



Foals and Yearlings— How Bones Grow

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Individual horses vary in growth rate, mainly depending upon the feed they receive and their genetic potential. Bones grow strongest when a young horse is fed an adequate and well-balanced diet, where all the components needed for proper growth are supplied in the proper amounts. If one element is insufficient or missing, the structure is either weakened or does not progress at a proper rate—it's like trying to build a house without the nails. Even if all the other materials are there, the building cannot continue, or it continues in a precarious fashion with the end result much less perfect than planned.

Overfeeding can be just as detrimental as underfeeding, especially when it comes to skeletal soundness. The young animal may grow swiftly and become fat, but not have the strength of bone to stay sound. Accel-

erated growth and early stress such as training or forced exercise (*see below*) can be harmful to immature skeletons.

Many yearlings are double the height they were as newborn foals. Most of this growth occurs at the flexible areas of cartilage (growth plates) at the ends of the leg bones. These growth plates are soft, producing cartilage that then turns to bone. Cartilage is a specialized type of connective tissue that forms the temporary structure that eventually hardens into bone, and which plays an important role in the growth of young animals.

The long bones of the young horse still have soft, flexible cartilage plates at each end, where a four-layer building process is occurring. New layers of cartilage grow on top of existing layers. The outermost layer is rapidly making new cartilage, the two middle layers are maturing and dying, and the bottom layer is turning the meshwork of dead cartilage into new bone. The

bone lining creates new bone cells that invade the dead cartilage, and nutrients from the bloodstream seep into this construction site. Protein fibers are added to the cartilage residue, which then converts to mineral—the protein matrix framework is quickly filled in with calcium salts to make solid bone (ossification).

Other body tissues grow by multiplication of cells, but bones grow by adding layers. The mineralized portion of a bone can't grow—it can only add more layers to the outside. Leg bones grow by adding onto the ends. To grow properly and have bone with uniform strength and hardness, the construction sites at the growth plates must receive a steady stream of nutrients from the blood.

In a young horse with a developmental bone disorder like OCD (osteochondritis dissecans), the affected cartilage contains cells that reproduce and grow at a fast rate, but during the last

Exercise

Forced exercise programs have become common practice on some breeding farms where weanlings and yearlings are pushed for fast growth, since breeders are now aware that idle overweight youngsters are more at risk for trouble. Exercise can reduce the severity of bone problems caused by overfeeding—burning off some of the excess energy being fed and helping create stronger bones and more fit bodies. But care must be taken to avoid injury caused by the exercise itself. A common cause of leg problems is a nutritional imbalance coupled with forced exercise on hard ground. Footing should be soft,

but not deep and heavy because that can stress the tendons and ligaments.

Some horsemen turn out youngsters for a limited time each day, or use a daily session of round pen work, longeing or ponying, at the trot. Longeing (or any fast work in circles) puts stress and torque on immature bones and joints, however, and should be avoided if possible. If free exercise is not an option, ponying or some form of straight motion is safer than circles. Youngsters being exercised should be warmed up with slow work before fast work, and then cooled down before being confined again. Hard surfaces can

help strengthen bones (mild stress stimulates bone remodelling, creating denser bone) but too much concussion is damaging. Long workouts can be more damaging than shorter ones. It's often better to give several short workouts daily instead of one long one.

However, all this labor intensive management is unnecessary if young horses can be given room to self-exercise rather than being confined. It is risky to do any forced exercise before a youngster is 18 months old, since many of the programs that utilize repetitive maneuvers or traveling in circles can be hard on growing bones and joints.

part of the cycle when they should be maturing into bone, they fail to properly calcify. Cartilage is being created faster than it can be converted into bone, so it piles up—thickening in an irregular pattern that is not as strong as it should be. The inner layers of cartilage get thicker but don't turn to bone properly, creating weak spots. The resulting one is fragile, with pockets of inferior material.

Bones are strongest if supplied with a combination of the proper amount of building materials and some stress (exercise and weight bearing). Exercise stimulates bone development, strengthens the tendon and ligament attachments, and creates strong bones as they adapt to the stress. Confinement impairs circulation, adversely affecting development by slowing down the delivery of nutrients to the ossification sites at the growth plates. Confinement can also be frustrating to an energetic youngster who then explodes into strenuous activity when he does get a chance for turn-out, thus possibly injuring his bones.

The growing horse who gets a lot of natural exercise develops stronger bones than a confined youngster who can't run and play. The younger the horse, the more responsive the developing bone is to the stress of activity. After a horse reaches puberty, the ability of bones to remodel and strengthen in response to activity stress diminishes. Even after bone growth has stopped, some remodeling in response to stress will continue throughout the life of the horse.

In the still-growing horse, however, increased activity greatly increases volume and possibly the density of bones, while confinement or inactivity has the opposite effect. Thus bones can be strengthened and conditioned in the young horse by the gradual increase of activity (and this is why some horse breeders have initiated enforced exercise programs for weanlings and yearlings), so long as the stresses are not so great as to damage the bones. The most logical and natural situation, though, is just to allow young horses plenty of room—and they will exercise themselves.