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ADAP Animal Health Survey for Guam, Northern Marianas Islands,  
Palau, Federated States of Micronesia, and American Samoa  
ADAP 2000-25 • December 2000

# Animal Health Survey for Guam 1999



**A D A P**  
PROJECT

Agricultural Development in the American Pacific  
Pacific Land Grant Programs

## **ADAP Animal Health Survey for Guam 1999**

The health of the food animals in the Pacific is of great importance to the lives and livelihood of Pacific Islanders. This is the first study to identify the current health of animals in Guam.

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## ABSTRACT

Aspects of the animal health status of Guam have been investigated clinically since the 1960's. Unfortunately previous records have either been lost or are otherwise unavailable. This survey, which included serological testing, clinical observation and some identification of parasites, is not intended to be definitive. Instead, the survey should be recognized as a component in an ongoing program of surveillance.

The findings indicate that Guam is free from all exotic diseases. However there are reports of a number of diseases of economic and public health concern. Brucellosis (*Brucella sp.*) has not been detected thus far in cattle, carabaos, goats or pigs. In the absence of reactors to the tuberculin test there is also no evidence to indicate the presence of bovine tuberculosis (*Mycobacterium bovis*). *Mycobacterium avium* is present in free range chickens and fighting cocks.

Serology suggests that *Toxoplasma gondii* is present in the goat population. While this is of public health concern, to our knowledge, the disease has not been reported in humans.

Tick vectors for anaplasmosis and babesiosis (*Boophilus sp.* and *Rhipicephalus sp.*) are present on island. Positive titers for anaplasmosis in some cattle and carabao indicate the presence of the causative organism. The specificity of the serological tests for *Babesia bovis* and *Babesia bigemina* has not been determined.

The pig population shows evidence of parvovirus infection but appears free of other important diseases including pseudorabies, porcine reproductive and respiratory syndrome and trichinosis.

Poultry diseases which are common elsewhere in the region are also found on Guam. These diseases include infectious brochitis, infectious laryngotracheitis, infectious bursal disease, avian encephalomyelitis, Marek's disease, and mycoplasmosis (*M. gallisepticum* and *M. synoviae*).

The horse population on Guam appears to be in good health. Equine herpesvirus (EHV-1), common globally, has also been identified on Guam.

Parasite control (both endoparasites and ectoparasites) probably accounts for 75% of the clinical cases seen in dogs and cats. The most common viral diseases recognized in dogs are parvovirus, coronavirus and transmissible venereal tumor. The most common viral diseases of cats are feline immunodeficiency, and the feline upper respiratory complex: feline calicivirus, feline herpesvirus, *Chlamydia*, *Mycoplasma spp.* and *Bordatella spp.*



## INTRODUCTION

In recent years, Guam has undergone remarkable economic growth. This growth, coupled with population expansion and cultural diversification, has underscored the need to develop programs to maximize the use of our natural resources. One of the most important of these is our livestock industry. We are already experiencing an increasing demand for fresh, locally produced livestock products and many more will be needed in the future. The cultural diversity in Guam is leading to a demand for a great variety of livestock products. The importation of genetically improved breeds selected for their ability to adapt to Guam's climate and its local feeds will improve livestock quality and quantity. With these improvements a valuable export industry becomes a possibility, and could lead to even greater economic development. The key to this type of development are animal health surveys.

Animal health surveys are key to the establishment of free trade zones between nations and regions because they provide vital information on significant animal diseases. Regulatory decisions are based on this kind of information. The Office International Epizootics (OIE) and the United States Department of Agriculture (USDA) have established guidelines listing significant infectious diseases that are to be identified by animal health officials.

Past and future economic developments, in conjunction with more effective wildlife conservation practices and a growing pet population, has also increased the risk of zoonotic diseases. With the increased exposure to animals, both domestic and feral, the likelihood of transmitting infectious agents from animals to people also increases. Identification and assessment of the risk posed by such agents will allow implementation of more appropriate public health strategies.

This survey was not intended to be definitive, in the sense of being final. Rather it should be understood as the groundwork for an on going program of inquiry and surveillance.

### Location and Topography

Guam is the largest and most southerly island in the Mariana Archipelago. It is located in the Western Pacific region at approximately 13 degrees north latitude and 144 degrees west longitude. It is close to an imaginary line drawn from Honolulu to Manila and a line drawn from Tokyo to Sydney. Distances from Honolulu, Manila, Tokyo and Sydney are 3,700, 1,500, 1,500 and 3,100 miles respectively.

The island is approximately 30 miles in length with a variable width ranging from 4 miles at the narrowest to 12 miles at the widest and an area, excluding reef formations, of approximately 212 square miles. Created by an uplift of undersea volcanoes, there are two distinct geological regions. The northern half of the island is a coral limestone plateau while the southern half is a mixture of volcanic hills and valleys. The highest point, with an elevation of 1,334 feet above sea level, is located in the south along an elongated ridge.

### Agriculture and Livestock

The population density for Guam is 590 people per square mile. The southern half of the island is the least populated and mostly rural. The central and northern parts are more densely populated and may be considered urban. The ethnic groups are Chamorros (46%), Filipinos (22%), US mainlanders (22%), Micronesians and Asians (10%). There are 17 villages and farming activities distributed in the northern, central and southern portions of the island. Farming activities are mostly for subsistence, family operated and small scale operations. Aside from the usual staple crops grown such as taro, yam and breadfruit, the industry has become more diversified by expanding into the marketing of new crops, ornamentals and other related products.

### **Goat Industry**

The meat goat industry is slowly developing with the introduction of meat goat breeds (Boer and Kiko). Goats are primarily raised and marketed for meat. Goat farms vary from 2-40 does. Goats are tethered or free grazing. Nutrition is supplemented with imported hay and commercial goat feed.

### **Cattle Industry**

The cattle population is very low on Guam. There are probably four family operated cattle farms, each with a population of more than twenty head of cattle. These cattle are confined on pasture areas or tethered around residences. Inbreeding is a problem, as there have been no live importations of breeding cattle and no artificial insemination program.

### **Swine Industry**

The swine industry is the biggest livestock operation on Guam. Farms range from 1-50 sow operations and also vary from backyard (free-range), semi-intensive (concrete pens and floors) to intensive (all concrete buildings with gestation stalls, farrowing crates, automatic drinking systems) designs.

The local breeding stock has been improved through the years by the importation of live breeders and the introduction of artificial insemination in 1992 continuing to the present. Major breeds are US Landrace, Large Whites, Duroc and Hampshire.

Most hog farms are “farrow to grower” operations as the major market is for grower pigs (50 to 100 lbs.) for roasting.

### **Poultry Industry**

Guam was self-sufficient in egg production in the 1970's but slowly declined through the years due to numerous typhoons that destroyed buildings and stocks in addition to the impact of stringent environmental laws. At present, there is one commercial brown egg farm and a small-scale hatchery operation. Free-range birds can be found in villages. There is also one duck farm that produces “balut” and salted eggs.

## MATERIALS AND METHODS

The format of the survey was based on recommendations from the Secretariat of the Pacific Community (SPC). The SPC has been recognized by (OIE) as the coordinating body for animal health activities in the region.

Blood collection was carried out over a period of two to three years. A team of veterinarians and staff from Land Grant Institutions in the American Pacific, the local Department of Agriculture, the Secretariat of the Pacific Community, the Animal and Plant Health Inspection Services (APHIS) - Hawaii, travelled to Micronesia to collect blood samples. A representative number of animals were tested in Guam, CNMI, Federated States of Micronesia (FSM) and American Samoa. The sample sizes varied according to the presence of each species and their numbers. Animals were examined at the time of blood sampling and clinical investigations were performed if indicated. Animals were chosen randomly and were humanely restrained for blood collection.

### Collection Methods

1. Animals were positioned to perform venipuncture. The following sites were used: swine (brachiocephalic vein), cattle and carabaos (tail vein), horses and goats (jugular vein).
2. (i) The site for venipuncture was cleansed with alcohol. A Vacutainer tube was used with 18 to 20 gauge, 1 1/2 inch needle. At least 10 ml. of blood was collected.  
  
(ii) For poultry, a 25 to 27 gauge, 1/2 to 5/8 inch needle and 5 cc syringe was use to aspirate blood from the wing vein. Samples were placed in a cooler after collection.
3. Samples were centrifuged at 5,000 rpm for 5 minutes.
4. Serum was extracted and kept frozen prior to shipment to the laboratories.
5. Samples from Guam, CNMI, FSM and American Samoa were sent to the Foreign Animal Disease Laboratory, Plum Island, National Veterinary Services Laboratory and Veterinary Diagnostic Laboratory, Iowa State University in Ames, Iowa for testing. Samples from FSM were also sent to laboratories in Central Animal Health Laboratory, New Zealand, Veterinary Pathology Laboratory, Fiji and Laboratory of Microbiology and Pathology, Australia.



## RESULTS AND DISCUSSION

### A. GOATS

The goat population on Guam appears to be free of the major infectious and contagious diseases. Clinically, endoparasitism is the most commonly diagnosed condition. *Strongyloides spp.*, *Trichostrongylus spp.*, *Haemonchus spp.* and *Eimeria spp.* are the most prevalent.

The range of other clinical conditions is provided in Table I.

**Table I. Clinical Observations for Goats**

---

#### REPRODUCTIVE SYSTEM

- metritis
- mastitis
- dystocia
- "C" section
- mastectomy surgery
- pregnancy toxemia

#### GASTROINTESTINAL SYSTEM

- *Clostridial enterotoxemia*
- *Hemorrhagic enteritis*
- bloat

#### TOXIC PLANTS

- *Chromolena odorata*
- *Crotolaria polleda* ( rattle box)

#### RESPIRATORY SYSTEM

- pneumonia
- *Mycoplasma spp.*
- *Pasteurella spp.*

#### ENDOPARASITES

- *Haemonchus spp.*
- *Strongyloides spp.*
- *Trichostrongylus spp.*
- *Eimeria spp.*

#### ECTOPARASITES

- Psoroptic mange (unconfirmed)

#### MISCELLANEOUS

- conjunctivitis
  - trauma
  - foot rot
  - alopecia-idiopathic
-

Serology was carried out for the diseases listed in Table II.

**Table II. Disease Serology Results for Goats**

Diseases	No. of Samples		Apparent Prevalences
	Tested	Positive	%
Bluetongue	94	0	0
Q' Fever	93	8	8
CAE	93	0	0
Brucellosis	71	0	0
Toxoplasmosis	64	33	51
Tuberculosis	6	0	0

*Bluetongue* - Bluetongue serotypes tested were 2, 10, 11, 13 and 17. All tests were carried out at 1:10 dilutions.

*Q' Fever* - Results of the goat serology gave positive reactions to certain diseases of zoonotic importance. There was a 8% apparent prevalence of Q' Fever but the significance of this positive test results are uncertain. This is due to the sensitivity and specificity of the test used. There is a plan to consult with NVSL and carry out further sampling to determine the importance of Q' Fever on Guam.

*Toxoplasmosis* - Serology also indicated the presence of *Toxoplasma gondii*. However, the clinical disease has not been observed in either human or animal populations.

*Brucellosis* - One clinically toxic goat had a marginally positive titer of 1:25 for brucellosis. This titer is attributed to high background antibody levels and is not considered a true positive.

## **B. CATTLE**

Overall the health of the cattle population on Guam is good with no reports of OIE list A diseases. Poor nutrition and parasitism are the major conditions of importance. Nematodes are one of the most important endoparasites listed in Table III. *Boophilus* ticks and mange are the most prevalent ectoparasites. The range of clinical conditions diagnosed on Guam is provided in Table III.

### Table III. Clinical Observations for Cattle

---

#### MISCELLANEOUS

- abomasal impaction
- agalactia
- bloat
- dystocia
- mastitis
- fibro-papillomatosis (warts)
- Dermatophilosis

#### ENDOPARASITES

- Nematodes
  - Ascaris spp.*
  - Strongyloides spp.*
  - Cooperia spp.*
  - Oesophagostomum spp.*
  - Bunostomum spp.*
- Trematodes
  - Fasciola hepatica*
- Protozoa
  - Trichomonas spp.*
  - Giardia spp.*

#### ECTOPARASITES

- *Boophilus microplus*

Serology was carried out for the diseases listed in Table IV.

**Table IV. Disease Serology Results for Cattle**

Diseases	No. of Samples		Apparent Prevalence
	Tested	Positive	%
Bluetongue 17	60	5	8
Leptospirosis	34	0	0
Q' Fever	71	1	1
Anaplasmosis	60	13	21
<i>Babesia bovis</i>	60	1	1
<i>Babesia bigemina</i>	60	2	3
Brucellosis	60	0	0
Bovine leukosis	34	4	4
Infectious Bovine Rhinotracheitis	71	2	2
Tuberculosis	53	0	0
Paratuberculosis	60	0	0

Remarks: The results from the serological survey further demonstrate the freedom of the cattle population from important infectious diseases.

*Bluetongue* - Bluetongue has not been detected on Guam. All specimens tested negative for serotypes 2, 10, 11 and 13. Advice from NVSL suggests the positive test results for BT 17 may be due to cross reaction. In addition, considering the low cattle numbers on Guam, it would be surprising if Bluetongue Virus (BTV) is able to survive in the present population.

*Leptospirosis* - A US Navy medical officer reported leptospirosis in three enlisted personnel who had been swimming in a jungle pool. Because the personnel had recently arrived on Guam from the Philippines, the actual source of the infection is not known. Leptospirosis has been diagnosed in dogs.

*Q' Fever* - The authors are not certain if the one positive test result for Q' Fever is a true or false positive. As reported in the discussion on the goat results, further work need to be carried out on Q' Fever on Guam.

*Anaplasmosis* - Tick vectors for anaplasmosis and babesiosis (*Boophilus sp.* and *Rhipicephalus sp.*) are present on Guam. Clinical anaplasmosis has not been reported on Guam, however, positive titers demonstrate the presence of the organism.

*Babesiosis* - The specificity of *Babesia bovis* and *Babesia bigemina* serology is not well established, therefore, these results should be regarded as inconclusive. Further testing is required to determine if these organisms are present. Test results may indicate low incidence of disease. Further testing would be helpful in association with clinical evaluation of suspected cases.

*Infectious Bovine Rhinotracheitis (IBR)* - If IBR were actively present, it would be expected that 75% of cattle would be positive. Our data indicates that the active disease is dying out.

### **C. SWINE**

The health of the swine population on Guam, both domestic and feral, is very good. Clinically a wide range of conditions have been diagnosed but there is no single condition which is of overriding concern and disease outbreaks are sporadic and generally involve a small number of animals.

Clinical observations are provided in Table V.

**Table V. Clinical Observations for Swine**

---

#### NEONATAL

- baby pig anemia
- umbilical hernia
- atresia ani
- microphthalmia
- splay leg
- cleft palate/lip
- neonatal diarrhea
- post weaning diarrhea
- navel infection

#### SKIN

- exudative epidermitis
- greasy pig disease
- photosensitization
- aural hematoma
- contact dermatitis
- coral abscess dermatitis
- baby pig knee necrosis

#### DIGESTIVE SYSTEM

- colibacillosis
- *E. coli* (edema disease)
- swine dysentery ( bloody scours) *Treponema spp.*
- proliferative enteritis

- porcine intestinal adenomatosis
- *Campylobacter spp.*
- rectal prolapse

#### RESPIRATORY SYSTEM

- Actinobacillus
- pleuropneumonia
- *Pasteurella multocida* pneumonia
- Glasser's Disease
- *Haemophilus parasuis*
- atrophic rhinitis - *Bordatella spp.*
- swine influenza

#### MUSCULOSKELETAL SYSTEM

- Glasser's Disease
- *Haemophilus parasuis*
- Mycoplasma arthritis and polyserositis
- neonatal septic polyarthritis
- apophysiolysis
- epiphysiolysis
- degenerative joint disease
- leg injuries
- radial paralysis
- cellulitis

#### REPRODUCTIVE SYSTEM

- postparturient dysgalactia (MMA)
- dystocia
- prolapsed uterus/vagina
- abortion
- orchitis
- penile injuries and hematoma
- Porcine Parvovirus - mummified fetus
- infertility

#### INTERNAL PARASITES

- *Eimeria sp.* (coccidiosis)
- *Stephanurus dentatus*
- *Oesophagostomum spp.*
- *Trichuris suis*
- *Metastrongylus spp.*
- *Ascaris spp.*

#### ECTO PARASITES

- *Sarcoptes scabiei*

## MISCELLANEOUS

- tetanus
- salt poisoning
- uveitis
- conjunctivitis
- suspected leptospirosis
- suspect swine pox

---

Serology was carried out for the diseases listed in Table VI. Results of serological testing added further evidence to the assertion that Guam's high population has an excellent health status.

**Table VI. Disease Serology Results for Swine**

Diseases	No. of Samples		Apparent Prevalence
	Tested	Positive	%
Pseudorabies	65	0	0
Brucellosis	66	0	0
Trichinellosis	53	0	0
Enzootic pneumonia	70	0	0
Swine Influenza	61	0	0
Transmissible Gastroenteritis	27	0	0
Parvovirus	14	7	50
Leptospirosis	52	0	0
Porcine Reproductive Respiratory Syndrome	16	0	0

One sow exceeded the "cut-off" titer, but was excluded because the positive result is most likely attributable to high globulin levels as the sow was sick at the time.

## D. POULTRY

The health of the poultry population on Guam, both domestic and feral, is good. None of the major poultry diseases including Newcastle disease and avian influenza have been detected on Guam. While endemic conditions have been diagnosed, the incidence of clinical signs is low. The range of clinical conditions is listed in Table VII.

**Table VII: Clinical Observations for Poultry**

---

MISCELLANEOUS

- necrotic dermatitis with secondary mycosis
- bumble foot
- fowl pox
- ulcerative enteritis
- aflatoxicosis in feed and liver lesions
- lymphoid leukosis
- conjunctivitis
- trauma

ENDOPARASITES

- *Eimeria spp.*
- *Capillaria spp.*
- *Ascaridia spp.*
- *Heterakis spp.*

ECTOPARASITES

- lice
  - mites
- 

Serology was carried out for the diseases listed in Table VIII.



**Table VIII. Disease Serology Results for Poultry**

Serology failed to demonstrate the presence of Newcastle Disease and Highly Pathogenic Avian influenza from the poultry population. Guam may be considered free from Newcastle Disease and Highly

Diseases	No. of Samples		Apparent Prevalence
	Tested	Positive	%
Infectious bronchitis 41	60	32	52
Infectious bronchitis 46	60	33	55
Infectious bronchitis JMK	43	17	39
Infectious laryngotracheitis	61	32	52
Infectious Bursal Disease	69	51	73
Marek's Disease	68	30	44
<i>Mycoplasma gallisepticum</i>	60	28	46
<i>Mycoplasma synoviae</i>	60	39	65
Eggdrop Syndrome	10	3	33
Newcastle Disease	62	0	0
Avian Influenza	92	0	0
Avian encephalomyelitis	68	68	91
<i>Mycobacterium sp.</i>	21	6	28

Pathogenic Avian influenza.

The importation of show birds, commercial laying stock and game birds from the US mainland is very common. This may account for the endemic status of infectious bronchitis, infectious laryngo-tracheitis, infectious bursal disease, Marek's disease, mycoplasmosis and avian encephalomyelitis.

Ducks were tested for Egg Drop Syndrome. Titers may not be significant and no clinical signs were observed such as abnormal egg shell development.

Twenty fecal samples were pooled from backyard chickens, caged fighting roosters, wild sparrows and caged outdoor pet parrots. After testing, 3 of the 6 samples were identified positively as *M. avium* and *M. fortuitum*.

The TB tests was conducted on birds as part of the endangered species program on Guam.

## **E. HORSES**

Generally the health of the horse population on Guam is good with clinical disease rarely reported. Negligence and poor husbandry among owners of single horses is the chief problem.

The range of clinical conditions is provided in Table IX.

**Table IX. Clinical Observations for Horses**

---

### MISCELLANEOUS

- colic/sand colic
  - mastitis
  - conjunctivitis
  - founder
  - foot lesions
  - poor nutrition
  - neglect
  - trauma
- 

Serology was carried out for the diseases listed in Table X.

**Table X. Disease Serology Results for Horses**

<b>Diseases</b>	<b>No. of Samples</b>		<b>Apparent Prevalence</b>
	Tested	Positive	%
Equine viral arteritis	53	0	0
Equine Influenza A1	53	29	54
Equine Influenza A2	53	7	13
Equine Influenza A2 KY	53	4	7
Equine Herpes Virus	53	36	67
Japanese Encephalitis	32	0	0
Equine Infectious Anemia	68	0	0
Japanese 'B' Encephalitis	32	0	0
Equine Infectious Anemia	68	0	0

The positive titers for equine influenza were from horses kept on two different ranches at the extreme north and south ends of the island. Neither of the ranches has history of vaccination. There may have been an outbreak 10 years ago, in which case these could be residual titers. No cases of clinical disease have been reported in the last 10 years.

The positive titers cannot be attributed to vaccination. However, no clinical illness has been reported. Equine herpes virus maybe present in mild form. The results include six horses imported to Guam from Saipan and Tinian.

Horses were tested for equine encephalitis. However, as horses on Guam have been vaccinated with tri-valent equine encephalomyelitis vaccine, titers are not reported in this publication.

## F: CARABAO

A small number of carabao were sampled and with the exception of anaplasmosis, all tests proved negative. Given the situation in cattle it is possible the single positive for anaplasmosis is a true positive.

**Table XI. Disease Serology Results for Carabao**

Diseases	No. of Samples		Apparent Prevalence
	Tested	Positive	%
<i>Babesia bigemina</i>	6	0	0
<i>Babesia bovis</i>	6	0	0
Anaplasmosis	7	1	14
Bluetongue	3	0	0
Brucellosis	6	0	0
Tuberculosis	3	0	0
Q' Fever	3	0	0
Infectious Bovine Rhinotracheitis	3	0	0

Due to the small number of animals tested no definite conclusions can be drawn from the carabao serology. These results are seen only as a starting point and future testing in larger numbers would be helpful.

## RECOMMENDATIONS AND SUGGESTIONS

As stated in the abstract and the introduction, the animal health survey for Guam was not intended to be definitive. Rather, the survey should be recognized as a preliminary assessment and groundwork for future investigations. With this thought in mind the following recommendations are made.

Because the survey is to be recognized as on-going, a surveillance program must be established. The goal of the program will be to provide an early warning system for the detection of animal diseases of significance to Guam. This warning system will be based on clinical observations and laboratory investigations. The presence of disease is most often brought to the attention of veterinarians by pet and livestock owners. Thus, efforts to create greater public awareness of potential problems should be encouraged. Education, of course is the key.

A similar program of public awareness through education should be encouraged in regards to zoonotic diseases. Reports from the Guam Department of Health and the frequency of disease transmission from animal to people presently does not appear to be out of the ordinary. However, again as stated in the introduction, if current trends continue, it is expected that the public will be increasingly at risk to exposure. Thus, a basic understanding of how disease agents may be transmitted to the human population is important. Areas of particular concern include food borne disease agents such as Campylobacteriosis, Salmonellosis, *E. coli* and Trichinellosis; parasitic diseases such as visceral larva migrans, filariasis and giardiasis, and diseases which may be transmitted through poor hygiene or husbandry practices such as toxoplasmosis, leptospirosis, Q' Fever and brucellosis.

Public awareness of diseases that are significant from the perspective of economics and/or public health may be enhanced by Guam's participation in the paraveterinary training program. This program should be helpful in providing the region with qualified veterinary technicians.

An additional benefit to be derived from participation in the paraveterinary program will involve animal welfare. At least one module of the program will be devoted to improving the conditions under which animals, both livestock and pets, are kept. This in turn could decrease some of the environmental factors associated with disease.

Specific issues worth mentioning for future study should include the following:

1. Determination of the presence of leptospirosis in the animal population on Guam, given the island's snake and rat populations and the equilibrium that appears to exist between them.
2. Confirmation or disconfirmation of the presence of Q' Fever.
3. Certification by the Angus Program that Guam is free of particular diseases.
4. Identification of animal parasites in the contexts of public health and disease vectors; e.g., the presence of rat lungworm, *Angiostrongylus cantonensis*.
5. Investigation into the health status of wildlife; for example, avian tuberculosis and avian malaria, Cervid (deer) bluetongue, Epizootic hemorrhagic disease and anaplasmosis.
6. Creation of a fish disease surveillance program.

## List of Abbreviations used in this publication

1.	AGID	-	Agar Gel Immunodiffusion
2.	APHIS	-	Animal and Plant Health Inspection Service
3.	CF	-	Compliment Fixation
4.	CNMI	-	Commonwealth of the Northern Mariana Islands
5.	ELISA	-	Enzyme Linked Immunosorbent Assay
6.	FSM	-	Federated States of Micronesia
7.	HI	-	Hemagglutination Inhibition
8.	IFA	-	Indirect Immunofluorescent Assay
9.	LAT	-	Latex Agglutination
10.	MAT	-	Microscopic Agglutination Test
11.	Micro-Agg	-	Micro-Agglutination
12.	NT	-	Neutralization test
13.	NVSL	-	National Veterinary Services Laboratory
14.	OIE	-	Office International Epizootics
15.	USDA	-	United States Department of Agriculture
16.	VN	-	Virus Neutralization

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### Procedures for Sending Specimens for Testing to the National Veterinary Services Laboratory (NVSL)

#### Recommended Laboratory for Analysis

*(Use this address when sending samples via US Postal Service - Express Mail)*

National Veterinary Services Laboratories  
P.O. Box 844  
Ames, IA 50010

Phone: (515) 663-7266

Fax: (515) 663-7402

Email: [HELPLINE@aphis.usda.gov](mailto:HELPLINE@aphis.usda.gov)

Website: [www.aphis.usda.gov/vs/nvsl/userfee.htm](http://www.aphis.usda.gov/vs/nvsl/userfee.htm)

*(Use this address when sending samples via United Parcel Service-UPS, DHL, Federal Express)*

National Veterinary Services Laboratories  
1800 Dayton Ave.  
Ames, IA 50010

#### Procedures for Serum Samples Testing/Analysis

1. To establish a User Fee Account or for inquiries regarding charges on your statement, please contact the USDA/APHIS Business Services Office in Minneapolis, Minnesota (612) 370-2291. When the account is established, an account number will be assigned and services billed to that account. NVSL will send you an invoice to process payment.
2. If an account is not established, payment for services must be made in advance in the form of check, money order or bank draft in US dollars payable to USDA. VISA or MasterCard are also

acceptable. Include the credit card number and expiration date on the submission form.

### **How to Ship**

1. Packaging/shipping kits (shipping boxes, labels, ice packs) and required VS Form 10-4 are available from NVSL upon request, free of charge.
2. Freeze the ice packs to prepare for shipment.
3. Fill out required form VS Form 10-4 and specimen labels in detail. All specimens must be labeled and identified properly.
4. Samples from different specie or origin (swine, poultry, serum, etc.) must be packed separately in unbreakable sample containers, include ID label, then put into zip lock bags. Seal the samples tightly, then tie or tape bags with rubber bands to ensure that the samples do not break, “burst out” or get mixed up during transit.
5. Pack samples tightly in shipping/insulated box container with frozen ice packs to ensure samples cannot move during transit. Use paper towels or packing material for extra padding. Include a copy of the VS Form 10-4 in the box for specimen information.
6. It is all right to pack samples from different specie in one shipping box. When samples are received at NVSL, each sample will be directed to the lab handling the specimen. If you have various samples that need to be forwarded to other laboratories within Iowa State such as Iowa State Laboratory, you must include a letter to the laboratory manager with information that some samples need to be forwarded to another lab for other tests. Do not include samples that need to be sent outside of Ames, Iowa. It is recommended that you handle this separately.
7. If you intend to use the US Postal Service, use the required address above. Bring the package to the US Post Office and send it via Express Mail. US Postal Service does not accept purchase orders. (For approved ADAP Projects, please pay for the postage up front then request reimbursement from the ADAP Office in your institution).
8. If you use DHL, Federal Express or UPS, use the address stated above (these vendors do not use PO box addresses). If your institution has an account with these vendors, you will be billed for the service. (For approved ADAP Projects, forward the bill to the ADAP office in your institution for processing of payment).
9. Mail specimens on Monday or Tuesday to ensure it arrives at NVSL by Wednesday or Thursday at NVSL. Avoid mailings on Friday for delays in transit over the weekend.
10. NVSL will send a card to sender to acknowledge receipt of shipment.
11. Laboratory results will be mailed to you 2-3 weeks after NVSL receives the specimen.
12. An invoice will be mailed by NVSL, however, wait for National Finance Center (NFC) statement and process payment to NFC. For inquiries regarding the charges on your statement, please contact 1-800-242-3632.

## **General considerations from NVSL**

(Reference: USDA-APHIS-NVSL web page <[www.aphis.usda.gov/vs/nvsl/userfee.htm](http://www.aphis.usda.gov/vs/nvsl/userfee.htm)>)

1. For serological testing, submit one tube containing 2 ml of clear serum per animal for each test required.
2. Pack fresh and formalin-fixed specimens separately. Ship in separate containers when possible.
3. Prelabel specimen containers to insure all recommended specimens will be collected.
4. Fresh specimens:
  - a. Double bag all tissues; refrigerate with ice packs if samples will reach the laboratory within 24 hours.
  - b. Tubes should be sent in shipping boxes with each tube labeled and arranged in numerical order starting with 1, 2, 3...N. Do not use animal identification numbers only on tubes.
  - c. If tissues or swabs are to be in transit more than 48 hours, use dry ice unless agents should not be frozen. When using dry ice, all containers must be tightly sealed; CO<sub>2</sub> gas can inactivate some viruses and prohibit isolation. Do not freeze or use dry ice in boxes that contain formalinized tissues.
5. Formalin-fixed specimens may be placed in plastic bag with formalin-soaked cotton after they have remained in the 10:1 volume of formalin for at least three hours, or they may be shipped in 10:1 (liquid to tissue) formalin.
6. "Biological materials" include all specimens or reagents sent to FADDL at Greenport NY, or the DBL, DVL, and PL at Ames.
7. "Specimens" include, but are not restricted to: blood, serum, tissues, organs, animals or animal parts, tissues cultures, and viruses or other microorganisms (either infectious or inactivated).
8. An approved exterior shipping container, such as that recommended by USDA, APHIS, or the National Centers for Disease Control, must be used by all shippers.
9. Appropriate labels must be placed on the outer shipping container. This is in accordance with the International Air Transportation Association Restricted Articles Regulation, 22<sup>nd</sup> edition, effective July 1, 1979.