

Academic Year: 2025-2026

Summary of the DVM thesis No 28580, Faculty of Veterinary Medicine, Urmia

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Title: Kidney ultrasonographic findings and Investigation erythropoietin and erythron in cats with renal diseases.

Abstract

Objective

This clinical study was conducted to investigate changes in erythropoietin (EPO) levels and erythron tissue indices (including red blood cell count (RBC), hemoglobin (Hb), hematocrit (HCT), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), and mean corpuscular hemoglobin concentration (MCHC)) in cats with chronic kidney disease (CKD) exhibiting abnormal ultrasonographic kidney findings.

Methods

In this study, 29 cats with clinical signs related to urinary tract disorders, referred to the Veterinary Hospital of Urmia University, were evaluated from Ordibehesht to Bahman 1403. CKD staging was performed based on the IRIS guidelines using serum creatinine measurements (and SDMA where necessary). Blood sampling was conducted for urea and creatinine assessment via spectrophotometry (Delta Darman Part kit) and EPO via ELISA (MyBioSource kit). Hematological indices were assessed using a cell counter, and urinary tract ultrasonography was performed with the SonoScape P40 device. Statistical analysis was carried out using SPSS 27, including ANOVA, Tukey, and Pearson and Spearman correlation tests.

Results

Of the 29 cats, 7 (24%) were in stage 1, 8 (28%) in stage 2, 4 (14%) in stage 3, and 10 (34%) in stage 4 of CKD. The predominant breeds were Persian (45%) and domestic shorthair (38%), with 90% being male. Abnormal ultrasonographic findings included polycystic kidney (28%), hydronephrosis (21%), kidney stones (3%), ureteral stones (7%), and bladder stones (3%). Urea levels increased from 60.4 to 321.33 mg/dL, and creatinine from 1.44 to 12.23 mg/dL with disease progression. EPO levels decreased from 6.62 to 0.19 ng/mL with CKD advancement. In erythron tissue, RBC decreased from $6.52 \times 10^6/\mu\text{L}$ to $3.83 \times 10^6/\mu\text{L}$, Hb from 11.99 to 8.47 g/dL, and HCT from 33.65 to 24.5%, while MCV (42.4 to 45.74 fL), MCH (14.09 to 14.91 pg), and MCHC (32.64 to 34.42 g/dL) showed no significant changes. White blood cell count (WBC) also remained stable. Pearson correlation indicated a negative correlation of EPO with urea and creatinine, and a positive correlation with RBC, Hb, and HCT.

Conclusion

Abnormal ultrasonographic kidney findings in cats with CKD are associated with reduced EPO levels and erythron tissue disturbances (particularly decreased RBC, Hb, and HCT), indicative of non-regenerative anemia related to CKD. These changes intensify with disease stage progression, suggesting that early evaluation of EPO and erythron indices may be beneficial in therapeutic management.

Keywords: Ultrasonography findings, Erythropoietin, Erythron, kidney diseases, Cat.