ALTERATION IN SERUM CAROTENE AND VITAMIN-A IN DRAUGHT EQUINES SUFFERING WITH FOOT AFFECTIONS*

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ABSTRACT

Present research work was conducted on 51 horses of either sex. The carotene values in buttress foot (231.00±18.08 μg/dl), contraction of flexor tendon (231.00±18.08 μg/dl), navicular diseases (228.00 ± 10.44 μg/dl), osselets (209.75± 9.04 μg/dl), ringbone (220.00 ± 6.02 μg/dl) and sidebone (219.44 ± 5.06 μg/dl) were found to be significantly higher (P£0.05) than the mean value (204.35 ± 6.20 μg/dl) of the normal animals. The vitamin-A values in buttress foot (7.75±0.22 μg/dl), contraction of flexor tendon (7.75± 0.22 μg/dl), navicular diseases (7.69±0.13 μg/dl), ringbone (7.78±0.07 μg/dl) and sidebone (7.84±0.06 μg/dl) were found significantly lower (P ≤≤≤≤≤ 0.05) than the mean values (7.99 ± 0.07 μg/dl) of the normal animals.

INTRODUCTION

Blood constituents are good indicators of physiological status of an animal. The alterations in serum carotene and vitamin-A level are of great clinical importance of their healthy, nutritional status, diagnosis and prognosis of metabolic bone diseases of equines. Vitamin-A is important for healthy bones. However, hypervitaminosis-A can lead to reductions in bone mineral density in animals (Moore and Wang, 1945). The excessive amounts of vitamin A trigger an increase in osteoclasts. Too much vitamin A may interfere with vitamin D, which plays an important role in preserving bone (Dickson and Walls, 1985). It is not possible to get too much vitamin A from beta carotene, because body converts beta-carotene to vitamin A only as needed. Osteomalacia is ascribed to occur due to deficiency of calcium or phosphorus and possibly vitamin-A (Bardwell, 1959). The present study was undertaken to determine the serum carotene and vitamin-A levels of equines with foot affections.

MATERIAL AND METHODS

In the present study 51 horses of either sex, were presented with a history of lameness in Surgery Clinics, College of Veterinary and Animal Science, Bikaner for diagnosis of possible foot affections. All the animals underwent the serum carotene and vitamin-A level analysis by the Carr-Price method as described by Varley (1988). The data obtained were analyzed using ‘t’ test (Snedecor and Cochran, 1994) and compared with standard reference values and altered values were corroborated with pathological changes observed.

RESULTS AND DISCUSSION

Out of 51 cases screened clinically and radiographically, 33 cases had foot affections and 18 cases were found normal. Total numbers of foot affections recorded were 67, out of which 9 were in males and 58 were in females. In some cases there were more than one-foot affections e.g. ringbone and sidebone together, osselets, ringbone, sesamoiditis and navicular disease together. The age of equines ranged from 1 to 12 years. The incidence of foot affections were found more in females (87%) than males (13%).

The carotene values in buttress foot (231.00±18.08 μg/dl), contraction of flexor tendon (231.00±18.08 μg/dl), navicular diseases (228.00 ± 10.44 μg/dl), osselets (209.75± 9.04 μg/dl), ringbone (220.00 ± 6.02 μg/dl) and sidebone (219.44 ± 5.06 μg/dl) were found to be significantly higher (P£0.05) than the mean value (204.35 ± 5.20 μg/dl) of the normal animals. The reference values of carotene in equines were 20 – 175 μg/dl (Kaneko et al., 1997). However, in the animals of present study the higher level of carotene may reflect the

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metabolic disorders by which the carotene is converted into vitamin-A. Thus, higher level of carotene and lower level of vitamin A predispose to the mineralization of soft and bony tissues.

The vitamin-A values in buttress foot (7.75±0.22μg/dl), contraction of flexor tendon (7.75±0.22μg/dl), navicular diseases (7.69±0.13μg/dl), ringbone (7.78±0.07μg/dl) and sidebone (7.84±0.06μg/dl) were found significantly lower (P ≤0.05), while in case of osselets (7.99±0.11μg/dl), pedal ostitis (7.91±0.22μg/dl), sesamoiditis (7.94±0.15μg/dl) the difference was non significant than the mean values (7.99 ± 0.07 μg/dl) of the clinically normal animals. The reference values of vitamin-A in equines ranges from 9 to 16 μg/dl (Kaneko et al., 1997). Subclinical hypovitaminosis-A is associated with foot affections in equines. The serum vitamin-A level below 7.84±0.06 μg/dl was associated with diverse foot affections related to bony changes. Vitamin-A was negatively associated with diverse foot affection in all the cases. Excessive vitamin-A causes increased resorption of bone and subsequent skeletal fragility and fractures (Wolback, 1946). Vitamin-A deficiency decreases endochondral bone growth and causes abnormal bone remodeling in other species, but this has not been reported in horses (Higgins and Wright, 1999). However, in the present study the lower level of vitamin-A proved as a predisposing factor of mineralization of soft and bony tissue. The explanation may lie in the fact that such a deficiency may retard bone growth and in particular, the formation of endochondral bone formation. The retardation of endochondral bone formation must be specific because bone matrix (osteoid) formation continues. Several studies on animals have shown the importance of vitamin A in the bone remodeling process (Moore and Wang, 1945; Mellanby, 1947, Fell and Mellanby, 1952). Vitamin A deficiency results in retarded bone growth (Mellanby, 1947), but the most prominent features of hypervitaminosis-A are accelerated bone resorption, bone fragility, and spontaneous fracture (Moore and Wang, 1945). These findings have been confirmed in several mammalian species by using highly purified crystalline forms of the vitamin-A and its derivatives-retinoids (Nieman and Obbink, 1954; Bauernfeind, 1980; Kamm et al., 1984; Hathcock et al., 1990; Armstrong et al., 1994).

More recent studies (Kindmark et al., 1993, Saneshige et al., 1995) have shown that both osteoblasts and osteoclasts express the nuclear receptors for retinoic acid (retinoic acid receptors and retinoid X receptors). Retinoic acid inhibits osteoblast activity (Togari et al., 1991), stimulates osteoclast formation (Scheven and Hamilton, 1990), and induces bone resorption (Togari et al., 1991; Scheven and Hamilton, 1990, Kindmark et al., 1995). Hakan Melhus et al. (1998) reported that excessive dietary intake of vitamin A was associated with reduced bone mineral density and increased risk fractures in human being.

The interrelationships between vitamins, minerals and amino acids are vital to the overall well being and care of the horse. It is necessary to seek the advice and expertise of equine professionals in order to ensure that the horse is receiving the overall diet and care. The results of present investigation indicated that alteration in serum carotene and vitamin-A were good indicators to assess the foot affections in equines, which did not exhibit apparent signs of lameness related to foot affections. Laboratory determinations were considered a helpful aid in evaluating clinical bone disease in growing and developing horses.

REFERENCES
