

other research workers studying growth in chronic disease. It is interesting that in the patients with renal failure, puberty did not start until their height had reached virtually that of the controls when they started puberty; however, by this time height velocity was far below normal and the subsequent pubertal spurt was very much

reduced. Such a fine analysis does require many measurements of height to be made during the growth period but results in a much better understanding of the dynamics associated with the disorder than has previously been possible.

James M. Tanner, MD

## Hypersomatotropism in the Dysmature Infant at Term and at Preterm Birth

de Zegher et al report umbilical cord-serum growth hormone (GH) levels in a large group of small (<2.4 kg), appropriate ( $3.4 \pm 0.1$  kg), and large (>4.4 kg) infants born at term and in the cord-serum of prematurely born twins (28 to 36 weeks) in which both twins were appropriate for gestational age or 1 twin was appropriate and the other small for gestational age. The results demonstrate that appropriate and large infants have similar cord-serum GH concentrations ( $16.7 \pm 1.0$  ng/mL versus  $16.5 \pm 1.2$  ng/mL respectively), but small infants have significantly elevated cord-serum

GH levels ( $24.2 \pm 1.8$  ng/mL) when compared with either of the other 2 groups ( $P < 0.001$ ). Serum GH concentrations in twins concordant for weight and appropriate for gestational age were similar, while GH levels were significantly higher ( $P = 0.007$ ) in the smaller of twins discordant for weight.

The authors point out that the mechanisms underlying the elevations in cord-serum GH levels at birth are unclear, but that increased cord-serum levels of GH have been documented in both the human and ovine fetus when acidotic or hypoxic, in fetuses of undernourished ewes, in ovine

fetuses undergoing surgery, and in ovine fetuses in conditions associated with growth retardation. Although GH is not known to influence fetal circulating insulin-like growth factor (IGF)-1 levels and is not essential for fetal growth, the authors state that the elevations in GH in the small-for-gestational age infant are likely to be related to insulin antagonizing actions or lipid metabolism. These data support the hypothesis that GH plays a homeostatic role in the late-gestational fetus in particular, and possibly in the metabolic adaptations to conditions associated with subnormal intrauterine growth.

de Zegher F, Kimpen J, Raus J, et al. *Biol Neonate* 1990;58:188-191.

**Editor's comments:** *This is a well-conducted study with appropriate controls that suggests that GH, although not necessarily involved in stimulating fetal growth, may play a very important role during the last trimester of pregnancy. Obviously, more research is needed to establish the significance of these findings.*

William L. Clarke, MD

## 30-Second Sampling of Plasma GH in Man: Correlation With Sleep Stages

The authors used a refined technique to draw 2 drops of blood every 30 seconds over an 8-hour period in 6 young male adults, following 24 hours of fasting. Growth hormone (GH) was measured on each sample. The accuracy was verified by comparing the GH concentrations in plasma and in whole blood. EEG recordings were used to correlate GH pulsatility with stages of sleep. GH pulses were analyzed by cluster analysis; GH secretion rates were determined by deconvolution analysis. Data analysis revealed the nocturnal pulse frequency to be 1.2 pulses per hour. If analysis had been done on blood samples drawn every 20 minutes, the number of identifiable peaks would have been 61% less, or 0.5 pulses per hour. Mean GH concentrations

and secretory rates were significantly higher during stages 3 and 4 of sleep as compared with stages 1 and 2 and REM sleep. There was a close correlation of EEG-identifiable sleep and initiation of the GH secretory peaks (4.5 minute time delay). The authors suggest that normally there are major episodes of GH release (secretory episodes) that consist of multiple small pulses within each major episode.

Holl RW, Hartman ML, Veldhuis JD, et al. *J Clin Endocrinol Metab* 1991;72:854-861.

**Editor's comment:** *Working with these authors at the University of Virginia through the years has been both a pleasure and an enlightening experience. The method described for measuring GH in 2 drops of*

*whole blood is remarkable — and it works! It is a research, not a diagnostic, tool. From the data, we can conclude that the number of GH pulses increases phenomenally based on the frequency with which the investigator analyzes GH. The reader needs to realize, however (as pointed out by Evans et al Am J Physiol 1987;252:E459-E556), there are major secretory episodes, each comprised of multiple pulses. Sampling every 20 minutes permits identification of the majority of GH secretory episodes, but not pulses. For many physiologic and diagnostic studies, sampling blood and measuring GH in blood drawn every 20 minutes over 12 to 24 hours is adequate.*

Robert M. Blizzard, MD