



## **Anatomy of the Dog**

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This subject is of utmost importance to the dog show exhibitor, the breeder of purebred dogs and the judge.

The Standard of a breed is written around the basic skeletal structure and its covering muscles, skin and coat. General appearance and proportions are determined by the underlying skeleton and movement by the skeletal structures and their relative proportions. All important organs are housed within the skeleton - the scenting organs and taste buds and the masticating structures inside the jaws - the brain within the bony skull - the spinal cord within the vertebrae - the lungs, heart and esophagus - the large vessels at their origin within the thoracic cage (chest), the pelvic organs within the bony pelvis and the abdominal organs lying along the spine or hanging from that area, protected by muscles attached to the chest cage, pelvis and spine.

Fundamental to the description of the anatomy of the dog therefore is an understanding of the skeleton. Perhaps it can best be described by comparing the animal skeleton to that of the human. For example, the hock is analogous to the heel of the human, the pastern to the human wrist, the elbow to the human elbow, etc.

The head consists essentially of a skull cavity made up of rigid joints. This rigid structure includes the bones of the muzzle holding the upper teeth. The bones of the lower jaw are rigidly united in front and have a hinge joint at the upper and back angle. These joints, one on each side, are the only moveable ones in the head. The orbital cavity for the eye faces in a characteristic direction - mainly forward in the Bulldog, Boston, etc., but more toward the side and front in the long-headed breeds like the Collie. In front of the nose bones is an area of cartilage and the nostrils are well in front of the ends of these bones and allow some movement of the nose itself. The width of skull and cheek and its relation to the muzzle varies over a wide range within different breeds -but in general there are but two types of heads, one, the broad skull and wide apart Zygomatic bones, those bones forming the lower margin of the eye sockets and extending backwards to the skull, coupled with a short broad muzzle. The other type has relatively fine and flat Zygomatic arches with a much longer muzzle forming the wedge shaped head of the Collie, Doberman, etc.

The spine supports the head, forms the backbone and extends to the end of the tail. It is divided into five parts, the neck (cervical) region, the thoracic, or chest part with a pair of ribs attached to each vertebrae (at transverse processes), the lumbar region, a relatively firm yet flexible span between the last thoracic vertebrae and the pelvis, the sacrum which consists of three fused vertebrae to which is attached the pelvic girdle and the tail bones. Some of these sections are freely moveable, particularly the neck and tail, to a lesser degree the lumbar



and thoracic and the sacrum not at all.

Cervical: there are 7 cervical vertebrae. The head rests on the first which is shaped to form a cup to receive the head and allows it some nodding movement. It is appropriately called the Atlas, after the mythical giant who was pictured as bearing the world on his shoulders. The second cervical vertebrae is concerned with rotation of the head and is appropriately called therefore the Axis. The other five allow free flexion and extension.

There are 13 thoracic vertebrae, each carrying a pair of ribs. Each rib in the mature dog ends in front in a cartilage and this cartilage in the case of the first ten ribs is attached to the breast bone. The cartilage of the eleventh is attached to the cartilage of the 10th, that of the 12th to the cartilage of the 11<sup>th</sup> and thus the 11<sup>th</sup> and 12<sup>th</sup> are attached indirectly to the breast bone. The last pair of ribs, the floating ribs end in a somewhat blunted cartilaginous end. The ribs lie at an angle to the vertebrae extending backwards from their origin, this angle increasing more and more from the first to the 13th. From a point approximately half way around the chest they extend forward again toward the breast bone. The ribs have a double purpose – they form a protective cage for the vital organs, such as lungs and heart, and yet must move at their juncture with the spine, so they may move forward and outward to increase the size of the chest cavity. This action along with movement of the diaphragm, a muscular sheet separating the chest organs from the abdominal cavity, allow an increase in the size of the chest cavity and so allows expansion of the lungs and the intake of air. When the muscles which expand the chest cavity relax the ribs move backwards and inwards without any muscular effort and so the chest cavity becomes smaller and air escapes from the lungs. The Thoracic vertebrae do not need to move much, but can flex and extend a little.

The seven lumbar vertebrae need to be really large and strong, since all the big muscles of the back are attached to them and they must support directly or indirectly the abdominal organs - as well as conducting the spinal cord. They also transmit the thrust of the hind legs to the thoracic spine and front legs.

The three pelvic bones from each side form a cartilaginous joint which is virtually solid but which softens during pregnancy in the female, expand somewhat and allow an appreciable enlargement of the pelvic cavity during delivery of puppies. The pelvic bone of each side thus form a solid basket for the pelvic organs. The joints between sacrum and pelvic girdle, the sacro-iliac joints, are also relatively immobile. When they are not or become arthritic, pain results. A lot of people have sacro-iliac arthritis! The joint uniting the sacrum and the pelvic bones must be rigid, because in the center of each three pelvic bones is a shallow cup, the acetabulum into which the ball shaped head of the femur fits. In other words the hind legs support the body through this joint between sacrum and ilium. Through this joint the thrust of the hind legs is transmitted to the spine.



The tail bones vary in number from six to 23 - are well formed and flexible in many breeds such as the Collie and German Shepherd, are held in unusual positions by the imbalance of flexor and extensor muscles as in the Chow, Pekingese etc. who carry their tails over their backs, doubly curled as in the Basenji, or shortened, irregular or deformed as in most Bulldogs and Boston Terriers.

The front extremity is attached to the sides of the chest by muscle and tendon only. There is no clavicle or collar bone in the dog as in the human. The scapula or shoulder blade is applied to the chest wall and should fit well. It should be placed in most breeds at an angle of 45° backwards and upwards at such a position as to show the foremost portion of the chest a little in front of the shoulder joints. The whole assembly can be too far forward, usually also with too open a joint i.e. too large an angle between shoulder blade and upper arm. In some cases there is a prominent area of chest projecting well ahead of the front assembly - normally in the Dachshund.

The front assembly consists of a scapula or shoulder blade, an upper arm, a forearm, a pastern and foot. In most breeds as Boxer, Dobe, Pointer and Retriever, the upper arm is nearly equal in length to the shoulder blade and meets it at right angle. This brings the elbow under the chest and supports the front of the dog firmly. The forearm consists of two bones radius and ulna, the pastern of two rows of small bones, the foot of 4 metatarsals and four toes. The thumb is represented by the dew-claw – a poorly developed vestifial structure, sometimes removed.

The similarity between the canine and human structure is fairly obvious, except for the pastern. Few people realize that the wrist has movement in all directions because there are two rows of carpal bones forming the hand. Similarly there is free movement in the pastern because of this double row of relatively small bones between the radius and ulna and the metacarpals (front legs). The dog walks on his fingers and toes - the horse on his toe-nails.

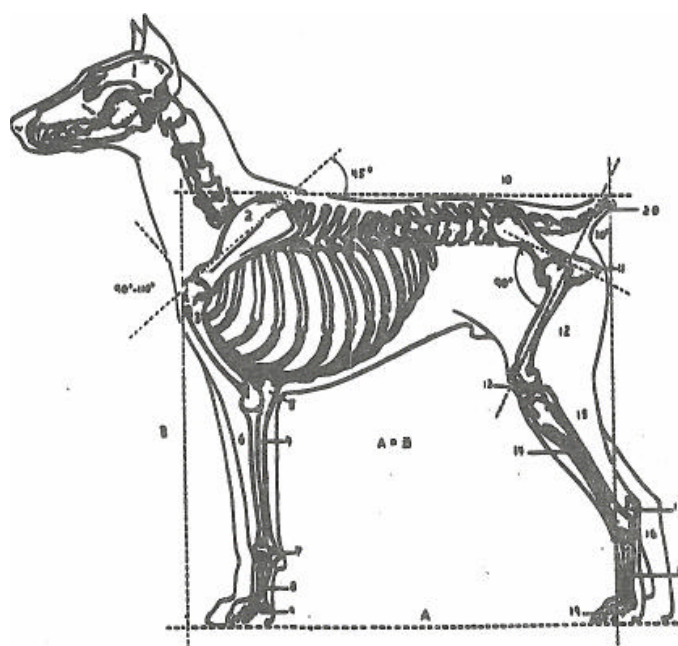
The rear extremity consists first of a single long strong bone called the femur whose rounded head together with the socket formed at the junction of the three pelvic bones on each side forms the hip joint. Then the femur at its lower end forms a hinge joint with the tibia and fibula, the bones of the lower thigh. The tibia and fibula in turn end at the hock joint, comparable to the human heel. Just as the heel of the human projects backwards beyond the leg, so the hock of the dog shows a projection upward of the uppermost bone of the hock. The strong tendo-Achilles can be seen and felt plainly behind the human ankle joint and above the canine hock joint.

In the rear extremity for most breeds of dogs there are also specific angles desirable for proper movement and proportion. The pelvic bone should extend downward and backward at 30° from the horizontal, the femur 90° forward from



the hip joint and then a definite angle of the tibia and fibula backwards from the knee or stifle to reach a relatively short foot or hock joint to form a definite angle there also. Draught horses and heavy working breeds such as the St. Bernard and Newfoundland need stability and power so have less angulation at the stifle and hock. The German Shepherd Standard calls for more angulation between thigh and hip and lower thigh and hock than any other breed. The Chow Chow Standard specifies no bend of hock and so forth. Muscles are attached to ridges or bumps in the bones, these being large or small depending on the size of the muscle concerned. They end in tendons attached to other ridges or bumps. Under the skin is a layer of fibrous tissue in whose spaces fat can collect in smaller or larger amounts.

Perhaps some questions have arisen in the mind of the reader as to the variations in different breeds in the skeleton. For example, some breed Standards require a long graceful neck and short bodies and backs, while others require a short neck and a relatively long back. It is hard to imagine, perhaps, but true, that there are the same number of bones in the neck region of the Greyhound and in the Pekingese. Similarly the Dachshund and Basset have essentially the same bone structure in the front assembly as have the Doberman and Pointer or Setter.



**A Length - B Height-**

- 1. Head - 2. Shoulder blade -3. Upper arm - 4. Forearm -**
- 5. Elbow - 6. Radius bone - 7. Front ankle - 8. Pastern -**
- 9. Toes - 10. Hip - 11. Haunch - 12. Upper thigh - 13. Stifle -**
- 14. Lower thigh - 15. Fibula - 16. Heel - 17. Hock -**
- 18. Rear pastern - 19. Toes - 20. Tail**