultry						1991									
Avian influenza															
Poultry	1993		1999	1992		1991	2003	1996		1997	1998	1998	1992		1997

Animal diseases	Cook Islands ^a	Fiji ^b	Guam ^c	Kiribati ^d	New Caledonia ^e	Niue ^f	Oceania ^g	Palau ^h	PNG ⁱ	Samoa ^j	Solomon Islands ^k	Tokelau ^l	Tonga ^m	Vanuatu ⁿ	Wallis & Futuna ^o	
Bluetongue																
Carabao			1999													
Cattle	1993					1992		1994		1997			1992			
Goat	1993		1998	1992		1992		1996			1998		1992			1997
Bovine ephemeral fever																
Cattle	1993					1992		1995					1992			
Bovine virus diarrhoea																
Cattle						1992		1994			1998					
Canine distemper virus																
Dog										1997						1997
Caprine arthritis encephalitis																
Goat	1993		1998	1992		1992							1992			1997
Classical swine fever																
Pig				1992				1996		1997		1998				1997
Enzootic bovine leucosis																
Cattle	1993					1992				1997						
Equine infectious anaemia																
Horse	1993		1999							1997	1998		1992			1997
Equine influenza																
Horse	1993									1997			1992			
Equine rhinopneumonitis																
Horse	1993															
Equine viral arteritis																
Horse			1999								1998					1997
Foot and mouth disease																
Cattle	1993															
Goat	1993															
Pig	1993															
Infectious bovine rhinotracheitis																
Carabao			1999													
Cattle	1993					1992										
Japanese encephalitis virus																
Dog										1997						1997
Goat										1997						1997
Horse			1999													1997
Pig								1997		1997		1998				1997
Newcastle disease																
Poultry		2000	1999			1991		1996		1997	1998	1998				1997
Porcine respiratory and reproductive syndrome																
Pig			1999					1996		1997	1998	1998				1997
Porcine rotavirus																
Pig						1994										
Q fever																
Carabao			1999													
Cattle						1992										
Goat	1993			1992		1992		1996					1992			1997

Animal diseases	Cook Islands ^a	Fiji ^b	Guam ^c	Kiribati ^d	New Caledonia ^e	Niue ^f	Oceania ^g	Palau ^h	PNG ⁱ	Samoa ^j	Solomon Islands ^k	Tokelau ^l	Tonga ^m	Vanuatu ⁿ	Wallis & Futuna ^o
Simbu serogroup															
Cattle	1993							1995					1992		
Swine influenza															
Pig			1999												
Transmissible gastroenteritis															
Pig			1999							1997	1998	1998			1997
Vesicular stomatitis															
Cattle	1993														
Goat	1993														
Horse	1993														
Pig	1993														
Parasitic diseases															
Amblyomma spp.															
Bird								2010							
Cattle					2010			2010							
Avian malaria															
Poultry				1992											
Babesiosis															
Carabao			1999												
Cattle	1993		1999					1992		1995					
Cryptosporidiosis															
Dog										2010					
Cysticercosis															
Dog									1999						
Pig									1999						
Ehrlichiosis															
Dog										2010					
Leishmaniosis															
Dog										2010					
Rhipicephalus spp.															
Cattle		2010											2010	2010	
Theileriosis															
Cattle	1993							1992							
Toxoplasmosis															
Goat															1997
Trichinellosis															
Pig			1999			1994			2000			1998	1992		
Trypanosomosis															
Cattle									1998						
Deer									1998						
Multi species									2002						

Dates presented in the table above represent the year the study was conducted or the year the disease report was released.

^a (Saville, 1994)

^b (Angus, 2001; Barre and Uilenberg, 2010; Lupo, 2003)

^c (Duguiés et al., 2000)

^d (Saville, 1996a)

^e (Barre and Uilenberg, 2010; Mediannikov et al., 2011)

^f (Saville, 1996b)

^g (Barre and Uilenberg, 2010; Senne, 2003)

^h (Saville, 1999)

ⁱ (Owen, 2006; Owen et al., 2000; Reid, 2002; Reid and Copeman, 2000; Wai'in, 2007)

^j (Carslake et al., 2012; Martin, 1999a)

^k (Martin and Epstein, 1999; Reid and Van Eaton, 1993)

^l (Martin, 1999b)

^m (Barre and Uilenberg, 2010; Saville, 1996c)

ⁿ (Barre and Uilenberg, 2010)

^o (Martin, 1999c)

bibliography on animal husbandry and diseases in the Pacific area dating from 1966 (Pacific Science Information Center Bernice P. Bishop Museum Honolulu, 1966). The work presented in this present paper may help fill the gap in knowledge of animal diseases for the region and should give a wider access to currently available data.

Thanks to the access to the database available at the Secretariat for the Pacific Community and because we were able to review papers written either in English or in French (which are the 2 main official languages in the region), we think that we have been able to retrieve and analyse the majority and the most relevant references available on domestic animal diseases in the Pacific Islands region. It is acknowledged that the PICTs may have individually conducted animal disease studies without publishing the results on the databases selected for this study. This data would thus be missing in this literature review.

This review has extracted data from gray literature usually only accessible to a limited number of stakeholders within the Pacific Islands region and made this available to the scientific community.

However, the possibility of intentional non-reporting or public disclosure of animal diseases for fear of the negative impact on trade and tourism shall not be excluded.

The type of data collected varied between papers and reports. Some studies presenting only one piece of information for a particular animal disease in one species and for only one PICT while other studies gave an extensive list of data for several animal diseases studied in multiple species. In particular, SPC has conducted a series of animal disease surveys in 10 PICTs between 1994 and 2000 that provide an extensive amount of information for the main animal diseases in the region. However these data are already about 15 years old and would benefit from updated methods of disease detection.

The large number of references providing information for PNG and New Caledonia presumably reflects the interest and the investment in terms of animal disease surveillance and investigation done in these two countries by Australia and France respectively. This literature review shows that for 17 other PICTs less than five references were retrieved per country, emphasising the lack of information or lack of diseases in these countries.

The fact that a majority of data compiled focused on parasitic diseases may reflect the particular interest in such diseases in this part of the world and/or may indicate that these diseases are a main issue faced by local farmers. But it may also reflect the fact that few PICTs are actually equipped with diagnostic laboratories and most of the PICTs have to send samples abroad for a proper laboratory diagnosis of bacterial or viral diseases.

Our literature review shows that there is no clearly defined focus on a specific disease in the Pacific Islands region and that the research done so far in the region does not seem to highlight any one disease of particular significance to a single PICT or the region generally.

Most of the published data was related to cattle and pigs and this may reflect the importance of these two species for the livestock industry in the region but also the very particular role of pigs in Pacific society for traditional and social events (SPC, 2007). However, the proportionally limited amount of data retrieved for poultry is surprising considering the importance of that sector in most of the PICTs at the commercial and semi-commercial level but also at the village level as a subsistence product for locals.

4.2 Diseases of zoonotic interest to the region

In the literature reviewed, all samples tested for avian influenza were reported to be negative. The studies did not specify which strains were tested but our database query assessed whether there had been signs of pathology and/or high mortality in the local poultry population if a virulent strain was circulating in any of the PICTs. Only a low pathogenic strain of avian influenza was suspected in PNG in 2011 ([OIE, 2011a](#)).

Leptospirosis is an endemic zoonosis in Oceania ([Kline et al., 2013](#)) and is consistently reported as present in animals by the OIE member countries. The latest sero-prevalence studies on animals are from 2002 in Fiji ([Lupo, 2003](#)) and 2006 in PNG ([Wai'in, 2007](#)). Recent public health studies have been conducted in American Samoa and have been looking at the risk factors related to backyard piggeries ([Lau et al., 2012a](#); [Lau and DePasquale, 2012](#); [Lau et al., 2012b](#)). More studies within the susceptible animal populations and extended to the other PICTs are required to complement these studies in American Samoa.

Animal disease reports submitted for the year 2011 to OIE confirmed the present of Brucellosis in Fiji and French Polynesia and suspicion of occurrence in Tonga. The only recent sero-prevalence study retrieved for this disease was conducted in Wallis and Futuna islands ([Antras and Garin-Bastuji, 2011](#)).

Domestic animals are known to be the hosts of some arboviral infections such as Japanese encephalitis, Murray Valley encephalitis and Ross River virus ([Kuno, 2001](#); [Russell, 2002](#); [Sabchareon and Yoksan, 1998](#)) but only very limited information on these diseases was retrieved for domestic animals while they are identified as being of major importance in Oceania from a public health perspective ([Kline et al., 2013](#)).

4.3 Based on the references retrieved through this literature search, rabies has not been detected or reported on domestic animals during the reference period of 1992 and this status seems to be confirmed by the “no” to “low” risk for humans of contracting rabies within the PICTs (WHO, 2008, 2011). But rabies was nevertheless reported as “present” in the Oceania region in 2007 (WHO, 2007). Diseases of economical importance and at potential risk for the region:

Foot and Mouth disease and Classical Swine Fever are reported in various countries of South East Asia but PICTs seem to have remained free of these transboundary diseases. Similarly, Porcine respiratory and reproductive syndrome is now widely spreading in various parts of Asia ([An et al., 2011](#)), but within our PICT survey seems only to have been detected in French Polynesia. ([OIE, 2011a](#)). The Pacific Islands region therefore appears to be relatively free of economically important diseases. In an area composed of 25,000 islands dispersed over 180 million square kilometres and hosting 9 million people it is a challenge to maintain a disease free environment. So far, the Pacific region is said to have a “favourable animal health status” with almost no serious livestock diseases. Nevertheless, these statements have to be mitigated by the fact that many PICTs do not have adequate animal disease surveillance and reporting systems to confirm this status ([Secretariat of the Pacific Community, 2009a, b](#)). However, an AusAID funded project is currently supporting the establishment of a network of laboratories in the region to help addressing this issue (REF???)

Besides giving the PICTs the opportunity to access international markets, establishing and maintaining a national animal disease surveillance and information management system would create in-country benefits by enabling early detection of disease outbreaks and emerging diseases and reduce the impact of endemic diseases (Secretariat of the Pacific Community, 2009a)

5 Conclusion

This paper reviews the current knowledge on domestic animal diseases in 22 PICTs with an emphasis on data from 1992 to 2012 and shows that very little information is available for this region. While our review was seeking information on any domestic animal disease, no single disease appears to be a principal concern for the region. Considering the very broad scope of this review in terms of animal diseases, retrieved literature is scarce and no longer up-to-date. This paper stresses the need for more investment on animal disease status in Pacific Islands region, particularly given the tropical environment and ideal conditions for disease emergence. Responsible, commensurate investments and international coordination are needed to improve the knowledge of the current animal health status in the region and to enable PICTs wishing to control diseases of public health concern or to access international trade in live animals and animal products.

6 Acknowledgements

This review was conducted in partnership between the Animal Health and Production Team, Land and Resources Department of the Secretariat for the Pacific Community (SPC) and the School of Veterinary and Biomedical Sciences of James Cook University (JCU), Townsville, Queensland, Australia as part of the Food Animal Biosecurity Network project funded by the Australian Agency for International Development (AusAID).

We are most grateful to the Secretariat for the Pacific Community who provided access to their databases.

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