

FORGOTTEN SIDE OF THE SALIX DEBATE:
THE CALCIUM CONNECTION
by Jane Allin

IT SEEMS a day does not go by without some reference to drugs and breakdowns in the world of horse racing here in North America.

While it is unambiguous that a drug culture permeates America's racetracks where horses are over-medicated with the misaligned intent of keeping them on the track without heed to their welfare, the Salix debate stands alone in its incoherency and lack of reliance on the science behind its use.

Without a doubt the arguments for and against its use focus wholly on the incidence of EIPH (Exercise-Induced Pulmonary Hemorrhage) – whether it is ethically and humanely correct to administer it and of course the tipping point – its demonstrated performance-enhancing effects alongside the fact that North America is the only racing jurisdiction in the world that sanctions its use.

Indeed this has stirred frenetic sensationalism on both sides of the debate and despite a number of scholarly articles and other research projects on the subject no consensus has been reached; at least not in North America.

However there is a glaring deficiency in these well-intentioned undertakings in that there seems no concern or interest in investigating the effects of Salix beyond the EIPH and performance-enhancing perspectives.



Image: Anne Eberhardt

Salix is a powerful drug with numerous serious side-effects and harmful drug interactions, many of which are also administered to racehorses, yet the pro-Salix crowd tends to

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downplay the significance of these effects and oversimplifies the science of its mechanism and interactions within the body.

A survey of the average of the number of starts by North American horses reveals a systematic downward trend since the introduction of Salix to the sport in the mid to late sixties and early seventies where the sustaining incentive was not the health of the horse but rather the performance advantage it conferred.

Note the precipitous drop starting in 1965 at or around the time of its induction.

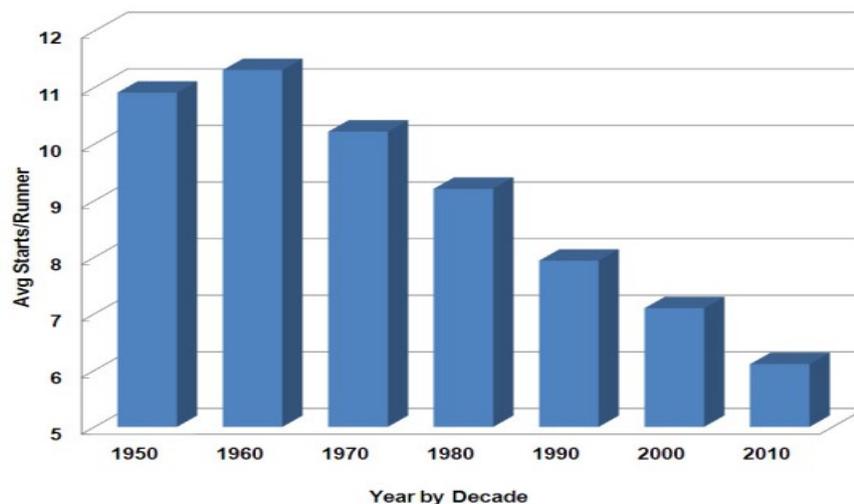


Figure 1. Average Starts per Runner Since 1950
<http://www.jockeyclub.com/factbook.asp?section=10>

Coincidence? I think not.

As time has unfolded the conjecture as to its advantage has carefully, and at the same time recklessly, been manipulated and massaged to conform to horse welfare when in fact the underlying ideology is presumably related to providing a competitive advantage; simply put, compulsive and unwarranted cheating.

Repeatedly we hear the same droning mantra from the salix camp asserting that salix is innocuous and has no significant side effects that would put the horse in harm's way. Add to that the constant reminder that there will be an exponential increase of deaths on the track if salix is withheld.

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“Thomas Tobin, D.V.M. and Ph.D. in pharmacology, said racing could see the number of EIPH-related sudden deaths on the track skyrocket if race-day Salix is banned in the U.S.”

Tobin goes on to say:

“We respectfully submit that it is unethical and improper to withhold medication that protects the lives of horses and riders,” Tobin said. “Salix has no significant adverse effects.”

See [Horsemen Call for More Research Before Salix Policy Decisions](#), *Thoroughbred Times*, Jul. 22, 2011 »

Really? Surely then it must be divine intervention to explain why other Salix-free racehorses around the world are spared this ill-fated end. Did God leave out the North American horses? I hardly think so.

I beg to differ on both counts. Science tells us otherwise.

Salix or furosemide is a loop diuretic, the most common and most powerful class of diuretics available.

Loop diuretics act rapidly upon the kidneys by blocking the normal electrolyte re-absorption mechanisms causing large volumes of urine to be excreted along with a host of electrolytes such as sodium, potassium, chloride, calcium and magnesium.

Add this to the fact that horse sweat is hypertonic meaning that it contains more mineral salts or electrolytes than water, unlike humans who lose more water than salts (isotonic – same concentration of electrolytes as the blood).

The use of Salix exacerbates the already-depleted stores of calcium and other salts lost through sweating that occurs during training or on race day and taxes the horse even further.

Despite the fact there are myriad side effects of excessive electrolyte loss the primary focus here will be the potentially deleterious effects of chronic furosemide administration on calcium loss and the skeletal soundness of the physically immature racehorse.

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Compromising bone development certainly can only lead to ruin in the young racehorse whose skeletal system dynamically changes over time with the conversion process to maturity taking a minimum of 5 ½ years depending on the size and sex of the horse.

See [Racing Babies, Part 2, The Horse Fund, by Jane Allin](#) »

Until then bone is in a continuous state of turnover and remodeling. Also take into consideration that many racehorses begin their careers as early as 18 months of age when they are extremely vulnerable to injury as a result of bone mineralization lagging behind growth in height and weight.

Just how does the depletion of calcium on an on-going basis affect and disrupt the remodeling and bone development in the horse?

Ninety-nine percent of the calcium in the body, horses and humans alike, is found in the bones and teeth. Calcium (and phosphorous) plays a vital role in maintaining strong and healthy bones, as well as cartilage and joints, helping to maximize performance while minimizing the risk of injury or breakdown.

Calcium is incorporated into bone in the form of calcium phosphate as a highly structured crystal called hydroxapatite which is instrumental to the development of bone hardness and rigidity. Moreover horses are naturally prone to suffer from a lack of calcium and phosphorous more than other minerals which can lead to adverse effects on bone formation and development.

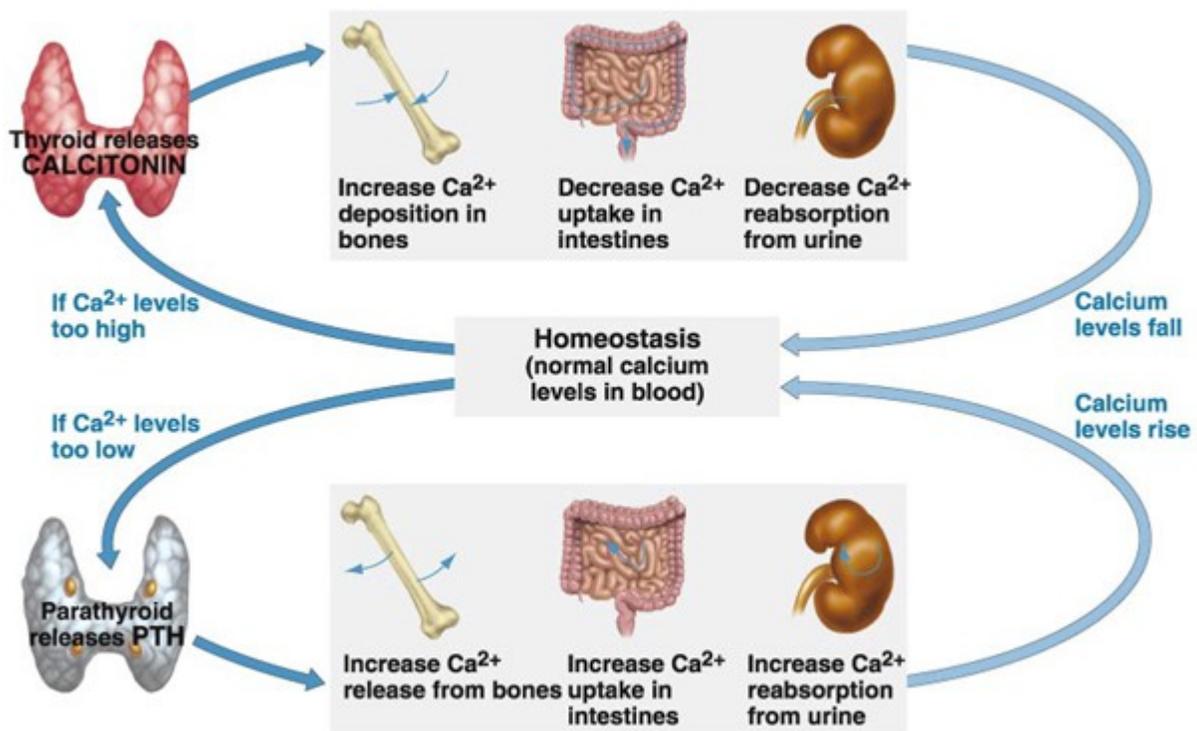
Bone is comprised of about 35% calcium which not only performs a structural role in skeletal robustness but also serves countless other functions related to cardiac function, muscle contraction, blood coagulation, cell membrane function and enzyme regulations necessary for biological reactions.

See [Optimizing Bone Formation](#), Equiforce.com »

Blood-calcium content is tightly controlled within a narrow range due to the dependencies on physiological function inherent to homeostasis and control.

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Figure 2. Calcium regulation in the blood is tightly controlled.
<http://blogs.scientificamerican.com/a-blog-around-the-clock/2011/11/19/bio101-physiology-coordinated-response/>



As a result of this tightly controlled mechanism, blood calcium levels alone do not provide a good assessment of just how much calcium is actually stored in bone – the process is complex and continuously maintains a fixed level in the blood via the mechanisms of release from the bone stores, uptake from the blood to the bone and excretion in the urine.

Accordingly even if the blood level is in the normal range this is not an indication of bone integrity.

Bone is a major bioavailable storage reservoir for calcium. When furosemide is administered the large loss of calcium flushed out in the urine signals a feedback mechanism such that

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within 15 minutes calcium is being released from the bone reserves to return blood calcium levels to an acceptable level.

See [Optimizing Bone Formation](#), Equiforce.com »

Furosemide is regularly used in humans to reduce high calcium blood levels which are inherently dangerous to the kidneys. Moreover it is well known that the chronic use of loop diuretics, such as furosemide, in humans is associated with increased fracture risk, decreased calcium bone reserves, thinning bones and osteoporosis.

This is no different in the horse – the same mechanisms are involved. Horses here in North America are routinely worked on Salix as a preventative measure against EIPH, not just on race day. How can anyone say that this is not chronic in nature?

Many will use the argument that calcium levels in the blood and bone can be restored by overfeeding with calcium supplements. Despite the fact that without doubt a calcium-rich diet is beneficial to the developing horse, this is not the case.

“Because of tight regulation in the blood, absorption of dietary calcium will vary in order to maintain normal calcium homeostasis. Therefore, free-choice or overfeeding calcium does not ‘increase’ stored levels of this mineral. Excess calcium will be eliminated from the body through urinary and fecal losses.”

See *also* [Optimizing Bone Formation](#), Equiforce.com »

This demonstrates how the mechanism for calcium balance in the bloodstream supersedes the requirements for optimum bone formation.

Since these horses are constantly subjected to significant migration of calcium from the bone to the bloodstream to maintain equilibrium as a result of the amount flushed out in the urine, the potential for calcium deficiency over the long term is undeniably of concern.

If such a scenario arises one can only expect that this constant state of flux would lead to decreased bone strength and inadequate bone mineralization especially given the need for adequate calcium in the still-developing bones of the two and three year old horse, or any horse for that matter.

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It is simply ludicrous to assume that the chronic use of Salix has no effect on soundness and neglecting to consider this is shamelessly irresponsible.

Moreover, a study conducted by Kentucky Equine Research (KER) confirms the profound and long-lasting effect of Salix administration on electrolyte balance in horses. Urinary and fecal calcium, phosphorous, magnesium, sodium, potassium, chloride and sulfur levels were measured 72 hours before and 24, 48 and 72 hours after the administration of a single dose of 0.5 mg of furosemide per kilogram of bodyweight.

See <http://www.ker.com/library/PopularPress/Feedstuffs/FeedStuffs-12-04-30.pdf>

Of particular note was the observation that urinary levels of calcium, potassium, chloride and sulfur levels remained elevated for a full 72 hours post-treatment. That's three days where the bone stores are being called upon to restore blood-calcium levels. What's more, calcium, potassium and chloride balances were negative at 72 hours despite the fact the horses had been given adequate dietary mineral levels.

See also <http://www.ker.com/library/PopularPress/Feedstuffs/FeedStuffs-12-04-30.pdf>

Clearly there is good reason for further investigation. No drug is without side effects, including furosemide, regardless of what the pro-salix crowd will have you believe. And, as with all medications, it is necessary to determine whether the side effects outweigh the benefits or vice versa.

Unfortunately in the case of salix and the racehorse it seems there is little interest in performing a risk/benefit analysis of its implications on the skeletal foundation of the young racehorse. The impression is that it's never about the welfare of the horse, only the deep pockets of those who exploit them.

Consider the analogy "out of sight, out of mind".

No one can "see" calcium-depleted bones nor do horses typically display any severe clinical signs of increased fluid losses apart from excessive sweating and dehydration after a race.

Besides it is normal procedure to treat them after the race with "post-race jugs" to replenish electrolytes which rehydrate them and quickly restores them to their pre-race condition.

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The KER study clearly points out that what you see is not always indicative of what is happening with the systemic processes within the horse particularly in the case of calcium homeostasis and its relationship to the operative mechanism of bone mineralization.

The question then that begs asking is whether these horses are given adequate time between these incessant Salix injections to allow recovery from this constant leaching of calcium from the bone stores?

Given the dynamic nature of bone formation and remodeling, particularly in the immature horse, it seems this cyclic and significant disruption in calcium reservoirs in the bone can only spell disaster for the North American Thoroughbred. As it stands the most vulnerable part of the breed is their structural skeletal system in consequence of inbreeding for speed rather than stamina and endurance.

One need not look further than the difference in breakdowns between Salix-infused North American horses and those around the world who train and race without it. Comparing apples to apples (i.e. turf to turf) a quote from an article posted on the ThoroEdge Equine Performance blog entitled: "Foes of Lasix are Cruel to Horses? Ridiculous Nonsense" says it all.

"At last look, 2 of the top 6 horses in the world according to Timeform are Australian sprinters Black Caviar and Hay List. No American turf sprinters make the top 20. I've heard the subjective arguments that our turf courses are firmer than others and that is partially to blame for our sky high breakdown rate – but how can that be if our race times are slower? On turf US horses are allowed to use a potent diuretic 4 hours prior to post – and breakdown 3X more often while running slower finishing times, far from an ideal combination. I, for one, don't require a Jockey Club sponsored study to confirm this fact."

See <http://thoroedge.wordpress.com/2011/07/21/foes-of-lasix-are-cruel-to-horses-ridiculous-nonsense/>

Reflect also on the pitiful situation with the Kentucky Derby hopefuls and contenders over the last few years. Many don't make it through the Derby trail, others may race in the Triple Crown series but are injured shortly after and retired to stud or worse yet forgotten about and end up in places no wants to think about.

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Just look at this year's Breeder's Cup Classic — the North American race that often decides the "Horse of the Year" — and count the number of 3YO's who raced in it. Only three, and only one of whom ran in one of the Triple Crown races placing 12th in the Kentucky Derby.

Where were all the rest of the great hopefuls? Either in the shed or broken down I suspect. These horses are only three years old and already washed up.

Furthermore it is mind-boggling why anyone would breed such fragile, chemically-saturated horses and expect their offspring to be sound. The widespread and permissive use of these so-called "therapeutic" drugs is literally running the North American Thoroughbred into the ground before our very eyes. How can the breed's integrity be preserved if this insanity continues?

Indeed, the science speaks for itself yet the misanthropes insist that administering Salix and other potent medications is the "humane" thing to do.

These drugs are simply band-aids that cover up the sorry state of racehorse welfare here in North America. Pump these innocent creatures full of Salix to keep them on the track irrespective of the negative consequences of compromised skeletal structures all at the expense of the horse.

Well at least we can be thankful that there won't be rivers of blood gushing down the backside. The sensationalism is simply too much to tolerate.

END.