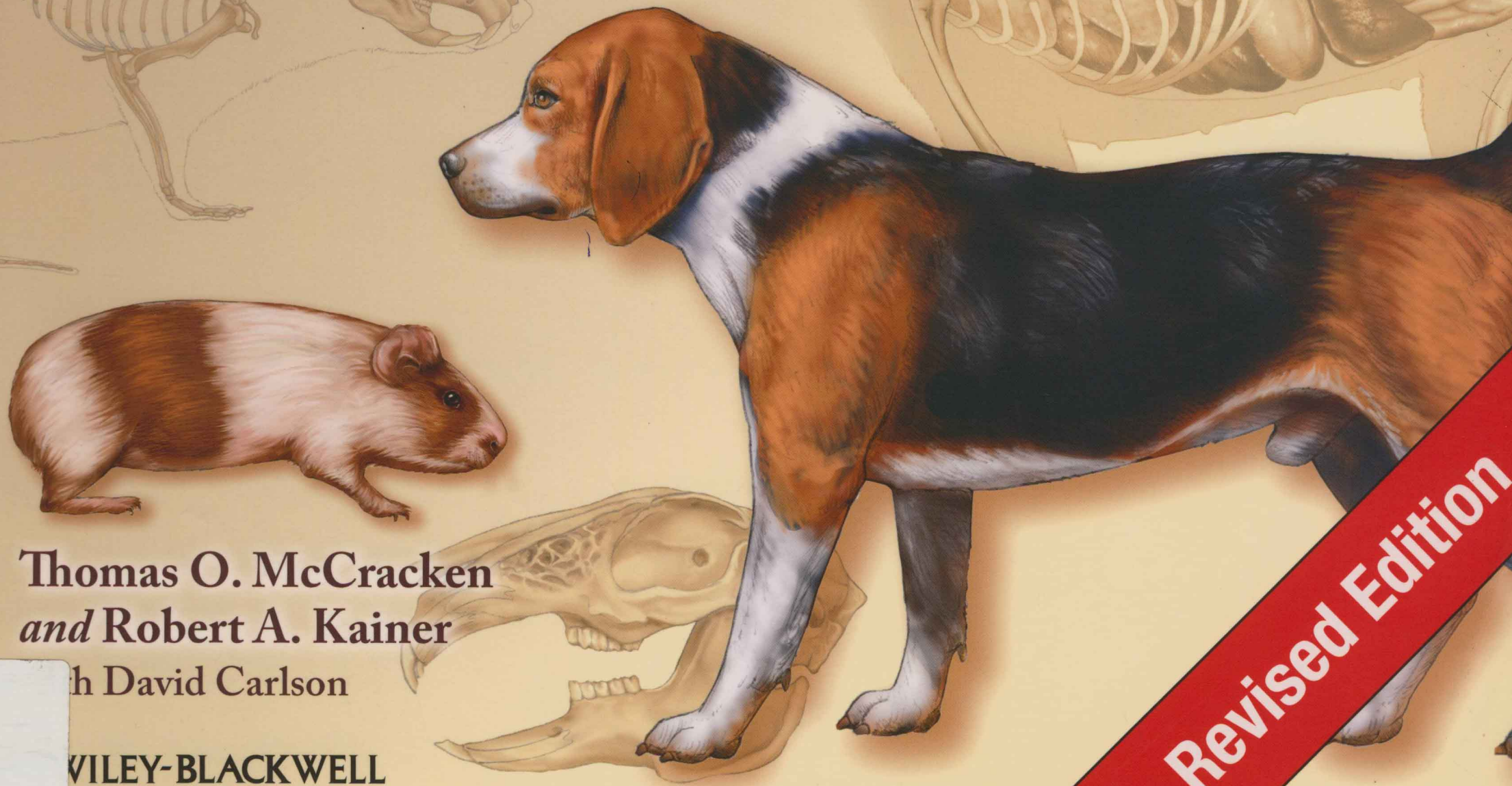


# *Color Atlas of* **SMALL ANIMAL ANATOMY**

## *The Essentials*



**Thomas O. McCracken**  
**and Robert A. Kainer**

with David Carlson

**WILEY-BLACKWELL**

**Revised Edition**

# Color Atlas of

# Small Animal Anatomy: *The Essentials*

Thomas O. McCracken, MS, PhD (Hon)

*Professor Anatomy  
University of Medicine and Health Sciences/  
International University of Nursing  
Basseterre, St. Kitts  
West Indies*

Robert A. Kainer, DVM, MS

*Professor Emeritus of Anatomy  
College of Veterinary Medicine and Biomedical Sciences  
Colorado State University  
Fort Collins, Colorado*

David Carlson, Illustrator

*President/Creative Director  
BioGraphix, LLC  
Windsor, Colorado*

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# INTRODUCTION



he Color Atlas of Small Animal Anatomy: *The Essentials* is not a complete, detailed anatomic atlas. Instead it presents topographic relationships of the major organs of the dog, cat, rabbit, rat, and guinea pig in a simple yet technically accurate format. Throughout most of the *Atlas*, a male and a female of a given species are on facing pages. The majority of the plates contain information on the entire body. Some plates are confined to a region; a few contain organs isolated from the rest of the body. Whereas most systems (e.g., digestive and reproductive) are presented for each animal, other systems are included only for some species to illustrate general anatomic patterns. Structures common to the various animals are labeled several times; other structures are labeled on only one or two species, usually emphasizing specific anatomy (the anatomy peculiar to a certain species).

Small animal specialists and researchers have advised the authors on special plates for individual animals.

The *Atlas* is intended for use by individuals at different stages of their education, serving as a survey of the specific anatomy of the different small animals. Advanced 4-H club members, high school vocational agriculture students, and college students studying veterinary medical technology, veterinary medicine, animal science, and wildlife biology can use this *Atlas* as an introduction to the anatomy of common small / laboratory animals. The *Atlas* can also serve as a reference for dog and cat breeders and trainers, as well as laboratory technicians and researchers. It will provide a quick review for persons with previous training in anatomy and will be an invaluable aid for the professional—e. g., a veterinarian or animal scientist—in explaining to a client some aspect of anatomy that pertains to an animal's condition and needs.

The following introductory pages provide the reader with a background in nomenclature and anatomic orientation.



# NOMENCLATURE AND ANATOMIC ORIENTATION

## ANIMAL CLASSIFICATION

**Dog (*Canis lupus familiaris*).** The dog (*Order Carnivora*) is a domesticated wolf in the family Canidae, to which the jackal and fox also belong. Two characteristics distinguish the dog from other canids and, indeed, from all other animal species. The first is its worldwide distribution in close association with humans. The second is the enormous amount of variability found within the subspecies.

The anatomy of dogs varies tremendously from breed to breed. Some basic physical characteristics are identical among all dogs, from the smallest to the largest; most but not all dogs have long muzzles, large canine teeth, and long tails. Like most predatory mammals, the dog has powerful muscles, a cardiovascular system that supports both sprinting and endurance, and teeth for catching, holding, and tearing. Dogs have disconnected shoulder bones (no collar bone) that allow a greater stride length for running and leaping. They walk on four toes, front and back, and have vestigial dewclaws (dog thumbs) on their forelimbs and hind limbs. Dogs exhibit a diverse array of fur coats; they range from different coat textures, colors, markings, and patterns.

**Cat (*Felis catus*).** Cat is the name applied broadly to the mammals in the order Carnivora, family Felidae, and specifically to the domestic cat. All cats have rounded heads, short muzzles, large eyes, sensitive tactile hairs around the mouth, and erect pointed ears. They have short, wide jaws equipped with long canine teeth and strong cheek teeth with sharp cutting edges. Their tongues are coated with sharp backward-facing papillae that aid in drinking and grooming. The ends of the toes bear strong, sharp, curved claws. The claws are completely retractile, being withdrawn into protective cutaneous sheaths when not in use, a distinguishing feature of the cat family. Cats have long tails which they use for balance. The musculo-skeletal system is extremely flexible, allowing cats to arch and twist their bodies in a variety of ways. Most cats have good vision and are able to see well in very dim light; their color vision is weak. Their sense of hearing is excellent; their sense of smell

is not as acute as that in dogs. Cats may be solid-colored or have patches or shadings of a second color; some common patterns are: tabby, tortoiseshell, and calico, among others.

**Rabbit.** The European rabbit (*Oryctolagus cuniculus*) is in the order Lagomorpha which also includes the hare and the pika. These animals have two large upper first incisor teeth with two small second incisors behind them. This immediately distinguishes lagomorphs from rodents. Other distinguishing features are short tails and large hind limbs and feet adapted for running or jumping. In most, the length of the ears is considerably greater than the width. The rabbit skeleton is light, making up only 7-8% of body weight. The forelimbs are short and fine, in contrast to the long and powerful hind limbs. The plantar surface of the hind limb from the tarsus distad is in contact with the ground at rest. The spine is naturally curved.

The upper lip of the rabbit is cleft (hare lip). Rabbits have a total of 6 incisors (the teeth you see in the front), two sets upper and one set lower, and no canine teeth. The cheek teeth consist of three upper premolars and three upper molars, and two lower premolars and two lower molars on each side.

Although usage varies, the term rabbit generally refers to small, running animals which give birth to altricial (naked and blind) young, while hare refers to larger, hopping forms, with longer ears and limbs whose young are precocious (born furred and open-eyed). They have acute senses of smell and hearing.

**Rat.** Rats are rodents with stout bodies, usually having a pointed muzzle, a long, slender, naked tail, and dexterous forepaws. Rat refers particularly to the two species of house rat—the brown, or Norway, rat (*Rattus norvegicus*) and *Rattus rattus*, the black, roof, or Alexandrine, rat. Besides the house rats, the genus *Rattus* contains several hundred wild-living species.

The brown rat is the larger of the two, growing up to 10 in. (25 cm) long excluding the naked, scaly tail, and sometimes weighing more than a pound (.5 kg). It is commonly brown with whitish underparts and pink ears, feet, and tail. The laboratory white rat is an albino strain of the brown rat. The black rat is commonly dark gray. It reaches a maximum length of 8 in. (20 cm) and has a longer tail and larger ears than the brown rat. As with the rabbit, the rat's teeth grow continually during its life.

**Guinea pig.** The guinea pig (*cavy*, *Cavia porcellus*). It is a South American rodent unrelated to the pig; the name may refer to its shrill squeal. The guinea pig is a small, burrowing rodent that has a compact body. They have rounded bodies, large heads, and blunt noses and reach a length of 6 to

10 in. (15-25 cm) and a weight of 1 to 2 lb (450-900 grams). The guinea pig's rapid reproductive rate and high resistance to disease make it a valuable laboratory animal. It has small ears and eyes, a small snout with sensory tactile hairs on each side, and no tail. Like most rodents, it has two upper and lower teeth at the front of the mouth which continue to grow throughout its life. It has short limbs and small feet with claws; the forefeet have four toes/claws, but the hind feet have only three.

There are a number of varieties of guinea pig; their coats can have short or long smooth hair with a great variety of color combinations, mainly mixtures of black and white and many shades of brown.



## GENERAL TERMINOLOGY

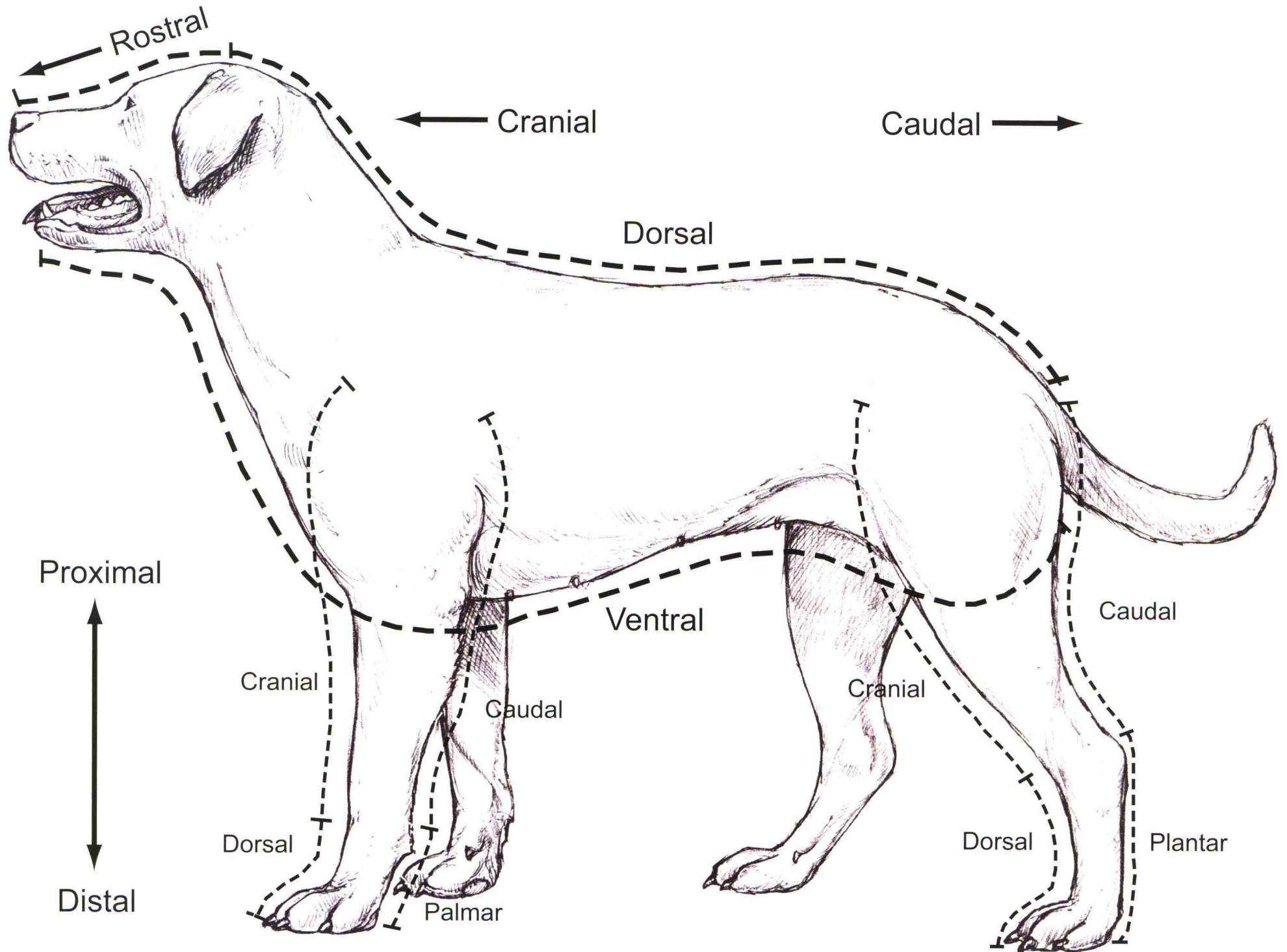
With some exceptions, particularly for some muscles wherein traditional Latin names are used, the terminology in this *Atlas* conforms to English translations of Latin terms in the *Nomina Anatomica Veterinaria* (N.A.V.), 3rd ed., 1983. In compliance with the intent of N.A.V., nomenclature will be consistent for all species. Common terms and laboratory terms are used in some plates. Abbreviations for organs in this *Atlas* include: a, artery; b, bone; j, joint; lig., ligament; ln., lymph node; m, muscle; n, nerve; v, vein. Double letters indicate the plural form of these words (e. g., aa, arteries). Positional and directional terms, body planes, and the extent of body cavities are used to indicate the location of parts of the body and functional change in position.

## POSITIONAL AND DIRECTIONAL TERMS

The following terms are illustrated on the accompanying illustration of the dog. **Dorsal** and **ventral** are opposite terms indicating relative locations toward the back (L., dorsum) or belly (L., venter). Above the knee (carpus) and the hock (tarsus) and from the belly to the back, a structure located closer to the cranium (skull case) is **cranial** to another structure, and a structure located toward the tail (L., cauda) is **caudal** to another. On the head, the term **rostral** indicates a structure closer to the nose (L., rostrum).

**Proximal** indicates a location toward the attached end of a limb; **distal** indicates a location toward the free end of a limb, that is, further from the trunk. Distal to and including the carpus, **dorsal** replaces cranial; **palmar** replaces caudal. Distal to and including the hock, dorsal replaces cranial, and **plantar** replaces caudal.

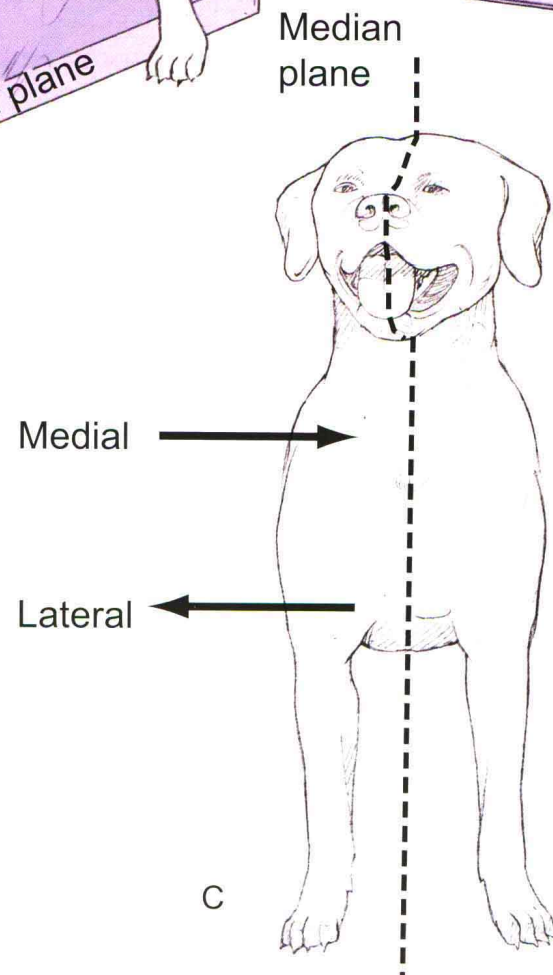
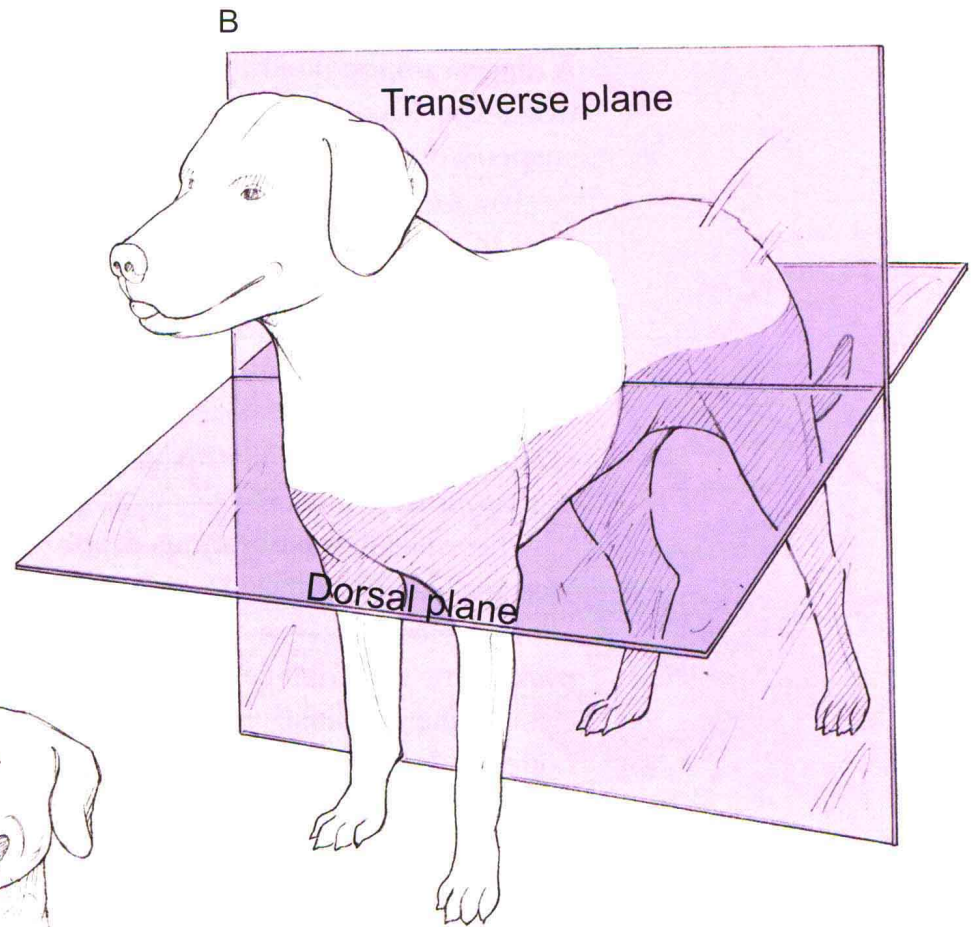
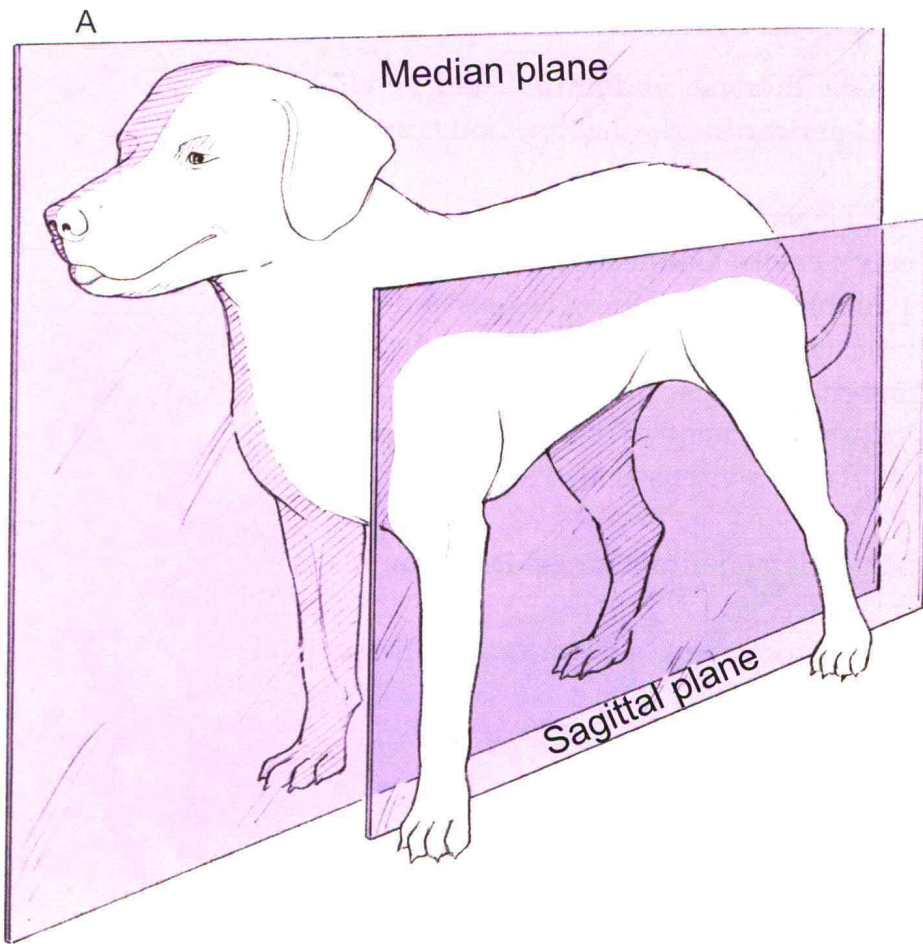
Positional adverbs end in -al; directional adverbs, in -ad. For example, one structure is proximal to another; a tendon extends distad to join another. A vein courses proximad.





## BODY PLANES

Illustrations of the dog are used to illustrate body planes. The **median plane** (L., medius, middle) divides the animal body into right and left halves. A **sagittal plane** (L., sagitta, arrow) is any plane parallel to the median plane. **Medial** and **lateral** (L., latus, side) are positional terms relative to the median plane. Medial structures are located closer to the median plane. Lateral structures lie away from the median plane, that is, toward the side. They extend laterad (directional term). A **transverse plane** passes through the head, trunk, or limb perpendicular to the part's long axis. A **dorsal plane** (also called a **frontal plane**) is a longitudinal plane that passes through the body parallel to its dorsal surface at right angles to the median plane.





## BODY CAVITIES AND MEMBRANES

A diagrammatic illustration of the female dog illustrates the **thoracic, abdominal, and pelvic cavities** and the serous membranes—**peritoneum, pleura, and pericardium**—that line body cavities and suspend organs.

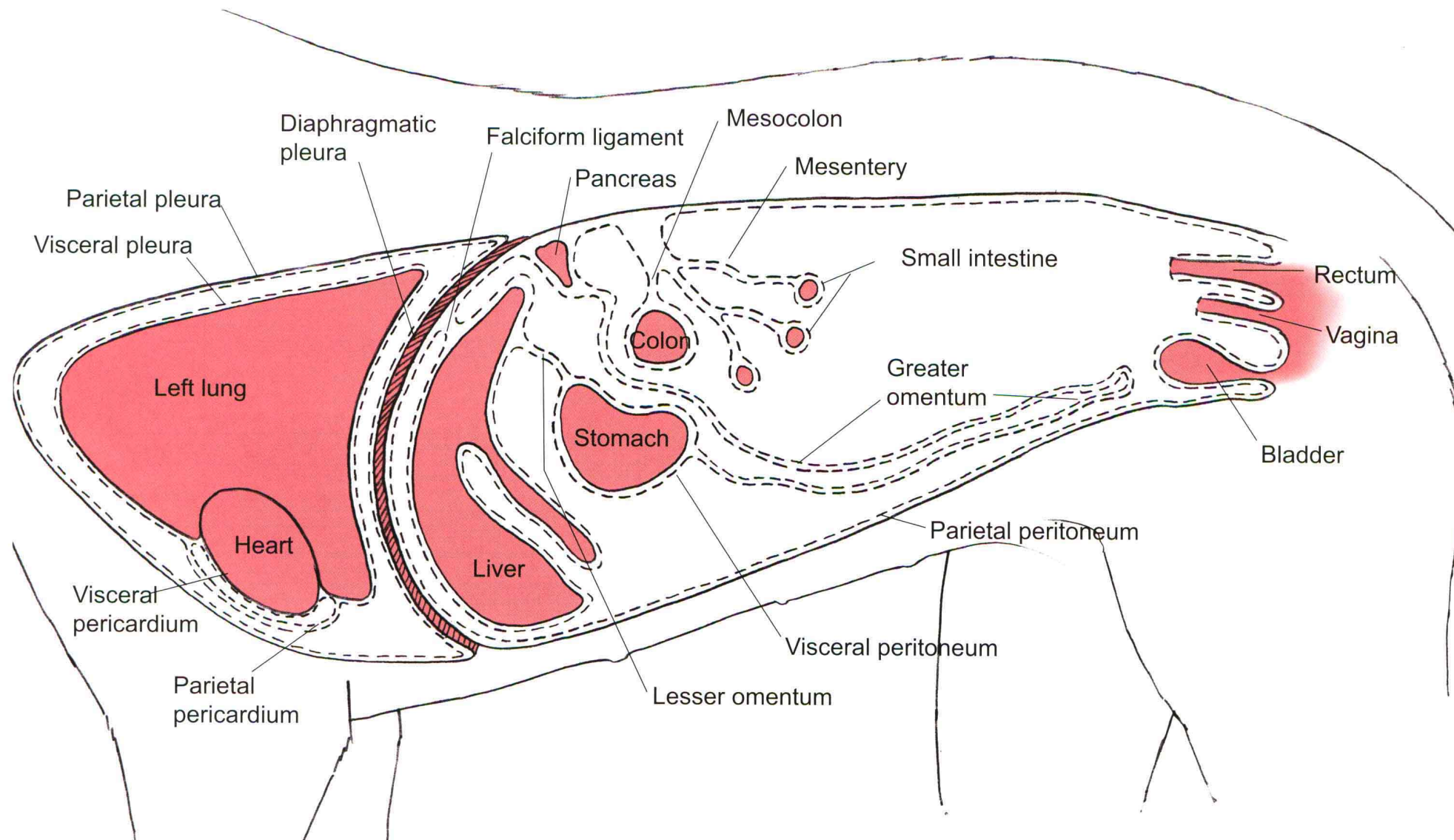
The peritoneum consists of three continuous parts. The **parietal peritoneum** (L., *paries*, wall) lines the abdominal cavity and the cranial part of the pelvic cavity. **Connecting peritoneum** reflects from the parietal peritoneum and suspends organs in a double fold containing vessels and nerves as it extends to an organ. The connecting peritoneum is indicated by *mes-* (G., *mesos*, middle) plus the Latin or Greek name of the organ. An example is **mesentery**: *mes-* plus *enteron* (G. intestine). Peritoneal ligaments suspend and support—e.g., falciform ligament of the liver. **Visceral peritoneum** is continuous with connecting peritoneum, encircling a viscus (Latin for a large, internal organ; plural, **viscera**).

The musculomembranous **diaphragm** is covered with parietal peritoneum on its abdominal surface and parietal (diaphragmatic) pleura on its thoracic surface.

The **pleurae** are two continuous serous membranes, each forming a pleural sac. The **parietal pleura** line each half of the thoracic cavity. **Mediastinal pleura** is connecting pleura on each side enclosing the **mediastinum**, a space containing the heart, esophagus, trachea, blood vessels, lymph nodes and ducts, thymus, nerves, and adipose tissue. **Visceral (pulmonary) pleura** covers each lung.

The **pericardium** is the heart sac. **Visceral pericardium** (also called epicardium) covers the heart and reflects around the base of the heart and great vessels to become continuous with the **parietal pericardium**. The latter is attached to a fibrous layer, the fibrous pericardium.

The serous cavities—**peritoneal cavity, pleural cavity, and pericardial cavity**—are potential spaces between parietal and visceral membranes containing lubricating serous fluids named for each cavity or sac.



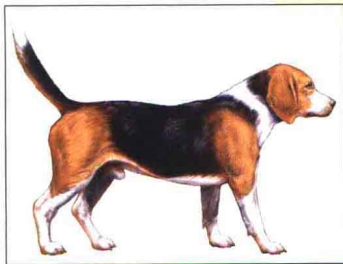


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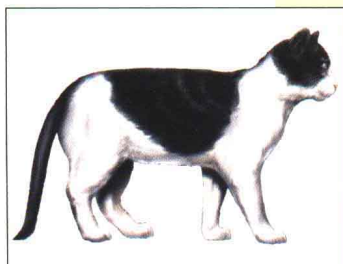
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