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GROWING THE SALE YEARLING
EXERCISE IN YOUNG STANDARDBREDS PROTECTS AGAINST OCD©

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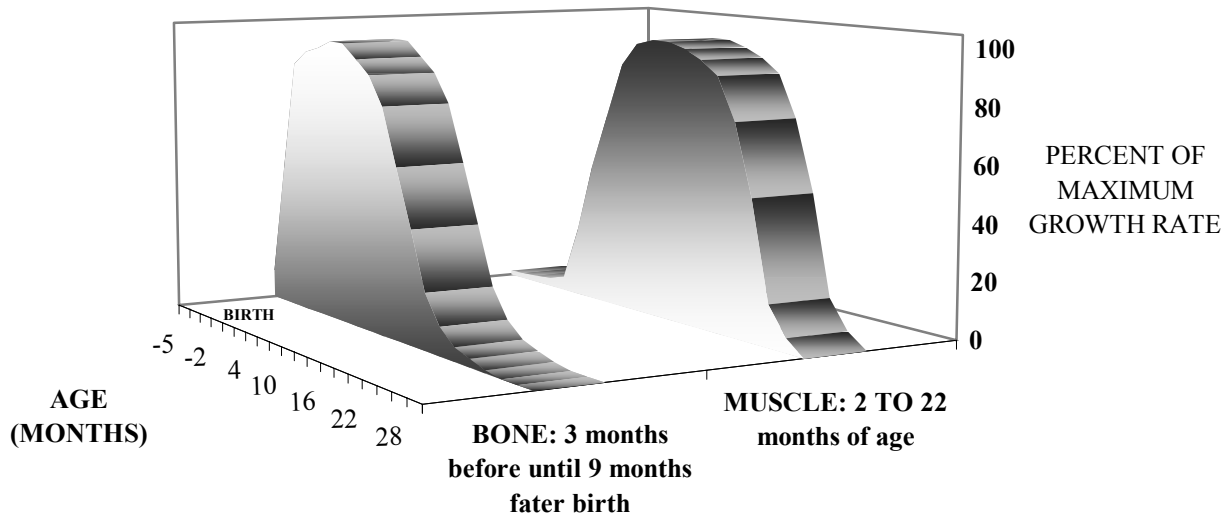
To create a winning horse and allow it to achieve genetic potential, requires a recognition of the limits of the animal's physical capabilities and an understanding of bone and muscle growth. While bone development must be nurtured and protected during the first 12 months, muscle growth dominates in the yearling. Muscle fibre mass affects maximal force output and failure to meet growth potential at the yearling stage can reduce ultimate stride length and acceleration. Recognising the nutritional demands on the yearling and the multiple demands on those involved in yearling management, MITAVITE formulates feeds to support continued muscle development as well as produce a quality sales finish. The skill of the person feeding the horse and knowledge of the individuality of horses are essential to good management and will never be replaced, but as in any business, it is important to have a team of advisers.

The racing industry is plagued by a high incidence of bone and joint problems. The serendipitous nature of these disorders necessitates that close attention be paid to factors that increase the risk of developing such conditions. So whilst considering the windows of opportunity for achieving genetic potential in terms of growth, stud managers must simultaneously be aware of the major risk periods for OCD and other developmental bone diseases.
Absorption of large amounts of raw grain carbohydrate affects hormones that control behaviour and bone and cartilage development. In addition, grain fermentation causes acid build-up, which lowers skeletal mineral retention. The racing industry is plagued by a high incidence of bone and skeletal disorders, which can cause temporary or permanent lameness. The potential to develop chronic and debilitating bone diseases occurs early in life, making correct nutrition of the foal and weanling as important as the yearling prep for achieving sales success.

Since 'bone', 'muscling' and 'clean' X-rays are critical for sales success, it is prudent to examine the time frames in which these structures are inherently programmed to reach genetic potential and the risk periods during which complications may occur.

As shown in the chart below, the period of maximum bone growth in terms of achieving genetic potential, is from 3 months before birth until around 12 months after birth; for muscle it is from 2 to 22 months of age.

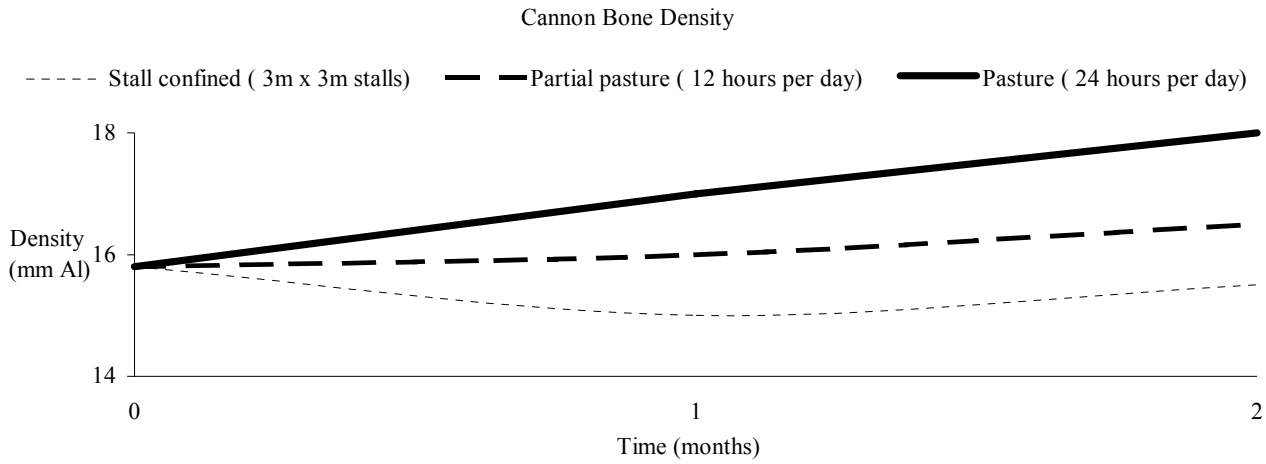
MAJOR GROWTH PERIODS FOR BONE AND MUSCLE



The major risk period for development of hock OCD is from 2 months before until 3 months after birth; for stifle OCD, from 5 to 8 months of age. Without compromising growth in terms of height, a lighter condition is preferable at this age. Muscle development will not ultimately be affected because muscle fibre size increases by up to 70% between 7 and 18 months of age and growth continues well into the second year of life. Muscle growth in terms of size and number of fibres continues until 2 years of age. It is wise to protect bone and joint development during the first 12 months by controlling body condition and understanding that muscle development will not be affected as it continues well beyond the yearling stage.

Alterations to normal growth patterns have been shown to have a large impact on bone strength in later life. Exercise stimulates bone formation at points of increased loading to ensure that bone can withstand subsequent loading forces. Lack of loading produces bone that is ill-prepared for the rigours of training and pre-disposes to bone-related injuries.

It is not uncommon for yearlings to be stabled for several months in preparation for sale presentation. However, comparison of stabled and non-stabled yearlings has shown that yearlings kept in stalls for 2 months have a decreased rate of bone formation, increased bone resorption and decreased bone mineral content compared to yearlings allowed 12 hours access to pasture per day and yearlings kept at pasture.



Factors such as speed, impact and strain rate are more important for bone density than duration of exercise. Under natural conditions, horses travel up to 25km a day and at pasture, growing horses gallop on average for 3.5 minutes per 24 hours, divided into approximately 40 sprints. Free pasture exercise also produces the highest glycosaminoglycan content in joints and tendons of growing horses. Recent studies have found an ideal paddock length of 40 metres allows foals to run at a speed that stimulates bone density and produces permanent increases in tendon and joint strength.

Growth and radiographic studies of young horses have found similar weight and whither height gains, but differences in cannon bone circumference between exercised and stabled weanlings and yearlings. Exercise during this period was shown to improve the stress-bearing characteristics (radiographic bone density and metacarpal circumference) of the third metacarpal without affecting the weight and height. There is a tendency for more severe OCD lesions of both the hock and the stifle in foals whose exercise has been restricted.

Studies have shown that stalled yearlings become quite active, (running, bucking and rearing) approximately 3 weeks after being confined. Stabled weanlings and yearlings spent more time engaged in aberrant behaviours such as licking, kicking or chewing the wall, pawing, rearing and bucking. Paddocked yearlings display a time budget more like feral horses with more time spent moving and less time lying. Interestingly, foals of low- or middle-ranking mares were less likely to develop abnormal behaviour than foals of dominant mares Crib-biting was initiated by 10.5% of horses at median age 20 weeks, weaving by 4.6% of horses at median age 60 weeks, box-walking by 2.3% of horses at median age 64 weeks and wood-chewing by 30.3% of horses at median age 30 weeks. Wood-chewing developed at a lower rate in horses born to subordinate or mid-ranking mares than in horses born to dominant mares and at a higher rate in stabled horses compared to those kept at grass after weaning.

Maximum mineral content of the cannon bone may not be reached until 6 years of age. When training starts, a decrease in bone density occurs between 0 and 64 days, remains low and then gradually increases from day 104 to day 244. Cannon bone radiographs have shown that exercised yearlings are better prepared for the future mechanical stresses placed upon them, whereas yearlings stabled for 3 months lost bone mineral content and

bone density. Pasture exercise seems best for an optimal development of the musculoskeletal tissues. The combination of short bouts of heavy exercise superimposed on a basic box rest regimen appears to have adverse effects on long term viability of the tissues and may lead to an impaired resistance to injury. Yearling horses exercised on a treadmill demonstrated an increase in bone density.
Gait and behaviour differences have also been found between confined and paddocked yearlings. Pasture exercise leads to a normally developed locomotion pattern. Although velocity is similar between pastured and stabled weanlings, pastured foals have a smaller range of motion of the shoulder and hip joint and less maximal step height of both fore and hind hooves. Paddocked foals trot the same distance with less joint motion and more efficient coordination that confined weanlings.

Exercise permits the development of a superior athlete and also has a protective effect against OCD. Confinement to a stable or yard has been shown to have an osteoporotic effect in young horses, whereas paddock exercise has been shown to increase bone strength and cortical thickness.

Correctly fed yearlings achieve greater gains in whither height, reach mature height earlier and deposit less fat. Two horses may be gaining similar amounts of weight, but one may be building bone and lean muscle mass and another depositing fat. Although weight and height measure growth, they are not sensitive enough to reveal the effects of lowered amino acid absorption on skeletal or muscle development. Analysis of diets of yearlings that are laying down too much cover - instead of gaining in height and muscle development - have revealed essential amino acid deficiency. A close watch must be kept on weekly weight gain as well as height. A recent study of 2698 records that tracked changes in body shape, leg volume and density shows an s-shaped growth curve. Some current monitoring programs recommending a smooth growth curve can lead to erroneous estimates of growth data.

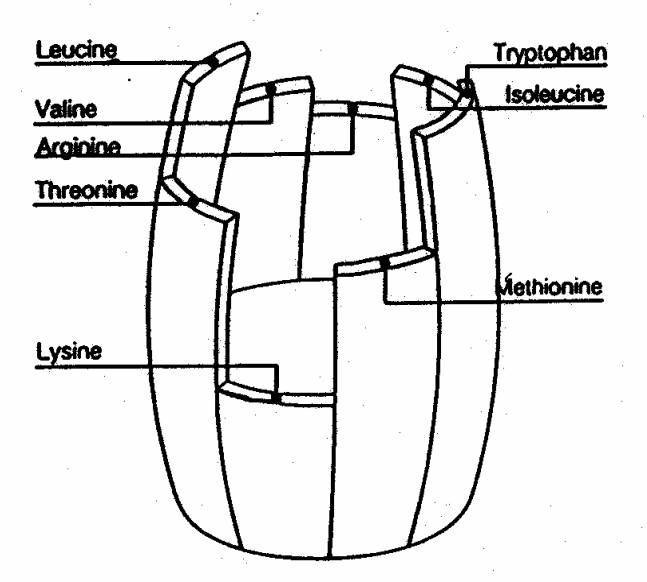
Overnutrition, excess energy and mineral imbalances should be avoided and growth monitored. However, because we must be primarily concerned with bone during the first 12 months of life, tracking body weight has limited usefulness as it gives no indication of body composition or bone development. For example, 2 weanlings may have a similar average daily gain, but one may be building muscle and bone and the other laying down fat or ‘cover’.

There is a link between above average weight gains and the onset of bone diseases. Monitoring growth in terms of height and weight is a useful management practice to aid in maximising athletic potential while minimizing risks associated with deviations from normal growth. The major period of bone growth is from 3 months before birth until 15 months of age. For muscle, the major growth period in terms of achieving genetic potential for muscle fibre size and number is from 2 to 24 months of age. For stifle OCD there is a positive correlation with weight gain between the 3rd and the 5th month of age, which coincides with the period in which most stifle lesions become apparent.

Whether a growing horse builds bone and lean muscle mass or lays down fat is determined in the first instance by the quality and quantity of protein in the diet - energy, vitamins and minerals play supporting roles. The quality of any protein in the diet is determined by the number and amount of essential amino acids it contains. It is critical that the diet contains all essential amino acids in a form that is readily digested by the small intestine. Whilst there is widespread understanding of the pivotal role of lysine,

there are 9 other essential amino acids and a deficiency of any one of these will impact on body composition and the power-to-weight ratio.

Picture a wooden water barrel. The barrel can only hold water to the level of the shortest slat. Similarly, if each wooden slat represents an essential amino acid, a deficiency of any one, will place a limit on bone and muscle building. The other essential amino acids cannot be used and are converted to energy, increasing energy levels and stored as fat. When this occurs, the young horse will lay down 'cover' (fat) instead of building muscle, blood and bone.



Amino acid utilization also depends on digestibility. It doesn't matter how good the protein looks on paper if the amino acids don't make their way into the body efficiently. Digestibility of vegetable proteins varies between 59 and 80%, depending on how carefully they are processed. Steam-extrusion increases digestibility by up to 40%. Overheating is damaging to many amino acids and dry-extrusion results in loss of vitamins and destruction of proteins due to friction and shear in the extruder barrel. Studies in Switzerland have shown up to 50% lysine damage when dry extrusion is used. Losses during steam-extrusion are negligible (around 5%).
Protein and mineral deficiencies in this age group, impact in the first instance on bone density, strength and height, and secondly on muscle development. Weanlings and yearlings are sensitive to the quality of dietary protein, i.e. the amino acid supply. Lysine and threonine have been indicated as the two first-limiting amino acids for growth, although requirements are influenced by ambient temperature and the type of energy source fed. Diets need to be formulated on the basis of digestibility. High quality forage can provide significant amounts of protein and amino acids, but the protein digestibility is only 60%.

Analysis of the diets of growing horses that are laying down too much cover - instead of gaining in height and muscle development – invariably show amino acid deficiencies. Although weight and height measure growth, they are not sensitive enough to reveal the effects of lowered amino acid absorption on skeletal or muscle development.

Recent studies have found that the addition of copper and zinc to the diets of yearling standardbreds did not increase bone mineral deposition. Minerals such as iron, manganese, cobalt and iodine are critical for bone mineralization and yearlings on recommended trace mineral intakes – of all trace minerals, deposit more bone than those fed suboptimal levels. In addition, when minerals are supplied as chelated proteinates instead of as salts, hoof growth is significantly increased.

In a 14 week study, hip height was higher in yearlings fed an extruded concentrate versus yearlings fed a pelleted concentrate. Although eating less feed, those on the extruded concentrate grew taller and deposited less fat than the pellet fed yearlings, reflecting higher protein digestibility and increased bioavailability of nutrients in extruded feed.

	Extruded concentrate	Pelleted concentrate
Energy (Mcal/kg)	3.96	2.97
Feed intake (kg/day)	3.53	4.83
Weight gain (kg)	35.5	43.5
Croup fat (cm)	1.5	2.9
Hip height (cm)	4.3	2.9

Other nutrients such as magnesium, boron and silicon are important, as is the ratio of calcium:magnesium, zinc to manganese and zinc to copper. Studies on magnesium deficiency in other animals have shown normal weight gain and appearance, but reduced bone density – indicating that ‘growing normally’ means they look normal on the outside and reach normal size – but their bones were not normal. This is a good example of the difference between ‘adequate’ and ‘optimal’ nutrition.

A balancing act between economics, management and nutritional requirements occurs between weaning and 18 months of age. Owners and trainers want well-muscled, well-grown sales yearlings and avoid those that are overfat. But how a yearling is managed for sales presentation bears little relationship to how it was managed during the critical foal and weanling stages – the time when yearling sales prep must begin. Fundamental to the formulation and processing of MITAVITE feeds is an understanding of the requirements, risks and growth patterns of the foal and weanling.

The elimination of subclinical disease in the young horse is an advantage for future racing career and the future racing career must be part of the goal in yearling sales prep as it ultimately affects the reputation of the stallion, the mare, the stud and through this, the results at future sales. Improper bone and cartilage formation may occur in animals fed high grain diets to promote rapid growth and development.

Since the muscular and cardiovascular systems respond to training much faster than the skeletal system, horses often appear to be ready for racing before their bones have sufficient strength to prevent skeletal failure. The musculo-skeletal system begins its development while the foal is in-utero and rapid development of bone, joints and tendons continues for the first 12 months. It is essential that this early growth is nurtured and supported by exercise and correct nutrition, because it influences the final strength of these structures. The importance of exercise cannot be over-emphasized for future athletic achievement and periods of restricted exercise should be minimized for weanling and yearling standardbreds.

For further information on Mitavite feeds, contact Mitavite on 1800 025 487 www.mitavite.com.au