

# Feline Health Topics

*for veterinarians*

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## Clinical Evaluation of Young Kittens

Johnny D. Hoskins, D.V.M., Ph.D.

A kitten's first visit to the veterinarian usually occurs at 8 weeks of age, when it receives its first vaccines. Occasionally, a veterinarian may be asked to examine and evaluate younger kittens. However, to assess the physical condition of an animal that is still developing after birth requires knowledge of normal developmental stages (refer to Table 1) and a systematic approach to the physical examination.

### Case History

Obtaining the kitten's case history from the owner is the first step in the evaluation process. The easiest approach is to have the owner provide a chronological listing of the events preceding the visit. Leading questions may provide additional insight into a problem, such as the kitten's nutrition, other kittens affected in the litter, treatments administered by the owner, and the queen's reproductive history.

### Physical Examination

Most diagnostic errors occur during the physical examination. Common errors include poor examination technique, undetected abnormalities, erroneous test interpretation, and omissions when recording information. These errors can be greatly reduced by using a systematic approach to the physical examination. An orderly examination will avoid confusion and apprehension on the part of the kitten and client. The most organized approach is to proceed from the kitten's head to tail. However, information collected during the examination should be ascribed to the various body systems—digestive, urinary, circulatory, sensory, respiratory, and neuromuscular.

Basic equipment used for examining kittens includes a small digital rectal thermometer, otoscope with infant cones, a penlight and hand-held lens or an indirect ophthalmoscope, small accurate gram scale, stethoscope with pediatric or infant-sized bell (2 cm) and diaphragm (3 cm), and a pediatric pleximeter.

### Newborns to 5 Weeks of Age

Kittens younger than five weeks of age should be examined with the queen present to keep the kitten calm throughout the procedure. All kittens should be examined on a warmed examination table. Warmth can be provided by a warm-water heater blanket or a small cardboard box lined with blankets. (Electric heating pads are not recommended because severe burns can occur if the kitten is left unattended.) Before handling the kitten, first observe its reactions to its environment. During this brief time, make note

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of the kitten's overall physical condition, mentation, posture, locomotion, and respiration pattern. This is usually followed by recording the kitten's weight and temperature.

Body weight is the most important parameter in determining the health of very young kittens. Weight loss or failure to gain weight is one of the first signs of illness in newborns. Having the client keep an accurate daily record of each kitten's weight for the first two weeks is helpful in detecting a problem. Kittens usually weigh about 100 grams (+/- 10 grams) at birth, doubling their birth weight within two weeks.

The normal body temperature for newborn kittens is 96-97°F. After one to two weeks the temperature gradually increases until it reaches 100°F by four weeks of age.

Check the head for evidence of malformation of the skull, as well as harelip, stenotic nares, and cleft palate. Brachycephalic breeds, such as Persian and Burmese, are predisposed to these malformations. Open the mouth and look at the mucous membranes, which should be light pink and moist.

Evaluate the condition of the skin, checking for wounds, state of hydration, and completeness of hair cover. The haircoat should be shiny and free of debris. If necessary, the skin examination may include easily performed diagnostic procedures such as exfoliative cytology, bacterial culture and sensitivity testing, skin scraping, and dermatophyte culture and identification of external parasites.

Carefully observe the kitten's breathing. The respiratory rate will be 15 to 35 breaths per minute. Breathing should be regular and unlabored. It is usually very difficult to auscultate newborns because of their rapid heart rate. However, using an infant-sized bell and diaphragm increases the possibility of hearing a heart murmur or abnormal lung sounds.

Inspect the umbilicus carefully for evidence of infection or abnormalities of the abdominal wall. The

umbilical cord usually falls off two to three days after birth. Check the limbs, tail, anus, and genitalia to ensure that all are present and appear normal. Look for any signs of diarrhea, constipation, or abnormal micturition.

## Five Weeks to 6 Months of Age

### Head and Neck

**Eyes.** A penlight is useful in examining the eyes. Depending on the kitten's age certain features may not be observable. Examine the eyelids for cilia and evidence of accumulative discharge. Note the clearness of the cornea. The sclera should be eggshell-white with minimal blood vessel injection. The anterior chamber should be clear and of uniform thickness throughout. Check the iris for irregular margins (colobomas) and persistent pupillary membranes, which appear as spidery strands of pigmented epithelium adhering to either the cornea or the lens.

## Feline Health Topics

*A publication for veterinary professionals*

The ultimate purpose of the Cornell Feline Health Center is to improve the health of cats everywhere, by developing methods to prevent or cure feline diseases, and by providing continuing education to veterinarians and cat owners. All contributions are tax-deductible.

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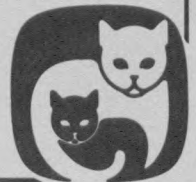
*Assistant Director:* James R. Richards, D.V.M.

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Tear production can be evaluated using the Schirmer tear test, which should be completed before any solutions are applied to the eyes.

Optimal examination of the lens and fundus requires the pupil to be dilated using one drop of 1% tropicamide solution, followed in five minutes by a second application. The pupil of kittens often dilates quickly, since their lightly pigmented uvea are less likely to bind the drug and delay mydriasis. After the pupil is dilated, the penlight or direct ophthalmoscope (set at +8 to +12 diopters) can be used to examine the lens. The retina and optic disc may be easily evaluated by 6 weeks of age using an ophthalmoscope setting of -2 to +2 diopters. When examining the eyes, it is important to look for any congenital or inherited defects such as colobomas, cataracts, or retinal dysplasia.

**Ears.** The pinnae and periauricular regions should be checked first for evidence of trauma, erythema, alopecia, and primary or secondary skin lesions that may be indicative of dermatophytosis. The external ear canals can be inspected by gently pulling the pinnae vertically and then caudally. Inspect the ear for any exudate. Typically, a black crusty exudate suggests an ear mite infestation; a thick brown exudate indicates a yeast infection; and bacterial exudates usually are white, yellow or green with a foul odor. Cytologic samples are easily collected by using a cotton-tipped swab.

If the ear canal appears abnormal and irritated, or if neurologic disorders are suspected, then an otoscopic examination is warranted. The tip of the otoscope cone should reach to within 0.5 to 1.0 cm of the tympanic membrane to prevent any damage to the ear.

**Nose.** Check the nares for obstruction, stenosis, discharge, or abnormal shape. The patency of the airways may be determined by closing the animal's mouth and allowing the kitten to breathe on a glass slide or metal table.

Infectious rhinitis occurs commonly in young kittens. It can be caused by bacteria, viruses, or fungi. Sneezing is the primary signalment. Initial discharge is often serous, followed several days later by a mucopurulent discharge.

**Mouth.** Examine the kitten for any congenital abnormalities such as anomalies of the tongue, cleft palate, or malocclusions. Look for evidence of string or foreign objects. The color of the gums and hard palate should be checked for cyanosis or pallor. Examine the teeth for early occlusion problems.

**Neck.** Testing for the menace reflex, pupillary light reflex, jaw tone, facial sensation, and swallowing reflex provides basic information on the health of the kitten's nervous system. Carefully palpate the left side of the neck for evidence of megaesophagus. The lymph nodes should be examined for swelling, localized temperature increase, or ulceration. The mandibular lymph nodes are located just cranial and dorsal to the mandibular salivary glands, which are larger and firmer.

### **Forelimbs and Thorax**

Examine the forelimbs joint-by-joint, beginning at the toes and proceeding to the shoulder. Gently palpate and flex each limb to determine joint mobility.

Carefully observe the rise and fall of the chest for respiratory rate, breathing pattern, and evidence of respiratory distress. Then palpate the thorax for abnormal rib and sternal conformation.

To auscultate the lungs and heart, divide the thorax into right and left sides, upper and lower fields, and cranial and caudal fields. Using the pediatric-sized bell and diaphragm with the stethoscope, listen to the respiratory sounds, then to the cardiac sounds. Pay close attention to any audible asymmetry, which generally denotes disease.

Heart murmurs are the most common cardiac abnormality found in kittens. The location, timing and quality of the murmur help determine cause and

**Table 1. Age-related Developmental Stages**

System	Age	Developmental Stages
Eyes	Birth-13 days	Lids are closed, but kitten responds to a bright light with a <u>blink reflex</u> . This reflex disappears at 21 days probably due to development of accurate pupil control. <u>Palpebral reflex</u> is present at 3 days, becoming adultlike by 9 days.
	5-14 days	<u>Menace reflex</u> is present, but slow. Eyelids separate into upper and lower lids. <u>Pupillary light responses</u> are present within 24 hours after lids separate. <u>Reflex lacrimation</u> begins when lids separate. Eyes open 12-14 days after birth. <u>Corneal reflex</u> is present after eyelids separate.
	3-4 weeks	Vision should be normal.
Ears	Birth-5 days	External ear canals are closed. Hearing is poor.
	10-14 days	External ear canals open (should be completely open by 17 days). For the first week after the ear canals are completely opened there is an abundance of desquamated cells and some oil droplets, which is normal as the ear canals remodel to the external environment.
Mouth	2-3 weeks	Deciduous incisors erupt, followed by deciduous canines.
	4-5 weeks	Deciduous lower premolars erupt.
	8 weeks	Deciduous upper premolars erupt.
Circulatory	Birth-4 weeks	Lower blood pressure, stroke volume and peripheral vascular resistance. Increased heart rate (>220 bpm), cardiac output and central venous pressure. Heart rhythm is regular sinus.
Respiratory	Birth-4 weeks	Respiratory rate is 15 to 35 breaths per minute.
Neuromuscular	Birth	<u>Flexor dominance</u> is present at birth, with <u>extensor dominance</u> starting as early as 1 day. <u>Seal posture reflex</u> can last up to 19 days. <u>Sucking reflex</u> is present, but disappears by 23 days. <u>Anogenital reflex</u> disappears between 23-39 days. <u>Cutaneous pain perception</u> is present, but <u>withdrawal reflex</u> is noticeable at about 7 days. <u>Tonic neck reflexes</u> are present until 3 weeks of age. Can raise head. <u>Righting response</u> is present. <u>Myotatic reflexes</u> are present at birth, but difficult to elicit in newborns. <u>Panniculus reflex</u> is present at birth.
	5 days	<u>Nystagmus</u> associated with rotatory stimulation appears at the end of the first week. <u>Cross extensor reflex</u> ends between 2-17 days—persistence of this reflex indicates upper motor neuron disease. Direct forelimb support of body weight.
	14-16 days	Kitten is crawling. Rear limb support of body weight.
	20 days	Kitten can sit and has reasonable control of distal phalanges.
	22 days	Kitten is walking normally. <u>Vestibular nystagmus</u> becomes adultlike.
	23-40 days	Kitten is climbing and has air righting response.
	3-4 weeks	<u>Hemiwalking response</u> , but may not be fully developed in rear limbs until 6 weeks old.
	6-8 weeks	<u>Postural reactions</u> are fully developed.

*The time frame is an approximation for normal development, with variances occurring with some individuals.*



significance. Heart murmurs can be systolic, diastolic, or continuous. The differential diagnosis for systolic or diastolic murmurs is difficult. However, the characteristics, case history and signalment should suggest the most likely cause. Continuous murmurs are usually associated with patent ductus arteriosus. Functional murmurs are usually soft, early systolic murmurs heard best at the left cardiac base. These murmurs generally result from increased blood velocity that occurs during infection, anemia or hypoproteinemia. In any case, if the murmur persists beyond four months, the kitten should be evaluated by special diagnostic tests (electrocardiography or echocardiography), or evaluated by a veterinary cardiologist.

The incidence of congenital heart disease is low, occurring in only 1 to 2 percent of kittens. Generally, the Siamese breed seems to be afflicted with a heritable predisposition to several congenital heart diseases. Those that may occur in kittens include endocardial cushion defect, ventricular septal defect, endocardial fibroelastosis, aortic stenosis, patent ductus arteriosus, and tetralogy of Fallot.

### **Abdomen**

Gentle palpation, from cranial to caudal, can be performed using one hand. Imagine the various internal organs while palpating. This will help you recognize any changes in size, shape, and texture of those organs. Usually the liver and spleen are not palpable. However, the kidneys can be felt. The left kidney is more caudal and more mobile than the right kidney. Check each kidney for enlargement by cupping the kidney in one hand, and tracing the kidney's margin with your fingers. The urinary bladder is free moving and easy to palpate. Gently squeeze the bladder to determine resistance to urinary flow.

The stomach will feel like a large, fluid-filled sac if the kitten has recently eaten, or firm and painful if a foreign object has been ingested. The small intestines are located cranial to the middle abdominal area. The cecum is palpated in the cranial abdomen, and the

colon runs the length of the abdomen from cranial to caudal. Be careful not to accidentally identify feces in the colon as a tumor or mass.

### **Hindquarters**

The rectal thermometer that was inserted at the beginning of the physical examination now can be removed and the temperature recorded. Any feces adhering to the thermometer should be examined visually and microscopically for parasites, especially if no stool sample was brought in by the client.

Palpate the popliteal lymph nodes, which lie caudal and dorsal to the stifle. Palpate the femoral pulses in older kittens for symmetry, size and pulse rate. Then do a basic orthopedic check of the hindlimbs, similar to the forelimbs.

Examine the perineal region and the genitals for congenital defects or intersex characteristics. The testicles should be descended by 4 to 6 weeks of age. If both testes have not descended by 16 weeks of age, cryptorchidism should be suspected. Examine the rectum and anus for signs of inflammation or congenital defects. Rectal prolapse secondary to gastrointestinal disorders and imperforate anus are conditions often observed in kittens.

### **Laboratory Tests**

A kitten's serum chemistry and hematologic values are different than adult cats. Reference laboratories may provide their normal value ranges for kittens for their tests.

Collecting adequate blood samples from kittens younger than five weeks of age is very difficult. In those cases, it is advisable to at least perform simple in-house tests—i.e., obtaining the packed cell volume from a microhematocrit, blood cell morphology from microscopic examination of a stained blood smear, blood glucose and blood urea nitrogen determinations by reagent strips for whole blood, urine evaluation by reagent strip and a urine sediment microscopic examination, and total plasma solids and urine specific gravity determinations by refractometer. Even

**Table 2. Laboratory Reference Intervals for Healthy Kittens**

Parameter:	Age: 2 weeks	4 weeks	6 weeks	8 weeks
RBC (x10 <sup>6</sup> /ul)	5.05-5.53	4.57-4.77	5.66-6.12	6.31-6.83
Hemoglobin (gm/dl)	11.5-12.7	8.5-8.9	8.3-8.9	8.8-9.4
PCV (%)	33.6-37.0	25.7-27.3	26.2-27.9	28.5-31.1
Total WBC (x10 <sup>6</sup> /ul)	9.10-10.24	14.10-16.52	16.08-18.82	16.13-20.01
band neutrophils	0.04-0.08	0.07-0.15	0.14-0.26	0.14-0.30
segmented neutrophils	5.28-6.64	6.15-7.69	7.92-11.22	5.72-7.78
lymphocytes	3.21-4.25	5.97-7.15	5.64-7.18	8.02-11.16
monocytes	0.00-0.02	0.00-0.04	0	0.00-0.02
eosinophils	0.53-1.39	1.24-1.56	1.22-1.72	0.88-1.28
basophils	0.01-0.03	0	0	0.00-0.04
Plasma sodium (mmol/L)	---	149-153	151-156	150-152
Plasma potassium (mmol/L)	---	4.0-4.8	4.5-5.5	4.1-5.3
Plasma chloride (mmol/L)	---	120-124	119-125	119-125
Plasma calcium (mg/dl)	---	9.4-10.6	9.5-10.7	9.4-10.0
Plasma phosphorus (mg/dl)	---	6.3-7.5	6.9-9.3	7.3-9.1
Blood urea nitrogen (mg/dl)	<30	<30	<30	<30
Plasma creatinine (mg/dl)	---	0.4-0.6	0.5-0.7	0.6-0.8
Glucose (mg/dl)	76-129	99-112	<120	<120
Total protein (gm/dl)	4.0-5.2	4.6-5.2	4.4-5.0	4.5-5.3
Albumin (gm/dl)	2.0-2.4	2.2-2.4	2.2-2.5	2.3-2.4
Bile acids (uM/L)	<10	<10	<10	<10
Total bilirubin (mg/dl)	0.1-1.0	0.1-0.2	---	---
ALT (IU/L)	11-24	14-26	---	---
AST (IU/L)	8-48	12-24	---	---
ALP (IU/L)	68-269	90-135	---	---
Urine specific gravity	---	1.020-1.038	1.024-1.026	1.047-1.080

knowing the results of these few tests may be sufficient information for confirming the cause of the kitten's illness or for assisting in the case management of the illness. (Refer to Table 2 for normal test values.)

## Summary

A thorough clinical evaluation of sick kittens is important. However, the clinical evaluation is often complicated by age-related changes in body systems because the development of the body systems in young kittens continues after birth. Assessing bodily functions during this developmental stage requires knowledge of testing procedures and expected and

abnormal results. Furthermore, diagnostic errors can be reduced by following a systematic approach to the physical examination. ■

*Dr. Johnny D. Hoskins is professor of veterinary internal medicine, Department of Veterinary Clinical Sciences at Louisiana State University. He is editor of the book Veterinary Pediatrics published by W.B. Saunders (1990) and has written several articles on the subject for various veterinary journals.*

*Table 2 was published in its entirety in The Compendium of Continuing Education, April 1990.*



## Research Briefs

### Increased Serum Growth Hormone Concentration in Feline Hypertrophic Cardiomyopathy

Serum growth hormone concentration was measured by radioimmunoassay in 31 cats with hypertrophic cardiomyopathy, 38 normal cats, and 35 cats with other cardiac disease. Cats with hypertrophic cardiomyopathy (HCM) had a significantly increased serum growth hormone concentration when compared with normal cats and cats with other cardiac disease. The serum growth hormone concentration in cats with HCM was less than previously reported in cats with growth hormone secreting pituitary tumors. Pituitary tumors were not identified in eight of the cats with HCM examined at necropsy. An increased serum growth hormone concentration may be measured in cats with HCM but it is unclear if the increased serum growth hormone concentration is a cause or effect of HCM.—(*Resource: Jour Vet Int Med* 6:320-324, 1992)

### Induction and Enhancement of FIP by Canine Coronavirus

Preexisting antibody to feline infectious peritonitis virus (FIPV) causes acceleration and enhancement of disease on subsequent infection of cats with FIPV. Other researchers have shown that canine coronavirus (CCV) can infect cats subclinically, but have found no evidence of enhancement of, or protection against, subsequent FIPV infection.

With various isolates of CCV, researchers at the University of Liverpool Field Station determined that one strain of CCV can induce transient mild diarrhea in cats, and furthermore, that previous infection with CCV causes acceleration and enhancement of subsequent infection with FIPV. In

addition, sequential inoculation of cats with another strain of CCV caused lesions indistinguishable from those of FIP, without exposure at any time to FIPV.—(*Resource: Amer Jour Vet Res* 53(9):1500-1506, 1992)

### Isolation of *B. bronchiseptica* from Kittens with Pneumonia in a Breeding Cattery

*Bordetella bronchiseptica* has been isolated from both clinically healthy cats and cats with respiratory disease, particularly bronchopneumonia. This report describes kitten deaths, apparently due to bronchopneumonia associated with *B. bronchiseptica*. The study included six litters of kittens (5 to 10 weeks old) at a large breeding colony of longhaired cats.

Although *B. bronchiseptica* has previously been considered a disease of cats in laboratory colonies, this outbreak suggests that bordetellosis should be considered in outbreaks of respiratory disease in the field, perhaps particularly in kittens in crowded conditions. The precise role of *B. bronchiseptica* in feline respiratory disease requires further investigation. (*Resource: The Vet Rec* 129:407-408., 1991)

### The Influence of Dry Food on the Development of Feline Neck Lesions

The pH of the tooth surface was determined in cats with neck lesions. The presumption that commercial dry cat food with an acid coating can lead to neck lesions was investigated by researchers at the University of Vienna, Austria.

In general, cats with neck lesions had lower pH values of the tooth surface (7.93 +/- 0.61) than healthy cats (8.65 +/- 0.58). Feeding dry cat food with an acid surface did not contribute to the pathogenesis of neck lesions.—(*Resource: Jour Vet Dent* 9(2):4-6, 1992)

## Five Ways You Can Help Us

- ① Actively participate in the Feline Memorial Program.
- ② Become a Professional Member of the Feline Health Center. ( Only 10% of those receiving Feline Health Topics are members. Your membership helps to support our educational programs as well as providing many benefits to you.)
- ③ Make a charitable contribution or bequest to the Feline Health Center .
- ④ Encourage your cat-owning clients to become supporting members. (Our office can supply you with membership applications for cat owners.)
- ⑤ If clients indicate an interest in providing funds in their wills to an organization, tell them about the Cornell Feline Health Center. (Our office can provide free copies of our bequest brochure, "How do you say Thank You?") Bequests received by the Center are primarily the result of veterinarians informing their clients about the Cornell Feline Health Center.

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Cornell University  
College of Veterinary Medicine  
Ithaca, New York 14853