

# Serum Bone GLa Protein (BGP): A Potential Marker of Growth Hormone Deficiency and the Response to Growth Hormone Therapy

Serum bone GLa protein (BGP), a calcium-binding protein of the bone matrix, is the most important noncollagenous protein in the skeleton. BGP has been shown to be an important indicator of the rate of bone formation. In this paper, Johansen and coinvestigators studied the usefulness of BGP in predicting the long-term response of growth hormone (GH)-deficient patients to GH treatment.

Sixty-six GH-deficient children aged 6 to 18 years, 49 boys and 17 girls, were studied before and after 3, 6, 9, and 12 months of daily GH treatment. Patients were divided into 2 groups: those who remained prepubertal throughout the study period were included in group 1 (n = 51; mean age, 11.2 years; 35 boys and 16 girls), while those who had entered stage 3 of puberty before starting treatment or those who reached that stage during the study were included in group 2 (n = 15; mean age, 14.2 years; 14 boys and 1 girl). Serum BGP concentrations were determined by radioimmunoassay (RIA). Height velocities were estimated from all available height measurements. The change in height velocity from 0 to 12 months of treatment was correlated with the change in BGP concentration at each period.

The mean pretreatment height velocities were 4.5 and 5.1 cm/yr in groups 1 and 2, respectively, while the mean height velocities at 12 months of GH treatment were 8.3 and 8.2 cm/yr in groups 1 and 2, respectively. The mean BGP in patients before treatment was significantly lower than the levels found by other investigators in normal controls ( $P < 0.001$  in prepubertal patients and  $P < 0.01$  in pubertal patients). The BGP levels increased significantly in both groups of GH-deficient children, reaching normal levels at 3 months, and plateaued at a higher level thereafter.

The authors conclude that the present study demonstrates that determination of serum BGP is a valid contribution to the prediction of growth response after 12 months of treatment; the change in serum BGP determined after 3 months of therapy was able to predict the height at 12 months of therapy with the same validity as the prediction at 6 months without using BGP. The present study suggests that determination of serum BGP may help to assess the extent to which bone metabolism is affected in GH-deficient children. Furthermore, serum BGP could be particularly useful to monitor treatment. Measurement of changes in serum BGP after short-term GH administration may thus help to identify those children who will benefit from long-term therapy as well as those who will not respond to therapy.

Johansen JS, et al. *J Clin Endocrinol Metab* 1990;71:122-126.

**Editor's comment:** *The efficacy of GH treatment in improving the ultimate height of a child is an important question that has been difficult to address. The response to GH has been widely variable even among patients with GH deficiency. For example, in this study with supposedly GH-deficient subjects there was a normal growth rate before treatment and an improved growth velocity of +3 cm/yr with GH treatment. The growth of these patients and the response to GH is more like that of normal short-statured patients. Usually, GH-deficient patients grow less than 4 cm/yr and exhibit catch-up growth when treated with human GH.*

*However, it has always been difficult to predict who will benefit most from long-term GH treatment. The good predictive value of serum BGP concen-*

*trations reported here at 3 months of treatment, if duplicated by other studies, might help the clinician decide which patient will benefit most from treatment. Potentially this would facilitate optimization of dosing regimen, growth response, and monetary expenditures. For example, if the dose of GH being employed does not increase the BGP in an ordinary patient, it may be beneficial to increase the dose; or, if the patient is being treated 3 times per week, it may be better to give it daily. The prompt recognition of poor GH response before wasting many months of treatment would be of great benefit.*

*Other investigators have studied the usefulness of procollagen levels as a biochemical marker for growth.<sup>1,2</sup> Various methods are available to measure either type I (pColl-1-C) or type III procollagen (P III NP). More studies have been done on P III NP, which also reflects generalized somatic growth, presumably because this assay has been simplified and RIA kits are commercially available. P III NP concentrations have also been found to be good predictors of growth response to GH treatment.<sup>3,4</sup> Comparative studies between BGP and these other procollagen measurements have not been done. This approach is very important.*

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## References

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