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Characteristics of the biochemical bone metabolism parameters in the serum of yearlings during breaking in and start of training

We examined the concentration of osteocalcin and the activity of bone specific alkalene phosphatase as biochemical markers of bone building, the concentration of cross-linked carboxyterminal telopeptids (ICTP) as markers for bone resorption, and of 1,25-dihydroxycholecalciferol as indicator for the homeostasis of calcium-phosphorus-metabolism in 29 Thoroughbred yearlings (aged 15-22 months) during breaking in and after the start of training. In 15 horses, we additionally measured the optic bone density by means of radiographic densimetry.

Osteocalcin, bone-specific alkalene phosphatase and 1,25-dihydroxycholecalciferol were measured by means of immunoassays, ICTP by a serum CrossLaps One Step ELISA. The bone density was assessed on radiographs with a densitometer by comparison with a defined graded scale.

The stress of changing from stud to racing-track resulted in a transient increase of ICTP and decrease of osteocalcin concentrations. The start of training tended to lead to a decrease of ICTP, while osteocalcin and bone specific alkalene phosphatase increased. 1,25-dihydroxycholecalciferol was correlated positively with ICTP and negatively with bone specific alkalene phosphatase and osteocalcin.

Significant interrelationships were shown between the markers of bone building, that is the concentration of osteocalcin correlated positively with the activity of bone specific alkalene phosphatase, but the concentration of ICTP as a marker of bone resorption was correlated negatively with osteocalcin and bone specific alkalene phosphatase.

After start of the training the radiographic measured bone density increased significantly in all measuring points. None of the analysed biochemical parameters of bone metabolism showed a significant correlation with bone density.

Our results indicate constructive bone building processes after the start of training and a skeletal adaptation to mechanical strain.