

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



CENTRE FOR ANIMAL & VETERINARY SCIENCES
NATIONAL PARKS BOARD (NPARKS)
ANIMAL & PLANT HEALTH CENTRE (APHC)
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CAVS SERVICES

The Centre for Animal & Veterinary Sciences (CAVS) is located at the Animal & Plant Health Centre (APHC).

As the national animal health laboratory of Singapore, CAVS provides laboratory diagnostic support for biosurveillance programmes for the detection of animal and zoonotic diseases in Singapore. CAVS supports the maintenance of Singapore's animal disease-free status through the facilitation of international trade and the protection of the health of local animal populations.

CAVS laboratories are accredited to ISO/IEC17025:2017 standards.

INSTRUCTIONS FOR SAMPLE SUBMISSION

A. General Instructions

1. NParks accepts no liability for loss or damage to samples submitted for laboratory examination.
2. All test requests should be submitted via the e-Services platform. For Post-Mortem (PM) examination requests, testing will only commence upon receipt of the signed "Post-Mortem Examination Consent Form". The Requestor shall submit this form to CAVS, along with any supportive documentation available (e.g. clinical history, epidemiologic information, pertinent laboratory results, images, etc.).
3. All samples should be clearly labelled and identified. The labels on the samples should match information provided in the e-Submission application.
4. All samples (whole or partial) and derivatives submitted for testing are the sole property of NParks and will not be returned to the Requestor. The Requestor shall hold NParks harmless from any losses or claims whatsoever and howsoever arising in connection with the tests conducted.
 - a. Special arrangements are available for the return of animal carcasses submitted for Post-mortem (PM) examination*. The return of animal carcasses sent for PM examination will be subject to the discretion of NParks. Please refer to the "Post-Mortem Examination Consent Form" for additional information.
 - b. To avoid doubt, unless otherwise requested for and approved by NParks in writing, all containers and packaging material used in sample submissions (including articles and accessories that are submitted together with animal carcasses for PM examination) will be considered the property of NParks and be disinfected and/or destroyed as deemed fit.
 - c. All submitted specimens and materials derived thereof (e.g. histopathology slides or isolates from bacteriological culture) will be disposed of immediately following issuance of the laboratory report.
5. Testing is dependent on the quantity and quality of the sample submitted. Samples found unsuitable for the required testing will be rejected. The Requestor will be notified if re-sampling is required. A sample may also be rejected if improperly collected, stored, packaged, transported or labelled, at the discretion of NParks. Test requests will be rejected if the test is unavailable at the point of submission.
6. Under circumstances where a sample is deemed less than the optimal standard for the requirements of the test and there are valid difficulties in obtaining another sample, written instructions must be given by the Requestor for NParks to proceed with testing. The condition of the sample will be reflected in the Laboratory Report and will include information as to the extent to which the test result or its interpretation was likely to have been affected by the quality of the sample tested, and that testing on such a sub-optimal sample was carried out at the Requestor's request.

Note: Blood samples that are haemolysed may be rejected at the discretion of CAVS, as test results may be adversely affected by such condition of the samples.

7. Cancellation of Application

Cancellation of an application will not be allowed once the test sample has been submitted & acknowledged by NParks and the Requestor shall remain liable for the charges payable in connection with the testing.

8. Samples Submission from Overseas

- a. Prior notification and arrangement must be made with NParks before submitting overseas samples for testing. Please email NPARKS_CAVS_Service_Enquiries@nparks.gov.sg for information on the procedure and documentation required for sending samples for testing. An NParks import permit is required. Samples will be rejected if documentation is incomplete.
- b. Refer to section on Samples Submission for Export Testing if submitting samples for export testing.
- c. Samples must be packaged and sent in compliance to IATA guidelines and National Parks Board/Animal & Veterinary Service (NParks/AVS) regulations for Importation of Biological Specimens.

9. Sample Submission for Export Testing or Other Licensing Requirements

- a. All samples for export testing, must be submitted in tamper-proof security packaging to ensure sample integrity, traceability, and accountability. Samples submitted without use of a tamper-proof security packaging will be rejected.
- b. The referring veterinarian must sign across the seal of the tamper-proof security packaging and include the date.
- c. For live fish, refer to guidelines on sample submission in part B 10(a) of this document.

10. Diagnostic Testing & Reporting

- a. Generally, a test report will be issued within 10 days from the date of receipt of sample(s) and will only be released upon payment.
Note: Due to the nature of certain test methods, some tests may take more than 10 days to complete. Please refer to NParks/AVS website (<https://www.nparks.gov.sg/avs/who-we-are/our-centres/aphc-cavs>) for more information. If unsure, the Requestor should check with NParks and make provisions for sufficient time for tests to be completed.

- b. One report will be issued for samples submitted per application upon payment unless otherwise indicated and agreed by NParks. Where required, the Requestor will have to fill in a separate application to receive separate diagnosis reports for the samples.
- c. Approval from NParks is required before any Laboratory Report can be reproduced in full. Where reference is made to the Requestor or the tests done in relation to the sample provided, by NParks in any of its materials or publications, such mention shall not constitute an endorsement for the Requestor or its product (s) by NParks. To avoid doubt, NParks will not provide any recommendations or endorsements on any product tested.
- d. Any unauthorised reproduction or abuse of the NParks Laboratory Report shall constitute an offence under Section 27 (1) and (2) of the NParks Act & subject to prosecution. The mention of tradename (s) is NOT an endorsement for the product(s) by NParks.
- e. All reports are proprietary to the Requestor. NParks will not release any information from a report without written authorisation from the Requestor.
- f. Any suspicion or detection of notifiable diseases listed in the Schedule of the Animals and Birds (Disease) Notification arising during diagnostic investigations must be reported to NParks/AVS. Please refer to NParks/AVS website (<https://www.nparks.gov.sg/avs/animals/animal-health-and-veterinarians/animal-diseases-and-antimicrobial-resistance/reporting-notifiable-diseases>) for more information.

B. Samples For Bacteriology, Histopathology, Parasitology and Post-Mortem Examination

Note:

- i. All specimens for bacteriological culture should be collected **prior** to antibiotic treatment (unless monitoring treatment efficacy).
- ii. Collect the specimens aseptically in sterile leak-proof containers and transport chilled to the Animal & Plant Health Centre (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 one specimen for each test request** (e.g. submit 2 specimens from the same animal if you are requesting for general aerobic culture and *Salmonella* culture)
- iv. Submitters should provide your own sampling kit (including transport media, formalin), which is available commercially.

1. Serum / Blood / Other body fluids

Specimens should be submitted in sterile, leak-proof screw cap plastic containers with external thread. 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: Store at 2°C to 8°C for up to 72 hours.
- b. Clotted Blood: Tube should not be more than 2/3-full unless it contains clotting agents. Clotted blood can be transported at ambient temperature 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. **DO NOT FREEZE.**
- c. Whole 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 APHC with a cold pack. Specimens may be stored at 2° to 8°C for up to 48 hours.
- d. Other fluids for bacteriological culture: Specimens should be collected in sterile plain tubes and delivered to the APHC as soon as possible. Specimens may be stored at 2 to 8°C for up to 24 hours. **DO NOT FREEZE.**

2. Swabs for bacteriological culture / molecular tests

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

- a. Ear swab: Use a sterile swab moistened with bacterial transport medium or 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 bacterial transport medium or saline against the nasal mucosa.
- c. Cloacal/Rectal swab: Collect using a sterile swab moistened with bacterial transport medium or saline. Ensure faecal material is present on the swab after collection.
- d. Swabs for *Chlamydomphila* isolation: Rayon, Dacron or cotton swabs are recommended. **Do NOT use calcium alginate swabs** as it is toxic to *Chlamydomphila*. 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 (to be provided by the submitter):

- 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.
- Detection of *Chlamydomphila* spp: *Chlamydomphila* transport media.

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

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.

- a. Disinfect surface with 70% alcohol.
- b. Aspirate approximately 3 ml of pus / material with a sterile needle and syringe.
- c. Place the sample in a sterile container.
- d. If swabs have to be used, place in bacterial transport media immediately after collection and send to the APHC within 24-48 hours after collection.

5. Urine for bacteriological culture

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

6. 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.

7. 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 a separate sample according to the instructions above if routine aerobic bacteriological culture is also required.

8. Formalinized tissues for histopathology

Tissue specimens for histopathology 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). Container(s) should be clearly labelled with the following:

- a. identity and number of organs / type and origin of tissues;
- b. animal species and identification;
- c. name of submitter i.e. owner, veterinarian and / or clinic.

These should match records on the e-submission. Store and transport all specimens at room temperature, avoiding extremes of heat and cold.

9. Animal carcasses for post-mortem examination

Aside from live fish, only freshly dead specimens will be accepted, as autolysis will often reduce the likelihood of diagnosis. Carcasses should be stored at 2°C to 8°C and packaged securely in two layers of strong plastic leak-proof bags. The outer bag should be clearly labelled with the following:

- a. animal species and identification;
- b. name of submitter i.e. owner, veterinarian and / or clinic.

These should match records on the e-submission and “Post-Mortem Examination Consent Form”. Submit the carcass to the APHC as soon as possible, preferably within 24 hours. **DO NOT FREEZE** the carcass. For after-office hours submission, the carcass can be handed over to security personnel who will place the carcass in a cold storage facility at the APHC.

(Arrangements for the return of remains of carcasses for cremation or burial purposes can be made if indicated at time of submission. For more information, please refer to the “Post-Mortem Examination Consent Form” and email NPARKS_CAVS_Service_Enquiries@nparks.gov.sg).

- a. Aquatic animals (live): Send live fish packed in two layers of strong plastic 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. Moribund 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 will be accepted, as putrefaction continues in cold-blooded animals even at chilled temperatures. Samples should be kept at 2° to 8°C, packed in two layers of strong plastic 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 animals (dead): Aside from live fish, CAVS does **not** accept live animals. Only freshly dead specimens will be accepted. Carcasses should be kept at 2° to 8°C, packed in two layers of strong plastic leak-proof bags, and submitted preferably within 24 hours. **DO NOT FREEZE**.

C. Samples For Virology

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 (VTM):

Most viral specimens need to be transported to the laboratory in a medium to maintain viral activity. The need for transport medium is indicated under the specific tests offered below. Submitters should provide your own VTM, which is available commercially.

2. Collection and transport temperature

- a. Specimens should be collected as early as possible after clinical signs appear and transported to the APHC as quickly as possible. This increases the chance of viral detection because viruses are generally of the highest titre at this time.
- b. 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 more than 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 gel packs are adequate for this purpose.
- c. 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 or 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 with cold gel packs 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 with cold gel packs 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.

- 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 with cold gel packs 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 with cold gel packs 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.

- 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 with cold gel packs.

Specimens may be stored at 2°C to 8°C for up to 24 hours. 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 with cold gel packs.

Specimens may be stored at 2°C to 8°C for up to 24 hours. 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 cold gel packs. Avoid exposure to high temperatures and **DO NOT FREEZE**.

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 with cold gel packs in an insulated container.

Specimens may be stored at 2°C to 8°C for up to 24 hours.

- j. Other specimens:

Please email your enquires to:

NPARKS_CAVS_Service_Enquiries@nparks.gov.sg.

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.

For routine screening of aquatic animals (which had been healthy otherwise) for specific diseases, targeted post-mortem sampling would be recommended as test results may be reported faster. A post-mortem sampling charge equivalent to the post-mortem examination charge will be incurred so long as the whole animal is submitted for testing.

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.

Annex A: LABORATORY FEES

Table 1. Post-Mortem Examination And Sampling

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

Please refer to Part B. Samples For Bacteriology, Histopathology, Parasitology and Post-Mortem Examination for instructions on sample submission.

HISTOPATHOLOGY and PARASITOLOGY**Table 2. Diagnostic Tests On Histopathology And Parasitology**

| Service / Test | Sample | Turn-around time | Laboratory fee (Inclusive of GST) |
|--|----------------------------------|------------------|-----------------------------------|
| Histopathology | Formalinized tissue samples | Up to 10 days | \$36.75 per organ / wax block |
| Parasitology | | Up to 10 days | |
| - Haemoparasites (Microscopic examination of peripheral blood film)* | - 0.5 ml blood in EDTA (chilled) | | \$32.60 per test |
| - Endoparasites (Faecal flotation)# | - Faecal sample | | \$32.60 per test |
| Ectoparasites of fish (Wet mount microscopic examination) | Live fish preferable | Up to 10 days | \$32.60 per batch |

^ A post-mortem sampling charge equivalent to the post-mortem examination charge will be incurred if the whole animal is submitted for testing.

Please specify pathogen of interest (if any) upon sample submission.

AQUATIC ANIMALS**Table 3. Diagnostic Tests For Aquatic Animals**

| Service / Test | Sample | Turn-around time | Laboratory fee (Inclusive of GST) |
|--|---|------------------|---|
| Routine bacteriological aerobic culture ⁺ | Live or freshly dead fish [^] | 3 - 7 days | \$30.45 per test |
| Specialised bacteriological culture ^{+ #} | Live or freshly dead fish [^] or organs from freshly dead fish | 3 - 10 days* | \$54.60 per test |
| Molecular detection of bacteria affecting fish: <i>Yersinia ruckeri</i> , <i>Streptococcus agalactiae</i> | Live or freshly dead fish [^] | 3 - 10 days | \$262.50 per batch of 5 pools or part thereof; \$31.50 for each subsequent pool |
| Molecular detection of fungi affecting fish: <i>Aphanomyces invadans</i> | Live or freshly dead fish [^] | 3 - 10 days | \$262.50 per batch of 5 pools or part thereof; \$31.50 for each subsequent pool |
| Molecular detection of viruses affecting fish: Koi Herpesvirus (KHV), Infectious Spleen and Kidney Necrosis Virus (ISKNV) / Red Sea Bream Iridovirus (RSIV), Viral Nervous Necrosis Virus (VNNV), Megalocytivirus (MCV), Epizootic Haematopoietic Necrosis Virus (EHNV), Goldfish Haematopoietic 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 [^] | 3 - 10 days | \$262.50 per batch of 5 pools or part thereof; \$31.50 for each subsequent pool |

Table 3. Diagnostic Tests For Aquatic Animals (continued)

| Service / Test | Sample | Turn-around time | Laboratory fee (Inclusive of GST) |
|--|---|------------------|---|
| Molecular detection of bacteria affecting crustaceans: Hepatobacter penaei (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 | 3 - 10 days | \$262.50 per batch of 5 pools or part thereof; \$31.50 for each subsequent pool |
| Molecular detection of viruses affecting crustaceans: 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 <i>Baculovirus penaei</i> (BP) | Live or freshly dead shrimp^ Pleopods of broodstock for testing WSSV, TSV, IHHNV, IMNV | 3 - 10 days | \$262.50 per batch of 5 pools or part thereof; \$31.50 for each subsequent pool |
| Molecular detection of viruses affecting frog, including Frog Virus 3 (FV3) | Live or freshly dead frog^ | 3 - 10 days | \$262.50 per batch of 5 pools or part thereof; \$31.50 for each subsequent pool |
| Molecular detection of <i>Batrachochytrium dendrobatidis</i> | Amphibian skin swab | 3 - 10 days | \$262.50 per batch of 5 pools or part thereof; \$31.50 for each subsequent pool |

^ A post-mortem sampling charge, equivalent to the post-mortem examination charge, will be incurred if the whole animal is submitted for testing.

Please specify pathogen of interest upon sample submission.

+ Please specify at time of submission if antimicrobial sensitivity test is required. Test will not be done if request is not indicated at time of submission

* Note that the culture of fastidious bacteria such as *Mycobacterium* sp. may take 8 weeks or more. Live specimens should be packed in leak-proof bag filled with 2/3 air and 1/3 water.

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

AVIAN ANIMALS**Table 4. Diagnostic Tests For Avian Animals**

| Service / Test | Sample | Turn-around time | Laboratory fee (Inclusive of GST) |
|---|---|------------------|---|
| Molecular detection of Avian Influenza virus (Influenza A, AI subtype H5 Eurasian strain, H5 North American strain or H7) | Faecal, choanal or cloacal swabs in VTM*, max. 5 swabs per pool; or affected organs | 10 days | \$262.50 per batch of 5 samples or part thereof; \$31.50 for each subsequent sample (Per test)) |
| Molecular detection of Newcastle Disease Virus (NDV) | Faecal, choanal or cloacal swabs in VTM*, max. 5 swabs per pool; or affected organs | 10 days | \$262.50 per batch of 5 samples or part thereof; \$31.50 for each subsequent sample |
| <i>Salmonella</i> culture ⁺ | Faecal sample, faecal / cloacal swab | 3 - 7 days | \$54.60 per test |
| Routine bacteriological aerobic culture ⁺ | Various | 3 - 7 days | \$30.45 per test |
| Specialised bacteriological culture ^{+#} | Various | 3 - 10 days*** | \$54.60 per test |
| Molecular detection of <i>Chlamydophila psittaci</i> * | Faecal swabs, cloacal swabs or faecal material in Chlamydophila transport media* | 3 - 10 days | \$262.50 per batch of 5 samples or part thereof; \$31.50 for each subsequent sample |

* Please refer to Part C. Samples For Virology for instructions for sample submission.

* Please specify pathogen of interest (if any) upon sample submission.

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

+ Please specify in submission form if antibiotic sensitivity testing is required. Test will not be done if request is not indicated at time of submission

Please specify pathogen of interest upon sample submission.

CATS and DOGS**Table 5. Diagnostic Tests For Cats And Dogs**

| Service / Test | Sample | Turn-around time | Laboratory fee (Inclusive of GST) |
|---|---|------------------|---|
| Microscopic examination of peripheral blood film for haemoparasites [#] : <i>Babesia canis</i> / <i>Babesia gibsoni</i> / <i>Trypanosoma evansi</i> | 0.5 ml blood in EDTA (chilled) | Up to 10 days | \$32.60 per test |
| Molecular detection of canine or feline parvovirus | Faecal sample | 3 - 10 days | \$262.50 per batch of 5 samples or part thereof; \$31.50 for each subsequent sample |
| Molecular detection of canine Influenza Virus | Nasal or tracheal swab in viral transport media | 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>) i) Heartworm antigen test / ii) Knott's microfilaria test / iii) Microfiltration test | 1 ml blood in EDTA (chilled) | Up to 10 days | \$35.70 per test |
| Endoparasites (Faecal flotation) [#] | Faecal sample | Up to 10 days | \$32.60 per test |
| Molecular detection of <i>Babesia gibsoni</i> | 0.5 ml blood in EDTA (chilled) | Up to 10 days | \$262.5 per 5 samples; \$31.50 per sample from 6 th sample onwards |
| Routine bacteriological aerobic culture ⁺ | Various | 3 - 7 days | \$30.45 per test |
| Specialised bacteriological culture ^{+#} | Various | 3 - 10 days** | \$54.60 per test |

Table 5. Diagnostic Tests For Cats And Dogs (continued)

| Service / Test | Sample | Turn-around time | Laboratory fee (Inclusive of GST) |
|--|---------------------------------|------------------|-----------------------------------|
| <i>Babesia gibsoni</i> antibody IFAT screening at 1:40 single serum dilution only | 0.5 ml serum | Up to 10 days | \$120.75 per test |
| <i>Ehrlichia canis</i> antibody IFAT screening at 1:40 single serum dilution only | 0.5 ml serum | Up to 10 days | \$71.40 per test |
| <i>Ehrlichia canis</i> IFAT - antibody titre | 0.5 ml serum | Up to 10 days | \$88.20 per test |
| <i>Brucella canis</i> antibody Tube agglutination test | 2 ml serum or 4 - 5 ml blood | 3 - 7 days | \$53.55 per sample |
| <i>Leptospira interrogans</i> serovar Canicola antibody Microscopic agglutination test | 2 ml serum or 4 - 5 ml blood | 3 - 7 days | \$53.55 per sample |
| <i>Toxoplasma gondii</i> antibody IFAT screening | 0.5 ml serum | Up to 10 days | \$112.35 per sample |
| <i>Toxoplasma gondii</i> antibody IFAT (End-point titration) | 0.5 ml serum | Up to 10 days | \$186.90 per sample |
| <i>Leishmania infantum</i> and <i>Leishmania donovani</i> antibody ELISA | 0.5 ml serum | Up to 10 days | \$74.90 per test |

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

+ Please specify in submission form if antibiotic sensitivity testing is required. Test will not be done if request is not indicated at time of submission.

Please specify pathogen of interest upon sample submission.

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

IFAT= Indirect Immuno-fluorescent Antibody Test

ELISA = Enzyme-linked Immuno-sorbent Assay

HORSES**Table 6. Diagnostic Tests For Horses**

| Service / Test | Sample | Turn-around time | Laboratory fee (inclusive of GST) |
|--|---|------------------|---|
| Virology | | | |
| Molecular detection of Equine Influenza virus | Nasal, tracheal or nasopharyngeal swab in VTM* | 3 - 7 days | \$262.50 per batch of 5 samples or part thereof; \$31.50 for each subsequent sample |
| Molecular detection of Equine Herpes virus type 1 (EHV-1) | Nasal swab in VTM*, or buffy coat cells | 3 - 7 days | \$262.50 per batch of 5 samples or part thereof; \$31.50 for each subsequent sample |
| Molecular detection of Equine Herpes virus type 4 (EHV-4) | Nasal swab in VTM*, or buffy coat cells | 3 - 7 days | \$262.50 per batch of 5 samples or part thereof; \$31.50 for each subsequent sample |
| Bacteriology | | | |
| Routine bacteriological aerobic culture ⁺ | Various | " | \$30.45 per test |
| Specialised bacteriological culture ^{+#} | Various | 3 - 10 days** | \$54.60 per test |
| <i>Streptococcus equi</i> subsp. <i>equi</i> (Strangles) | Nasopharyngeal swab / Nasal swab / Tracheal wash | 3 - 10 days | \$54.60 per test |
| <i>Taylorella equigenitalis</i> (Contagious Equine Metritis) | Swabs of clitoral, deep cervical, penile sheath and urethra; placed in Amies transport medium with charcoal | 10 - 14 days | \$54.60 per test |
| Parasitology | | | |
| Microscopic examination of peripheral blood film [#] : Equine Piroplasmosis (<i>Theileria equi</i> or <i>Babesia caballi</i>) | 0.5 ml blood in EDTA (chilled) | Up to 10 days | \$32.60 per test |

Table 6. Diagnostic Tests For Horses (continued)

| Service / Test | Sample | Turn-around time | Laboratory fee (inclusive of GST) |
|---|---------------------------------|------------------|---|
| SEROLOGY | | | |
| Equine Infectious Anaemia (EIA) virus AGPT (Coggin's Test) | 2 ml serum or 4 - 5 ml blood | 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 SNT in cell culture | 2 ml serum or 4 - 5 ml blood | 7 - 10 days | \$65.10 per test |
| Equine Viral Arthritis (EVA) virus antibody SNT in cell culture | 2 ml serum or 4 - 5 ml blood | 7 - 10 days | \$65.10 per test |
| <i>Theileria equi</i> antibody Competitive ELISA | 0.5ml serum | Up to 10 days | \$110.25 per batch of 5 samples or part thereof |
| <i>Babesia caballi</i> antibody Competitive ELISA | 0.5ml serum | Up to 10 days | \$110.25 per batch of 5 samples or part thereof |
| <i>Theileria equi</i> antibody Immunofluorescent Antibody Test | 0.5ml serum | Up to 10 days | \$71.40 per sample |
| <i>Babesia caballi</i> antibody Immunofluorescent Antibody Test | 0.5ml serum | Up to 10 days | \$71.40 per sample |
| <i>Trypanosoma evansi</i> antibody ELISA | 0.5ml serum | Up to 10 days | \$147.00 per 10 samples |

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

+ Please specify in submission form if antibiotic sensitivity testing is required. Test will not be done if request is not indicated at time of submission.

* Please refer to the instruction for sample submission.

Please specify pathogen of interest (if any) upon sample submission.

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

PIGS**Table 7. Diagnostic Tests For Pigs**

| Service / Test | Sample | Turn-around time | Laboratory fee (Inclusive of GST) |
|--|---|---------------------------|---|
| Virology | | | |
| Molecular detection of Classical Swine Fever virus | Tonsils, lymph node in viral transport media [^] | 3 - 7 days | \$262.50 per batch of 5 samples or part thereof; \$31.50 for each subsequent sample |
| Molecular detection of Swine influenza virus (Influenza A) | Nasal / tracheal swab in viral transport media [^] | 3 - 7 days | \$262.50 per batch of 5 samples or part thereof; \$31.50 for each subsequent sample |
| Bacteriology | | | |
| Routine bacteriological aerobic culture ⁺ | Affected tissue / organs | 3 - 7 days | \$30.45 per test |
| Specialised bacteriological culture ^{+ #} | Affected tissue / organs | 3 – 10 days ^{**} | \$54.60 per test |
| <i>Burkholderia pseudomallei</i> (Meliodiosis) culture | Affected tissue / organs | 3 - 10 days ^{**} | \$54.60 per test |
| <i>Salmonella</i> culture | Affected tissue / organs | 3 - 10 days | \$54.60 per test |
| <i>Actinobacillus pleuropneumoniae</i> (APP) culture | Affected tissue / organs | 3 - 10 days ^{**} | \$54.60 per test |

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

⁺ Please specify in submission form if antibiotic sensitivity testing is required. Test will not be done if request is not indicated at time of submission.

[#] Please specify pathogen of interest upon sample submission.

^{*} 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.

[^] Please refer to the instruction for sample submission.

Table 7. Diagnostic Tests For Pigs (continued)

| Service / Test | Sample | Turn-around time | Laboratory fee (inclusive of GST) |
|--|-------------------------------|------------------|---|
| SEROLOGY | | | |
| Aujeszky's Disease virus antibody ELISA | 2 ml serum or 4 - 5 ml blood | 7 - 10 days | \$78.75 per batch of 5 samples or part thereof; \$15.75 from the 6 th sample onwards |
| Classical Swine Fever antibody ELISA | "2 ml serum or 4 - 5 ml blood | 7 - 10 days | \$78.75 per batch of 5 samples or part thereof; \$15.75 from the 6 th sample onwards |
| Transmissible Gastroenteritis (TGE) / Porcine Coronavirus antibody (non-differential) SNT in cell culture | "2 ml serum or 4 - 5 ml blood | 7 - 10 days | \$65.10 per test |
| <i>Brucella abortus</i> Slide agglutination test | "2 ml serum or 4 - 5 ml blood | 3 - 7 days | \$53.55 per batch of 10 samples or part thereof* |
| <i>Leptospira interrogans</i> Microscopic Agglutination Test (MAT): serovars Pomona, Grippotyphosa or Hardjo | 2 ml serum or 4 - 5 ml blood | 7 – 10 days | \$53.55 per test |

HI = Haemagglutination Inhibition; SNT= Serum Neutralisation Test; NPLA = Neutralisation Peroxidase-Linked Assay

* 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.

BOVINE**Table 8. Diagnostic Tests For Cattle**

| Service / Test | Sample | Turn-around time | Laboratory fee inclusive of GST) |
|--|---|----------------------------|---|
| Virology | | | |
| Molecular detection of Bluetongue Virus | EDTA Blood, or Spleen in viral transport media [^] | 3 – 10 days | \$262.50 per batch of 5 samples or part thereof; \$31.50 for each subsequent sample |
| Bacteriology | | | |
| Routine bacteriological aerobic culture ⁺ | Various | 3 - 7 days | \$30.45 per test |
| Specialised bacteriological culture ^{+ #} | Various | 3 - 10 days ^{**} | \$54.60 per test |
| <i>Salmonella</i> culture ⁺ | Faeces | 3 - 10 days | \$54.60 per test |
| <i>Escherichia coli</i> O157:H7 culture ⁺ | Faeces, rectal swab | 3 - 10 days | \$54.60 per test |
| <i>Listeria monocytogenes</i> | Faeces, affected tissue / organs | 3 - 10 days | \$54.60 per test |
| Mycobacteria | Affected tissue / organs | 8 - 20 weeks ^{**} | \$54.60 per test |
| Serology | | | |
| <i>Brucella abortus</i> Slide agglutination test | 2 ml serum or 4 - 5 ml blood | 3 - 7 days | \$53.55 per batch of 10 samples or part thereof [*] |
| <i>Leptospira interrogans</i> Microscopic Agglutination Test: serovars Pomona, Grippotyphosa or Hardjo | 2 ml serum or 4 - 5 ml blood | 7 - 10 days | \$53.55 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.

+ Please specify in submission form if antibiotic sensitivity testing is required. Test will not be done if request is not indicated at time of submission.

Please specify pathogen of interest upon sample submission.

[^] Please refer to the instruction for sample submission.

MULTIPLE SPECIES**Table 11. Diagnostic Tests For Multiple Species**

| Service / Test | Sample | Turn-around time | Laboratory fee (inclusive of GST) |
|--|---------------------------|---------------------------|-----------------------------------|
| Rabies Antigen test by FAT | Brain, fixed brain smears | 3 - 7 days | \$52.50 per test |
| Routine bacteriological culture ⁺ - general aerobic culture | Various | 3 - 7 days | \$30.45 per test |
| Specialised bacteriological culture ^{+#} | Various | 3 - 10 days ^{**} | \$54.60 per test |

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.

+ Please specify in submission form if antibiotic sensitivity testing is required. Test will not be done if request is not indicated at time of submission.

Please specify pathogen of interest upon sample submission.

CONTACT INFORMATION**Our Address:**

Animal and Plant Health Centre
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Singapore 718827

Our Operating Hours:

| | Operating hours | Sample submission hours |
|--|-----------------------------|-------------------------|
| Mondays - Thursdays | 8.00 am - 5.30 pm | 8.30 am – 5.00 pm |
| Fridays | 8.00 am – 5.00 pm | 8.30 am - 4.30 pm |
| Lunch Break | 12.30 pm - 1.30 pm (Closed) | |
| New Year's Eve, Chinese New Year Eve and Christmas Eve | 8.00 am - 12.30 pm | 8.00 am – 12.00 pm |
| Saturdays, Sundays, and Public Holidays | Closed | |

For any queries, please contact us via email:

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