Serum Concentrations of Intact Parathyroid Hormone in Healthy Children, Michele Cioffi,* Maurizio Corradino, Patrizio Gazzarro, Maria-Teresa Vietri, Catia Di Macchia, Anna Contursi, Rosalia Colicigno, Teodoro Catalano, and Anna M. Molinari (Institute General Pathology and Oncology, Second School of Medicine of Naples, 80138 Naples, Italy; * address correspondence to this author at: Istituto di Patologia Generale e Oncologia, Seconda Università degli Studi di Napoli, Via S. Andrea delle Dame 2, 80138 Napoli, Italy; fax 39-81-566-5695)

Parathyroid hormone (PTH) plays an important role in calcium homeostasis by maintaining the concentration of ionized calcium within the precise limits necessary to achieve metabolic and neuroregulatory functions of this essential mineral (1–3). PTH produces calcium mobilization from the large skeletal stores into the extracellular fluid, increases absorption of dietary calcium, and decreases renal clearance of urinary calcium (3, 4). Serum PTH assays are an important aid in the assessment of calcium metabolism disorders. The aim of this study was to determine serum intact PTH in a large group of healthy children according to their ages.

We selected 794 healthy children (409 girls, 385 boys), ages 2–16 years, arriving for routine clinical check-ups in the Department of Pediatrics over 4 years (1994–1998). Sample sera were taken at 0800 from non-fasting children.

None of the subjects was receiving any medication, and all were ambulatory. All children with evidence of endocrine, hepatic, renal, or other known diseases were excluded from consideration. All subjects were free from diseases affecting the growth rate and bone metabolism. Phosphate and calcium values were within the reference ranges. A single venous blood sample was obtained, and serum was obtained by centrifugation and stored at −20 °C until assay.

This study was carried out in accordance with the ethics standards of the institution’s human investigation committee, and with the Helsinki Declaration of 1975 (as revised in 1983).

Serum intact PTH was assayed by a two-site immuno-radiometric method (Nichols Institute). The assay precision was measured by assaying four samples at different concentrations (40, 60, 133, and 266 ng/L) 30 times in the same assay (mean CVs, 1.8%, 1.6%, 2.5%, and 3.4%, respectively) and 15 times over a 5-week period (mean CVs, 3.8%, 5.6%, 6.1%, and 7.2%, respectively). The minimum detectable concentration (1.0 ng/L) was obtained by 20 replicate measurements of the zero calibrator and calculating the 3 SD threshold for these measurements.

Serum intact PTH concentrations in healthy children were lower and in a narrower range than our adult (age range, 18–55 years) reference interval for the same assay (1.5–62.8 ng/L) (5–7).

In the girls, serum PTH concentrations increased after the 8th year and peaked at the 10th to the 14th year, decreasing slightly thereafter ($P = 0.20$). In contrast, serum PTH values in the boys increased persistently from the 8th until the 16th year.

No significant differences in serum PTH concentrations were seen between boys and girls; however, the girls’ serum PTH concentrations were slightly higher than boys from the 10th to the 12th year and from the 12th to the 14th year. These data could be related to changes in the need for calcium in girls for bone metabolism during puberty (8, 9).

Moreover, our data suggest that serum intact PTH concentrations in children covered narrower ranges than adult values.

With advancing age, PTH blood concentrations progressively increase, whereas calcium concentrations tend to decrease. The most likely explanation of this condition is a reduced intestinal absorption of calcium with an attendant decrease of calcium in blood and a reactive increase of PTH secretion. Calcitonin and vitamin D$_3$ also decrease with age. Most likely, the vitamin D$_3$ decrease is multifactorial, depending on reduced hydroxylation of vitamin D by kidney and liver, inadequate dietary intake, impaired intestinal absorption, and possibly reduced sun exposure.

Although we found no differences in serum intact PTH

### Table 1. Serum intact PTH.

<table>
<thead>
<tr>
<th>Age, years</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1–4</td>
<td>48</td>
<td>12.46</td>
</tr>
<tr>
<td>4.1–6</td>
<td>46</td>
<td>9.65</td>
</tr>
<tr>
<td>6.1–8</td>
<td>48</td>
<td>9.93</td>
</tr>
<tr>
<td>8.1–10</td>
<td>60</td>
<td>13.11</td>
</tr>
<tr>
<td>10.1–12</td>
<td>57</td>
<td>13.02</td>
</tr>
<tr>
<td>12.1–14</td>
<td>54</td>
<td>12.84</td>
</tr>
<tr>
<td>14.1–16</td>
<td>72</td>
<td>13.57</td>
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</table>
concentrations with age, our results nevertheless represent a useful set of reference values in children.

We thank Marisa Punzo, Angela Sglavo, and Bianca Tesone for excellent technical assistance in the assay procedure.

References


Fig. 1. Confidence intervals for mean values in boys and girls.

Values in ng/L.

Effects of Hemoglobin C and S Traits on Seven Glycohemoglobin Methods, Elizabeth L. Frank,† Linda Moulton,‡ Randie R. Little,§ Hsiao-Mei Wiedmeyer,∥ Curt Rohlfing,∥ and William L. Roberts† († University of Utah, Department of Pathology, Salt Lake City, UT 84108; ‡ ARUP Institute for Clinical and Experimental Pathology, Salt Lake City, UT 84108; § University of Missouri-Columbia School of Medicine, Departments of Child Health and Pathology, Columbia, MO 65212; * address correspondence to this author at: ARUP Laboratories, 500 Chipeta Way, Salt Lake City, UT 84108; fax 801-584-5207, e-mail william.roberts@arup-lab.com)

Glycohemoglobin (gHb) is a marker of long-term glycemic control that has been shown to correlate with complications of diabetes mellitus (1). The National Glycohemoglobin Standardization Program (NGSP) was established to standardize gHb results so that clinical laboratory results are comparable to those reported by the Diabetes Control and Complications Trial (2, 3). Previous studies have shown that some gHb methods yield inaccurate results with samples heterozygous for hemoglobin (Hb) C or Hb S (4–6). At least 10% of black Americans have either Hb C or S trait, and there were 19 million black Americans over age 19 in 1990 (7–10). The prevalence of diabetes is estimated to be 5.1% of the adult population, with the rate for non-Hispanic blacks being 1.6-fold higher than that of non-Hispanic whites (11). It is therefore probable that at least 150 000 Americans with