

## **Timing and Rate of skeletal maturation in Horses**

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### **All Horses of All Breeds Mature Skeletally at the Same Rate**

There is no such thing as an ‘early maturing’ or ‘slow maturing’ breed of horse. Let me repeat that: no horse on earth, of any breed, at any time, is or has ever been mature before the age of six (plus or minus six months). So, for example, the Quarter Horse is not an “early maturing” breed – and neither is the Arabian a “slow maturing” breed. As far as their skeletons go, they are the same. This information comes, I know, as a shock to many people who think starting their colt or filly under saddle at age two is what they ought to be doing. This begs discussion of (1) what I mean by “mature” and (2) what I mean by “starting”.

### **When is a Horse Skeletally Mature?**

Just about everybody has heard of the horse’s “growth plates”, and commonly when I ask them, people tell me that the “growth plates” are somewhere around the horse’s knees (actually the ones people mean are located at the bottom of the radius-ulna bone just above the knee). This is what gives rise to the saying that, before riding the horse, it’s best to wait “until his knees close” (i.e., until the growth plates convert from cartilage to bone, fusing the epiphysis or bone-end to the diaphysis or bone-shaft). What people often don’t realize is that there is a “growth plate” on either end of every bone behind the skull, and in the case of some bones (like the pelvis, which has many “corners”) there are multiple growth plates.

So do you then have to wait until all these growth plates convert to bone? No. But the longer you wait, the safer you’ll be. Owners and trainers need to realize there’s a definite, easy-to-remember schedule of fusion – and then make their decision as to when to ride the horse based on that rather than on the external appearance of the horse. For there are some breeds of horse – the Quarter Horse is the premier among these – which have been bred in such a manner as to look mature long before they actually are mature. This puts these horses in jeopardy from people who are either ignorant of the closure schedule, or more interested in their own schedule (for futurities or other competition) than they are in the welfare of the animal.

## The Schedule of Growth-Plate Conversion to Bone

The process of converting the growth plates to bone goes from the bottom of the animal up. In other words, the lower down toward the hoofs you look, the earlier the growth plates will have fused; and the higher up toward the animal's back you look, the later. The growth plate at the top of the coffin bone (the most distal bone of the limb) is fused at birth. What that means is that the coffin bones get no taller after birth (they get much larger around, though, by another mechanism). That's the first one. In order after that:

Short pastern – top and bottom between birth and 6 months.

Long pastern – top and bottom between 6 months and one year.

Cannon bone – top and bottom between 8 months and 1.5 years

Small bones of the knee – top and bottom of each, between 1.5 and 2.5 years

Bottom of radius-ulna – between 2 and 2.5 years

Weight-bearing portion of glenoid notch at top of radius – between 2.5 and 3 years

Humerus – top and bottom, between 3 and 3.5 years

Scapula – glenoid or bottom (weight-bearing) portion – between 3.5 and 4 years

Hindlimb – lower portions same as forelimb

Hock – this joint is “late” for as low down as it is; growth plates on the tibial and fibular tarsals don't fuse until the animal is four (so the hocks are a known “weak point” – even the 18th-century literature warns against driving young horses in plow or other deep or sticky footing, or jumping them up into a heavy load, for danger of spraining their hocks).

Tibia – top and bottom, between 3 and 3.5 years

Femur – bottom, between 3 and 3.5 years; neck, between 2.5 and 3 years; major and 3rd trochanters, between 2.5 and 3 years Pelvis – growth plates on the points of hip, peak of croup (tubera sacrale), and points of buttock (tuber ischii), between 3 and 4 years.

And what do you think is last? The vertebral column, of course. A normal horse has 32 vertebrae between the back of the skull and the root of the dock, and there are several growth plates on each one, the most important of which is the one capping the centrum. These do not fuse until the horse is at least 5 ½ years old (and this figure applies to a small-sized, scrubby, range-raised mare. The taller your horse and the longer its neck, the later the last fusions will occur. And for a male – is this a surprise? – you add six months. So, for example, a 17-hand Thoroughbred or Saddlebred or Warmblood gelding may not be fully mature until his 8th year – something that owners of such individuals have often told me that they “suspected”).

## **Significance of the Closure Schedule for Injuries to Back and Neck vs. Limbs**

The lateness of vertebral “closure” is most significant for two reasons. One: in no limb are there 32 growth plates! Two: the growth plates in the limbs are (more or less) oriented perpendicular to the stress of the load passing through them, while those of the vertebral chain are oriented parallel to weight placed upon the horse’s back. Bottom line: you can sprain a horse’s back a lot more easily than you can displace those located in the limbs.

Here’s another little fact: within the chain of vertebrae, the last to fully close” are those at the base of the animal’s neck (that’s why the long-necked individual may go past 6 years to achieve full maturity – it’s the base of his neck that is still growing). So you have to be careful – very careful – not to yank the neck around on your young horse, or get him in any situation where he strains his neck (i.e., better learn how to get a horse broke to tie before you ever tie him up, so that there will be no likelihood of him ever pulling back hard).

## **Relationship of Skeletal to Sexual Maturity**

The other “maturity” question I always get is this: “so how come if my colt is not skeletally mature at age 2 he can be used at stud and sire a foal?” My answer to that is this: sure, sweetie, if that’s how you want to define maturity, then every 14 year old boy is mature. In other words, the ability to achieve an erection, penetrate a mare, and ejaculate some semen containing live sperm cells occurs before skeletal maturity, both in our species and in the horse.

However, even if you only looked at sperm counts or other standard measures of sexual maturity that are used for livestock, you would know that considering a 2 year old a “stallion” is foolish. Male horses do not achieve the testicular width or weight, quality or quantity of total ejaculate, or high sperm counts until they’re six. Period. And people used to know this; that’s why it’s incorrect to refer to any male horse younger than 4 as a “stallion,” whether he’s in service or not.

Peoples' confusion on this question is also why we have such things as the Stallion Rehabilitation Program at Colorado State University or the behavior-modification clinic at Cornell – because a two year old colt is no more able to “take command” on a mental or psychological level of the whole process of mating – which involves everything from “properly” being able to ask the mare’s permission, to actually knowing which end of her to jump on, to being able to do this while some excited and usually frightened humans are banging him on the nose with a chain – than is a 14 year old boy.

## **What Does it Mean to “Start” a Young Horse?**

Let us now turn to the second discussion, which is what I mean by “starting” and the whole history of that. Many people today – at least in our privileged country – do not realize how hard you can actually work a mature horse – which is very, very hard. But before you can do that without significantly damaging the animal, you have to wait for him to mature, which means – waiting until he is four to six years old before asking him to carry you on his back.

What bad will happen if you put him to work as a riding horse before that? Two important things – and probably not what you’re thinking of. What is very unlikely to happen is that you’ll damage the growth plates in his legs. At the worst, there may be some crushing of the cartilages, but the number of cases of deformed limbs due to early use is tiny. The cutting-horse futurity people, who are big into riding horses as young as a year and a half, will tell you this and they are quite correct. Want to damage legs? There’s a much better way – just overfeed your livestock (you ought to be able to see a young horse’s ribs – not skeletal, but see ‘em – until he’s two).

Structural damage to the horse’s back from early riding is somewhat easier to produce than structural damage to his legs. There are some bloodlines (in Standardbreds, Arabians, and American Saddlebreds) that are known to inherit weak deep intervertebral ligament sheathing; these animals are especially prone to the early, sudden onset of “saddle back” However, individuals belonging to these bloodlines are by no means the only ones who may have their back “slip” and that’s because, as mentioned above, the stress of weightbearing on the back passes parallel to its growth plates as well as parallel to the intervertebral joints. However, despite the fact that I have provided a photo of one such case for this posting, I want to add that the frequency of slipped backs in horses under 6 years old is also very low.

So, what's to worry about? Well...did you ever wish your horse would "round up" a little better? Collect a little better? Respond to your leg by raising his back, coiling his loins, and getting his hindquarter up underneath him a little better? The young horse knows, by feel and by "instinct", that having a weight on his back puts him in physical jeopardy. I'm sure that all of you start your youngstock in the most humane and considerate way that you know how, and just because of that, I assure you that after a little while, your horse knows exactly what that saddle is and what that situation where you go to mount him means. And he loves you, and he is wiser than you are, so he allows this. But he does not allow it foolishly, against his deepest nature, which amounts to a command from the Creator that he must survive; so when your foot goes in that stirrup, he takes measures to protect himself.

The measures he takes are the same ones you would take in anticipation of a load coming onto your back: he stiffens or braces the muscles of his topline, and to help himself do that he may also brace his legs and hold his breath ("brace" his diaphragm). The earlier you choose to ride your horse, the more the animal will do this, and the more often you ride him young, the more you reinforce the necessity of him responding to you in this way. So please – don't come crying to me when your six-year-old (that you started under saddle as a two year old) proves difficult to round up. Any horse that does not know how to move with his back muscles in release cannot round up.

Bottom line: if you are one of those who equates "starting" with "riding", then I guess you better not start your horse until he's four. That would be the old, traditional, worldwide view: introduce the horse to equipment (all kinds of equipment and situations) when he's two, crawl on and off of him at three, saddle him to begin riding him and teaching him to guide at four, start teaching him maneuvers or the basics of whatever job he's going to do – cavalletti or stops or something beyond trailing cattle – at five, and he's on the payroll at six. The old Spanish way of biting reflected this also, because the horse's teeth aren't mature (the tushes haven't come in, nor all of the permanent cheek teeth either) until he's six.= This is what I'd do if it were my own horse. I'm at liberty to do that because I'm not on anybody else's schedule except my horse's own schedule. I'm not a participant in futurities or planning to be. Are you? If you are, well, that's your business. But most horse owners aren't futurity competitors. Please ask yourself: is there any reason that you have to be riding that particular horse before he's four?

When I say "start" a horse I do not equate that with riding him. To start a young horse well is one of the finest tests (and proofs) of superior horsemanship. Anyone who does not know how to start a horse cannot know how to finish one. You, the owner, therefore have the following as a minimum list of enjoyable "things to accomplish" together with your young horse before he's four years old, when you do start him under saddle:

Comfortable being touched all over. Comfortable: not put-upon nor merely tolerating, but really looking forward to it.

This includes interior of mouth, muzzle, jowls, ears, sheath/udder, tail, front and hind feet. Pick 'em up and they should be floppy.

Knows how to lead up. No fear; no attempt to flee; no drag in the feet; knows that it's his job to keep slack in the line all the time.

Manners enough to lead at your shoulder, stop or go when he sees your body get ready to stop or go; if he spooks, does not jump toward or onto you, will not enter your space unless he's specifically invited to do so.

Leads through gate or into stall without charging.

Knows how to tie, may move to the side when spooked but keeps slack in the line all the time.

Knows how to be ponied.

Carries smooth nonleverage bit in mouth. Lowers head and opens mouth when asked to take the bit; when unbridled, lowers head and spits the bit out himself.

Will work with a drag (tarp, sack half filled with sand, light tire, or sledge and harness).

Mounts drum or sturdy stand with front feet.

Free longes – comes when called and responds calmly to being driven forward; relaxed and eager.

When driven, leaves without any sign of fleeing; when stopped, plants hind feet and coils loins; does not depend on back-drag from your hand to stop him.

Familiar with saddle, saddle blanket, and being girthed and accepts it quietly.

Backs easily, quietly and straight in hand, “one step at a time”.

Loads quietly in horse trailer, unloads by stepping backwards from inside horse trailer without rearing or rushing.

Various people might like to add to this list. Please feel free, just so long as what you're asking your young horse isn't more than he can physically do. Getting the horse “100% OK” mentally and emotionally – those are the big areas in successful early training; most of the physical and athletic skills can come later, when it is fitting.

I've had people act, when I gave them the above facts and advice about starting youngstock, like waiting four years was just more than they could possibly stand. I think they feel this way because the list of things which they would like to include as necessary before attempting to ride is very short. Their whole focus is on riding as why they bought the animal, and they think they have a right to this. Well, the horse – good friend to mankind that he is – will soon show them what he thinks they have a right to.