

## Correlation between Urinary Growth Hormone, Pyridinoline, Parathyroid Hormone-Related Protein and Calcium/Phosphate Excretion in Normal Children

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### Introduction

GH and pyridinoline are known to be involved in bone metabolism in children. Recently, PTH-related protein (PTHrP) was identified and using RIA (1) for PTHrP we have investigated the pathophysiological role of PTHrP in normal and diseased states (2,3). PTHrP, which is the main factor causing humoral hypercalcemia of malignancy (HHM), is suggested to have also some role in bone metabolism in normal children, but the detail has not been clarified. Therefore in this study, we investigated urinary excretion and correlation of GH, pyridinoline, PTHrP and calcium/phosphate in normal children.

### Subjects and Methods

The subjects in this study were 50 normal children aged 3-15 years. Urine samples in the early morning were collected and used for measurements of GH, pyridinoline, PTHrP, calcium, phosphate and creatinine. Serum levels of IGF-I, PTHrP and ALP activity were

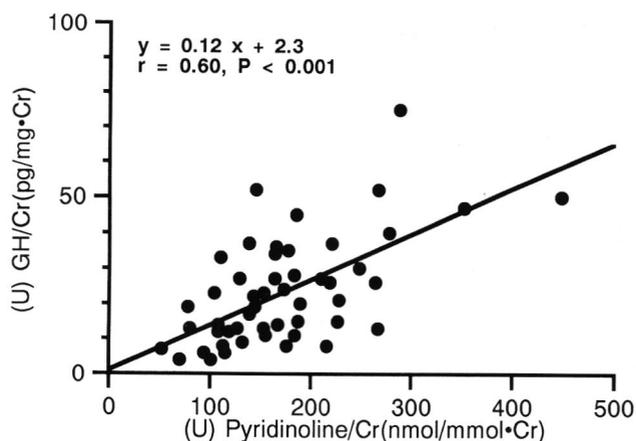
also measured in 10 of these subjects. Assay kits were as follows: urinary GH, Picoia HGH plate Sumitomo Pharmaceutical Co., Ltd, Japan; urinary pyridinoline, Metra Biosystems Inc., USA; urinary and serum PTHrP, Daiichi Radioisotope, Japan.

### Results and Discussion

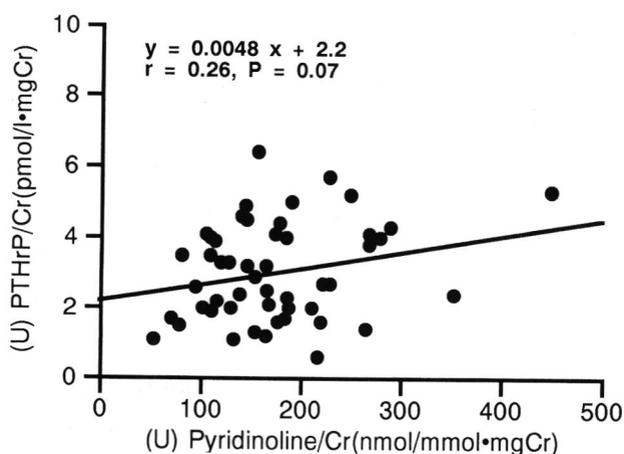
Mean concentration of GH, pyridinoline and PTHrP in urine were  $29 \pm 8$  pg/mg cr,  $186 \pm 76$  nmol/mmol cr and  $3.8 \pm 1.3$  nmol/mg cr, respectively. Age-related decline was found in urinary concentrations of pyridinoline and PTHrP ( $P > 0.01$ ), but not in those of GH, calcium or phosphate. These results suggest an elevated bone turnover rate in younger children.

There was significant correlation between urinary pyridinoline and GH, and a weak correlation tendency between pyridinoline and PTHrP (Fig. 1, 2). Serum levels of IGF-I and PTHrP and ALP activity showed significant correlation with each other ( $P < 0.05$ ), and significant correlation was also found between urinary PTHrP and serum PTHrP level and ALP activity (data not shown). These correlations suggest close relationships among these 3 factors which may be involved in bone metabolism in children.

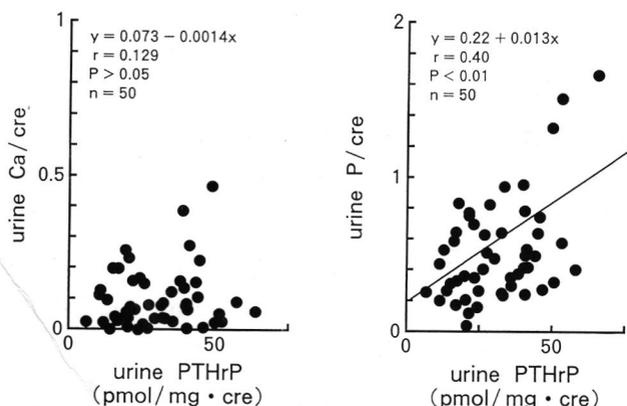
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**Fig. 1** Correlation between urinary excretion of pyridinoline and GH in normal children



**Fig. 2** Correlation between urinary excretion of pyridinoline and PTHrP in normal children



**Fig. 3** Correlation between urinary excretion of PTHrP and calcium/phosphate in normal children

Urinary PTHrP concentration showed a significant positive correlation ( $P < 0.05$ ) with urinary phosphate excretion, but only a weak negative correlation with urinary calcium (Fig.3). PTHrP is one of the oncofetal hormones, and release of PTHrP by fetal rat long bones in culture was observed (4). Moreover, PTHrP is reported to act through the same PTH receptor and to be involved in calcium/phosphate regulation. Consequently, these results suggest that PTHrP may be also involved in calcium and phosphate metabolism in bone and kidney. These findings offer the key to the investigation of the physiological role of PTHrP in children.

### References

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