

**CENTRE FOR ANIMAL & VETERINARY
SCIENCES (CAVS)
SERVICE BOOKLET**



CENTRE FOR ANIMAL & VETERINARY SCIENCES
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Instruction for sample submission**A. SPECIMENS FOR BACTERIOLOGY AND OTHER EXAMINATIONS**

Note:

- i. All specimens for bacteriological culture should be collected **PRIOR TO ANTIBIOTIC TREATMENT** (unless monitoring treatment efficacy).
- ii. Collect the specimens aseptically (wear gloves), place them securely in sterile leak-proof containers and transport chilled to the APHC in a secondary container / bag on the day of collection. If there is a delay of delivery of specimens to the APHC for more than 24 hours, store at 2 to 8°C (temperature of a normal domestic refrigerator), unless otherwise stated below. **DO NOT FREEZE.**
- iii. **Submit a specimen for each test requested for**, e.g. submit 2 swab samples from the same animal if both general aerobic culture and *Salmonella* culture are requested for.
 - iv. A specimen may be rejected if improperly collected, packed, transported, labelled or deemed unsuitable for testing at the discretion of the APHC.
 - v. Specimens submitted will be considered the property of the APHC.
- vi.

1. Serum / Blood / Other body fluids

Specimens should be submitted in unbreakable sterile, leak-proof screw cap containers with external thread. The specimens should be clearly labelled and identified. These specimens should match records on the Sample Submission Form. Send the specimens to the APHC chilled (taking care to avoid freezing and leakage of melted ice into specimens) in an insulated container or with a cold pack.

- a. Serum can be stored at 2°C to 8°C for up to 72 hours.
- b. Clotted blood for serology: Tube should not be more than 2/3-full unless it contains clotting agents. Clotted blood can be transported at ambient temperatures within the same day of collection, or left at room temperature (~25°C, or temperature of an air-conditioned room) for up to 24 hours. Place the clotted blood tube tilted at an angle above a flat surface to facilitate clotting. Allow the blood to clot and release serum before placing it on ice. Avoid exposure to high temperatures and **DO NOT FREEZE**. Note: **Blood samples that are haemolysed would be rejected at the discretion of CAVS, as test results may be adversely affected.**
- c. Blood and other fluids for bacteriological culture: Specimens should be collected in sterile plain tubes and delivered to the APHC as soon as possible. Fluids other than blood may be stored at 2 to 8°C for up to 24 hours. **DO NOT FREEZE.**
- d. Whole unclotted blood: Collect in a sterile tube containing anti-coagulant such as ethylenediaminetetraacetic acid (EDTA). Heparin should be avoided as it can interfere with some molecular diagnostic assays. Send the specimens to the APHC with a cold pack. Specimens may be stored at 2° to 8°C for up to 48 hours.

2. Swabs for bacteriological culture/molecular tests

- a. Ear swab: Use a sterile swab moistened with sterile Brain Heart Infusion Broth (BHI, available from Veterinary Bacteriology and Mycology Laboratory (63165177/179) with advance notice), or sterile saline (without preservatives) to remove any debris or crust. Obtain a sample by firmly rotating a fresh moistened swab in the canal.
- b. Nasal swab: Rotate a sterile swab moistened with sterile BHI or sterile saline against the nasal mucosa.
- c. Cloacal/Rectal swab: Collect using a sterile swab moistened with sterile BHI. Ensure faecal material is present on the swab after collection.
- d. Swabs for *Chlamydophila* isolation: Rayon, Dacron or cotton swabs are recommended. **Do not use calcium alginate swabs** as it is toxic to *Chlamydophila*. Swabs with wooden shafts are not recommended because wooden shafts may contain toxic resins and formaldehydes.

Where specified in this booklet, swabs must be submitted in the appropriate transport media:

- Isolation of *Campylobacter*: *Campylobacter* transport medium.
- Isolation of *Taylorella equigenitalis*: Amies transport medium with charcoal, single swab.
- Isolation of *Shigella*: Buffered glycerol-saline transport medium or equivalent.
- Isolation of *Chlamydophila* spp: *Chlamydophila* transport media.

The above transport media are available (by self-collection) from the APHC. Please contact the Veterinary Bacteriology and Mycology Laboratory (63165177/179) at least 3 working days in advance.

Note: Material sent on swabs is liable to desiccation. Where possible, a more generous amount of material should be submitted, such as biopsy material, several ml of pus, exudate or faeces. Otherwise, swabs should be collected in BHI or commercial transport medium (e.g. Stuart's or Amies).

3. Fresh tissue / organs

Each tissue / organ should be individually packed in separate sterile leak-proof containers and clearly labelled with type and origin of tissue. These should match records on the submission form. Fresh tissues should preferably be chilled. **DO NOT FREEZE.**

4. Abscesses / skin lesions for bacteriological culture

Disinfect surface with 70% ethanol. Aspirate approximately 3 ml of pus / material with a sterile syringe and fine needle. Place the sample in a sterile container. Collect from recently formed abscesses. Pus at the centre of abscess is often sterile. A sample of the base of the lesion and a sample of the abscess wall is most productive. If swabs have to be used, place in BHI or commercial transport media immediately after collection and send to the APHC within 24-48 hours after collection.

5. Animal feed samples for bacteriological culture

Submit at least 500 g of sample. Chilling during transport and storage is not required.

6. Urine for bacteriological culture

Collect mid-stream sample in a sterile container. Send to the APHC within 24-48 hours after collection.

7. Water samples for bacteriological culture

Submit at least 500 ml of water in a leak-proof sterile container (kept chilled during transport and storage).

8. Faecal samples for bacteriological culture and parasitology

Send chilled samples, as fresh as possible, in a leak-proof sterile plastic container. For *Campylobacter* and *Shigella* isolation, fresh faecal samples should be transported directly to the laboratory within 2 hours after collection. If this is not possible, the appropriate transport medium should be used. The specimens in transport media should be maintained at 2 to 8°C and be transported to the APHC on the same day of collection or latest by the following day.

- a. *Campylobacter* isolation: collect at least 5 g of FRESH specimen in 30 ml of *Campylobacter* transport medium.
- b. *Shigella* isolation: collect 10 to 20 g of FRESH specimen in 30 ml of buffered glycerol-saline transport medium or equivalent.

9. Samples for anaerobic bacteriological culture

Specimens for anaerobic bacteriological culture should be transported to APHC within two hours after collection. If this is not possible, the samples should be collected in an anaerobic specimen collection container, and submitted to APHC within 72 hours after collection. Store and transport all specimens at room temperature, avoiding extremes of heat and cold. **DO NOT REFRIGERATE.**

Note: Collect and submit another sample according to the instructions above if routine aerobic bacteriological culture is also required.

10. Tissues for histopathology

Specimens should be sent in leak-proof, formalin-resistant plastic, appropriately sized container(s), in a 10% neutral-buffered formalin solution (tissue to formalin ratio of 1:10). Label the container(s) with the following:

- i. identity and number of organs / tissues;
- ii. animal species and animal identity;
- iii. name of submitter i.e. owner, veterinarian or clinic.

11. Animal carcasses for post-mortem examination

Store the carcass at 2°C to 8°C, package it securely in two layers of strong plastic bags, label the outer bag with the identification of the animal and name of submitter, i.e. owner, veterinarian or clinic, and submit the carcass to the APHC as soon as possible. **DO NOT freeze** the carcass. During after-office hours, on weekends and public holidays, the carcass can be handed over to security personnel who will place the carcass in a cold storage facility.

(Arrangements to save the remains of carcasses for private cremation can be made if indicated at time of submission. Please contact the Veterinary Pathology Laboratory (63165140/172) for more information).

- a. Aquatic animals (live): Send live fish packed in leak-proof bags filled with 2/3 air and 1/3 water. Avoid temperatures above 25°C during transport. Avoid sending recently fed fish, as vomiting and water fouling may occur during transport. Very sick fish are best transported as freshly dead chilled specimens (see 10b), as dissolved oxygen often drops during transport, especially in seawater.
- b. Aquatic animals (dead): Only freshly dead specimens can be accepted, as putrefaction continues in cold-blooded animals even at chilled temperatures. Samples should be kept at 2° to 8°C, packed in leak-proof bags, and submitted preferably within 24 hours. Cold packs are recommended, although ice packed separately in leak-proof bags are acceptable during transport. **DO NOT freeze**.
- c. Other live animals: Aside from live fish, APHC does **not** accept live animals.

Please note that:

- A specimen may be rejected if improperly collected, packed, transported, labelled or deemed unsuitable for testing at the discretion of the APHC.
- All specimens submitted for testing shall be considered the sole property of APHC. Once submission of samples to APHC has been made, no parts of the processed test material or remnant test material, except animal carcass remains that are sent for post mortem examination*, will be returned to the submitter or legal owner or authorized representative of the animal(s) that were sampled. This test material will be disposed upon test completion at the sole discretion of APHC. (*The return of animal carcasses sent for post mortem examination will be subject to NParks regulations on animal health. Please refer to the "Post Mortem Examination Consent Form" for additional info.)
- Unless otherwise requested for in writing, all containers, effects accompanying the animal carcass and packaging material used in sample submissions will be considered the property of the APHC and be disposed as deemed fit.

B. SAMPLES FOR VIROLOGY:

The ability to grow a cultivable virus present in a clinical specimen depends on maintaining the infectivity of the virus from the time the specimen is obtained until it arrives at the APHC for culture. Collecting the correct specimen by an appropriate method at the proper time during infection significantly enhances virus isolation frequency and improves the clinical relevance of the laboratory results.

General guidelines for specimen collection are listed below. Individual specimen collection procedures that differ from those listed below are indicated under the specific tests below.

General considerations

1. **Viral transport media:** Most viral specimens need to be transported in a medium to maintain viral activity. The need for transport medium and the appropriate type of medium to use are indicated under the specific tests offered below. We provide 2 types of transport media for self-collection:
 - a. ND/AI transport media for the isolation of avian viruses and Equine Influenza Virus.
 - b. Viral transport media for isolation of other viruses.

Media is available from the Veterinary Virology Laboratory (63165187/189) with at least 1 day notice.

2. **Collection and transport temperature:** Specimens should be collected as early as possible after symptoms appear and transported to the APHC as quickly as possible. This increases the chance of viral recovery because viruses are generally of the highest titre at this time.

When delays of more than 1 hour are anticipated in transporting specimens to the APHC, specimens should be maintained at 2° to 8°C. Temperatures in excess of room temperature (>25°C) or unintentional freezing can render a virus non-viable. Therefore, when a courier or other transport services are used, specimens must be protected from extremes of temperature possible in delivery vehicles or even in the open air. Insulated containers with ice or cold packs are adequate for this purpose.

Prolonged delays (>24 hours) may significantly compromise the ability to isolate certain labile enveloped viruses. It is therefore important that specimens are frozen at -70°C and below. DO NOT FREEZE at -20°C, in a frost-free freezer (of any temperature) or in the freezer compartment of a domestic refrigerator. Doing so can seriously compromise the recovery of some viruses.

3. **Type of swabs for specimen collection:** Use dacron, nylon or rayon swabs with plastic shafts. Do not use cotton or calcium alginate swabs or swabs with wooden shafts as these can contain inhibitors which interfere with our tests. Flocked nylon swabs with plastic shafts are preferred.
 - a. **Cloacal swab:** Insert a dry sterile swab to the cloaca. Rotate the swab and carefully withdraw it. Faecal material should be present on the swab. Place the swab in the appropriate transport medium and cut the shaft so that the swab fits into the vial. For pooled samples, up to 5 swabs can be placed in the same vial. Send the specimen to the APHC on wet ice in an insulated container. Specimens may be stored at 2°C to 8°C for up to 48 hours. If longer delays are anticipated, store at -70°C or below.
 - b. **Nasal & nasopharyngeal swab:** Hold the swab in place for 15 to 30 seconds, then rotate it 3 times. Place the swab in the appropriate transport medium and cut the shaft so that the swab fits into the vial. Send the specimen to the APHC on wet ice in an insulated container. Specimens may be stored for up to 48 hours at 2° to 8°C. If longer delays are anticipated, store at -70°C or below.
 - c. **Conjunctiva swab:** Moisten a sterile fine swab with sterile saline. Carefully swab the lower conjunctiva to collect both cells and fluids. If both eyes are to be cultured, a separate swab should be used for the other eye. Place both swabs in the same vial containing the appropriate transport medium and send to the APHC on wet ice in an insulated container. Specimens may be stored at 2° to 8°C for up to 48 hours. If longer delays are anticipated, store at -70°C or below.
 - d. **Throat / tracheal swab:** Moisten a sterile swab with sterile saline. A moistened swab will have more cells adhered to it than a dry swab. Vigorously rub the swab across the tonsils and posterior pharynx. Place the swab in the appropriate transport medium and cut the shaft so that the swab fits into the vial. For pooled samples, up to 5 swabs can be placed in the same vial. Send specimen to the APHC on wet ice in an insulated container. Specimens may be stored for up to 48 hours at 2° to 8°C. If longer delays are anticipated, store at -70°C or below.
 - e. **Faecal material:** Collect 2 to 10 g of faeces in a clean container with a tight-fitting lid. Do not use preservatives. For faecal swab, roll a sterile swab thoroughly over freshly-voided faecal

material, ensuring that the faecal material sticks to the swab. For caged birds, ensure the sample is representative of all birds in the cage by sampling from various areas of the cage. Place into transport medium. Specimens should be refrigerated to retard bacterial growth and sent to the APHC under chilled condition as soon as possible after collection.

- f. Tissues: Collect tissues aseptically, taking care to prevent cross-contamination when specimens are taken from multiple sites. Necropsy specimens should be collected within 24 hours from the time of death. Tissue specimens should be placed in a sterile container and covered with an adequate amount of viral transport medium to ensure that the specimen does not dry out during transport. (If transport medium is not available at the time the specimen is collected, sterile normal saline can be used). Send specimens to the APHC on wet ice or with a cold pack. Specimens may be stored for up to 24 hours at 2° to 8°C. If longer delays are anticipated, store at -70°C or below.
 - g. Whole unclotted blood: Collect in a sterile tube containing anti-coagulant such as ethylenediaminetetraacetic acid (EDTA) or acid citrate dextrose (ACD). Heparin should be avoided as it can interfere with some molecular diagnostic assays. Send the specimens to the APHC on wet ice or with a cold pack. Specimens may be stored for up to 24 hours at 2° to 8°C. If longer delays are anticipated, store at -70°C or below.
 - h. Serum: For clotted blood for serology, tube should not be more than 2/3-full unless it contains clotting agents. Clotted blood can be transported at ambient temperatures within the same day of collection or left at room temperature (approximately 25°C, or temperature of an air-conditioned room) for up to 24 hours. Place clotted blood tube at an angle above a flat surface to facilitate clotting. Allow blood to clot and release serum before placing it on ice. Avoid exposure to high temperatures and DO NOT FREEZE. **Please note that blood samples that are lysed may be rejected at the discretion of the APHC, as test results may be adversely affected by such condition of the samples.** Serum can be stored at 2°C to 8°C for up to 72 hours.
 - i. Cerebrospinal fluids, pericardial fluids, urine and other body fluids: Collect in a leak-proof sterile container. For urine, collect a freshly voided sample. Send the specimens to the APHC on wet ice in an insulated container. Specimens may be stored for up to 24 hours at 2° to 8°C.
 - j. Other specimens: Please contact the Veterinary Virology Laboratory (63165187/189).
4. A specimen may be rejected if improperly collected, packed, transported, labelled or deemed unsuitable for testing at the discretion of the APHC.
 5. Specimens submitted will be considered the property of the APHC.

POST-MORTEM EXAMINATION

The post-mortem examination includes gross and microscopic analyses and may include additional laboratory tests as deemed appropriate by the laboratory veterinarian. Extra tests **specifically requested for by the customer** will incur an additional charge.

Please note that when carcasses are submitted as a batch, post-mortem findings will be reported on the batch as a whole and not on individual animals.

Table 1. Post-mortem examination

	Animals	Sample	Remarks	Turn-around time	Laboratory fee (inclusive of GST)
	Fish or other aquatic animals (AA) <500 g body weight	Live or freshly dead specimens		10 days – 5 weeks	\$126.00 per batch
	Fish or other aquatic animals(0.5 kg to 10 kg body weight)	Freshly dead specimens		"	\$220.50 per batch
	Fish or other aquatic animals(>10 kg to 50 kg body weight)	Freshly dead specimens		"	\$220.50 per animal
	Large aquatic animals (>50 kg bodyweight)	Freshly dead specimens		"	\$294.00 per animal
	Companion animals			10 days – 5 weeks	\$112.35 per animal
 	Avian and laboratory animals			"	\$119.70 per batch of 10 animals or part thereof

HISTOPATHOLOGY and PARASITOLOGY

Table 2. Diagnostic tests on histopathology and parasitology

	Test	Sample	Remarks	Turn-around time	Laboratory fee (inclusive of GST)
	Histopathology	Formalinized tissue samples		10 days	\$36.75 per organ
	Parasitology - haemoparasites (microscopy) - endoparasites (faecal flotation)	Blood or faecal sample		"	\$32.60 per test \$32.60 per test
	Parasitology (Fish)	Live fish preferable		2 days	\$32.60 per batch
	Special stains (histopathology)	Tissue paraffin block		"	\$23.10 per tissue block

MYCOLOGY

Table 3. Diagnostic tests on mycology

	Test	Sample	Remarks	Turn-around time	Laboratory fee (inclusive of GST)
	Routine culture (Note: This test only provides an indication of the presence / absence of fungi only – identification is not carried out)	Various		10 - 21 days	\$30.45 per test
	Specialised culture - please contact the Veterinary Bacteriology Laboratory (63165177/179) regarding fungi of interest prior to sample submission	Various		14 - 28 days	\$54.60 per test

AQUATIC ANIMALS

Fish / shellfish professional consultations covering advice on farm health management, and disease prevention and investigations are available. For more information, please contact the Veterinary Comparative Pathology Laboratory (63165172/63165140).

Table 4. Diagnostic tests for aquatic animals

	Service/test	Sample	Remarks	Turn-around time	Laboratory fee (inclusive of GST)
➔	Cell culture isolation of Viral Hemorrhagic Septicemia Virus (VHSV)	Live or freshly dead fish	Minimum of 5 specimens or 0.02g of tissue should be submitted	21 days	\$73.50 per pool of samples
	Cell culture isolation using Epithelioma Papulosum Cyprini (EPC), BF2, GF, SB and SKF9 cell lines	Live or freshly dead fish	Minimum of 5 specimens or 0.02g of tissue should be submitted	3 - 8 weeks	\$73.50 per pool of samples
➔	Routine bacteriological culture - general aerobic culture	Live or freshly dead fish	Please specify at time of submission if antibiotics sensitivity test is required+	3 - 7 days	\$30.45 per test
➔	Specialised bacteriological culture - please specify bacteria of interest upon sample submission	Live or freshly dead fish [^] or Organs from freshly dead fish	Please specify at time of submission if antibiotics sensitivity test is required+	3 - 10 days*	\$54.60 per test

[^] A post-mortem sampling charge will be incurred if the whole animal is submitted for testing.

+ Test will not be done if request is not indicated at time of submission

* Note that the culture of fastidious bacteria such as mycobacteria may take 8 weeks or more.

LIVE specimens should be packed in leak-proof bag filled with 2/3 air and 1/3 water.

DEAD specimens should be transported as freshly dead specimens at 2 to 8°C in leak-proof bags. **DO NOT FREEZE.**

DEAD specimens should be transported as freshly dead specimens at 2 to 8°C in leak-proof bags. **DO NOT FREEZE.**

Table 4. Diagnostic tests for aquatic animals (continued)

Service/test	Sample	Remarks	Turn-around time	Laboratory fee (inclusive of GST)
Parasitology (Fish)	Live fish preferable		2 days	\$32.60 per batch
Histopathology	Formalinised tissue samples		10 days	\$36.75 per wax block used
Molecular examination of bacteria affecting fish, including <i>Yersinia ruckeri</i> and <i>Streptococcus agalactiae</i>	Live or freshly dead fish	DNA detection	3 - 10 days	\$262.50 per batch of 5 pools or part thereof; \$31.50 for each subsequent pool
Molecular examination of viruses affecting fish, including Koi Herpesvirus (KHV), Infectious Spleen and Kidney Necrosis Virus (ISKNV) / Red Sea Bream Iridovirus (RSIV), Viral Nervous Necrosis Virus (VNNV), Molluscum Contagiosum Virus (MCV), Epizootic Haematopoietic Necrosis Virus (EHNV), Goldfish Haematopoeitic Necrosis Virus (GFHNV), Infectious Hematopoietic Necrosis Virus (IHNV), Infectious Pancreatic Necrosis Virus (IPNV), Ranavirus, Singapore grouper iridovirus (SGIV), Spring Viraemia of Carp Virus (SVCV), and Viral Hemorrhagic Septicemia Virus (VHSV)	Live or freshly dead fish	DNA/RNA detection of each virus	3 - 10 days	\$262.50 per batch of 5 pools or part thereof; \$31.50 for each subsequent pool

LIVE specimens should be packed in leak-proof bag filled with 2/3 air and 1/3 water.

DEAD specimens should be transported as freshly dead specimens at 2 to 8°C in leak-proof bags. **DO NOT FREEZE.**

Table 4. Diagnostic tests for aquatic animals (continued)

Service/test	Sample	Remarks	Turn-around time	Laboratory fee (inclusive of GST)
Molecular examination of viruses affecting frog, including Frog Virus 3 (FV3)	Live or freshly dead frog	DNA/RNA detection of each virus	3 - 10 days	\$262.50 per batch of 5 pools or part thereof; \$31.50 for each subsequent pool
Molecular examination of viruses affecting crustaceans, including White Spot Syndrome Virus (WSSV), Yellow-head Virus (YHV), Taura Syndrome Virus (TSV), Infectious Hypodermal and Haematopoietic Necrosis Virus (IHHNV), Infectious Myonecrosis Virus (IMNV) and Baculovirus penaei (BP)	Live or freshly dead shrimp Pleopods of broodstock	DNA/RNA detection of each virus	3 - 10 days	\$262.50 per batch of 5 pools or part thereof; \$31.50 for each subsequent pool
Molecular examination of bacteria affecting crustaceans, including <i>Candidatus Hepatobacter penaei</i> (also known as Necrotising Hepatopancreatitis Bacterium, NHPB) and Acute hepatopancreatic necrosis disease (AHPND)-causing <i>Vibrio parahaemolyticus</i>	Live or freshly dead shrimp Pleopods of broodstock	DNA/RNA detection	3 - 10 days	\$262.50 per batch of 5 pools or part thereof; \$31.50 for each subsequent pool
Molecular examination of fungi affecting fish, including <i>Aphanomyces invadans</i>	Live or freshly dead fish	DNA/RNA detection	3 - 10 days	\$262.50 per batch of 5 pools or part thereof; \$31.50 for each subsequent pool
Molecular examination of <i>Batrachochytrium dendrobatidis</i>	Amphibian skin swab	DNA detection	3 - 10 days	\$262.50 per batch of 5 pools or part thereof; \$31.50 for each subsequent pool

LIVE specimens should be packed in leak-proof bag filled with 2/3 air and 1/3 water.

DEAD specimens should be transported as freshly dead specimens at 2 to 8°C in leak-proof bags. **DO NOT FREEZE.**

AVIAN ANIMALS

Table 5. Diagnostic tests for avian animals

	PATHOGEN CULTURE	Sample	Test	Turn-around time	Laboratory fee (inclusive of GST)
	Avian Influenza (AI) virus, Newcastle Disease Virus (NDV) and other avian paramyxoviruses	Faecal, cloacal or tracheal swabs in ND/AI transport media*, max. 5 swabs per pool; or affected organs	Inoculation into SPF embryonated eggs: 2 passages	12 - 14 days	\$52.50 per test
	Avian Influenza virus (Influenza A, AI subtype H5 or H7)	Please check with the Veterinary Virology Laboratory (63165182/189)	PCR	3 - 7 days	\$262.50 per batch of 5 samples or part thereof; \$31.50 for each subsequent sample
	Infectious Bursal Disease Virus (Gumboro Disease)	Faecal or cloacal swabs in ND/AI transport media*, max. 5 swabs per pool; or affected organs	Inoculation into SPF embryonated eggs: 2 passages	10 - 21 days	\$52.50 per test
	Infectious Bronchitis Virus (IBV)	Tracheal swabs in ND/AI transport media*, max. 5 swabs per pool; or affected organs	Inoculation into SPF embryonated eggs: up to 3 passages	14 - 28 days	\$52.50 per test
	Avian Infectious Laryngotracheitis Virus	Tracheal swabs in ND/AI transport media*, max. 5 swabs per pool; or affected organs	Inoculation into CEL cell cultures: 2 passages	10 - 21 days	\$73.50 per test

CEL = Chicken Embryo Liver; PCR = Polymerase Chain Reaction; SPF = Specific Pathogen Free

Table 5. Diagnostic tests for avian animals (continued)

	PATHOGEN CULTURE	Sample	Test	Turn-around time	Laboratory fee (inclusive of GST)
🦜	Avian Reoviruses and Adenoviruses	Faecal or cloacal swabs in ND/AI transport media*, max. 5 swabs per pool; or affected organs	Inoculation into CEL cell cultures: 2 passages	"	\$73.50 per test
🦜	Fowl / Avian Pox virus	Skin, oral or tracheal lesions	Inoculation into SPF embryonated eggs: 2 passages	"	\$52.50 per test
🦜	Avian Encephalomyelitis virus	Brain	Inoculation into SPF embryonated eggs: 2 passages	"	\$52.50 per test
🦜	Other avian viruses		Please check with the Veterinary Virology Laboratory (63165182/189)		Depending on type of test
SEROLOGY					
🦜	Avian Influenza virus	1- 2 ml serum or 2 - 3 ml blood	HI (subtype H5 or H7), AGPT	3 - 7 days	\$31.50 per batch of 5 samples or part thereof; \$6.30 for each subsequent sample
🦜	Avian Paramyxovirus (Type 2)	"	HI	"	\$31.50 per batch of 5 samples or part thereof; \$6.30 for each subsequent sample
🦜	Infectious Bronchitis Virus (IBV)	"	SNT in embryonated eggs	7 - 14 days	\$132.50 per test

AGPT = Agar Gel Precipitin Test (also known as Agar Gel Immuno-diffusion [AGID]); CEL = Chicken Embryo Liver; HI = Haemagglutination Inhibition; SNT= Serum Neutralisation Test; SPF = Specific Pathogen Free

Table 5. Diagnostic tests for avian animals (continued)

	PATHOGEN CULTURE	Sample	Test	Turn-around time	Laboratory fee (inclusive of GST)
SEROLOGY					
🐦	Infectious Bursal Disease (IBD, Gumboro Disease) virus	"	SNT in tissue culture, SNT in embryonated eggs, ELISA	7 - 10 days 7 - 14 days 3 - 7 days	\$65.10 per test \$132.50 per test \$78.75 per batch of 5 samples or part thereof; \$15.75 for each subsequent sample
🐦	Infectious Laryngotracheitis (ILT) virus	"	SNT in embryonated eggs	7 - 14 days	\$132.50 per test
🐦	Marek's Disease virus	1- 2 ml serum or 2 - 3 ml blood	AGPT	3 - 10 days	\$31.50 per batch of 5 samples or part thereof; \$6.30 for each subsequent sample
🐦	Newcastle Disease virus (NDV)	"	HI	3 - 7 days	\$31.50 per batch of 5 samples or part thereof; \$6.30 for each subsequent sample
🐦	Other avian pathogens		Please check with the APHC admin (63165168)		Depending on type of test
🐦	Salmonella pullorum	"	RST	2 - 5 days	\$53.55 per batch of 10 samples or part thereof**

AGPT = Agar Gel Precipitin Test (also known as Agar Gel Immuno-diffusion [AGID]; ELISA = Enzyme-linked Immuno-sorbent Assay (also known as Enzyme Immuno-assay [EIA]); HI = Haemagglutination Inhibition; RST = Rapid Slide Test; SNT= Serum Neutralisation Test

** Test results of specimens submitted as a batch will be reported as a batch on the whole and not on individual specimens. Where results of individual animals or specimens are required, each specimen will incur a separate fee.

Table 5. Diagnostic tests for avian animals (continued)

	PATHOGEN CULTURE	Sample	Test	Turn-around time	Laboratory fee (inclusive of GST)
BACTERIOLOGY					
	<i>Salmonella</i> culture	Faecal sample, faecal / cloacal swab	Please specify in submission form if antibiotic sensitivity testing is required+	3 - 7 days	\$54.60 per test
	Routine bacteriological culture - general aerobic culture	Various	"	"	\$30.45 per test
	Specialised bacteriological culture - please specify bacteria of interest upon sample submission	Various	"	3 - 10 days***	\$54.60 per test
	<i>Chlamydophila psittaci</i> *	Faecal swabs, cloacal swabs or faecal material in <i>Chlamydophila</i> transport media*	PCR	3 - 10 days	\$262.50 per batch of 5 samples or part thereof; \$31.50 for each subsequent sample

* Please refer to the instruction for sample submission, pages 3-4.

*** Note that the culture of fastidious bacteria such as mycobacteria may take 8 weeks or more.

+ Test will not be done if request is not indicated at time of submission

CATS and DOGS

Table 6. Diagnostic tests for cats and dogs

	Pathogen / Disease / Examination	Sample	Test	Turn-around time	Laboratory fee (inclusive of GST)
	<i>Babesia canis</i> / <i>Babesia gibsoni</i> / <i>Trypanosoma evansi</i>	0.5 ml blood in EDTA (chilled)	Peripheral blood smear	1 - 3 days	\$32.60 per test
 	Canine and feline parvovirus	Faecal sample	PCR	3 - 10 days	\$262.50 per batch of 5 samples or part thereof; \$31.50 for each subsequent sample
	Canine Influenza Virus	Nasal or tracheal swab in viral transport media	PCR	3 - 10 days	\$262.50 per batch of 5 samples or part thereof; \$31.50 for each subsequent sample
	Canine heartworm (<i>Dirofilaria immitis</i>)	1 ml blood in EDTA (chilled)	i) Heartworm antigen test, ii) Knott's microfilaria test iii) Microfiltration test	3 - 7 days	\$35.70 per test
	Hookworm	Faecal sample	Faecal flotation test	1 - 3 days	\$32.60 per test
	Other parasites	Faecal sample	Faecal flotation test	"	\$32.60 per test
	<i>Babesia gibsoni</i>	0.5 ml blood in EDTA (chilled)	PCR	3-10 days	\$262.5 per 5 samples; \$31.50 per sample from 6 th sample onwards

PCR = Polymerase Chain Reaction

Table 6. Diagnostic tests for cats and dogs (continued)

	Pathogen / Disease / Examination	Sample	Test	Turn-around time	Laboratory fee (inclusive of GST)
SEROLOGY					
	<i>Babesia gibsoni</i> antibody screening at 1:40 single serum dilution only	0.5 ml serum	IFAT	3 - 7 days	\$120.75 per test
	<i>Ehrlichia canis</i> antibody screening at 1:40 single serum dilution only	"	IFAT	"	\$71.40 per test
	<i>Ehrlichia canis</i> - antibody titre	"	IFAT	"	\$88.20 per test
	<i>Brucella canis</i> antibody	2 ml serum or 4 - 5 ml blood	Tube agglutination test	3 - 7 days	\$53.55 per sample
	<i>Leptospira interrogans</i> serovar Canicola antibody	"	Microscopic agglutination test	"	\$53.55 per sample
 	<i>Toxoplasma gondii</i> antibody screening	"	IFAT	3 - 7 days	\$112.35 per sample
 	<i>Toxoplasma gondii</i> antibody end-point titration	"	IFAT	"	\$186.90 per sample
	<i>Leishmania infantum</i> and <i>Leishmania donovani</i> antibody	0.5 ml serum	ELISA	3 – 7 days	\$74.90 per test
	Nipah virus antibody (IgG)	0.5 ml serum or 1.5 ml blood	Indirect ELISA	3 - 10 days	\$78.75 per batch of 5 samples or part thereof; \$15.75 for each subsequent sample
	<i>Trypanosoma evansi</i> antibody	0.5 ml serum	Card Agglutination Test	3 – 7 days	\$53.55 per test

ELISA = Enzyme-linked Immuno-sorbent Assay (also known as Enzyme Immuno-assay [EIA]); IFAT= Indirect Immuno-fluorescent Antibody Test

Table 6. Diagnostic tests for cats and dogs (continued)

	Pathogen / Disease / Examination	Sample	Test	Turn-around time	Laboratory fee (inclusive of GST)
SEROLOGY					
	Rabies antibody ELISA (qualitative assay only) <ul style="list-style-type: none"> Please note that this is a qualitative assay to measure vaccination response to meet Singapore's import requirements and may not be acceptable for international movement to other countries. The ELISA test is also less sensitive than the Virus Neutralisation test and may result in false-negative results in a small percentage of cases. 	For animals in Singapore: 0.5 ml serum or 2 ml blood. Samples from outside Singapore: 0.5 ml serum; do not send blood.	ELISA	"	\$78.75 per test
BACTERIOLOGY					
 	Routine bacteriological culture	Various	Please specify in submission form if antibiotic sensitivity testing is required+	3 - 7 days	\$30.45 per test
 	Specialised bacteriological culture - please specify bacteria of interest upon sample submission	Various	Please specify in submission form if antibiotic sensitivity testing is required+	3 - 10 days**	\$54.60 per test
 	Molecular examination	Various	Nucleic acid detection	3 - 10 days	\$262.50 per batch of 5 samples or part thereof; \$31.50 for each subsequent sample

ELISA = Enzyme-linked Immuno-sorbent Assay (also known as Enzyme Immuno-assay [EIA])

**Note that the culture of certain fastidious bacteria such as *Leptospira* and mycobacteria may take 6 to 20 weeks.

+ Test will not be done if request is not indicated at time of submission

HORSES

Table 7. Diagnostic tests for horses

	Pathogen / Disease / Examination	Sample	Test	Turn-around time	Laboratory fee (inclusive of GST)
VIRUS ISOLATION					
	Equine Influenza virus	Nasal, tracheal or nasopharyngeal swab in viral transport media*	Inoculation into SPF embryonated eggs: 2 passages	10 – 21 days	\$52.50 per test
	Equine Influenza virus	Nasal, tracheal or nasopharyngeal swab in viral transport media*	PCR	3 - 7 days	\$262.50 per batch of 5 samples or part thereof; \$31.50 for each subsequent sample
	Equine Herpes virus type 1 (EHV-1)	Nasal swab in viral transport media*, buffy coat cells	Inoculation into cell culture: 2 passages	"	\$73.50 per test
	Equine Herpes virus type 4 (EHV-4)	Nasal swab in viral transport media*, buffy coat cells	Inoculation into cell culture: 2 passages	"	\$73.50 per test
SEROLOGY					
	Equine Influenza virus H3N8 antibody	2 ml serum or 4 - 5 ml blood	HI	5 - 10 days	\$31.50 per batch of 5 samples or part thereof; \$6.30 for each subsequent sample
	Equine Influenza virus H7N7 antibody	"	HI	"	\$31.50 per batch of 5 samples or part thereof; \$6.30 for each subsequent sample
	Equine Infectious Anaemia (EIA) virus antibody	"	AGPT (Coggin's Test)	4 - 7 days	\$31.50 per batch of 5 samples or part thereof; \$6.30 for each subsequent sample
	Equine Herpesvirus (EHV) type 1 and 4 antibody	"	SNT in cell culture	7 - 10 days	\$65.10 per test

AGPT = Agar Gel Precipitin Test (also known as Agar Gel Immuno-diffusion [AGID]); HI = Haemagglutination Inhibition; PCR = Polymerase Chain Reaction; SNT= Serum Neutralisation Test; SPF = Specific Pathogen Free

* Viral transport media: please refer to instruction for sample submission.

Table 7. Diagnostic tests for horses (continued)

	Pathogen / Disease / Examination	Sample	Test	Turn-around time	Laboratory fee (inclusive of GST)
SEROLOGY					
	Equine Viral Arthritis (EVA) virus antibody	2 ml serum or 4 - 5 ml blood	SNT in cell culture	7 - 10 days	\$65.10 per test
	<i>Theileria equi</i> antibody	"	Competitive ELISA	"	\$110.25 per batch of 5 samples or part thereof
	<i>Babesia caballi</i> antibody	"	Competitive ELISA	"	\$110.25 per batch of 5 samples or part thereof
	<i>Theileria equi</i> antibody	"	Immunofluorescent Antibody Test	"	\$71.40 per sample
	<i>Babesia caballi</i> antibody	"	Immunofluorescent Antibody Test	"	\$71.40 per sample
	<i>Trypanosoma evansi</i> antibody	"	ELISA	"	\$147.00 per 10 samples
BACTERIOLOGY					
	Routine bacteriological culture - general aerobic culture	Various	Please specify in submission form if antibiotic sensitivity testing is required ⁺	"	\$30.45 per test
	Specialised bacteriological culture - please specify bacteria of interest upon sample submission	Various	"	3 - 10 days**	\$54.60 per test
	<i>Streptococcus equi</i> subsp. <i>equi</i> (Strangles)	Nasopharyngeal swab / Nasal swab / Tracheal wash	Specialised bacterial culture	3 - 10 days	\$54.60 per test
	<i>Taylorella equigenitalis</i> (Contagious Equine Metritis)	Clitoral swabs, deep cervical swabs, swabs from penile sheath and urethra. Swabs must be placed in Amies transport medium with charcoal	Specialised bacterial culture	10 - 14 days	\$54.60 per test

ELISA = Enzyme-linked Immuno-sorbent Assay (also known as Enzyme Immuno-assay [EIA]); SNT= Serum Neutralisation Test

** Note that the culture of certain fastidious bacteria such as *Leptospira* and mycobacteria may take 6 to 20 weeks.

+ Test will not be done if request is not indicated at time of submission

Table 7. Diagnostic tests for horses (continued)

Pathogen / Disease / Examination	Sample	Test	Turn-around time	Laboratory fee (inclusive of GST)
PARASITOLOGY				
 Equine Piroplasmiasis (<i>Theileria equi</i> or <i>Babesia caballi</i>)	0.5 ml blood in EDTA	Peripheral blood film	1 - 3 days	\$32.60 per test

PIGS

Table 8. Diagnostic tests for pigs

	Pathogen / Disease / Examination	Sample	Test	Turn-around time	Laboratory fee (inclusive of GST)
VIRUS ISOLATION					
	Classical Swine Fever virus	Tonsils, lymph node	PCR	3 - 7 days	\$262.50 per batch of 5 samples or part thereof; \$31.50 for each subsequent sample
	Swine influenza virus	Nasal / tracheal swab	Inoculation into SPF embryonated eggs: 2 passages	10 – 21 days	\$52.50 per test
	Swine influenza virus (Influenza A) H1 and H3 sub-types: please check with Veterinary Virology laboratory (65163182/189)	Nasal / tracheal swab	PCR	3 - 7 days	\$262.50 per batch of 5 samples or part thereof; \$31.50 for each subsequent sample
SEROLOGY					
	Aujeszky's Disease virus antibody	2 ml serum or 4 - 5 ml blood	SNT in cell culture	7 - 10 days	\$65.10 per test
					
	Classical Swine Fever antibody	"	SF-NPLA	7 - 14 days	\$65.10 per test
	Nipah virus antibody (IgG)	"	Indirect ELISA	3 - 10 days	\$78.75 per batch of 5 samples or part thereof; \$15.75 for each subsequent sample

ELISA = Enzyme-linked Immuno-sorbent Assay (also known as Enzyme Immuno-assay [EIA]); NIF = Neutralizing Immune-Fluorescence; NPLA = Neutralisation Peroxidase-Linked Assay; PCR = Polymerase Chain Reaction; SNT= Serum Neutralisation Test; SPF = Specific Pathogen Free

Table 8. Diagnostic tests for pigs (continued)

	Pathogen / Disease / Examination	Sample	Test	Turn-around time	Laboratory fee (inclusive of GST)
SEROLOGY					
	Porcine Parvovirus antibody	"	HI	5 - 10 days	\$31.50 per batch of 5 samples or part thereof; \$6.30 for each subsequent sample
	Transmissible Gastroenteritis (TGE) / Porcine Coronavirus antibody (non-differential)	"	SNT in cell culture	7 - 10 days	\$65.10 per test
	<i>Brucella abortus</i>	"	Slide agglutination test	3 - 7 days	\$53.55 per batch of 10 samples or part thereof*
	<i>Leptospira interrogans</i> serovars Pomona, Grippityphosa and Hardjo	2 ml serum or 4 - 5 ml blood	Microscopic agglutination test	7 - 10 days	\$53.55 per test
BACTERIOLOGY					
	Routine bacteriological culture - general aerobic culture	Affected tissue / organs	Please specify in submission form if antibiotic sensitivity testing is required+	3 - 7 days	\$30.45 per test
	Specialised bacteriological culture - please specify bacteria of interest upon sample submission	"	"	3 - 10 days**	\$54.60 per test
	<i>Burkholderia pseudomallei</i> (Meliodosis)	"	Specialised bacterial culture	3 - 10 days	"
	<i>Salmonella</i>	"	"	"	"
	<i>Actinobacillus pleuropneumoniae</i> (APP)	"	"	"	"

HI = Haemagglutination Inhibition; SNT= Serum Neutralisation Test

* Test results of specimens submitted as a batch will be reported as a batch on the whole and not on individual specimens. Where results of individual animals or specimens are required, each specimen will incur a separate fee.

** Note that the culture of certain fastidious bacteria such as *Leptospira* and mycobacteria may take 6 to 20 weeks.

+ Test will not be done if request is not indicated at time of submission

BOVINE

Table 9. Diagnostic tests for cows

Pathogen / Disease / Examination	Sample	Test	Turn-around time	Laboratory fee (inclusive of GST)
DETECTION				
Bluetongue Virus	EDTA Blood, Spleen	PCR	3 – 10 days	\$262.50 per batch of 5 samples or part thereof; \$31.50 for each subsequent sample
SEROLOGY				
 <i>Brucella abortus</i>	2 ml serum or 4 - 5 ml blood	Slide agglutination test	3 - 7 days	\$53.55 per batch of 10 samples or part thereof*
 <i>Leptospira interrogans</i>	2 ml serum or 4 - 5 ml blood	Microscopic agglutination test	7 - 10 days	\$53.55 per test
 <i>Mycobacterium bovis</i> (tuberculosis)		Tuberculin test	2 visits on Day 0 and 3	Professional fees @ \$63.00 per hour + cost of antigen
BACTERIOLOGY				
 Routine bacteriological culture - general aerobic culture	Various	Please specify in submission form if antibiotic sensitivity testing is required*	3 - 7 days	\$30.45 per test
 Specialised bacteriological culture - please specify bacteria of interest upon sample submission	Various	"	3 - 10 days**	\$54.60 per test
 <i>Salmonella</i>	Faeces	Specialised bacterial culture	3 - 10 days	\$54.60 per test
 <i>Escherichia coli</i> O157:H7	Faeces, rectal swab	"	"	\$54.60 per test

* Test results of specimens submitted as a batch will be reported as a batch on the whole and not on individual specimens. Where results of individual animals or specimens are required, each specimen will incur a separate fee.

** Note that the culture of certain fastidious bacteria such as *Leptospira* and mycobacteria may take 6 to 20 weeks.

+ Test will not be done if request is not indicated at time of submission

Table 9. Diagnostic tests for cows (continued)

Pathogen / Disease / Examination	Sample	Test	Turn-around time	Laboratory fee (inclusive of GST)
 <i>Listeria monocytogenes</i>	Faeces, affected tissue / organs	"	"	\$54.60 per test
 Mycobacteria	Affected tissue / organs	"	8 - 20 weeks**	\$54.60 per test

** Note that the culture of certain fastidious bacteria such as *Leptospira* and mycobacteria may take 6 to 20 weeks.

MULTIPLE SPECIES

Table 10. Diagnostic tests for multiple species

	Pathogen / Disease / Examination	Sample	Test	Turn-around time	Laboratory fee (inclusive of GST)
	Rabies	Brain, fixed brain smears	Antigen test by FAT	3 - 7 days	\$52.50 per test
	<i>Chlamydomphila</i> spp.	Conjunctival swab, faecal swab or sample in <i>Chlamydomphila</i> transport media*	PCR	3 - 10 days	\$262.50 per batch of 5 samples or part thereof; \$31.50 for each subsequent sample
	Routine bacteriological culture - general aerobic culture	Various	Please specify in submission form if antibiotic sensitivity testing is required+	3 - 7 days	\$30.45 per test
	Specialised bacteriological culture - please specify bacteria of interest upon sample submission	Various	"	3 - 10 days**	\$54.60 per test
	Molecular examination	Various	Nucleic acid detection	3 - 10 days	\$262.50 per batch of 5 samples or part thereof; \$31.50 for each subsequent sample

FA = Fluorescent Antibody; FAT = Fluorescent Antibody Test; HI = Haemagglutination Inhibition; PCR = Polymerase Chain Reaction

* Please refer to the instruction for sample submission, pages 3-4.

** Note that the culture of certain fastidious bacteria such as *Leptospira* and mycobacteria may take 6 to 20 weeks.

+ Test will not be done if request is not indicated at time of submission

VACCINE QC

Where applicable, vaccines are tested according to the ASEAN Standards for Animal Vaccines. For tests involving live animals, please call the Veterinary Virology laboratory (65165134) to make advance arrangements, as animals of suitable age must be pre-ordered.

Table 11. Vaccine QC

	Test	Remarks	Turn-around time	Laboratory fee (inclusive of GST)
🔒	Sterility test (aerobic & anaerobic bacteria, Salmonella, fungi): a. with test for <i>Mycoplasma</i> b. without test for <i>Mycoplasma</i>		a. 28 - 30 days b. 14 - 16 days	\$74.55 per test
🔒	Purity test in embryonated eggs		7 - 28 days	\$121.80 per test
🔒	Purity test in tissue culture		7 - 28 days	\$252.00 per test
🔒	Vaccine titre in embryonated eggs	Per component	7 - 21 days	\$121.80 per test
🔒	Vaccine titre in cell culture	Per component	7 - 21 days	\$252.00 per test
🔒	Inactivation test in embryonated eggs		14 - 21 days	\$121.80 per test

SUPPLY OF BIOLOGICS AND OTHER SERVICES

Table 12. Supply of biologics and other services

	Test	Remarks	Turn-around time	Laboratory fee (inclusive of GST)
🔒	Verification of label, appearance, etc. for vaccines		1 - 3 days	\$63.00 / h
🔒	Vacuum test & appearance		1 – 3 days	\$63.00 / h
🔒	Destruction of vaccines	Please give advance notification	Same day	\$63.00 / h

Contact information**Head: Dr Charlene Fernandez**

Telephone: 63165141

E-mail: charlene_fernandez@nparks.gov.sg**General enquiries:**

Tel: 63165168 or 63165188

Fax: 63161090

Please contact the relevant laboratory / personnel for specific matters:

	Laboratory / Function	Contact (Telephone Number)	E-mail Address
	Veterinary Forensics and Pathology Laboratory (for post-mortem examinations including those of aquatic animals, histopathology and parasitology)	Dr Teo Xuan Hui (63165140) Ms Amy Chan (63165172/171)	teo_xuan_hui@nparks.gov.sg amy_chan@nparks.gov.sg
	Veterinary Bacteriology Laboratory Request for bacteriological transport media (<u>please call at least 3 working days in advance to order</u>)	Ms Wong Wai Kwan (63165179); Mdm Tay Yih Hong (63165179) Ms Angeline Lua / Ms Kuah Jia Xing (63165177)	wong_wai_kwan@nparks.gov.sg tay_yih_hong@nparks.gov.sg angeline_lua@nparks.gov.sg kuah_jia_xing@nparks.gov.sg
	Veterinary Virology Laboratory (including aquatic virology and vaccine QC, verification and destruction) Request for virological transport media (<u>please call at least 3 working days in advance to order</u>)	Dr Huangfu Taoqi (63165182) Dr Wang Yifan (63165189) Dr Toh Xinyu (63165134) – vaccine QC, verification and destruction Ms Tan Ee Leng (63165185) Dr Chen Jing (63165187) – aquatic virology Mr Teo Buay Hiang/ Mr Mohammed Firooz Bin Yunos	huang_fu_tao_qi@nparks.gov.sg wang_yifan@nparks.gov.sg toh_xinyu@nparks.gov.sg tan_ee_leng@nparks.gov.sg chen_jing@nparks.gov.sg teo_buay_hiang@nparks.gov.sg md_firooz_yunos@nparks.gov.sg
	Payment and billing enquiries	Mrs Chan Geok Hua (63165188);	chan_geok_hua@nparks.gov.sg
	Submission of specimens	Go to the reception counter (63165168)	-
	Collection of laboratory test reports	Go to the reception counter (63165168)	-
	Service feedback	Mrs Chan Geok Hua (63165188); Ms Tay Sim Ee (63165177)	chan_geok_hua@nparks.gov.sg tay_sim_ee@nparks.gov.sg