

CANINE CARE

CANINE DATA CHART

Life span	8–20+ years, depending on breed
Normal body temperature	100°–102°F (37.7°–38.8°C)
Respiration	10–30 breaths per minute
Pulse	Adults: 70–160 per minute Toy breeds: 70–180 per minute Puppies: 80–220 per minute
Blood collection sites	Cephalic vein, jugular vein, recurrent tarsal vein
Normal hemogram values	Hematocrit: 38%–55% White blood cells: 5,000–17,000/cu mm Total protein: 5.5–7.7 g/dl
Breeding information	
• Puberty	6–18 months of age, depending on breed
• Breeding season	Every 6–9 months, often in spring and fall
• Gestation	57–69 days (avg. 63); puppies are palpable from day 18–24 and 55–63, visible via ultrasound after day 28, and visible via radiography after day 43
• Litter size	1–8 puppies
• Signs of heat	Swollen vulva and blood-tinged vaginal discharge for 7–10 days, followed by a clear serous discharge for 4–7 days when the bitch attracts and accepts male dogs; phase of cycle may be determined by vaginal cytology
Neonates	Eyes open and ears functional at 10–17 days of age Puppies weaned at 6–8 weeks of age
Sexing	Males have a pendulous penis and suspended testes; testes may not be apparent at birth

BATHING

Bathing once a month will suffice unless the dog has a skin problem that requires more frequent attention. Dogs should be bathed before

they are dipped for fleas and ticks. Take care that young puppies do not become chilled. If a blow dryer is used, keep it at the lowest setting to avoid burns.

Protective Gear

A shaking dog can splash shampoo or dip into unprotected eyes, and many pesticides may be absorbed through the skin. There are risks of both short-term and long-term exposure to pesticide dips and shampoos. Always wear a waterproof apron, gloves, and goggles to protect yourself.

Procedure

Preparation

- ◆ Find an area large enough to accommodate the dog. (Large dogs may be happier being bathed outside, weather permitting.)
- ◆ Cover the floor of the bathing area with a nonskid mat for traction.
- ◆ Comb any mats and burrs out of the hair coat.
- ◆ For male dogs, coat the scrotal skin with petrolatum jelly (some therapeutic shampoos may be irritating to sensitive skin).
- ◆ Place cotton in the dog's ears and protective ointment in its eyes before bathing or dipping.

Baths

- ◆ Begin the bathing procedure at the dog's nose and work back toward the tail (to prevent fleas from running to the dog's head).
- ◆ Use a sponge to clean the face, head, and ears.
- ◆ Shampoo tips:
 - Small amounts of shampoo go a long way; too much will be difficult to rinse off.
 - Shampoo lathers better if the measured amount is diluted with water before application.
 - Most therapeutic shampoos must be left on the hair for at least 10 minutes before rinsing.
- ◆ Make sure you rinse the dog thoroughly. Rinse until you think all the soap is out, and then rinse one more time.



Dips

- ◆ For dips supplied as concentrations, carefully follow label instructions regarding dilution.
- ◆ Pour and sponge the dip solution over the dog so that every part of the body is covered.
- ◆ Allow the dip to dry completely on the dog.

REPRODUCTION

Contraception

The most common methods of contraception are ovariohysterectomy (spaying) in female dogs and vasectomy or castration in males. These surgical procedures are permanent and irreversible (see Surgery, p. 131).

There is no need for a bitch to go through a first heat or to have a litter before being spayed. In fact, the risk of mammary tumors is greatly reduced in bitches that are spayed before their first heat.

There are several medications on the market that can be given to female dogs to render them temporarily infertile. The effectiveness of these products varies with the product, the phase of the reproductive cycle during which it is given, and individual response.

Clients should be advised that chemical termination of a pregnancy is not without risk. Potentially terminal bleeding and/or uterine infection might result.

Breeding

Reproductive efficiency is greatest between 3 and 5 years of age. Bitches should not be bred on the first heat because they have not yet achieved their full growth. The heat period may last 21 to 28 days; the bitch is usually receptive to the male between days 4 through 14 of the cycle, but the length of the receptive period can vary widely.

Whelping

Late in gestation the bitch requires increased amounts of a well-balanced, high-energy diet to meet the needs of the developing offspring as well as to enable the bitch to produce enough milk for the offspring (see Diet and Feeding, p. 141). Lactation may begin as early as 7 days prepartum in the pregnant bitch, but most females produce milk 48

hours before they whelp. The bitch's appetite may decrease and nest building behavior begins 24 to 36 hours before parturition. A reduction in the bitch's body temperature of about 1.1°F signifies that whelping is 12 to 24 hours away. A whelping box should be provided in a quiet, dimly lit area that is free of drafts. The bitch should be left alone in the whelping box with free access to food and clean water and should be monitored as unobtrusively as possible.

If a puppy is not born within 2 hours of the start of abdominal contractions (true labor), the bitch may need medical attention. Once the bitch successfully expels a puppy, it should remove the translucent sac from the puppy within 2 minutes of birth (if it does not, the person in attendance should be prepared to do so to prevent the puppy from suffocating). After removing the membrane, the bitch will lick the puppy briskly, drying it and stimulating respiration. If the bitch does not bite through the umbilical cord to separate the puppy from the placenta, the cord can be tied off with clean suture or cotton umbilical tape ½ inch from the navel. The remaining cord is cut off with scissors. If the dam does not deliver another puppy within 30 minutes of giving birth and is obviously still in labor, it should be examined by a veterinarian for a fetal obstruction or for partial uterine inertia. It is important to count the placentas; there should be one for each puppy after whelping is completed. The bitch should not be allowed to eat more than one or two placentas because they will cause gastrointestinal upset. A greenish discharge will normally drain from the vulva for up to 12 hours immediately postpartum; this discharge will be replaced by a dark red to brownish discharge, which may last from 2 to 4 weeks.

Some of the complications of whelping include dystocia (the inability to expel a puppy while in labor), retained placentas, mastitis, uterine infections, and eclampsia (attributed to calcium deficiency). Cannibalism, or the savaging of puppies, is sometimes seen in young dams. This problem is usually alleviated by sedating the dam until it becomes accustomed to the puppies.

Pseudopregnancies are common in bitches and are thought to be caused by the endogenous production of a pituitary hormone. Clinical signs include abdominal distention, nesting behavior, and mammary enlargement with subsequent lactation for periods of up to 2 weeks. Signs will normally be present at about 60 days postovulation and



regress 1 or 2 weeks later. Ovariohysterectomy (spaying) is the only known method of preventing pseudopregnancies; however, ovariohysterectomy during pseudopregnancy can prolong the clinical signs.

PUPPY CARE

Neonatal Development

For all practical purposes newborn puppies are completely helpless. They rely on the lactating bitch for warmth, food, and cleanliness. They are incapable of thermal regulation for the first 6 days of life and require an external heat source for their first 3 weeks. They nurse every 1 to 2 hours for the first week; the bitch licks their external genitalia both to stimulate urination and defecation and to clean them after every feeding. Between 5 to 17 days after whelping the puppies' eyes open, but they have limited vision; a day or so later their ear canals open. By 18 days of age they begin to move around and explore their environment.

Nursing and Weaning

As mentioned, newborn puppies nurse every 1 to 2 hours for the first week. The sucking reflex is initiated within minutes of birth so that the puppies can consume colostrum, which contains antibodies to protect them from infectious diseases. If puppies are restless and crying, they probably are not getting enough milk to drink, and supplementation with a formula should be considered (see *Orphan Formulas*, p. 126). Peak lactation will occur between 3 and 6 weeks postpartum.

Puppies are usually weaned at 6 weeks of age. Many bitches begin weaning their puppies as early as 4 weeks after whelping. A soft, readily digestible gruel should be introduced to the puppies' diet as early as 3 to 4 weeks after birth so they will become accustomed to consuming solid food before weaning occurs.

Housing

Puppies should be kept in a small box with sides high enough to keep them inside the box and to prevent drafts. The bottom of the box should be raised off the floor and covered with a disposable or washable flooring with padding (such as with indoor-outdoor carpeting and disposable diapers or cotton towels) to keep the puppies as warm and

dry as possible. Materials that become slippery when wet, such as newspapers, should not be used as bedding. Covered hot water bottles or heating pads set on the lowest setting (never higher—severe burns can result) may help keep the environmental temperature stable. Do not cover the entire floor with a heating pad; the puppy must be able to get away from the heat source if it gets too warm. A puppy's body temperature should be maintained at 96° to 97°F the first week of life and at 97° to 100°F the second, third, and fourth weeks. A ticking clock placed in the box may help to keep puppies quiet.

Nutrition

If puppies are fed properly, they should gain 5% to 10% of their birth weights daily and double their birth weight. Overfeeding should be avoided as it may cause obesity and skeletal diseases. It is important to remember that puppies require twice the fat and protein and more calcium and phosphorus than ordinary cow's milk can provide. Specific feeding instructions can be found in the Diet and Feeding section (p. 141).

Orphan Puppies

Hand-raising orphan puppies requires a great deal of time and effort. The ideal solution to the problem of caring for a motherless puppy is to locate a lactating bitch that will accept the puppy and raise it with its own. When a foster bitch is not available, it is necessary to hand-feed the puppy until about 4 to 6 weeks of age. However, the puppy should be left with any littermates between feedings so it can interact with them and learn appropriate social behavior. Puppies are usually mature enough to be sold between 6 and 8 weeks of age.

Orphan Formulas

One of the following can be used as an orphan formula for puppies:

- ◆ Commercial bitch's milk substitutes (powdered or liquid)—Follow manufacturer's instructions for preparation.
- ◆ One part dry puppy food to three parts water—Process in a blender.
- ◆ Two parts canned puppy food to one part water—Process in a blender.



AMOUNT OF FORMULA TO FEED PER DAY

<i>Week of life</i>	<i>Amount per 100 g body weight</i>
1	13 ml
2	17 ml
3	20 ml
4	22 ml

None of these choices is a perfect substitute for the bitch's milk, however.

Methods of Feeding

Although puppies can be fed with a baby bottle (using a premature infant's nipple), the quickest and most efficient method is tube feeding. Measure the distance between the tip of the nose and the last rib and mark this point on a feeding tube (size 8 to 10 French) or soft male urethral catheter. With the puppy held in a normal position, slowly insert the feeding tube into the mouth and pass it to the distance marked on the tube. (This measurement should be changed on the tube weekly as the puppy grows.) If the tube will not pass, it is probably in the trachea and should be rerouted. Warmed formula should be slowly injected into the feeding tube via a syringe from which all air has been expelled. If regurgitation occurs, no more should be fed until the next scheduled feeding. Puppies should be fed four times a day.

After each feeding the puppy should be cleaned and the anal-genital areas should be swabbed with moist cotton to stimulate urination and defecation.

When the puppy reaches 3 to 4 weeks of age, a soft gruel of commercial puppy food and water blended together should be offered several times daily (refer to the Diet and Feeding section, p. 141). The puppy should be weaned by 6 weeks of age or sooner if it is consuming adequate amounts of commercial puppy food.

PREVENTIVE HEALTH SCHEDULE

Puppies should be checked for gastrointestinal parasites at 3 weeks of age, and they require fecal rechecks when they return for their vaccinations. Heartworm preventive medication should be started at 6 to 8

weeks of age in areas where heartworm is endemic. The initial vaccination series consists of one injection of a combined vaccine (multivalent) given at 6 to 8 weeks of age or about 2 weeks after weaning. Boosters are given twice at 4 week intervals (see Vaccinations, p. 133). Puppies whose immune status is uncertain may receive an additional injection of combined vaccine as early as 2 weeks of age. In most states the rabies vaccine is given at 3 months of age.

House-Training

By instinct a dog will not soil its bed if given alternative areas on which to relieve itself. During the first 3 weeks of the puppies' life the bitch licks the external genitalia every few hours with its tongue to stimulate urination and defecation and to clean the puppies. The bitch ingests the excreted waste, which would otherwise soil the bedding. Once puppies are old enough to begin eating solid food, they wander a short distance away from the nest to relieve themselves.

Puppies are not capable of controlling urination or defecation until 8 weeks of age. Before this time they express their bowels or bladder 15 to 30 minutes after waking and eating, during intense activity, and before bedtime. House-training a new puppy usually takes 2 to 4 weeks and is accomplished through confinement, a regular schedule of feeding and elimination breaks, and a great deal of praise but no punishment.

Initially, the puppy should be confined to a small box or crate that is large enough for it to lie down in with its legs extended. Food should be offered on a regular schedule (see Diet and Feeding, p. 141). Every hour and before bedtime the animal should be carried to a designated area to relieve itself. Successful urination or defecation should be rewarded with lavish praise. Food or large amounts of water should not be left in the crate with the puppy overnight.

The length of time between trips to relieve itself can be extended as the puppy learns to control its bladder and bowels. The puppy will signal its intent by crying or sniffing earnestly at the floor. The area of confinement should be gradually enlarged as the puppy learns control until it can spend the day unconfined. Nonetheless, even when completely house-trained, puppies should be confined to small areas at night to prevent accidents from occurring.



DETERMINING A PUPPY'S AGE BY DENTITION

<i>Teeth</i>	<i>Age at Which Teeth Appear</i>
Deciduous incisors	2–6 weeks
Full deciduous dentition ^a	8 weeks
Permanent incisors	4–5 months
Permanent premolars	4–6 months
Permanent canines	5–6 months
Full permanent dentition ^b	6–10 months

^aFull deciduous dentition:

Maxillary teeth—6 incisors, 2 canines, 6 premolars

Mandibular teeth—6 incisors, 2 canines, 6 premolars

^bFull permanent dentition

Maxillary teeth—6 incisors, 2 canines, 8 premolars, 4 molars

Mandibular teeth—6 incisors, 2 canines, 8 premolars, 6 molars

DENTAL CARE*

Normal Dentition

A tooth consists of a core of dentin covered with enamel at the crown and cementum at the root. At the center of a tooth is a bundle of epithelial tissues made up of nerves and blood vessels (the dental pulp). Dogs have four types of teeth: incisors, canines, premolars, and molars. Each tooth performs a different role (tearing, shearing, or grinding) in mastication.

Dogs are diphyodont animals; they produce a generation of deciduous teeth that are shed and replaced by permanent teeth when the jaw reaches its mature size. Deciduous incisors appear as early as 2 weeks of age. Full dentition is usually present by 8 weeks of age. Shortly after the deciduous tooth is completely erupted, it starts to undergo an absorptive process beginning at the root. Under each deciduous tooth root a permanent tooth bud starts to develop. The deciduous tooth is shed when the permanent tooth erupts through the gums (gingiva). Permanent teeth erupt a few days earlier in large breed dogs than in smaller breeds.

Typically, a dog has a scissors bite. A scissors bite is characterized by a slight overlap of the maxillary (upper) incisors over the mandibu-

*More details about canine dental care are provided in *Waltham Basic Canine Dentistry*, a video/manual package for veterinary hospital staff that can be purchased by calling 1-888-371-7900.

lar (lower) incisors and an interdigitation of the mandibular canine teeth with the maxillary canines and corner incisors.

Recognizing Dental Problems

Jaw Abnormalities

The major inherited defects of the jaw are brachygnathism, in which the maxilla protrudes beyond the mandible, and prognathism, where the mandible protrudes beyond the maxilla. Prognathism is considered a normal trait in brachycephalic breeds such as boxers, English bulldogs, and Boston bull terriers. Animals affected with brachygnathism should not be used for breeding purposes.

Supernumerary Teeth

A normal adult dog with full dentition has 42 teeth. Extra permanent teeth, usually premolars, are commonly found in some breeds, such as spaniels, hounds, and greyhounds. These teeth should be removed as soon as possible to avoid tooth crowding and resultant malocclusion.

Retained Deciduous Teeth

Retained teeth are commonly found in toy breeds. The teeth that most often fail to be shed are incisors and canine teeth. Permanent malocclusion and possible trauma to the hard palate will occur if these teeth are not removed.

Tooth Abnormalities

Tooth abnormalities seen in dogs include tetracycline or antibiotic staining, enamel hypoplasia, caries, and periodontal disease.

Routine Cleaning

Dogs should have their teeth examined and, if necessary, professionally cleaned at least once a year. Some dogs, especially toy breeds on moist diets, require cleaning twice a year. Teeth cleaning is necessary to remove plaque and dental calculus that accumulate on the teeth at the gum line and cause gum inflammation (gingivitis) and periodontal disease.

A mask should be worn by the technician cleaning the teeth to prevent the inhalation of aerosolized bacteria. The procedure is as follows:



- ◆ Following an overnight fast, the dog is anesthetized and intubated.
- ◆ Position the dog's head so that its nose is pointing downward slightly to allow fluids to drain from the mouth.
- ◆ Place cotton towels under the head to soak up water and keep the dog's head dry.
- ◆ Remove large deposits of calculus with dental hand scalers.
- ◆ Thoroughly clean the teeth with hand scalers (a time-consuming method) or a mechanical (ultrasonic or rotating) scaler. Take care not to traumatize sensitive gum tissue or scratch the enamel surface of the tooth.
- ◆ Check the depth of the periodontal pockets for evidence of periodontal disease and note any suspicious areas that may harbor dental caries.
- ◆ Polish the teeth with pumice to remove minute scratches in the enamel, which may become sites for plaque accumulation.

Home Care

Owners can lightly brush their dog's teeth at least twice a week to remove plaque deposits. A child's nylon toothbrush dipped in a toothpaste made for dogs should be used. Do not use toothpastes made for humans, which can cause nausea in dogs if swallowed. Also, baking soda and/or salt should never be used to brush a pet's teeth. Many pets that need daily toothbrushing may have or be predisposed to heart disease and the extra sodium could have life-threatening effects.

If the dog will not tolerate a toothbrush, the owner can try using a soft cloth instead. Dog biscuits, hard objects to chew on, and dry dog food also help prevent dental plaque accumulation.

SURGERY

Spaying (Ovariohysterectomy)

Spaying is an irreversible means by which a female dog is rendered sterile. The procedure entails complete removal of the uterus and ovaries, thereby eliminating the estrous cycle. Once spayed, females no longer attract males.

Surgery is preceded by a fasting period and requires general anesthesia and hospitalization for a full day. Complications are unusual but

may include postsurgical hemorrhage, uterine stump infection, tissue reaction to ligature material, and urinary incontinence. Because there is a greater risk of hemorrhage in bitches that are in heat or pregnant, these dogs are not usually spayed.

Postoperative care includes restriction of exercise for a week, protection of the incision from contaminants, and daily monitoring of the incision for inflammation or discharge. The incision must stay dry (i.e., no bathing or swimming until the sutures are removed). Suture removal is usually performed 7 to 10 days after surgery. Weight gains of up to 25% can occur following spaying if the bitch is allowed to be sedentary and overeat.

Castration (Orchiectomy)

Castration entails the surgical removal of both testes and renders the male dog irreversibly sterile. The procedure can be performed as early as 6 weeks of age and requires general anesthesia preceded by a fasting period. The dog can usually return home the afternoon of the surgery if there are no complications (which include scrotal bruising and swelling, postsurgical hemorrhage, and infection). Postoperative care includes restriction of exercise for a few days and protection of the incision from contaminants such as dirt, saliva, and water. The sutures are removed 7 to 10 days after surgery. Sexual activity usually declines within 6 months of castration. Other postoperative changes include weight gains and decreased incidences of aggression, roaming, and urine marking.

Ear Cropping (Cosmetic Otoplasty)

Ear trimming does not need to be performed except on the owner's request. The procedure should be done only in puppies that are healthy and well nourished to minimize the possibility of infection. Requirements vary with breed and are based on standards of the American Kennel Club. The age at which the procedure is best performed ranges from 8 to 24 weeks, depending on the breed. Success rates decrease with age.

The surgery is performed under general anesthesia, preceded by a fasting period. Complications include infection, unsightly blemishes, otitis externa, medial or lateral deviation of the tip of the ears, and failure of the ears to stand.



The puppy is sent home with its ears bandaged and will feel pain for about 5 days after surgery. The bandages must be checked daily for malpositioning, odors, and exudates. The sutures are removed 7 to 10 days after surgery. The ears must be checked and rebandaged regularly for 4 to 6 weeks. External support of the ear may be required for as long as 20 weeks.

Dewclaw Removal

The best time to remove dewclaws is when the puppy is 2 to 3 days old. Because the blood supply to the affected toe is minimal, the appendage can be quickly snipped off with sharp, clean scissors. Suturing with an absorbable material is preferred. A tiny tape bandage can be placed over the wound. If dewclaw removal is performed at 3 to 5 days of age, absorbable suture or tissue adhesive is required.

In older dogs dewclaw removal is more involved and requires general anesthesia and routine surgical preparation. Postoperative care is limited to keeping the bandage clean and dry for the 3 days it must be worn. Sutures can be removed 7 to 10 days after surgery.

Tail Docking

Ideally, tails should be surgically shortened during the first 5 days of life when the blood supply to the tail is minimal. The procedure does not need to be performed except at the owner's request. Tail length requirements vary with the breed of dog and are based on official standards of the American Kennel Club. Anesthesia is not required for the procedure. A single suture is placed to pull the skin edges together over the amputated stump; hemorrhage is minimal. The suture remains in place until it is removed by the dog.

Tail amputation in older dogs is an involved procedure that requires an overnight fast, general anesthesia, and adequate hemostasis. Postoperative complications include hemorrhage, infection, and a hairless scar.

VACCINATIONS

Dogs are very susceptible to certain infectious diseases, especially canine distemper, infectious canine hepatitis, parvovirus, parainfluenza, leptospirosis, and rabies. Colostrum in the bitch's milk contains

antibodies, which usually protect them from these diseases for 6 to 8 weeks. Once the puppies lose this maternal antibody protection, they are at high risk of contracting the aforementioned diseases if exposed to an infected animal. Because the duration of protection provided by maternal antibody varies from animal to animal, vaccines should be given regularly until the pup is 16 to 22 weeks of age. Vaccinating at more frequent intervals than the label recommends is not helpful and could be harmful:

- ◆ Antibodies produced from each vaccination persist in the bloodstream for several weeks; any antigen (vaccine) introduced while maternal antibody is still present will be tied up by that antibody. Thus an adequate immune response will not result.
- ◆ Overvaccinating could induce an allergic reaction.

Once the vaccination series is completed, boosters should be given according to the vaccine manufacturer's recommendation.

Although most dogs are protected by the vaccinations when administered appropriately, immune deficiencies in some of these animals may prevent them from mounting adequate antibody responses.

PARASITES

Fleas and Ticks

Flea Life Cycle

Knowledge of the life cycle of the flea is a tremendous aid in the battle against this ubiquitous parasite. When environmental conditions are favorable, the flea has great reproductive potential. Fleas thrive at low altitudes at temperatures of 65° to 80°F. Under these conditions the flea life cycle can be completed in as little as 12 to 14 days.

The female flea lays her eggs in the hair coat of the animal. Because the eggs are not sticky, they tend to fall off the animal into areas where the dog sleeps or plays. The eggs then hatch into very small, worm-like larvae. The larvae feed on organic debris, especially the dried blood droppings (flea dirt) left by adult fleas. The larvae molt and spin cocoons to form pupae that usually emerge as young, hungry adults in about 3 weeks; under certain conditions, however, the pupae can remain dormant for nearly a year.



CANINE VACCINATION PROTOCOLS

<i>Vaccine</i>	<i>Initial Administration (Weeks of Age)</i>	<i>Booster</i>	<i>Recommendations</i>
Distemper virus	8, 12, and 16	Annual	Recommended for all dogs
Measles virus	6–8 (one dose) followed by distemper vaccine 2–4 weeks later	None	Optional; not for dogs over 12 weeks of age
Adenovirus-2	8, 12, and 16	Annual	Recommended for all dogs
Parainfluenza (injectable)	8, 12, and 16	Annual	Recommended for all dogs
Parvovirus (MLV)	8, 12, and 16	Annual	Recommended for all dogs
Coronavirus	9 and 12	Annual	Optional; of uncertain value
<i>Leptospira</i>	12 and 16 Not recommended in puppies <12 weeks old	Annual	Recommended; may not protect for more than 6–8 months
<i>Bordetella bronchiseptica</i> (injectable)	9 and 12	Annual	Recommended for dogs in contact with others during boarding, travel, training, or work
<i>Bordetella/Parainfluenza</i> (intranasal)	As early as 3 weeks	Annual or 1 week prior to group exposure	Same as for injectable <i>Bordetella</i>
<i>Borrelia burgdorferi</i>	12 and 15	Annual	Optional; limited application
Rabies virus	12 or 16 Actual age may be established by local statutes	Every 1 to 3 years as required by state or local law	Required; does not meet legal requirements if administered by unauthorized person

Once emerged, an adult flea can live about 2 weeks before taking a blood meal from a host. Once it begins feeding, it must continue to feed regularly or it will die. Adult females begin laying eggs within 1 to 2 days of feeding.

Fleas can be hard to find on a dog. However, they often produce evidence of their presence in the form of “flea dirt” and/or scratching on the part of the dog. Flea dirt can be seen on the dog even when fleas are not readily visible. After combing or brushing a flea-infested dog, tiny dark dots or comma-shaped pieces of debris will be found. If these particles are combed onto a piece of wet white paper, they will dissolve and stain the paper red (the flea dirt is partially digested blood).

Tick Life Cycle

Ticks lay their eggs (as many as 18,000 in some species) in sheltered areas on or near the ground. Seed ticks hatch from the eggs and climb onto grass to wait for a suitable host. Once on a dog, they attach themselves to the skin and feed on blood, causing painful nodules wherever they attach.

Flea and Tick Control

Control on the Animal

Successful control of fleas and ticks depends on eliminating these pests from the dog and the environment. To control fleas on a dog, all animals in the household must be part of the flea control program.

Flea control products for adult dogs include a variety of drugs and chemicals available as collars, shampoos, sprays, dips, powders, long-lasting topicals, and oral medications. There are two basic categories of flea control products:

- ◆ Adulticides—These products kill adult fleas.
- ◆ Insect growth regulators (IGRs)/insect development inhibitors (IDIs)—These products prevent fleas from hatching or maturing.

The veterinarian will choose a product or products that combine safety, efficacy, and ease of use for the client. Often a combination of adulticide and an IGR or IDI is used.



Environmental Control

A complete flea and tick control program also includes a thorough treatment of the pet's environment. Places where dogs spend most of their time will have the greatest numbers of deposited eggs and newly emerged adult fleas and ticks. Thorough cleaning of the house and yard should precede any application of insecticides. It is always best to treat the dog and the environment on the same day.

Sprays or foggers (one per room) can be used in the house to kill fleas and ticks. The use of these insecticides must be preceded by a thorough vacuuming; special attention should be paid to the areas under furniture, near pet bedding, and along moldings. A product containing an IGR and an adulticide should be used as well. Foggers may not reach under furniture. A spray can be used in those areas where a fogger does not penetrate. Follow label instructions for the proper use of and precautions concerning sprays and foggers.

If a long-lasting spot-on adulticide is used, it may not be necessary to treat the environment as long as the client understands that fleas must have contact with the animal's hair before they are killed. However, if the pet is flea allergic, environmental treatment is essential, as just one flea bite can cause intense itching for several days.

Internal Parasites

Heartworms

Adult heartworms (*Dirofilaria immitis*) reside in the pulmonary arteries and in the right side of the heart. They produce larvae called microfilariae, which circulate in the blood for up to 2 years. These microfilariae are ingested by a feeding mosquito, molt to an infective stage in the mosquito's abdomen, and are injected into a new host when the mosquito feeds. They migrate through the body of the new host for several months before finally lodging in the heart and pulmonary vessels as mature adults. Microfilariae cannot mature into adult heartworms without first passing through a mosquito. In rare instances a bitch may pass microfilariae to her puppies through the placenta. These microfilariae will be in the blood but cannot cause an active infection.

Testing Procedures

Many dogs with heartworm infection have microfilariae in their

blood; some have occult infections where heartworms are present but do not produce microfilariae. In-hospital antigen or antibody blood tests will detect the presence of adult heartworms in either case.

Thoracic radiography can also be used to diagnose heartworm disease. Long-standing heartworm infections produce visible, predictable pathology in the heart and lungs of infected dogs.

Prevention and Treatment

Heartworm infection can be prevented by administering oral medications to heartworm-negative dogs on a regular basis. Puppies should be started on heartworm prophylaxis as early as 6 weeks of age.

Heartworm preventive medication should be administered regularly in areas where the disease occurs. It may be suspended during the winter if mosquitoes are not present.

Heartworm-positive dogs should be treated as soon as possible to minimize liver, kidney, lung, and heart pathology and to minimize risk of transmission to other dogs.

Gastrointestinal Parasites

Gastrointestinal parasites can cause serious disorders in dogs, including life-threatening anemia, hypoproteinemia, diarrhea, vomiting, hypoglycemia, intestinal obstruction, and weight loss. Puppies are particularly susceptible. The most common parasites found in dogs are hookworms, roundworms (ascarids), whipworms, tapeworms, *Giardia* spp., and coccidia. The method of infection varies with the type of worm but includes transplacental transfer, transmission via the milk while nursing, skin penetration, and oral ingestion.

Certain canine parasites, such as hookworms, roundworms, at least three species of tapeworms, heartworms, and several intestinal protozoa including *Giardia* spp., can be transferred to humans. Therefore caution should be exercised when working with animals and their waste products.

Humans may become infected with canine roundworm (*Toxocara*) larvae. In humans larvae migrate extensively through the body and cause a variety of signs. The most common signs involve the gastrointestinal system or lungs. More devastating are blindness or neurologic signs. Because of the high frequency of prenatal *Toxocara* infections in pups, prophylactic treatment is recommended before eggs can be passed in the stool. Pups should be treated at 2, 5, and 11 weeks old. Two treat-



ments, 2 weeks apart, are sufficient for newly acquired, weaned puppies. Lactating bitches should be treated at the same time as their offspring.

In addition to prophylactic roundworm treatment, puppies should be checked for internal parasites at 3 weeks, 6 to 8 weeks, 10 to 12 weeks, and 14 to 16 weeks of age; adults should be checked at least annually. The test requires a small sample of fresh feces, flotation solution (sodium nitrate solution with a specific gravity of 1.2 works best), and a compound microscope. The fecal sample is suspended in flotation solution, topped with a coverslip, and allowed to stand undisturbed for 5 to 10 minutes. A 24 hour flotation may be required for accurate evaluation of protozoal infection. The coverslip is then placed on a glass slide and examined for parasite ova. Whipworm ova will not float if the specific gravity of the flotation solution is not adequate. Tapeworm infections are rarely diagnosed by fecal examinations because the eggs are contained within segments of the tapeworm (proglottids), which crawl out of the dog's anus and fall to the ground. Commercially produced test kits can also be obtained to identify parasite ova in feces.

Treatment includes immediate therapy with appropriate anthelmintics (deworming medications), followup therapy 2 to 4 weeks later to kill migrating stages of the parasite, and cleanup of the environment to prevent reinfection.

BEHAVIOR PROBLEMS

Aggression*

The two most common manifestations of aggressive behavior toward humans are fear biting and dominance-related aggression. Fear biting is most commonly seen in a dog raised without appropriate human contact during the socialization period of growth (6 to 12 weeks of age). Such an animal fears people who are unfamiliar to it, and it may attempt to bite when feeling threatened. Treatment consists of desensitization and counterconditioning techniques to alleviate the dog's fear of humans. Drug therapy has been used in dogs, but its efficacy has not been established. Castration does not stop fear biting. Referral to a veterinary behaviorist for behavioral problems can be helpful if done at a young age.

**More complete discussion of canine aggression can be found in Textbook of Veterinary Internal Medicine, ed 4. Philadelphia, WB Saunders, 1995, and Readings in Companion Animal Behavior. Trenton, NJ, Veterinary Learning Systems, 1996.*

When a dog shows aggression toward members of the owner's family rather than strangers, the animal is probably attempting to establish dominance over those family members. This condition can be successfully treated with behavior modification, environmental manipulation, and, sometimes, drug therapy.

Other causes for canine aggression toward people include pain-induced aggression, hyperkinesis (overactivity), territorial aggression, and parental protectiveness.

Isolation from canine contacts between 4 to 7 weeks of age can also result in behavior problems manifested in adulthood as acts of aggression toward other dogs. This behavior should not be confused with intermale or territorial aggression.

Treatment for intermale and intraspecies aggression not related to territorial defense includes castration, counterconditioning programs, and drug therapy.

Coprophagy

Although the ingestion of feces is not harmful to the dog (other than the possibility of reacquisition of internal parasites), it is socially unacceptable to dog owners. The cause for this behavior is not known, but the possibilities include nutritional deficiencies (unlikely) and boredom (likely). This behavior can become an acquired habit. Coprophagy can be discouraged by promptly eliminating fecal matter from the environment and increasing the dog's exercise or play period. Commercial products are available to make the feces unpalatable.

Separation Anxiety

Separation anxiety is often seen in poorly socialized dogs. The behavior may be manifested as destruction of household items, excessive vocalization, digging, chewing, urination, and defecation. It is recommended that animals exhibiting such behavior not be crated or otherwise confined because they could injure themselves. Separation anxiety should be differentiated from the chewing and lapse in house-training a playful puppy may engage in.

Treatment of separation anxiety includes behavior modification and drug therapy. Referral to a veterinary behaviorist leads to a good prognosis for resolution of this problem. The addition of a companion ani-



mal to the household is controversial. Puppies should be confined to a small area with minimal access to furnishings and other belongings when left alone to prevent destructive behavior such as chewing, urination, and defecation.

Inappropriate Urination

Lapses in bladder control can be caused by disease conditions, anxiety, urine marking, or a lack of house-training. Once the cause is known, a treatment plan can be formulated to solve the problem. Disease conditions and anxiety can be cured with medical therapy. House-training problems can be solved by retraining the dog as if it were a puppy (i.e., confinement and the of a regular feeding and elimination schedule [see House-Training, p. 128]). Urine marking, mounting behavior, and roaming can be controlled by castration or drug therapy.

DIET AND FEEDING

Dogs eat to meet their energy needs. The quantity of food a dog requires each day depends on the caloric density of the product, the dog's physiologic status, age, activity level, and temperament, and the season of the year. The chosen product must have all required nutrients balanced to its caloric density. It is the calories, not the dry matter, that count.

A dog food should be chosen based on animal feeding studies to support the nutritional claim. Association of American Feed Control Officials (AAFCO) has recommended protocols that a manufacturer can follow to validate a nutritional claim. Look for a statement like "Animal feeding trials using AAFCO procedures show that [brand] provides 100% complete and balanced nutrition for [life stage]." This statement on a pet food package indicates that all criteria have been met for the particular life-stage nutritional claims.

Regulations require that products that are labeled as containing complete and balanced nutrition must have feeding directions. Manufacturers that do feeding studies base their feeding instructions on the caloric density of the food compared with the estimated energy requirements of the dog. The directions are only a starting place because every animal has different energy requirements and nutrient intake needs.

All the nutrients can be in the food and the food can be highly

digestible, but that doesn't guarantee that the dog will eat it. The product selected not only needs to contain high-quality ingredients but it must be highly palatable as well.

Dogs should always have plenty of fresh, cool water available.

Recommendations for Weaning

Weaning is a stressful time for the lactating bitch and its offspring. Weaning begins when the puppies are first offered a gruel of a high-quality dry or canned puppy food at 3 to 4 weeks of age. The food should be offered up to four times each day for 10 to 15 minutes or until the puppies have eaten their fill. The puppies are then allowed to nurse until the next feeding period. Over a 2 week period, the puppies are allowed to eat more of the puppy food gruel and nurse for shorter periods. Final weaning should occur over a 5 to 7 day period. During this time the bitch should be given reduced amounts of food until it reaches its maintenance level of intake by the seventh day and the puppies should be allowed to nurse only once each day (to reduce the discomfort felt by the dam). Always provide plenty of fresh water.

Feeding Puppies

After starting puppies on a gruel of a high-quality puppy food when they are 3 weeks of age, the amount of water added to the food can be gradually reduced over a couple of weeks until it is fed as is.

Puppy diets **should not be supplemented**. If an AAFCO-tested diet was selected, it will contain all the nutrients needed in the right proportions to each other and balanced to the energy (caloric) density of the diet. Puppies should be fed all they can consume in a 15 to 20 minute period. Feed four times a day from weaning to 3 months of age, three times a day until 8 months of age, and then twice a day until maturity (about 9 to 12 months of age for small breeds, 12 to 18 months for large breeds, and as late as 24 months for giant breeds).

Feeding Adults

Adult dogs do not need high protein, high energy diets unless they are working dogs, bitches in the last trimester of pregnancy, or lactating dams. Small or medium sized adult dogs should be fed a good quality, complete and balanced maintenance diet once daily; large breeds



should be fed twice daily if possible. The amount fed should be sufficient to maintain a lean body condition. Healthy, mature dogs fed a complete and balanced food do not normally require vitamin and mineral supplements.

Bitches that are pregnant or lactating will require up to three times the maintenance energy (and nutrient) intake. These requirements can be met through multiple feedings of a high quality product designed for all life stages (remember to look for the AAFCO statement) or a high quality puppy food. Using a puppy food for the bitch before whelping helps simplify the weaning process later on.

Feeding Older Adults

Life stage feeding, which includes special products for older dogs, helps the pet owner in the feeding process. Older pets are less active. A senior diet is lower in calories, reducing the chances of obesity, is fortified with higher levels of water-soluble vitamins to replace those lost, and contains lower amounts of higher quality protein so that the nitrogenous wastes are reduced. With a high quality senior diet, exercise, and care, an older dog's quality of life can continue for a long time.

Therapeutic Diets

Products intended as adjuncts to the treatment of disease are available only from veterinarians. If such a product is intended for long-term feeding, look for the statement "Animal feeding trials using AAFCO procedures show that (brand) provides 100% complete and balanced nutrition for adult maintenance." Without this statement, the product is suitable for short-term use only.

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