

Validation of Vision-based Estrus Monitoring in Chongming White Goats: Behavioral Manifestations and Serum Hormone Correlations

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Abstract

Vision-based estrus monitoring for goats has matured rapidly, yet endocrine validation in indigenous breeds is largely missing. Here we tested whether behavioral estrus events captured by a machine vision pipeline reflect genuine reproductive endocrine transitions in Chongming white goats. Ten multiparous does were monitored continuously for 21 days under standard housing conditions; daily jugular samples yielded 206 paired serum measurements of estradiol (E2), FSH, LH, and progesterone (P4). Behavioral events were extracted from infrared video by a YOLOv8-seg + MMPose pipeline and cross-checked against teaser-buck confirmation. Hormone profiles differed markedly between estrus and non-estrus windows (all $p < 0.001$): estradiol rose from 14.81 ± 4.17 to 21.79 ± 2.10 ng/L, and progesterone fell from 2386.70 ± 466.93 to 1719.68 ± 157.52 pmol/L. Estrus status correlated moderately with E2 ($r = 0.459$), FSH ($r = 0.435$), and LH ($r = 0.446$), and inversely with P4 ($r = -0.406$); the E2/P4 ratio produced the most pronounced per-event peak and is proposed as a sensitive auxiliary indicator. Vision-based detection reached 86.9% accuracy. The data indicate that camera-derived behavioral markers track real physiological state changes in this breed, supporting the deployment of vision-based estrus screening as a first-pass tool, with hormone assays reserved for confirmation in commercial Chongming white goat herds.

Keywords

Chongming White Goat, Estrus, Reproductive Hormones, Vision-based Monitoring, Reproduction