



Vector Borne Disease Diagnostic Lab



<https://cvm.ncsu.edu/research/labs/clinical-sciences/vector-borne-disease/>

SHIPPING INSTRUCTIONS: Ship Overnight on Freezer Packs to: NCSU/CVM, VBDDL, RM 462A 1060 William Moore Drive Raleigh, NC 27607 Phone #: 919-513-8279 Our lab receives shipments M-F. Samples drawn on Friday or over the weekend can be refrigerated and shipped on Monday.	Date of Sample: _____ Owner's First & Last Name: _____ Animal's Name: _____ Species: _____ Breed: _____ Age: _____ Sex: <input type="checkbox"/> F <input type="checkbox"/> FS <input type="checkbox"/> M <input type="checkbox"/> MC Is this animal to be exported? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, please provide microchip number: _____ Please indicate if this is a repeat/convalescent sample: Has this animal previously been tested for vector-borne disease? <input type="checkbox"/> Yes <input type="checkbox"/> No	(For Internal Use Only) S/E VBDDL #: _____ Date Received: _____
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DVM: _____ CLINIC: _____ ADDRESS: _____ CITY, STATE, ZIP: _____	PHONE: _____ EMAIL: _____ (Test results will be sent to this Email)
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COMPREHENSIVE PCR AND SEROLOGY TESTING (REQUIRES: 2ml of Serum and 2ml of EDTA whole blood)

<input type="checkbox"/>	Canine Comprehensive Panel	Includes: Serology Testing for <i>B. canis</i> , <i>B. gibsoni</i> , <i>E. canis</i> , <i>R. rickettsii</i> , <i>B. henselae</i> , <i>B. vinsoni</i> , <i>B. koehlerae</i> (by IFA) and Lyme, Anaplasma, Ehrlichia, and Heartworm (By Snap® 4DX Plus®) paired with PCR (DNA) testing to detect presence of Babesia, Bartonella, Anaplasma, Ehrlichia, Rickettsia, and hemotropic Mycoplasma organisms	\$175.00
<input type="checkbox"/>	Feline Comprehensive Panel	Includes: Serology Testing for <i>B. henselae</i> , <i>B. vinsoni</i> , <i>B. koehlerae</i> (by IFA) and Lyme, Anaplasma, Ehrlichia, and Heartworm (By ELISA) paired with PCR (DNA) testing to detect presence of Babesia, Bartonella, Cytauxzoon, Anaplasma, Ehrlichia, Rickettsia, and hemotropic Mycoplasma organisms. Please see the 'RESEARCH STUDIES' section of our website for information about our Feline-Fever Study. If samples meet the inclusion criteria, testing will be provided at no cost.	\$175.00

CANINE SEROLOGY TESTING (REQUIRES: 2ml of Serum; If available, please send EDTA whole blood for Hold)

<input type="checkbox"/>	Serology Panel	Includes: <i>Babesia canis</i> , <i>B. gibsoni</i> , <i>Ehrlichia canis</i> , <i>Rickettsia rickettsii</i> , <i>Bartonella henselae</i> , <i>B. vinsoni</i> , <i>B. koehlerae</i> (by IFA) and Lyme, <i>Anaplasma</i> , <i>Ehrlichia</i> and Heartworm (By Snap® 4DX Plus®)	\$95.00
<input type="checkbox"/>	Bartonella Serology	Includes: <i>Bartonella henselae</i> , <i>Bartonella vinsonii</i> , & <i>Bartonella koehlerae</i> serology testing by IFA	\$50.00
<input type="checkbox"/>	Babesia Serology	Includes: <i>Babesia canis</i> & <i>Babesia gibsoni</i> serology testing by IFA	\$40.00
<input type="checkbox"/>	Ehrlichia canis	Tests for antibody production against <i>Ehrlichia canis</i> by IFA	\$20.00
<input type="checkbox"/>	Leishmania infantum	Tests for antibody production against <i>Leishmania infantum</i> by IFA	\$20.00
<input type="checkbox"/>	Rickettsia rickettsii	Tests for antibody production against <i>Rickettsia rickettsii</i> (Rocky Mountain Spotted Fever) by IFA	\$20.00
<input type="checkbox"/>	SNAP® 4Dx® Plus	Tests for antibody production against <i>Borrelia burgdorferi</i> (Lyme C6), <i>Ehrlichia sp</i> (<i>E. canis</i> , <i>E. ewingii</i> , or <i>E. chaffeensis</i>), <i>Anaplasma sp</i> (<i>A. phagocytophilum</i> or <i>A. platys</i>), and for Heartworm antigen by Snap® 4DX Plus®	\$20.00

FELINE SEROLOGY TESTING (REQUIRES: 2ml of Serum; If available, please send EDTA whole blood for Hold)

<input type="checkbox"/>	Bartonella Serology	Includes: <i>Bartonella henselae</i> , <i>Bartonella vinsonii</i> , and <i>Bartonella koehlerae</i> serology testing by IFA	\$50.00
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PCR TESTING (REQUIRES: 2ml of EDTA whole Blood*; If available, please send Serum for Hold)

<input type="checkbox"/>	PCR Panel	Includes: Testing for known pathogens in six genera: Babesia, Bartonella, Anaplasma, Ehrlichia, Rickettsia, and hemotropic Mycoplasma	\$125.00
<input type="checkbox"/>	Anaplasma & Ehrlichia PCR	Tests for Anaplasma/Ehrlichia spp. including <i>A. phagocytophilum</i> , <i>A. platys</i> , <i>A. ovis</i> , <i>A. marginale</i> , <i>E. canis</i> , <i>E. chaffeensis</i> , <i>E. ewingii</i> , <i>E. muris</i> and <i>E. sp. Panola Mountain</i>	\$50.00
<input type="checkbox"/>	Babesia PCR	Tests for Babesia spp. including: <i>B. canis canis</i> , <i>B. canis rossii</i> , and <i>B. canis vogeli</i> genotypes; <i>B. gibsoni</i> Asian genotype; <i>B. coco</i> ; <i>B. conradae</i> ; <i>B. microti-like</i> ; and <i>B. odocoilei</i>	\$50.00
<input type="checkbox"/>	Bartonella PCR	Tests for <i>Bartonella</i> spp. including: <i>B. henselae</i> , <i>B. koehlerae</i> , <i>B. vinsonii</i> , <i>B. quintana</i> , <i>B. clarridgeiae</i> , and <i>B. rochalimae</i>	\$50.00
<input type="checkbox"/>	Cytauxzoon PCR	Tests for <i>Cytauxzoon felis</i>	\$50.00
<input type="checkbox"/>	H. Mycoplasma PCR	Tests for Mycoplasma spp. including: <i>M. haemofelis</i> , <i>M. haemocanis</i> , <i>M. haemominutum</i> , <i>M. haematoparvum</i> , and <i>M. turicensis</i>	\$50.00
<input type="checkbox"/>	Leishmania PCR	Tests on a genus level for <i>Leishmania</i> spp. in EDTA whole blood or lymph node aspirate (optimal sample is blood enriched with lymph node aspirate)	\$50.00
<input type="checkbox"/>	Rickettsia PCR	Tests for spotted fever group <i>Rickettsiae</i> (ie Rocky Mountain Spotted Fever) and Typhus group <i>Rickettsiae</i>	\$50.00

ADDITIONAL TESTS/FEEs

<input type="checkbox"/>	Babesia Blood Smear	Giemsa Smear for Babesia organisms (Available for EXPORT Animals Only-Please send EDTA whole blood sample)	\$20.00
<input type="checkbox"/>	STAT Single PCR Fee	Results sent out within 2 working days. Eligible with any individual PCR.	\$50.00
<input type="checkbox"/>	Tissue Extraction Fee	We accept fresh, frozen, or paraffin fixed tissues for Manual DNA Extraction & testing.	\$75.00

* Please see website for further instructions on submitting Lymph Node Aspirates. Fresh/Paraffin Embedded Tissues. and/or other specimens for PCR testing.

FAQs VBDDL Sample Submission and Testing

How do I ship samples to the Vector Borne Disease Diagnostic Lab?

Samples should be submitted overnight via UPS or FedEx on Freezer packs to the address at the top of our sample submission form. Padding and containment must satisfy federal shipping regulations in the event of breakage/leakage, i.e. wrap in absorbent towels or bubblewrap and place in sealed plastic bag within a Styrofoam or cardboard box. Optimally, use non-glass tubes. Each tube must be fully labeled to pair it with its completed test request.

The VBDDL is closed on the weekends. Blood samples drawn on Friday or Saturday, can be held in the refrigerator and shipped on Monday. Samples may be stored in the refrigerator for up to two weeks allowing for batching of multiple samples. Our University closes for energy conservation during the winter holiday. Please check our website for details on hours of operation. We regret that the VBDDL cannot provide prepaid shipping packaging.

PCR or Serology Testing?

Current evidence suggests that paired PCR and Serology results provide the most comprehensive information to assist in the diagnosis of vector borne infectious diseases. Please check our website for further information on the Value of Serological and Molecular Panels. **Serology** tests detect the presence of antibodies that typically develop in the first 3 weeks after infection and that may persist for months to years following exposure, sometimes regardless of effective treatment. **PCR** procedures amplify the DNA of infecting organisms in circulating blood; therefore a positive result is indicative of active infection. Since vector borne pathogens circulate in very low numbers, a negative PCR result is not conclusive proof that an animal is not infected.

Can samples from animals other than cats or dogs be submitted for testing?

Any animal species can be tested for known vector borne diseases through PCR testing. However, **IFA Serology** is limited to cats and dogs as our assays depend upon reagents that are host species specific.

What blood tubes are required for testing?

Serology IFA and/or the Snap® 4DXPlus component requires 2ml of Serum, spun down from serum or serum-separator tubes (Red, Gold, Tiger Top Tubes), sufficient for individual or IFA Panels or Combos.

PCR testing requires 2ml of EDTA anticoagulated whole blood (Purple Top Tubes), sufficient for a complete panel or any combination of single PCR assays requested.

The Comprehensive Panels require both EDTA and Serum, 2ml each.

Can I submit Tissue Sections or Aspirates for Testing?

Yes, we can accept aspirates or fresh, frozen, or paraffin embedded tissues, although a charge of \$75 must be added to cover the costs of the special handling required. Fresh samples stored in a Red top tube with sterile saline, on ice packs are preferred. Tissue samples stored in formalin solution are not recommended as prolonged exposure to formalin cross links DNA leading to false PCR results.

For instructions on properly obtaining and submitting Lymph Node aspirates please see https://cvm.ncsu.edu/wp-content/uploads/2016/05/Lymph_node_aspirate_PCR.pdf

What if my patient has already been treated with Antibiotic/Anti-protozoal medications?

Serology testing would be the more reliable testing method for an animal currently being treated for vector borne diseases. Antibiotic/anti-protozoal medications can inhibit the number of circulating organisms to levels below detection for PCR testing. We would recommend samples collected prior to or at least 20 days after the completion of antibiotic treatments.

What if my patient has already been treated with steroids or immune suppressing medications?

Immunosuppressive therapy is not a contraindication for PCR testing. The effect upon antibody development is not clear in all vector borne diseases. Prior steroidal treatment should not deter further testing.

I have a POSITIVE PCR test result- Now what?

Treatment is recommended. See information on specific diseases at <https://cvm.ncsu.edu/research/labs/clinical-sciences/vector-borne-disease/> Efficacy of treatment, or clearance of circulating organisms, may be determined by repeat PCR testing at 30, 60, and 90 days post treatment.

I have a POSITIVE Serology test result- Now what?

The VBDDL defines titers equal to or greater than 1:64 as Positive to avoid confusion with background autofluorescence that may occur at more concentrated serum dilutions. Submitting convalescent samples drawn 10 days to 3 weeks after the initial sample is considered the optimal way to identify acute infection. Such sampling in an active infection would show “seroconversion” with titers increasing several dilutions between dates as the host immune response is activated. Many vector borne infections result in antibody titers that persist for months to years regardless of effective treatment. In some diseases (RMSF), immunity is established, but in others, re-exposure to infected vectors can cause new infections. Titers without accompanying clinical signs may be noted in medical records, but do not always require action or treatment. Exposure histories based upon antibody titers indicate risks in the host animal’s environment that may warrant more stringent acaricide control.

How can I find the most current recommendations for treatment?

See information on specific diseases at <https://cvm.ncsu.edu/research/labs/clinical-sciences/vector-borne-disease/>

I believe that I have an unusual presentation of an infectious disease, what should I do?

We recommend paired IFA and PCR panels to uncover underlying stealth pathogens as well as classically presenting diseases. We have seen cases that present oddly or that appear nonresponsive to antibiotic treatments that are actually infections exacerbated by co-infecting agents or cases in which, once one infection is cleared, an underlying agent surfaces or lingers. To facilitate comprehensive testing, our service is offering such panels at significantly discounted rates.

Is there a possibility of a false negative test result?

PCR procedures amplify the DNA of infecting organisms in circulating blood; therefore a positive result is indicative of active infection. Since vector borne pathogens circulate in very low numbers, a negative PCR result is not conclusive proof that an animal is not infected. Negative IFA results can occur in the early stages (first three weeks) of infection as the host immune response is building. In some as yet unexplained circumstances, host animals may remain seronegative even with documentation by PCR or culture of active infection. Such results would be misleading but not necessarily considered “false”.

Can I receive a false positive test result?

Quality control measures in our lab are stringently maintained in order to minimize false positive results. Serum samples that are positive at screening dilutions undergo a second testing in order to determine the endpoint titer. Positive amplicons from PCR at the genus level are further tested to determine species, with gene sequence analysis performed in most cases. If any test results are unexpected, we do not hesitate to repeat testing and to verify by alternate methods, usually before results are released to our clients.

Payment / Billing

Payment should not be submitted with samples. Billing through the University accounting services occurs monthly and any questions or concerns can be directed to **CVM Accounting Department at (919) 515-7460 or (919) 515-7004**. Please have invoice number available for reference.

Disclaimers and Purpose:

The focus of the VBDDL at NCSU-CVM is research to benefit animal health. It is our intention to provide quality answers to diagnostic questions. The assays, antigens and controls used are developed and validated as a component of our research. We reserve the right to modify methods or reagents as needed to achieve the best analysis possible without reliance on any proprietary methods or reagents.

It is our intention to give each case with which we become involved the highest quality and attention possible. We will handle the sample with care and appropriate speed to obtain the most informative and accurate result. We intend to collect and utilize descriptive information imparted with that sample (address, age, breed, sex, history) in ways that reveal the useful and pertinent context for the diseases we study without using information in any way that might insult or harm the animal, owner, or veterinarian concerned.

All samples of sufficient volume are stored for potential future testing for a minimum of 2 years. We reserve the right to use archived samples for research purposes, always respecting privacy rights of the contributing animal, owner and veterinarian.