# Neural network modeling to predict intact parathyroid hormone in uremic patients on continuous ambulatory peritoneal dialysis.

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## Abstract

Background: Measuring plasma intact parathyroid hormone (iPTH) concentration is essential to evaluate renal osteodystrophy. Although frequent measurement is needed to avoid inadequate prescription of phosphate binder and vitamin D preparations, it is not cost- effective in some clinics. For this purpose, we developed an artificial neural network (ANN) to predict plasma iPTH concentration in uremic patients on continuous ambulatory peritoneal dialysis (CAPD). Methods: The study population consisted of 23 stable patients (11 male and 12 female, aged 48.8±15.3 years) on CAPD for more than 3 months. Among ANN models, the predictors included plasma calcium, phosphate, alkaline phosphatase concentrations, and calcium-phosphate product. The dependent variable was plasma iPTH concentration measured by radioimmunoassay (RIA-iPTH). Leave-one-out cross-validation was adopted to iron out generalization problems caused by finite population. The least ratio of standard deviation (SDR) was used to choose the best ANN model. For comparing the performance between predictive plasma iPTH concentration by ANN (ANN-iPTH) and RIA-iPTH, the correlation coefficient (r), mean error, and Passing and Bablok regression were evaluated. Results: The generalized regression neural network (SDR=0.74) was the final best ANN model. The relationship between RIA-iPTH and ANN-iPTH is described by Passing and Bablok regression ANN-iPTH=90.52+0.55×RIA-iPTH, with 95% confidence interval for intercept 23.08 to 122.83 and for slope 0.30 to 1.16, indicating that both methods are interchangeable without statistically significant deviation (P>0.10). Conclusion: ANN can accurately predict plasma iPTH concentration in uremic patients on CAPD. It is useful and beneficial to assess renal osteodystrophy frequently and led to proper treatment.