Efficiency of Dietary Calcium Use for Skeletal Growth and Mineralization in Young Pigs Fed Diets with Various Phosphorus Concentrations

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Abstract

Crossbred pigs (n=36) were weaned at 3 wk and fed standard UW Starter and Grower diets until ~13 kg. Pigs were housed in individual pens and randomly assigned to 1 of 6 diets for a 4 wk trial. Efficiency of nutrient use (nutrient retained/ consumed) is typically higher in animals fed diets with marginal P concentrations may have limited the efficiency of Ca use. The previous study (J Bone Miner Res 20: S193) was designed to assess recovery of skeletal growth in young pigs following a period of deficit growth induced by a Ca deficiency. Dietary P concentrations (either 70, 95, or 120% of requirements) were fed to 27 d to determine changes in bone mineral content (BMC), values for retention and efficiency of Ca and P were calculated from DXA scans and food consumption data.

Introduction

Both Ca and P are required for bone mineral formation, thus a greater limitation in response of P intake of Ca may induce an apparent inefficiency in Ca use.

Methods

Crossbred pigs (n=36) were weaned at 3 wk and fed standard UW Starter and Grower diets until ~13 kg. Pigs were housed in individual pens and randomly assigned to 1 of 6 diets for a 4 wk trial. Food consumption and pig weights were determined weekly. DXA scans were completed at 0, 2 and 4 wk to determine whole body bone mineral content (BMC). Values for retention and efficiency of Ca and P were calculated from DXA scans and food consumption data.

Dietary Treatments

<table>
<thead>
<tr>
<th>Dietary Treatments</th>
<th>Ca % of requirements</th>
<th>P % of requirements</th>
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</thead>
<tbody>
<tr>
<td>Marginal Ca</td>
<td>75%</td>
<td>70%</td>
</tr>
<tr>
<td>Marginal P</td>
<td>70%</td>
<td>70%</td>
</tr>
<tr>
<td>Excess Ca</td>
<td>150%</td>
<td>70%</td>
</tr>
<tr>
<td>Excess P</td>
<td>150%</td>
<td>70%</td>
</tr>
</tbody>
</table>

Calculations:

Bone Mineral Content Gain

BMCg = BMCg_i - BMCg_0

Calcium efficiency = Ca retention / Ca intake

Phosphorus efficiency = P retention / P intake

Results

Bone Mineral Content Gain

Calculations:

Bone Mineral Content Gain

BMCg, g/d = (BMCg_i - BMCg_0) / 27

Calcium efficiency = Ca retention / Ca intake

Phosphorus efficiency = P retention / P intake

Conclusions

MARGINAL Ca restriction improved growth, but decreased skeletal mineralization, especially in pigs fed diets with P at 120% of required amounts. Pigs fed diets with 95% P requirement had Ca more efficiently in Marginal v Excess Ca diets, but if it was with 120% P no differences in efficiency were detected.

Concentrations of dietary P affects efficiency of Ca use. The differential responses may be related to effects of P on animal growth rather than a direct effect on skeletal growth and mineral accumulation.