
Equine Skeleton, Bones And Their Forms

As you stand, admiring the horse running in the paddock, you take in its shiny coat and toned muscles. Not much appreciation is shown for the equine skeleton holding all that physique together. Without the support of approximately 205 skeleton bones the horse would collapse so they have a vital role to play in the animal.

The skeleton has five major functions which are to support and protect the bodies vital organs, to assist with movement, to produce and store minerals. Without the support of the skeleton bones the horse would collapse so they play an important role in the animal. The arrangement of the horse's skeleton determines the horse's conformation, movement, mechanics and efficiency. (Higgins G 2009).

The skeletal system is made up of cartilages, joints, ligaments and tendons and bones which all work together as one. Joints are where two bones meet and allow movement. Cartilage covers the ends of the bones at some joints and helps reduce friction and the force applied to joints. Tendons connect muscles to bones to help the horse move (Romich J 2015).

This assignment is going to cover the various types of bones within the equine skeletal system. The bone forms and their functions.

Equine Skeleton

Bones are a hard-living tissue that forms the skeleton and allow the horse to move. There are five types of bone in the equine skeleton. The long, flat, short, irregular and the sesamoid bones. Some facts and figures:

The skull-is made up of 34 bones

The spinal vertebrae

- cervical 7
- thoracic 18
- lumbar 6
- sacral 5 (fused)
- occygeal 18 (approx.)

Ribs and sternum- 37

Forelimb- 40-42

Hind legs – 40

Total 205-207

Source: Harris S.E (2016) Horse gaits, balance, and movement. Revised Edition 2006

The skeleton can be divided into two parts, the axial skeleton and the appendicular skeleton. The axial skeleton protects the horse's vital parts and consists of the skull, vertebra, sternum and the ribs (Romich J 2015).

The appendicular skeleton is the other half of the skeleton which supports the body and is made up of the bones of both fore and hind limbs, shoulders and the pelvis. Append means to hang or add, so think of the appendicular skeleton as the structure to hang the axial skeleton on to (Romich J 2015). A horse doesn't have a collarbone. The shoulders are attached to the horse's main body by a group of muscles call the "shoulder sling" which are made up of ligaments, facias and a mighty set of postural muscles which stabilize the shoulders and elbows (Harris S 2016).

Bone Forms and Locations

Bones are living tissue with nerves and blood vessels that act as a storehouse for calcium and phosphorus. In a mature adult horse, the skeleton contains about 9 to 10 kilograms of calcium. Of that amount about 20 percent can be used if required. Which makes the equine bones one of the body's most important mineral store (Fritz C 2011).

Bone consists of a hard-outer cortex encasing a spongy cavity. All surfaces of bones are covered by periosteum, this is a tough protective membrane which provides for the attachment of the ligaments and tendons (Higgins G 2015).

Each end of the bone has an enlarged end that is known as the epiphyses which provides a large surface for the joint and this renders it less likely to dislocate. Bony attachments close to the articular enlargement provide a place for the muscle and ligaments to attach (Berga J 2005).

Long Bones

Long bones consist of a shaft, two ends and a marrow cavity. They are operated by the attached muscle and joints and act as supporting columns and levers that permit movement. Long bones are plainly long bones that have two enlarged ends known as epiphyses, with a large surface area to allow for the greater joint to joint attachment, rendering it less likely to dislocate (Brega J 2005).

Long bones contain marrow and they are responsible for the production of new red and white blood cells. Long bones are mainly found in the fore and hind limbs, cannons, femur, radius, ulna and numerous bones. Long bone development is largely the most important as it impacts the soundness of the horse (Higgins G 2009).

The bones are hollowed out to form the medullary cavities in the center of the bone which contains yellow bone marrow. In adult horse's, yellow replaces red bone marrow. Yellow bone marrow is made up of fat cells so they serve as a fat storage area (Romich J 2015). The medullary cavity is surrounded by a thick, stable layer of bone called a compact bone. Bones have the trabecular structure which provides the required strength at a low weight ratio.

Short Bones

Short bones are cube shaped bones with no marrow cavity. Short bones are made from spongy bone material (spongiosa) and are covered with a thin hard substance (corticalis). They are strong and compact and found in joints such as the knee, hock and the fetlock, sesamoids and patella. When they are part of a joint such as the carpal or hock, they help absorb concussion (Brega J 2005).

Flat Bones

Flat bones are thin, flat bones such as the cranial, ribs and the parts of the pelvis and the lower jaw and are generally for protecting the underlying organs. Flat bones have broad flat surfaces and provide a large surface area for muscle attachment. Flat bones are made up with the same construction as the short bones which is spongiosa bone material covered with hard thin surface corticalis (Fritz C 2011).

Irregular Bones

The vertebral column and bones of the pelvis are considered irregular bones. The bones of the vertebral column are all somewhat different in shape and size as you move from the head to the tail. Each vertebra has a vertebral canal which the spinal cords runs through (Higgins G 2009).

The vertebra (also called the spinal column or backbone), support the head and body and protect the central nervous system. The vertebral column has a spinous and transverse processes that are bony projections that extend dorsally and laterally that provides areas for muscle and ligaments to attach and provides strength and support for the heavy trunk.

The vertebral column is divided into five groups and their parts vary on their location and function. The five areas are:

1. Cervical – Neck vertebra. The first vertebra is known as the atlas or C1 and this allows the horse to 'nod'.
2. The second is the axial known as C2 and this allows the horse to twist his head from side to side They make up the most flexible section of the spine.
3. Thoracic- The back vertebra is completely rigid and inflexible due to the shape of the and them and joints that restrict movement.
4. Lumbar- The loin vertebra is flat, wide and heavy vertebra and are the least flexible area in the back
5. Sacral- functions as one bone as it is 5 vertebrae fused together.
6. Coccygeal- Tail vertebra allows the horse to carry and swish his tail.

Sesamoid Bones

Sesamoid bones are two small bones that lie side by side, at the back of the fetlock, below the metacarpal bone to articulate: acting as a pulley. They are embedded with a tendon to add strength. The only exception is the distal sesamoid of the horse.

Bone Form

In the embryo all of the bones start out as cartilage and fibrous membranes that harden into bone before birth. Ossification, the formation of bones from the fibrous tissue, continues until maturity. Bones go through a continuous process of building up and breaking down throughout the animal's life. This continuous process is called bone remodeling and occurs in response to exercise (Romich J 2015).

Bones are a form of connective tissue made up of cartilage and fibrous membranes that harden into bone before birth. Bones are mainly composed of two types of inorganic calcium salts called calcium phosphate and calcium carbonate. The organic matter of bones is called ossein.

While the animal is still developing the long bones, which are made up of a shaft and two ends, the ends of the bones are still separated from the shaft by epiphysis cartilages. Length way development of the bone takes place at the epiphyseal cartilage until the horse is fully grown. Most horses are fully grown by 6 years old, but this varies with breeds (Fritz C 2011).

Bone Structure

If a bone was to be cut with a saw, it will be seen the outer layer, is a dense ivory coloured layer called the compact bone. About 80% of skeleton mass is made up of compact bone. The next layer of bone which is porous spongy bone is called either cancellous or spongy bones. Spongy bone is responsible for production of the red and white blood cells which are located at the ends of the bone. Bone also has yellow marrow which is mainly fat storage area. There are small holes and channels carrying blood vessels from the periosteum to the cancellous bone.

Compostion of Bone

Bone is a form of connective tissue known as supportive tissue. Bone is mainly composed of inorganic calcium salt and calcium phosphate and carbonate. The organic matter of bone is a substance called ossein.

Young horses have a higher rate of organic matter in the bones approximately 60 percent. As the horse ages the organic matter reduces, and the bones start to become brittle.

Mineral matter is what makes the bone hard, if removed the bone becomes brittle and easily broken. Organic matter provides a degree of elasticity which prevents the bone from breaking (Brega J 2011).

Bone is a living tissue and response to changes such as blood supply, physical load and nutrition. Bone can demineralize, become less dense due to a injury because of high mechanical strain to an area. This will result in bony enlargements such as splints or bone spavins developing.

Bone growth can also be affected by an inadequate diet or lack of minerals available throughout the horse's life. Bones lacking the necessary minerals will become porous and lacking in strength (Brega J 2011). It is very important to keep the ratios/balance of the minerals correct.

Conclusion

Knowledge of the equine skeleton structure is invaluable when considering the horse as a whole. The equine skeleton and the bones that make up the skeleton are important part of the horse. The skeleton provides us with the distinctive horse shape that we see on the outside, provides a strong framework that supports the body and protects all of the vital organs .It is what allows us to watch the horse run gracefully across the paddock that we all like to watch. Different breeds of horse have varied shapes and sizes of bones making up their skeletons. This gives them their own unique size and conformation and allows for the many different, wonderful activities the horse can excel at.