

## Hyperphosphatemia Modestly Retards Parathyroid Hormone Suppression during Calcitriol-Induced Hypercalcemia in Normal and Azotemic Rats

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### Key Words

- Calcitriol
- Hyperparathyroidism
- Parathyroid hormone
- Phosphate
- Renal failure

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### Abstract

**Background/Aims:** In in vitro studies, a high phosphate concentration has been shown to directly stimulate parathyroid hormone (PTH) secretion in a normal calcium concentration and to reduce PTH suppression in a high calcium concentration. In hemodialysis patients during dialysis-induced hypercalcemia, the effect of hyperphosphatemia on PTH secretion was less than in vitro studies. Our goal was to determine whether hyperphosphatemia retards PTH suppression during calcitriol-induced hypercalcemia in azotemic rats with hyperparathyroidism. **Methods:** Rats underwent a two-stage 5/6 nephrectomy or sham operations. After surgery, rats received a high phosphate diet (P 1.2%, Ca 0.6%) for 4 weeks to induce hyperparathyroidism and then were placed on a normal diet (P 0.6%, Ca 0.6%) for two additional weeks to normalize serum calcium values in azotemic rats. At week 7, rats were divided into five groups and before sacrifice received at 24-hour intervals, three doses of calcitriol (CTR) or its vehicle. The five groups and dietary phosphate content were: group 1 - normal renal function (NRF) + 0.6% P + vehicle; group 2 - NRF + 0.6% P + CTR; group 3 - renal failure (RF) + 0.6% P + vehicle; group 4 - RF + 1.2% P + CTR; and group 5 - RF + 0.6% P + CTR. **Results:** In the two CTR-treated groups with marked hypercalcemia (groups 2 and 5),  $15.52 \pm 0.26$  and  $15.12 \pm 0.13$  mg/dl, respectively, stepwise regression showed that hyperphosphatemia retarded PTH suppression. When the two azotemic groups treated with CTR (groups 4 and 5) were combined to expand the range of serum calcium

values, stepwise regression showed that hypercalcemia suppressed and hyperphosphatemia modestly retarded PTH suppression. Similarly, in groups 4 and 5 combined, correlations were present between PTH and both serum calcium ( $r = -0.70$ ,  $p < 0.001$ ) and serum phosphate ( $r = 0.64$ ,  $p = 0.001$ ). *Conclusions:* Hypercalcemia and high doses of calcitriol markedly reduced PTH secretion in azotemic rats despite severe hyperphosphatemia. Even though hyperphosphatemia did retard PTH suppression during hypercalcemia, its effect was small.

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