Equine

Hair Shedding (Exogen Phase)

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The horses winter coat hair has undergone a full circle (anagen, catagen, telogen and now exogen) so is about to shed before beginning the cycle again (Harkey, 1993; Lloyd, 1993; Stenn and Paus, 2001).

What triggers the coat to shed? The controls of exogen may be understood to be triggered by the environmental factors of light and temperature. (http://www.keratin.com/aa/aa029.shtml)

The major player in the hair coat cycles appears to be the changing length of daylight or photoperiod. The daily photoperiod effect on hair growth cycles brings the brain into the act. Light signals are routed biochemically to the pineal gland, the hypothalamic part of the brain and the pituitary gland. From there the control is hormonal.

It has been shown that horses wearing rugs and/or stabled in heated barns fail to develop a complete winter coat. It has been hypothesized that domestication (heated barns, rugging, rapid changes in geographic location and mares standing under artificial light) might cause a change from a single yearly shed as observed in the undomesticated horse to continuously shedding throughout the year, maintaining a short coat year round.

There is a primary coat known as the outer or "guard" coat and a secondary coat known as the inner coat. It has been reported that there are approximately 800-1,200 primary hairs and from 1,200-2,000 secondary hairs per square inch of skin in the horse. A horse's hair coat changes with the seasons; therefore the ability of the hair coat to regulate body temperature is related to its length, thickness and density per square inch of surface area of skin. One major factor in the hair's ability to serve in thermoregulation is the ability of a small muscle associated with every hair follicle under control of the nervous system to pull the hairs to a standing "puffed-up" position (piloerection). The physiological process of piloerection increases the insulating factor of the hair coat by increasing the air content within the hair coat and therefore the skin and the environment. It's like putting on a winter doona.

Shedding is helped by brushing daily to help shift the dead coat. But we warned not to 'over cleanse' your horse as the skin is also the primary barrier between the outside world and the internal structures of the body and it provides protection from dehydration and infection. The skin actually has a normal population of bacteria that live in balance (the normal bacterial "flora") and act as competition to potential invading

bacteria. These sebum secretions also form a barrier to repel water, so be practical when it comes using products to wash your horse with so as not to remove the sebum from the follicle bulb. (Baxter and Trotter, 1969)

Your goal should be to achieve a new richly coloured and glossy coat in Spring. Why? Glossiness of coat hair is also important in reflecting solar radiation. Tropical breeds tend to have glossy coats that reflect solar radiation well (Hayman and Nay, 1961; Holmes, 1970).

Research indicates that the greatest rate of growth occurs during the autumn in readiness of the cold.

Making the most of hair growth periods

Hair follicles are metabolically active tissues that require nutrients to support both structural and functional activities (Galbraith, 1998). As such nutrition has a profound effect on both its quality and quantity. Poor nutrition may produce and therefore be reflected by a dull, dry, brittle or thin hair coat. Colour disturbances may also occur. Nutritional factors that influence hair growth are very complex and can be *interrelated.*

Nutrients commonly associated with poor hair quality and hair loss have been summarized by Lewis (1995). They comprise dietary ***deficiencies*** of protein, phosphorus, iodine, zinc, and vitamins A and E, as well as dietary ***excesses*** of selenium, iodine and vitamin A. Other possible nutritional imbalances that can affect hair growth include B-vitamin and vitamin C deficiencies, copper and cobalt deficiencies and molybdenum ***toxicoses*** (Scott, 1988).

"Your goal should be to achieve a new richly coloured and glossy coat"

The most important requirement for hair keratin synthesis is the amino acid cysteine, as it is ultimately oxidized to form the stable disulphide bonds that give keratin its structure, strength, and stability. Horses, like non-ruminants are *unable to absorb inorganic* sulphur and must meet their sulphur requirements through *organic forms such as methionine*. (Lewis,1995). **Methionine** can be converted to cysteine in the liver.

Chronic illness may induce decreased production of sebum and apocrine secretions, resulting in dry lustreless hair. Poor hair quality in addition to hair thinning or alopecia can also arise from essential fatty acid deficiency (see Zinc for synthesis of fatty acids).

Selenium performs a number of roles pertaining to cellular function and is a necessary constituent of the diet for healthy hair growth. <u>*A word of caution:*</u> Chronic ***toxicity occurs when daily dietary levels exceed 5 mg***. Toxicity results in progressive loss of hair from the mane, tail and fetlocks and in extreme cases a generalized alopecia. (Crinion and O'Connor, 1978; McLaughlin and Cullen, 1986; Dewes and Lowe, 1987; Witte et al., 1993). Choose feeds supplements with ***Selenium below 2mg per day to be safe***, as grasses and other feeds can compound to exceed safe daily limits.

Zinc is an essential element to many metalloenzymes and metabolic processes including keratogenesis. It is also a cofactor for RNA and DNA polymerases and is involved in the synthesis of free fatty acids and vitamin A metabolism. Studies show the fractional absorption over this range of ingested zinc averages ≈0.4 when injested from non organic forms (http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2854914/) Sourcing bioavailable ***forms such as organic and chelated zinc*** clinically shows better absorption rates. (http://onlinelibrary.wiley.com/doi/10.2903/j.efsa.2008.694/pdf).

Copper. This element is essential in various enzyme systems including those involved in melanin synthesis, keratin synthesis, and disulphide bond linkage (Jarrett, 1977; Underwood, 1977). Copper deficiency results in fibre de-pigmentation and loss of hair tensile strength and elasticity leading to breakage. However, ***copper deficiency has not been observed in horses*.**

What about manes and tails?

Mane and tails do not shed out like the coat hair. The permanent hairs of the equine mane and tail undergo continual growth. Two studies involving small numbers of horses (four animals or less) over short periods of time suggest that the rate of growth of the mane is relatively constant (Whittem et al., 1998; Popot et al., 2000). In a larger investigation involving 29 horses of different breeds, they found that mane and tail growth was essentially linear over a 12-month period. Rate of hair growth in the mane was observed to be lowest in the region near the withers and highest near the poll. The rates of growth of both the mane and tail were greater in native breeds of ponies rather than in Thoroughbreds with other breeds falling in between.