The Use of Diagnostic Tests in Feline Medicine

June E. Tuttle, A.A.S., B.S.

Identifying the ailment affecting a cat often is no easy task. For the veterinarian, the cat's history and clinical signs may suggest several diagnoses. However, today's sophisticated diagnostic tests can help the veterinarian to establish an accurate diagnosis, which is crucial in selecting the proper treatment. Although the initial cost for diagnostic testing may seem high, it more than pays for itself in the long run by reducing treatment and hospitalization costs. The following is a brief synopsis of some of the more common diagnostic tests.

**Bacteriology and Mycology**

Many diseases are caused by bacteria or fungi. Bacteria and fungal cultures and antibiotic sensitivity tests are particularly useful to the veterinarian in diagnosis of an infection and in prescribing the appropriate treatment.

Scrapings from skin, swabs from lesions or mucous membranes, tracheal wash samples, and samples of blood, urine, or tissue all may be used for the isolation of bacteria in cultures. Sterile samples are plated onto a nutrient media (such as agar) and allowed to incubate for several hours at ideal growing temperatures. If bacterial growth occurs, the organisms can be identified in a variety of ways.

Once an organism has been identified, a sensitivity test is performed to determine which antibiotic is most effective against it. This is important because bacteria can become resistant to an antibiotic to which they were once susceptible. In the interim, a veterinarian may prescribe a broad-spectrum antibiotic to initiate treatment, then later may change the prescription to a more specific drug.

Small paper discs impregnated with different antibiotics are placed onto a culture plate which has been streaked with freshly isolated organisms. The culture is incubated for 8 to 24 hours, then examined for bacterial growth. If the bacteria are sensitive to a particular antibiotic, the area around the disc impregnated with that antibiotic will remain clear, while areas around discs containing antibiotics to which the bacteria are resistant will show growth.

The same general techniques are used to diagnose fungal infections, except that special growth media and temperature conditions must be provided. In addition, the incubation period may require several days.

**Endocrinology**

Several tests are available that measure hormone levels in the blood. Increases or decreases in hormone levels are indicative or even diagnostic of certain metabolic diseases and/or disorders. Such tests may be required periodically to...
monitor the effectiveness of a given treatment. Sophisticated equipment is needed to perform some of these tests, although rapid "in office" diagnostic kits are now available for a limited number of tests. Table 1 lists some of the tests that may be performed at larger veterinary hospitals, clinics at veterinary colleges, or commercial diagnostic laboratories.

**Virology/Immunology**

Viruses also can be recovered from affected animals, but culture procedures are much more complex and require very specialized laboratory equipment (not all veterinary diagnostic laboratories provide this service). In addition, virus isolation and culture are time-consuming and expensive. Hence other techniques, such as direct identification of viruses in tissue or blood specimens, are often applied.

**Serology** is used to determine the presence of antibodies (the body's counter-response to microbial invaders) or antigens (a foreign substance, such as a virus, that stimulates an immune response) in cat serum. The concentration or quantity of antibody or antigen present in the serum is commonly expressed as a titer. The titer is determined by serially diluting the serum until the specific reactivity being tested for is lost. The final dilution of serum showing positive reactivity is referred to as the titer. A positive or high serum antibody titer against a specific virus indicates previous infection (or vaccination) of the cat with that virus. For example, a serum antibody titer against feline panleukopenia virus of 1:5,000 indicates either previous infection with virus or vaccination with a panleukopenia virus vaccine.

The enzyme-linked immunosorbent assay (ELISA) can be used to detect either antibody or antigen, depending on how the assay is set up. Commercial test kits that measure either a positive or negative result have been developed that make it possible to perform this type of test at veterinary clinics rather than at a diagnostic laboratory. The ELISA can be used as an aid in diagnosing feline leukemia virus infection, feline immunodeficiency virus infection, toxoplasmosis, heartworm, and feline coronavirus infection. KELA is a kinetics-based ELISA wherein the speed of reaction is quantitated and from this a titer is calculated by computer.

The immunofluorescent assay (fluorescent antibody test) uses a fluorescent-labeled antiviral antibody that reacts with virus present within infected cells. The test may be set up to measure either antigen or antibody. If there is a virus in the cat's serum, then an antigen-antibody complex is formed which can be seen by using an ultraviolet light microscope. This type of test is one of the most widely used by diagnostic microbiologists, although procedures vary greatly among laboratories. (The Hardy test or slide test for feline leukemia virus is an immunofluorescence assay.)

Virus neutralization (VN) measures the effect of serum antibody against live virus. The procedure consists of combining the proper ratio of diluted serum and virus, then adding it to a cell culture (substrate for virus growth). After incubating for a period of time, the culture is
viewed microscopically for the presence or absence of viral effects. If the viral effect is absent, it indicates that specific antiviral antibody is present in the test serum.

**Hematology**

Hematology tests analyze whole blood in a variety of ways. The most common test is the hemogram which involves a series of tests including a complete blood count (the number of red and white blood cells per unit volume of blood), hemoglobin (the percent of oxygen-carrying pigment in red blood cells), packed cell volume (volume of cells in relation to the fluid volume of blood), and a blood smear (a thin layer of blood smeared on a slide, stained, and viewed under the microscope).

Coagulation tests provide important information on the factors that affect the blood's ability to clot. These tests may include prothrombin time, platelet count, clot retraction, fibrinogen, coagulation time, and thromboplastin time.

The Coombs test (direct or indirect methods) is used to identify the presence of antibody on red blood cells. Results are given as positive or negative. Positive means that, in the test system, red blood cells from the patient have clumped together because they are coated with antibody (an abnormal condition). The Coombs test is used to diagnose autoimmune diseases such as autoimmune hemolytic anemia and systemic lupus erythematosus. These diseases develop when the immune system attacks the body's own cells. The test is also used to determine blood compatibility (crossmatching) before giving a blood transfusion.

**Parasitology**

Diagnostic tests are often performed to determine the presence of internal parasites. The easiest way to determine the presence of internal parasites is by a fecal examination. A small sample of fresh feces is collected and liquefied with a saturated salt or sugar solution and centrifuged. A small amount of the sample is then placed on a slide, and viewed under a microscope. The eggs (ova) of various parasites are then visible and can be identified.

External parasites can be identified by removing the parasite directly, or by scraping affected skin areas. The scrapings are viewed microscopically for the presence of tiny parasites.

**Cytology and Histopathology**

Cytology is the microscopic evaluation of cells obtained by scraping a tissue surface (i.e. mucous membrane), washing (i.e. tracheal wash), or needle aspiration from bone marrow, lymph node, cerebrospinal fluid or urine. Diagnosis is based on the microscopic appearance of cells as seen in stained smears, or by specific immunological reactions (such as the immunofluorescence test).

A biopsy is a small sample of tissue obtained for microscopic examination or culture. Biopsies can be acquired by needle aspiration or direct surgical removal. Inflammation, cancer, and
specific infectious agents often can be identified by this procedure.

**Clinical (Serum) Chemistry**

Blood is a connective tissue whose liquid component (serum) "bathes" the cells of all tissues. Serum can be very useful in diagnosis of metabolic diseases in which abnormal levels of serum constituents are found. Some of the tests can be performed quickly in the veterinarian's office, such as blood glucose or blood urea nitrogen (BUN). However, some of the more sophisticated tests for electrolytes, enzymes, and minerals are usually sent to diagnostic laboratories for analysis.

Most diagnostic laboratories offer automated serum or clinical chemistry profiles that include numerous specific assays run on a small quantity of serum. In addition to blood glucose and BUN, tests available include creatinine, phosphorous, calcium, cholesterol, total protein, albumin/globulin ratio, sodium, potassium and chloride. (By comparing the results of these assays with normal values the veterinarian can detect specific abnormalities indicative of organ dysfunction.)

**Urinalysis**

Urinalysis is a series of physical and chemical tests that aids in diagnosis of urinary tract disorders. A sample of urine is examined for its physical properties (clarity, color, specific gravity), biochemical parameters (pH, protein, glucose, bilirubin, ketones), and presence of blood cells, crystals, casts, and bacteria. Urinalysis is also helpful in detecting diseases affecting other system, for example, glucose in the urine indicates diabetes mellitus.

**Radiography**

A number of tests employ radiographs (x-rays), ranging from the simple images produced on x-ray film to the more complex procedures requiring a contrast medium to better visualize internal structures. Examples of the latter procedures include the intravenous pyelogram (IVP) for evaluating the kidney and angiography for the heart. The more sophisticated tests often are available only at veterinary teaching hospitals located at university veterinary colleges.

**Electrocardiography**

This procedure records the electrical activity of the heart muscle during contraction and relaxation. Abnormal tracings seen on the graph paper readout aid the veterinarian in diagnosing heart disease.

**Echocardiography**

This is an ultrasound technique used to provide images of the exterior and interior heart without using the invasive technique of heart catheterization and angiography.

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**Dr. Saidla Is Appointed to Feline Extension Position**

The Cornell Feline Health Center and the College of Veterinary Medicine at Cornell University are pleased to announce the appointment of Dr. John E. Saidla of Auburn, Alabama to the newly established position of feline extension veterinarian effective October 1, 1988. Dr. Saidla will also serve as assistant director of the Feline Health Center and will be responsible for coordinating the extension and continuing education activities of the College of Veterinary Medicine and Feline Health Center in the area of feline medicine and surgery.
Songbird Fever

Fredric W. Scott, D.V.M., Ph.D.

This spring’s bird migration to the Northeastern United States was associated with a high incidence of diseased songbirds. States primarily involved were Vermont, New Hampshire, and Massachusetts, with some cases in Maine, Connecticut, and eastern New York. Songbirds most frequently involved were pine siskins, but black-capped chickadees, evening grosbeaks, common redpolls, American goldfinches, cardinals, boat-tailed grackles, cowbirds, and house sparrows were also affected.

Cats that preyed on diseased birds or frequented bird feeder areas developed acute infections lasting 2 to 7 days. Signs included acute lethargy and inappetance, sometimes bouts of vomiting also occurred. High fever (104-105°F) was a consistent finding, with reported cases of temperatures as high as 108°F. Frequently, clinical signs mimicked either poisoning or panleukopenia. The incubation period was 2 to 5 days, and the course of the disease varied from 2 to 7 days. Recovery was usually rapid and uneventful. However, some cats required up to three weeks to regain weight and normal eating habits. Most cats responded to antibiotic and supportive treatment unless there were complicating factors.

There is reasonably good evidence that the causative agent is *Salmonella typhimurium*. The original source of the infection in birds is unknown, but the spread of infection from feeder to feeder is undoubtedly due to fecal contamination of bird seed at the feeder site.

Control and Prevention

Songbird fever can be controlled by breaking the infection cycle in the bird and preventing the cat from eating birds. Bird feeders should be thoroughly cleaned and disinfected with Clorox. Cats should be confined indoors.

The disease outbreak this spring was self-limiting when the migration season for the birds was concluded. We do not know if reoccurrences will be seen during the fall migration, or in the spring 1989 migration.

Public Health Concerns

Owners should exercise special precautions in handling affected cats, their litter pans, and other contaminated material. Prudent washing of hands is a must. Disinfection of litter pans and food dishes with dilute Clorox (1:32 or 4 ounces per gallon of water) or other disinfectants should be done routinely for at least four months after infection.

Fredric W. Scott, DVM, PhD, is the director of the Cornell Feline Health Center and professor of veterinary virology at Cornell University College of Veterinary Medicine.

The Will Is the Way

The old adage "If there is a will there is a way" has new meaning when contemplating estate planning. The will is the way that you can best express your concern for animal health and welfare. The Cornell Feline Health Center has a brochure, "How do you say thank you for a lifetime of love?", that briefly explains bequests and other estate plans. This brochure is available free of charge. To obtain a copy call (607-253-3414) or write our office.
Setting goals and objectives are important for an organization to develop viable programs. Each summer a group of dedicated people interested in better health care for cats meet in Ithaca, NY to discuss short and long range goals for the Cornell Feline Health Center. These people are appointed by the Dean of the College of Veterinary Medicine to serve on the Feline Advisory Council. Council members are appointed to serve for a three-year term. **Dr. Barbara Stein**, director of the Chicago Cat Clinic, was appointed this year to the advisory council.

Ideas generated at this year's meeting included promotional ideas, developing 4-H educational materials on cat health, consultation/diagnostic service, and ways of increasing memberships to the Center. Drs. Arnoldi, Bicks and Stein have formed a committee to develop long range plans for the Center.

Returning to the council this year are: **Dr. George W. Abbott** (Rhode Island), **Dr. Joan Arnoldi** (Wisconsin), **Dr. Jane Bicks** (New York), **Joan Blackburn** (Texas), **Roger Caras** (New York), **Marjorie Cornell** (Florida), **Dr. Jean Holzworth** (Connecticut), **Hazel Lindstrand** (Illinois), **Dr. Mark L. Morris, Jr.** (Kansas), **Dr. Theodore A. Rude** (Wisconsin), **Ellen Sawyer** (Illinois), **Mordecai Siegal** (New York), **Joan Wastlhuber** (California).
**Honor Roll**

During the past three months the Center has received many contributions from individuals and cat clubs interested in the future health of cats. The following people have contributed at least $100 to support the Cornell Feline Health Center’s work on feline diseases. We are most grateful for their support and the support of many others who are not listed on the honor roll.

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<tr>
<th>Name</th>
<th>Funds given for:</th>
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<tr>
<td>Elizabeth Albon, Texas</td>
<td>General Donation</td>
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<td>Elizabeth Albon and Bev Taylor, Texas</td>
<td>In memory of Dr. Medford’s cat, Charlie</td>
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<td>Mr. and Mrs. Gordon Anderson, Rhode Island</td>
<td>In memory of Sneey</td>
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<td>Joan Blackburn, Texas</td>
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<td>Stephen Bradley, New York</td>
<td>In memory of Socks</td>
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<td>Carnation Company, California</td>
<td>General Donation</td>
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<tr>
<td>Hanna Eichwald, New York</td>
<td>In memory of Dr. Jo Lockwood, for Mynx and Murphy</td>
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<tr>
<td>Donald Goodyear, Jr., Pennsylvania</td>
<td>In memory of Becca</td>
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<td>William Lee, Maine</td>
<td>In honor of Dr. and Mrs. Ronald Lott</td>
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<td>Dr. and Mrs. Ronald Lott, Maine</td>
<td>In memory of Rita and Bill Bowdoin, and Eva Meyri</td>
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<td>Marguerite and Robert Lynch, California</td>
<td>In memory of Whiskey and Krump</td>
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<td>Ann MacLenathen, New York</td>
<td>In memory of Squeek</td>
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<td>Mr. and Mrs. Gregory Maier, New York</td>
<td>In memory of Spot</td>
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<td>Maine Coon Cat Club, New York</td>
<td>In honor of Dr. Randy Murphy</td>
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<td>Mr. and Mrs. Malcolm McAnn, New York</td>
<td>In memory of Calico IV</td>
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<td>Cindy and Max Mellott, Virginia</td>
<td>FIP Research in memory of Lady Bug</td>
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<td>Elizabeth Moore, Washington D.C.</td>
<td>In memory of Pushkin</td>
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<td>Frances Nail, Florida</td>
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<td>Jacqueline Ornsby, New York</td>
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<td>Mary Scotto, New Jersey</td>
<td>In honor of Dr. Clifford Glade</td>
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<td>Eleanor Seitter, New Jersey</td>
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<td>Synbiotics Corporation, California</td>
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<td>Beverly Widaseck, California</td>
<td>In memory of Bubbers and Lily</td>
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<td>Paul Williams, Massachusetts</td>
<td>FIP Research</td>
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**Contributing Membership:**
Gloria and Thomas Cole, New York

**Cat Club Support:**
Capricorn Cat Club, Maryland
Connecticats, Connecticut
Feline Alliance of Tidewater, Virginia
Hawkeye State Cat Club, Inc., Iowa
Massachusetts Colony Cat Club, Inc., Massachusetts
Persian Bi-Color & Calico Society, Inc., New Jersey
Pyrethrin Pesticides Can Be Harmful

Late summer and early fall marks the annual battle with fleas. An arsenal of pesticides is available for pet owners to use against these troublesome pests. The active ingredient in many products is pyrethrin and pyrethroid compounds. Although pyrethrins have been reported to be the safest pesticide, there have been several cases of poisoning in dogs and cats.

Pyrethroids lacking the alpha cyano group (permethrin, resmethrin) can cause incoordination, excitability, and convulsions. Products containing the alpha cyano group (fenvalerate, deltamethrin, cypermethrin) also cause excessive salivation and whole body tremors. Organophosphate and carbamate pesticides cause similar signs. However, treatment is different for these poisonings. Therefore, it is very important for the owner to know what pesticide was used on the animal if a reaction occurs.

Immediate treatment for an affected cat includes thoroughly bathing it with a mild shampoo to remove any residual pesticide. The cat then should be taken to the veterinary office for additional therapy.

Potential poisonings may be prevented by carefully reading the instructions for usage, then explicitly following the steps. When using a product for the first time, use it sparingly to determine if the cat is sensitive to the ingredients. Wait a minimum of two weeks before exposing the cat to a new pesticide.