10.5 ± 2.3 on SMA. Gas-liquid chromatography of the faecal fat in 2 of 3 infants showed that C16:0 was responsible for most of the excess fatty acid when they were fed Cow and Gate V formula.

We are grateful to Professor J. A. Davis for encouragement, Dr. E. M. Widdowson for helpful discussion, and Dr. A. H. Gowenlock in whose department the estimations of faecal fat were performed.

REFERENCES


Heinemann, London.


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Short reports

Urinary 3'5' cyclic AMP
Diag nostic test in pseudohypoparathyroidism

Pseudohypoparathyroidism is characterized by end-organ resistance to parathyroid hormone (PTH). There is evidence that this unresponsiveness is located in the renal cortex and involves failure of the hormone to activate adenylate cyclase, the enzyme which forms adenosine 3'5'-cyclic phosphate (cyclic AMP). In normal subjects infusion of PTH leads to a dose-dependent increase in urinary cyclic AMP (Chase, Melson, and Aurbach, 1969; Kaminsky et al., 1970; Greenberg, Karabell, and Saade, 1972). In patients with pseudohypoparathyroidism, infusion of the hormone fails to alter urinary levels of the cyclic nucleotide (Chase et al., 1969; Greenberg et al., 1972). It has been suggested (Chase et al., 1969) that measurement of urinary cyclic AMP in response to infusion of PTH may be a sensitive index for establishing the diagnosis of this disease. The present report describes 2 children diagnosed as having pseudohypoparathyroidism in whom urinary cyclic AMP levels failed to rise after infusion of PTH.

Case reports

Case 1. A white male, aged 2 years 9 months, was admitted to Vancouver Children's Hospital for assessment of obesity, subcutaneous calcifications, and delay in behavioural development. He had been previously examined (at age 14 months) for delayed behavioural development and at that time was found to have multiple subcutaneous nodules in the scalp; x-rays showed plaques of calcification in the scalp, right flank, shoulder, and dorsum of the left foot; serum calcium and phosphorus were normal. When seen by us (at 33 months) he had a history of polydipsia, bed-wetting, polyphagia, screaming attacks, and increased subcutaneous calcifications. His height was 88.2 cm, which placed him on the 3rd centile; his weight was 15.4 kg, falling between the 75th and 90th centiles. Multiple subcutaneous calcified lesions on the right shoulder, right occiput, and back of legs were noted. No central nervous system abnormality was noted other than mild mental retardation and hypotonia. His hands were short and chubby but there was no evidence of shortened metacarpals. Gesell assessment placed him at behavioural level of about 2 years. The serum calcium level was 7.6 mg/100 ml, serum phosphorus 6.4 mg/100 ml, and serum magnesium 2.0 mg/100 ml.

Case 2. A 9-year-old Caucasian female was admitted to hospital for reassessment of pseudohypoparathyroidism and behavioural problems. Subcutaneous calcifications had been present since birth; the diagnosis of pseudohypoparathyroidism had been made on the basis of low serum calcium (7.1 mg/100 ml) and raised serum phosphorus (7.5 mg/100 ml) as well as shortened metacarpals. When examined by us (at age 9 years) she exhibited emotional instability and had learning problems. Her height was 128.5 cm (25th centile) and her weight 40.9 kg (97th centile). The significant clinical findings included multiple subcutaneous calcifications and shortening of the 3rd, 4th, and 5th metacarpals bilaterally. Serum calcium was 10.4 mg/100 ml and phosphorus 5 mg/100 ml while she was on a dosage of 50,000 units of vitamin D daily. The metapyrone test for assessment of pituitary-adrenal axis was normal.
Control subject. The control subject was an 8-year-old male sib of Case 1. The significant features in this boy are small physical stature and short metacarpals. Since it has been known that pseudohyoparathyroidism is transmitted by an autosomal recessive mode, and that the transition from normocalcaemia to hypocalcaemia has been noted in patients with pseudohypoparathyroidism as is seen in the affected sib, parathyroid hormone infusion was carried out in this case to rule out the disease.

Parathyroid hormone (PTH) infusion

Infusion of PTH (Eli Lilly, L SEY84C) was performed after overnight fasting at 10, 25, 50, and 100 mU/kg per min, changing at 45-minute intervals as described by Kaminsky et al. (1970). The patients and a control were hydrated by drinking water, and urine specimens were collected every 15 minutes through an indwelling catheter. Calcium, phosphate, creatinine, and cyclic AMP concentrations were determined in each sample. Cyclic AMP was determined by the protein binding method of Gilman (1970), creatinine by the Jaffé reaction. Serum calcium, phosphorus, and magnesium levels were measured before and at the completion of the test procedures. In the control patient (7-year-old brother of Case 1) urinary cyclic AMP levels rose in a dose-dependent manner in response to PTH infusion (Fig.). In sharp contrast, urinary cyclic AMP levels in Cases 1 and 2 remained unchanged throughout the entire infusion sequence (Fig.). After the infusion, cyclic AMP excretion was measured in the patients for a period of 3 days. All values remained at the characteristically low levels. Urinary phosphorus excretion levels are presented in Table I.

![Graph showing response to parathyroid hormone (PTH) infusion in Cases 1 and 2 and control subject.](image)

Table I. No significant increased excretion of urinary phosphorus was observed after infusion of an initial small dose of PTH, while significant phosphorus diuresis was observed in the control subject. A twofold increase in urinary phosphorus was shown after an increase in dosage of PTH from 10 mU/kg per min to 50 mU/kg per min. Serum calcium, phosphorus, and magnesium levels before and after completion of the infusion are shown in Table II. There was a rise in calcium and fall in phosphorus concentration in the control. There was a fall in both phosphorus and calcium concentrations in the serum of Case 1, while no change was observed in Case 2.

Discussion

Features of pseudohypoparathyroidism include hypocalcaemia, hyperphosphataemia, tetany, convulsions, short stature, short metacarpals, round face, dental aplasia, mental retardation, cataracts, and subcutaneous calcifications. Although Albright (Albright et al., 1942) used the term pseudohypoparathyroidism to distinguish a case in which serum calcium and phosphorus values were normal, the possibility of transition from normo-

### TABLE I

<table>
<thead>
<tr>
<th>Urinary P excretion (mg/h)</th>
<th>Case 1</th>
<th>Case 2</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTH infusion (mU/kg per min)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>9.32</td>
<td>16.8</td>
<td>22.56</td>
</tr>
<tr>
<td>25</td>
<td>7.65</td>
<td>21.0</td>
<td>24.01</td>
</tr>
<tr>
<td>50</td>
<td>19.45</td>
<td>28.4</td>
<td>9.56</td>
</tr>
<tr>
<td>100</td>
<td>16.48</td>
<td>32.3</td>
<td>15.08</td>
</tr>
<tr>
<td>Baseline control</td>
<td>8.40</td>
<td>15.0</td>
<td>13.50</td>
</tr>
</tbody>
</table>

### TABLE II

<table>
<thead>
<tr>
<th>Calcium (mg/100 ml)</th>
<th>Phosphorus (mg/100 ml)</th>
<th>Magnesium (mg/100 ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
</tr>
<tr>
<td><strong>Case 1</strong></td>
<td>7.7</td>
<td>7.3</td>
</tr>
<tr>
<td><strong>Case 2</strong></td>
<td>9.6</td>
<td>9.6</td>
</tr>
<tr>
<td><strong>Control</strong></td>
<td>9.3</td>
<td>9.9</td>
</tr>
</tbody>
</table>

Pre, before PTH infusion; Post, after PTH infusion.
Short reports

Lupus-scleroderma syndrome induced by ethosuximide

Systemic lupus erythematosus (SLE) induced by anticonvulsant drugs is well known to many clinicians, though Alarcón-Segovia (1969) in his excellent review article was able to find only 60 published cases. Various anticonvulsant drugs, like diphenylhydantoin, troxidone, and primidone, have this potential despite differences in chemical structure. Recently another anticonvulsant, ethosuximide, has also been implicated in inducing the lupus syndrome (Livingston et al., 1968). However, scleroderma has never been reported to be induced by drugs. Winkelmann (1971) in his comprehensive review, mentioned no drugs in the pathogenesis of scleroderma.

This paper describes a young Chinese girl who developed SLE and scleroderma while on treatment with ethosuximide for epilepsy.

Case report

A 16-year-old Chinese girl had suffered from grand mal epilepsy since the age of 2 and was controlled with...
Urinary 3'-5' cyclic AMP. Diagnostic test in pseudohypoparathyroidism.
W J Tze, J Saunders and G I Drummond

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