

THE MUSCULO-SKELETAL SYSTEM

Kolts & Kitties Combined Cat Info – Lesson 3

I. The Skeleton

- ◆ The cat's skeleton is not very different from the human skeleton.
 - The cat has more bones—230 as opposed to 206—but many are identical to those in the human being.
 - Cats have 13 ribs, humans have 12.
 - Cats have clavicles (collarbones), but unlike humans, they are not attached to other bones
- ◆ Bones have two parts:
 - The cortex is the outside. It is made of minerals & protein,
 - The marrow cavity is the inside. It produces red blood cells.
- ◆ The cat's skeleton serves as a strong framework & provides protection for the vital organs.
- ◆ The body of the skeleton has 5 major areas: skull, spinal column, forelegs, hind legs, thorax

A. The Spinal Column

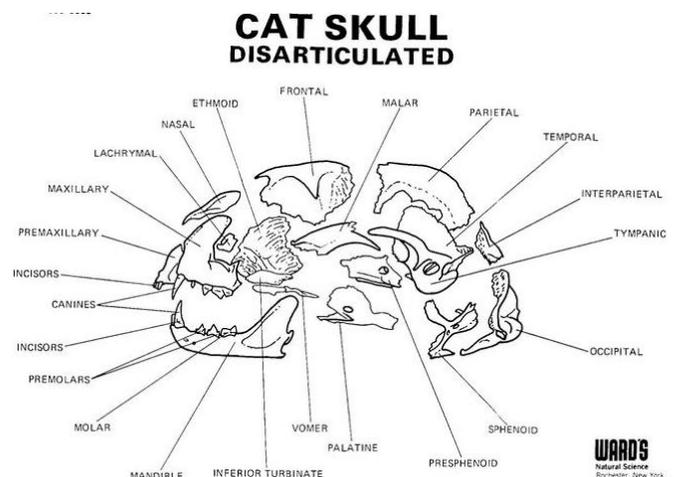
- ◆ The spinal column has 5 regions: cervical, thoracic, lumbar, sacral, & caudal
- ◆ Cervical Vertebrae
 - The vertebrae of the neck
 - Total of 7 vertebra
 - The first two are named the atlas & axis
- ◆ Thoracic Vertebrae
 - The vertebrae of the chest
 - There are 13 vertebrae
 - Each is associated with a pair of ribs
- ◆ Lumbar Vertebrae
 - The vertebrae of the back
 - There are 7 vertebrae
- ◆ Sacral Vertebrae
 - The vertebrae of the pelvis
 - There are 3 vertebrae that are fused together
- ◆ Caudal Vertebrae
 - The vertebrae of the tail
 - There are 18-23 vertebrae
- ◆ The cat's spine is probably the most flexible of all mammals.
- ◆ The cat can arch its back in a "U" shape.

B. Ribs

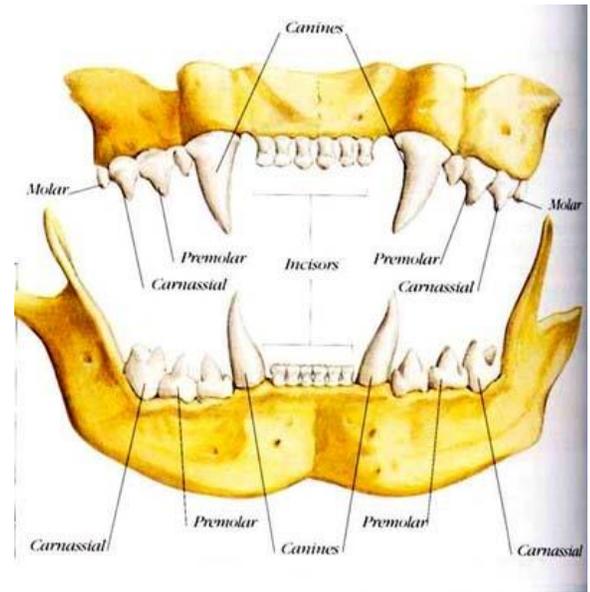
- ◆ The cat has 13 pairs of ribs
- ◆ All attach at the top to the thoracic vertebrae
- ◆ Most attach at the bottom to the sternum (breastbone.)
- ◆ The spine, ribs & sternum form the thorax that houses the heart & lungs.

C. The Skull

- ◆ The skull is attached to the spinal column at the atlas.
- ◆ It is made of many bones fused together.
- ◆ Inside are two air filled pockets called sinuses: Frontal sinus, Maxillary sinus



- ◆ The part of the skull that holds the upper teeth is the maxilla.
- ◆ The lower teeth are on the mandible.
- ◆ The small bones of the nose are the nasal bones.
- ◆ The skull holds 30 teeth:
 - 12 incisors
 - 4 canines
 - 10 premolars (6 top, 4 bottom)
 - 4 molars
- ◆ Kittens have 26 deciduous teeth. They have no molars

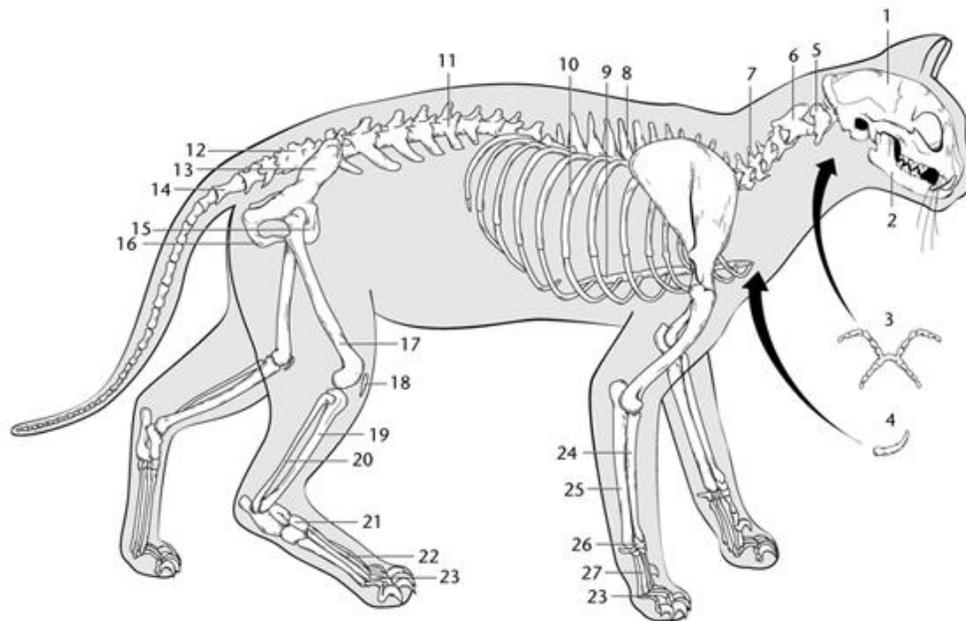


D. The Forelegs

- ◆ The foreleg bones include:
 - Scapula (shoulder blade)
 - Humerus
 - Radius
 - Ulna
 - Carpus (wrist)
 - Metacarpus
 - Phalanges/digits (toes)

E. The Hind Legs

- ◆ The hind leg bones include:
 - Pelvis
 - Femur
 - Patella (kneecap)
 - Tibia
 - Fibula
 - Tarsus (hock)
 - Metatarsus
 - Phalanges/digits (toes)



- | | | |
|----------------------------|---------------------------|------------------|
| 1 - Skull | 10 - Rib | 19 - Tibia |
| 2 - Mandible | 11 - Lumbar vertebra (7) | 20 - Fibula |
| 3 - Hyoid bones | 12 - Sacrum | 21 - Tarsals |
| 4 - Clavicle | 13 - Ilium | 22 - Metatarsals |
| 5 - Atlas | 14 - Caudal vertebra (22) | 23 - Phalanges |
| 6 - Axis | 15 - Pubis | 24 - Radius |
| 7 - Cervical vertebra (7) | 16 - Ischium | 25 - Ulna |
| 8 - Thoracic vertebra (13) | 17 - Femur | 26 - Carpals |
| 9 - Sternum | 18 - Patella | 27 - Metacarpals |

II. The Joints

- ◆ Joints are the places where 2 or more bones meet.
- ◆ Joints are usually held together by ligaments & tendons.
 - Ligaments connect bone to bone
 - Tendons connect bone to muscle
- ◆ Joints are cushioned by cartilage layers over the ends of the bones.
- ◆ There are 2 types of joints:
 - Hinge can only move forward & back
 - Ball & socket can move forward, backward & sideways
- ◆ Only the hip & shoulder are ball & socket
- ◆ The major joints of the foreleg are:
 - Shoulder
 - Elbow
 - Carpus (wrist)
- ◆ The major joints of the hind leg are:
 - Hip
 - Stifle (knee)
 - Hock (ankle)

III. Locomotion

- ◆ The cat has several gaits:
 - Walk – a 4 beat gait
 - Trot – a 2 beat gait
 - Run – a 3 beat gait

A. The Walk

- ◆ At the walk, each foot lands at a separate time.

B. The Trot

- ◆ Has contra-lateral motion
- ◆ The opposite front & rear leg land at the same time.

C. The Pace

- ◆ Some cats pace instead of trot
- ◆ The cat moves the forelegs & hind legs on one side, then the forelegs & hind legs on the other.

D. The Run

- ◆ A 3 beat gait that is really a series of jumps
- ◆ Only one foot at a time touches the ground

E. Broken Bones

- ◆ The most frequently broken bones are:
 - Foreleg bones
 - Hind leg bones
 - Pelvis

IV. The Muscular System

- ◆ Cats have 3 kinds of muscles:
 - Striated
 - Cardiac
 - Smooth

A. Striated Muscles

- ◆ Most muscles are striated muscles.
- ◆ Control voluntary movement
- ◆ Are usually attached to bone.
- ◆ These are the “flesh” of the body – legs, back, chest, & head

- ◆ Named for its striped appearance under a microscope.

B. Cardiac Muscles

- ◆ A specialized striated muscle found only in the heart.
- ◆ Contracts automatically.

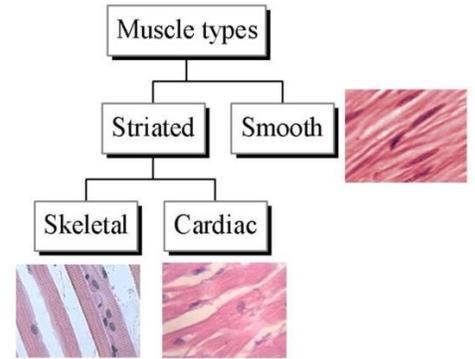
C. Smooth Muscles

- ◆ Also named for its appearance.
- ◆ Involuntary
- ◆ The muscle of the organs including:

- Digestive tract
- Urinary tract
- Reproductive tract
- Eyes
- Arteries & bronchioles

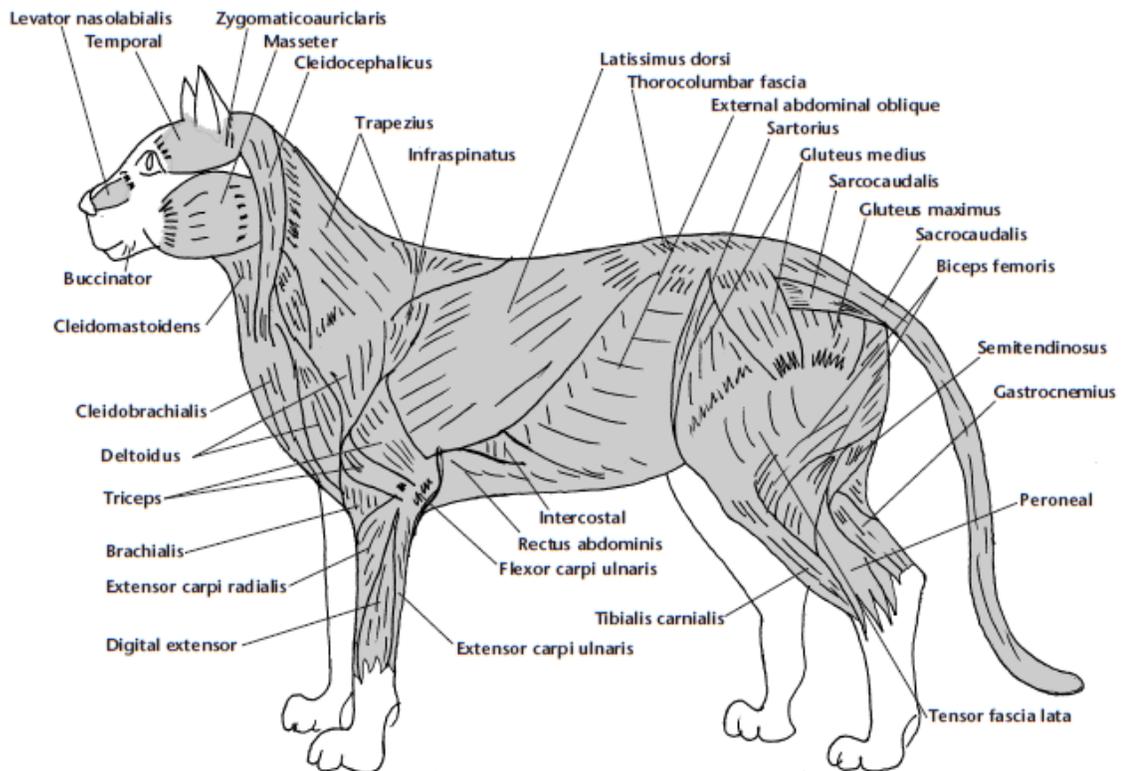
D. Skeletal Muscles

- ◆ Striated muscles that cross a joint & move bone or cartilage.
- ◆ Each muscle either extends (straightens) or flexes (bends) the joint.
- ◆ Usually named for where they attach
- ◆ Dorsal refers to the top of the body & ventral to the bottom.
- ◆ The cat has hundreds of muscles.
- ◆ Head & Neck
 - Temporal & Zygomaticoauricularis muscles pull the ears forward.
 - Caudal Auricular muscles pull the ears back.
 - Levator nasolabialis raise the upper lip & dilate the nostrils
 - Masseter closes the jaw. It is the muscle of chewing.
 - Buccinator forms part of the cheek & moves food in the mouth.
 - Brachiocephalicus starts in the head & extends to the shoulder.
- ◆ Dorsal Body
 - Trapezius muscle raises the head & shoulder
 - Latissimus dorsi flexes the shoulder
 - Thoracolumbar fascia anchors many back & abdominal muscles.
- ◆ Thorax, Abdomen & Tail
 - Intercostal connect the ribs to each other & aid in breathing.
 - External abdominal oblique forms the abdomen wall.
 - Rectus abdominis goes from the sternum to the pelvis & supports the abdomen.
 - Sarcocudalis moves the tail.
- ◆ Forelimbs
 - Brachiocephalicus extend the shoulder
 - Infraspinatus support the shoulder
 - Deltoidus flexes the shoulder
 - Brachialis flexes the elbow
 - Triceps extends the elbow
 - Flexor carpi radialis, Extensor carpi ulnaris & flexor carpi ulnaris control the carpus
 - Digital flexors & extensors control the toes
- ◆ Hind Limbs
 - Sartorius flex the hip & extend the stifle
 - Medial gluteal is the major muscle of the rump & flexes the hip



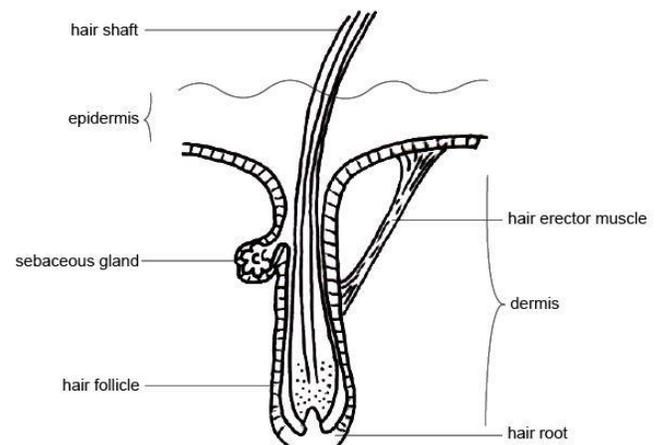
- Biceps femoris flexes the stifle
 - Tensor fascia lata helps flex the hip
 - Semitendinosus is the back muscle of the thigh & extends the hip.
 - Gastrocnemius flexes the stifle & extends the hock
 - Common & lateral digital extensors extend the toes.
- ◆ The cat's muscular control & skeletal flexibility allow it to right its body during a fall with incredible speed—a trick which is unique to cats.

MAJOR MUSCLES OF THE CAT

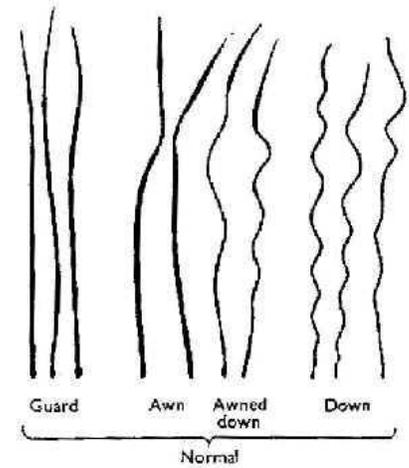


V. Your Cat's Hair

- ◆ The hair, or fur, serves as insulation against heat & cold.
- ◆ Hair also protects the cat against insect bites, stings, thorns, and other dangers & annoyances.
- ◆ The cat raises its hair, particularly the hair along its neck & spine, as a protective device when frightened or threatened. With its hackles raised, the cat assumes a wary & defiant position. Back arched, tail hairs bristling, muscles tensed, it turns itself broadside. In this attitude, the cat appears larger & more ferocious to its attacker.
- ◆ Cats shed their hair according to the climate & their state of health. Hair is shed naturally year-round, especially in the spring & fall. Excessive shedding is a warning signal of possible disease, poor diet, parasites, or overheating.
- ◆ Therefore, it is important to pay attention to the condition of your cat's hair.
- ◆ The hairs grow from tiny pits called follicles.

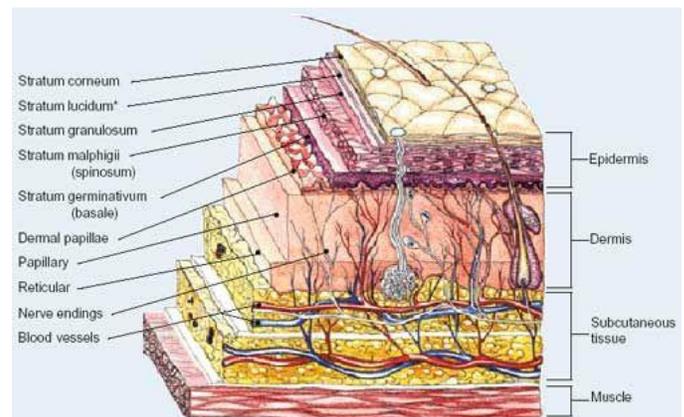


- ◆ The top or guard hairs grow from individual follicles.
- ◆ The secondary or undercoat hairs grow in groups from each follicle.
- ◆ There are 2 types of secondary hairs
 - Awn hairs, which have bristly tips
 - Down hairs, which are fine & crinkly
- ◆ Special follicles produce sensitive hairs called sinus hairs. They are:
 - On the muzzle = whiskers or vibrissae
 - On the back of the lower forelegs = carpal hairs



VI. Your Cat's Skin

- ◆ The cat's skin is made up of:
 - An outer layer, the epidermis,
 - An inner layer, the dermis.
- ◆ The epidermis has 4 sub-layers. The innermost layer regenerates the skin cells.
- ◆ The cat's skin is somewhat waterproof, but it is not impermeable. Certain oils & medicines can be absorbed through the skin. This should be kept in mind when you use insecticides or medications on a cat's skin. A toxic substance may prove fatal if absorbed through the skin.
- ◆ The cat's skin contains sweat glands that help regulate body temperature.
- ◆ The cat also has sweat glands in the pads of its feet.
- ◆ The cat is cooled by radiation of heat (panting) rather than by inner cooling (sweating), as in humans.
- ◆ Cats also have glands in their skin, known as sebaceous glands, that are connected with the hair follicles.
- ◆ These glands secrete an oily substance known as sebum that solidifies when exposed to the air.
- ◆ The sebum coats the hairs, protecting the fur & making it glossy.
- ◆ In a healthy state, the cat's skin is always elastic & pliable, with the ability to regenerate at a rapid pace.



VII. Toes & Toenails

- ◆ Most cats have:
 - 5 toes on their front paws
 - 4 toes on their rear paws.
- ◆ Some cats have more toes because of a mutation called polydactylism.
- ◆ The fifth front toe is called the "dewclaw." It provides better grip & traction while playing or climbing.
- ◆ The claws on the front paws are usually sharper than the ones on the hind feet.
- ◆ A cat's claws are curved, which helps them to climb & hold onto prey.
- ◆ Cats have retractable claws. This helps keep the nails sharp & allows a cat to walk silently.

