Hyperphosphatemia Modestly Retards Parathyroid Hormone Suppression during Calcitriol-Induced Hypercalcemia in Normal and Azotemic Rats
Aquiles Jara\textsuperscript{a}, Cecilia Chacón\textsuperscript{a}, Arnold J. Felsenfeld\textsuperscript{b}

\textsuperscript{a}Department of Nephrology, Pontificia Universidad Católica de Chile, Santiago, Chile; \textsuperscript{b}Department of Medicine, West Los Angeles VA Medical Center and UCLA, Los Angeles, Calif., USA

Address of Corresponding Author

\textit{Nephron} 2002;92:883-888 (DOI: 10.1159/000065454)

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

Abstract

\textit{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. \textit{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. \textit{Results:} In the two CTR-treated groups with marked hypercalcemia (groups 2 and 5), 15.52 ± 0.26 and 15.12 ± 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.

Copyright © 2002 S. Karger AG, Basel

---

**Author Contacts**

Dr. Aquiles Jara  
Department of Nephrology  
Pontificia Universidad Católica de Chile  
Marcoleta 345, Santiago (Chile)  
Tel. +56 2 686 3267, Fax +56 2 664 0466, E-Mail ajara@med.puc.cl

---

**Article Information**

Accepted: May 22, 2002  
Number of Figures : 1, Number of Tables : 2, Number of References : 35