CENTRE FOR
ANIMAL & VETERINARY SCIENCES (CAVS)
SERVICE BOOKLET

CENTRE FOR ANIMAL & VETERINARY SCIENCES
NATIONAL PARKS BOARD (NPARKS)
ANIMAL & PLANT HEALTH CENTRE (APHC)
6 PERAHU ROAD, SINGAPORE 718827

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CAVS SERVICES

The Centre for Animal & Veterinary Sciences (CAVS), which is operated by the Animal & Veterinary Service (AVS), a cluster of the National Parks Board (NParks), 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/IEC 17025:2017 standards.

INSTRUCTIONS FOR SAMPLE SUBMISSION

A. General Instructions

1. CAVS 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.). CAVS shall contact the referring veterinarian for further clinical details to assist in the PM examination, where necessary.

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 CAVS and will not be returned to the Requestor. The Requestor shall hold CAVS 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 PM examination*. The return of animal carcasses sent for PM examination will be subject always to the discretion of CAVS. Please refer to the "Post-Mortem Examination Consent Form" for additional information.
    b. To avoid doubt, unless otherwise requested for and approved by CAVS 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 disposed of accordingly by CAVS.
    c. All submitted specimens and materials derived thereof (e.g. isolates from bacteriological culture) will be the sole property of CAVS.

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 CAVS. 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 CAVS 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 or lipemic 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 is subject to the discretion of CAVS once the test sample has been submitted and acknowledged by CAVS and the Requestor shall remain liable for the charges payable in connection with any testing services provided.

8. Samples Submission from Overseas

a. Prior notification and arrangement must be made with CAVS 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. The submitter of the overseas samples shall obtain all necessary import permits. 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 all prevailing regulations for Importation of Biological Specimens.

9. Sample Submission for Export Testing or Other Licensing Requirements

a. All test requests for export or licensing purposes must be registered, via e-Services. In addition, for companion animals, registration must be submitted by a referring veterinarian or veterinary clinic to ensure sample integrity, traceability, and accountability.

b. Samples for these tests must be submitted in tamper-proof security packaging (e.g. poly mailers). Samples submitted without use of a tamper-proof security packaging will be rejected.

c. The referring veterinarian should sign across the seal of the tamper-proof security packaging and include the date.

d. For live fish, refer to guidelines on sample submission in part B 8 (a) of this document.

10. Diagnostic Testing and 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. f unsure, the Requestor should check with CAVS 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 CAVS. Where required, the Requestor will have to fill in a separate application to receive separate diagnosis reports for the samples.

c. The Requester shall not disclose, publish, reproduce or distribute, nor shall it allow the disclosure, publication, reproduction or distribution of, any part of the CAVS Laboratory Report in any form or medium without the prior written consent of CAVS and subject to such terms and conditions as CAVS may prescribe.

d. For the avoidance of doubt, no part of the CAVS Report shall be disclosed, published, reproduced or distributed with changes or amendments whatsoever.

e. Where reference is made to the Requestor or the tests done in relation to the sample provided, by CAVS in any of its materials or publications, such mention shall not constitute an endorsement for the Requestor or its product(s) by CAVS. To avoid doubt, CAVS will not provide any recommendations or endorsements on any product tested.

f. The mention of tradename (s) is NOT an endorsement for the product(s) by CAVS.

g. All reports are proprietary to the Requestor. CAVS will not release any information from a report without written authorisation from the Requestor.

h. 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 AVS. Please refer to 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, 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 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 *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 (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 *Chlamydophila* spp: *Chlamydophila* 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 are 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. Animal carcasses for post-mortem examination

Testing will only commence upon receipt of the signed “Post-Mortem Examination Consent Form”. The referring veterinarian must submit this form to CAVS, along with any supportive documentation available (e.g. clinical history, epidemiologic information, pertinent laboratory results, images, etc.).

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 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:

- animal species and identity;
- 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.

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 8b below), 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**.

Arrangements for the return of remains of carcasses for cremation or burial purposes can be made if indicated at time of submission. The return of animal carcasses sent for PM examination will be subject to the discretion of CAVS. The animal carcass remains will only be released to the person listed in part B of the “Post-Mortem Consent and Carcass Release Form”. Submitters are to ensure that all information is correct before submitting the form.

For more information, please refer to the “Post-Mortem Examination Consent Form” and email NPARKS_CAVS_Service_Enquiries@nparks.gov.sg.

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 to 8°C for up to 48 hours. If longer delays are anticipated, store at -70°C or below.

b. Nasal and 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 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 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 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 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 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 to 8°C for up to 24 hours.

j. Other specimens:

Please email your enquiries to:
NPARKS_CAVS_Service_Enquiries@nparks.gov.sg.

ANNEX: LABORATORY FEES

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. The information gathered is then synthesised into a report with an interpretation of what the findings likely represent. Extra tests **specifically requested by the customer** will incur an additional charge. The post-mortem examination is a **comprehensive and invasive examination and not a cosmetic process**. CAVS does **not** offer a toxicology testing service.

All animal carcasses for post-mortem examination **must** be submitted by a referring veterinarian. CAVS does **not** accept submissions from the general public. The report will be issued to the referring veterinarian. All correspondence on the report with CAVS will be with the referring veterinarian **only**. Animal owners are encouraged to discuss the results with their referring veterinarian.

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.

For more information, email NPARKS_CAVS_Service_Enquiries@nparks.gov.sg. 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 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, Parasitology and Post-Mortem Examination for instructions on sample submission.

PARASITOLOGY

Table 2. Diagnostic Tests On Parasitology

Service / Test	Sample	Turn-around time	Laboratory fee (Inclusive of GST)
Parasitology - Haemoparasites (Microscopic examination of peripheral blood film)[#]	- 0.5 ml blood in EDTA (chilled)	Up to 10 days	$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

Please refer to Part B. Samples For Bacteriology, Parasitology and Post-Mortem Examination for instructions on sample submission.
^ 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: a. *Yersinia ruckeri*; b. *Streptococcus agalactiae*	Live or freshly dead fish^	3 - 10 days	Per test $262.50 per batch of 5 pools or part thereof; $31.50 for each subsequent pool
Molecular detection of *Aphanomyces invadans*	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: a. Koi Herpesvirus (KHV); b. Infectious Spleen and Kidney Necrosis Virus (ISKNV) / Red Sea Bream Iridovirus (RSIV); c. Viral Nervous Necrosis Virus (VNNV); d. Megalocytivirus (MCV); e. Epizootic Haematopoietic Necrosis Virus (EHNV); f. Ranavirus; g. Singapore grouper iridovirus (SGIV);	Live or freshly dead fish^	3 - 10 days	Per test $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: a. *Hepatobacter penaei* (also known as Necrotising Hepatopancreatitis Bacterium, NHPB); or b. Acute hepatopancreatic necrosis disease (AHPND)-causing *Vibrio parahaemolyticus*	Live or freshly dead shrimp^ Pleopods of broodstock	3 - 10 days	Per test $262.50 per batch of 5 pools or part thereof; $31.50 for each subsequent pool
Molecular detection of viruses affecting crustaceans: a. White Spot Syndrome Virus (WSSV); b. Yellow-head Virus (YHV); c. Taura Syndrome Virus (TSV); d. Infectious Hypodermal and Haematopoietic Necrosis Virus (IHHNV); e. Infectious Myonecrosis Virus (IMNV); or f. *Baculovirus penaei* (BP)	Live or freshly dead shrimp^ Pleopods of broodstock for testing WSSV, TSV, IHHNV, IMNV	3 - 10 days	Per test $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 *Batrachochytrium dendrobatidis*	Amphibian skin swab	3 - 10 days	$262.50 per batch of 5 pools or part thereof; $31.50 for each subsequent pool

Please refer to Part B. Samples For Bacteriology, Parasitology and Post-Mortem Examination and Part C. Samples For Virology for instructions on sample submission.
^ 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 (AST) is required. If not specified during submission, AST will not be conducted. Additionally, AST may not be conducted if there are no applicable breakpoint interpretations available.
* Note that the culture of fastidious bacteria such as *Mycobacterium* sp. may take 8 weeks or more.

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 (AI) virus: a. Influenza A (Matrix Gene) b. AI H5 subtype (Eurasian strain); c. AI H5 subtype (North American strain); or d. AI subtype H7 strain	Faecal, choanal, tracheal,or cloacal swabs in VTM*, max. 5 swabs per pool; or affected organs	10 days	Per test $262.50 per batch of 5 samples or part thereof; $31.50 for each subsequent sample
Molecular detection of Avian Paramyxovirus-1 (APMV-1) – Matrix Gene	Faecal, choanal, tracheal, oropharyngeal 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
Salmonella 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 *Chlamydophila psittaci**	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 B. Samples For Bacteriology, Parasitology and Post-Mortem Examination and Part C. Samples For Virology for instructions on sample submission.
[#] Please specify pathogen of interest (if any) upon sample submission.
* Note that the culture of fastidious bacteria such as *Mycobacterium* sp. may take 8 weeks or more.
[+] Please specify in submission form if AST is required. If not specified during submission, AST will not be conducted. Additionally, AST may not be conducted if there are no applicable breakpoint interpretations available.

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[#]: a. *Babesia canis*; b. *Babesia gibsoni*; or c. *Trypanosoma evansi*	0.5 ml blood in EDTA (chilled)	Up to 10 days	$32.60 per test
Molecular detection of Canine or Feline Parvovirus	Faecal sample, faecal or rectal swab in VTM^	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 (Matrix Gene)	Nasal or tracheal swab in VTM^	3 - 10 days	$262.50 per batch of 5 samples or part thereof; $31.50 for each subsequent sample
Canine heartworm (*Dirofilaria immitis*) a. Heartworm antigen ELISA test; b. Knott's microfilaria test; or c. 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 *Babesia gibsoni*	0.5 ml blood in EDTA (chilled)	Up to 10 days	$262.5 per 5 samples; $31.50 per sample from 6th 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
Babesia gibsoni antibody IFAT screening at 1:40 single serum dilution only *(This test is temporarily unavailable. We will update once the test is available.)*	0.5 ml serum	Up to 10 days	$120.75 per test

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

Service / Test	Sample	Turn-around time	Laboratory fee (Inclusive of GST)
Ehrlichia canis antibody IFAT screening at 1:40 single serum dilution only	0.5 ml serum	Up to 10 days	$71.40 per test
Ehrlichia canis IFAT - antibody titre	0.5 ml serum	Up to 10 days	$88.20 per test
Brucella canis antibody Tube agglutination test *(This test is temporarily unavailable. We will update once the test is available.)*	2 ml serum or 4 - 5 ml blood	3 - 7 days	$53.55 per sample
Leptospira interrogans serovar Canicola antibody Microscopic agglutination test	2 ml serum or 4 - 5 ml blood	3 - 7 days	$53.55 per sample
Toxoplasma gondii IgG antibody IFAT screening	0.5 ml serum	Up to 10 days	$112.35 per sample
Toxoplasma gondii IgM antibody IFAT screening	0.5 ml serum	Up to 10 days	$112.35 per sample
Toxoplasma gondii antibody IFAT (End-point titration)	0.5 ml serum	Up to 10 days	$186.90 per sample
Leishmania infantum and *Leishmania donovani* antibody rapid ELISA	0.5 ml serum	Up to 10 days	$74.90 per test
Leishmania infantum antibody IFAT screening at 1:50 single serum dilution only	0.5 ml serum	Up to 10 days	$74.90 per test
Trypanosoma evansi antibody card agglutination test (CATT)	0.5 ml serum	Up to 10 days	$53.55 per sample

Please refer to Part B. Samples For Bacteriology, Parasitology and Post-Mortem Examination and Part C. Samples For Virology for instructions on sample submission.
Please specify pathogen of interest (if any) upon sample submission.
* Note that the culture of fastidious bacteria such as *Mycobacterium* sp. may take 6 to 20 weeks.
+ Please specify in submission form if AST is required. If not specified during submission, AST will not be conducted. Additionally, AST may not be conducted if there are no applicable breakpoint interpretations available.
ELISA = Enzyme-linked Immuno-sorbent Assay (also known as Enzyme Immuno-assay [EIA]);
IFAT= Indirect Immuno-fluorescent Antibody Test

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
Streptococcus equi subsp. *equi* (Strangles) culture	Nasopharyngeal swab / Nasal swab / Tracheal wash	3 - 10 days	$54.60 per test
Taylorella equigenitalis (Contagious Equine Metritis) culture	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 (*Theileria equi* or *Babesia caballi*)	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 SNT in cell culture	2 ml serum or 4 - 5 ml blood	7 - 10 days	$65.10 per test
Equine Herpesvirus (EHV) type 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 *(This test is temporarily unavailable. We will update once the test is available.)*	2 ml serum or 4 - 5 ml blood	7 - 10 days	$65.10 per test
Theileria equi antibody Competitive ELISA	0.5ml serum	Up to 10 days	$110.25 per batch of 5 samples or part thereof
Babesia caballi antibody Competitive ELISA	0.5ml serum	Up to 10 days	$110.25 per batch of 5 samples or part thereof
Babesia caballi antibody Immunofluorescent Antibody Test *(This test is temporarily unavailable. We will update once the test is available.)*	0.5ml serum	Up to 10 days	$71.40 per sample
Theileria equi antibody Immunofluorescent Antibody Test	0.5ml serum	Up to 10 days	$71.40 per sample
Trypanosoma evansi antibody card agglutination test (CATT)	0.5 ml serum	Up to 10 days	$53.55 per sample

Please refer to Part B. Samples For Bacteriology, Parasitology and Post-Mortem Examination and Part C. Samples For Virology for instructions on sample submission.
* Note that the culture of certain fastidious bacteria such as *Mycobacterium* sp. may take 6 to 20 weeks.
+ Please specify in submission form if AST is required. If not specified during submission, AST will not be conducted. Additionally, AST may not be conducted if there are no applicable breakpoint interpretations available.
# Please specify pathogen of interest (if any) upon sample submission.
AGPT = Agar Gel Precipitin Test (also known as Agar Gel Immuno-diffusion [AGID]; SNT= Serum Neutralisation Test; ELISA = Enzyme-linked Immuno-sorbent Assay (also known as Enzyme Immuno-assay [EIA]);

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 VTM	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 VTM	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
Burkholderia pseudomallei (Melioidosis) culture	Affected tissue / organs	3 - 10 days*	$54.60 per test
Salmonella culture	Affected tissue / organs	3 - 10 days	$54.60 per test
Actinobacillus pleuropneumoniae (APP) culture	Affected tissue / organs	3 - 10 days*	$54.60 per test

Please refer to Part B. Samples For Bacteriology, Parasitology and Post-Mortem Examination and Part C. Samples For Virology for instructions on sample submission.
* Note that the culture of certain fastidious bacteria such as *Mycobacterium* sp. may take 6 to 20 weeks.
+ Please specify in submission form if AST is required. If not specified during submission, AST will not be conducted. Additionally, AST may not be conducted if there are no applicable breakpoint interpretations available.
[#] Please specify pathogen of interest (if any) upon 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 6th 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 6th sample onwards
Brucella abortus Slide agglutination test	2 ml serum or 4 - 5 ml blood	3 - 7 days	$53.55 per batch of 10 samples or part thereof[1]
Leptospira interrogans Microscopic Agglutination Test (MAT): serovars Pomona, Grippotyphosa or Hardjo	2 ml serum or 4 - 5 ml blood	7 – 10 days	$53.55 per test

Please refer to Part B. Samples For Bacteriology, Parasitology and Post-Mortem Examination and Part C. Samples For Virology for instructions on sample submission.
[1] 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.
ELISA = Enzyme-linked Immuno-sorbent Assay (also known as Enzyme Immuno-assay [EIA])

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 VTM	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
Salmonella culture+	Faeces	3 - 10 days	$54.60 per test
Escherichia coli O157:H7 culture+	Faeces, rectal swab	3 - 10 days	$54.60 per test
Listeria monocytogenes	Faeces, affected tissue / organs	3 - 10 days	$54.60 per test
Mycobacteria	Affected tissue / organs	8 - 20 weeks*	$54.60 per test
Serology			
Brucella abortus Slide agglutination test	2 ml serum or 4 - 5 ml blood	3 - 7 days	$53.55 per batch of 10 samples or part thereof[1]
Leptospira interrogans Microscopic Agglutination Test: serovars Pomona, Grippotyphosa or Hardjo	2 ml serum or 4 - 5 ml blood	7 - 10 days	$53.55 per test

Please refer to Part B. Samples For Bacteriology, Parasitology and Post-Mortem Examination and Part C. Samples For Virology for instructions on sample submission.
[1] 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 *Mycobacterium* sp. may take 6 to 20 weeks.
+ Please specify in submission form if AST is required. If not specified during submission, AST will not be conducted. Additionally, AST may not be conducted if there are no applicable breakpoint interpretations available.
# Please specify pathogen of interest (if any) upon 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 Fluorescent Antibody Test (FAT)	Brain, fixed brain smears	3 - 7 days	$52.50 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

Please refer to Part B. Samples For Bacteriology, Parasitology and Post-Mortem Examination and Part C. Samples For Virology for instructions on sample submission.
* Note that the culture of certain fastidious bacteria such as *Mycobacterium* sp. may take 6 to 20 weeks.
+ Please specify in submission form if AST is required. If not specified during submission, AST will not be conducted. Additionally, AST may not be conducted if there are no applicable breakpoint interpretations available.
[#] Please specify pathogen of interest (if any) upon sample submission.
FA = Fluorescent Antibody; FAT = Fluorescent Antibody Test; PCR = Polymerase Chain Reaction

CONTACT INFORMATION

Our Address:

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APHC Counter Operating Hours:

Monday to Thursday
8.30am to 12.00pm 2.00pm to 5.00pm
Friday
8.30am to 12.00pm 2.00pm to 4.30pm
Eve of New Year, Chinese New Year and Christmas
8.30am to 12.00pm
Saturday, Sunday, and Public Holidays
Closed

For any queries, please contact us via email:
NPARKS_CAVS_Service_Enquiries@nparks.gov.sg.