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FREE T4 - NOT A PREDICTOR OF THYROID FUNCTION IN PRE-MATURE INFANT. P. Karna, E.A. Dolanski, D.Sciamanna, M. Netzloff. Michigan State University College of Human Medicine, Department of Pediatrics and Human Development and E.W. Sparrow Hospital, East Lansing, MI.

Thyroid screening is done in our center as recommended by AAP during the first week of life in all preterm as well as term infants in the NICU. During the past 6 months, 8 infants received complete laboratory evaluation due to low T4. The tests performed were T4 by RIA, TSH by RIA and Free T4 by RIA "Amersham Kit" method. Initial values revealed the following:

GA(weeks)	T4(μg/dl)	TSH (μIU/dl)	*Free T4(ng/dl)
TA 28	2.0	3.7	0.6
LA 28	2.1	4.0	0.3
PB 27	2.0	8.1	0.4
MB 30	2.0	7.2	0.5
FB 30	2.2	3.4	0.6
FA 27	2.0	2.5	0.5
PB 27	2.0	8.3	0.4
BB 29	4.3	5.5	0.4

*Normal Free T4 - 0.7 - 1.8 ng/dl

Further evaluation with time, including TRH stimulation test in two of these infants, suggested normal thyroid function. TSH increased from 5, 7 μIU/dl to 50.9, 32.0 μIU/dl at 30 minutes, and 46.4, 23.6 μIU/dl at 60 minutes, respectively after TRH stimulation in the two premature infants. This data suggests that Free T4 does not provide accurate evaluation of thyroid function in premature infants as it does in adults. This paper describes serum Free T4 values in very low birth weight infants.

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PROTEIN SYNTHESIS INHIBITORS INHIBIT 24,25-DIHYDROXY-VITAMIN D₃ SYNTHESIS IN THE D-DEPLETED KIDNEY
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The final step of activation of vitamin D occurs in the kidney. Depending upon the circulating levels of Ca, Pi and D, 24,25- and 1,25-dihydroxyvitamin D are produced in varying amounts by renal mitochondrial hydroxylases. 24,25-(OH)₂D₃, the major metabolite present under physiological conditions, may have a role in bone formation.

We have studied the biochemical control of 24,25-(OH)₂D₃ synthesis. When kidneys isolated from D-replete rats were perfused, they produced mainly 24,25-(OH)₂D₃. Kidneys from D-depleted animals produced 1,25-(OH)₂D₃. However, they began to synthesize 24,25-(OH)₂D₃ 2 to 3 hours after starting perfusion when the substrate was 10 ng/ml 25-hydroxyvitamin D₃ (25-OHD₃). We investigated whether the conversion of ³H-25-OHD₃ to ³H-24,25(OH)₂D₃ was dependent upon the synthesis of new protein. We added the protein synthesis inhibitor actinomycin D (4x10⁻⁶M) or cycloheximide (1x10⁻⁵M) to the perfusate. Addition of the inhibitors between 0 and 3 hours of perfusion abolished conversion of ³H-25-OHD₃ to ³H-24,25(OH)₂D₃ (control 2.76 ± 0.31 % vs inhibitor 0.30 ± 0.20%). However, when they were added 3 or 4 hours after starting perfusion, the synthesis of D metabolite was not inhibited (control 2.76 ± 0.31% vs inhibitor 3.95 ± 0.6%). The results suggest that the initiation of 24,25-(OH)₂D₃ production requires the synthesis of new protein.

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MINIMAL THYROID INSUFFICIENCY (MTI) IN CHILDREN WITH CONSTITUTIONAL DELAYED GROWTH (CDG). Vinod Lala, P. Jamias, B.Hermosa & Ashit Ray. (Spon. by T.W. Avruskin) N.Y. Medical College, Lincoln Hospital Department of Pediatrics, NY.

Therapeutic trial of thyroid preparation in absence of clinical & laboratory evidence of hypothyroidism has been reported in children of short stature. (J. Ped. 80, 988, 72). Patients with MTI have normal T3, T4, & TSH levels but an augmented TSH response to TRH. (Peak TSH response > 20 uIU/ml). TSH & T3 response to TRH was assessed in 20 children (mean age 11.7 range 7.9-15.8 yrs; 18: 2) with CDG. TRH test was done with IV bolus TRH 4ug/kg/BW. after an overnight fast of 10 hrs. 5 had augmented TSH response (Gr.B) 15 had normal (Gr.A). There was no significant difference in basal levels of T3, T4, free T4 & TSH. Mean TSH response was significantly higher at all times in Gr.B vs Gr.A T3 % increase was lower in Gr.B 29.1±2.5(N3) vs Gr.A 41.9±4.0(N9) p < 0.05.

Group	Basal	15	30	45	60	90	120	Peak
A(15)	3.0	12.6	13.6	11.6	10.1	7.2	5.7	13.8
	±0.4	±0.9	±0.9	±0.8	±0.7	±0.6	±0.6	±0.9
B(5)	3.3	24.4	30.5	25.8	18.1	12.4	10.0	31.7
	±1.0	±1.8	±3.0	±5.5	±3.5	±2.0	±1.7	±3.4
P	NS	< .001	< .001	< .05	< .05	< .05	< .05	< .001

Augmented TSH response & lower T3 % increase in response to TRH was found in 25% of children with CDG. This could be an evidence of minimal thyroid insufficiency or of hypothalamic pituitary thyroid dysfunction in children with CDG. Treatment with thyroxine in two patients for 5 months showed 140% increase in annual growth rate. Controlled therapeutic trial is indicated.

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STUDIES OF GROWTH HORMONE BINDING AND ITS INSULIN-LIKE METABOLIC EFFECT IN ISOLATED RAT ADIPOCYTES.
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Adipocytes isolated by collagenase digestion from normal rat epididymal (EP), subcutaneous (SC), or retroperitoneal (RP) locations were selected for a study of human growth hormone (hGH) binding and metabolic activity. Scatchard analysis of 125-I-hGH binding was linear; binding affinities ranged from 2.1-3.5 x 10⁹ M⁻¹ and were not different, but the number of binding sites per cell were highest in EP (8,300), followed by SC (6,700), p < .05, and then RP fat (2,700), p < .01. The metabolic response of fat cells was evaluated by the incorporation of 14-C(U) glucose into adipocytes (without pre-incubation). With pituitary hGH, basal and maximally stimulated glucose incorporation was: EP=202±9 to 265±18 (31% increase, p < .05), SC=97±6 to 111±8 (17% increase), and RP=96±10 to 104±9 nMoles/10⁶ cells (7% increase). Similar studies following biosynthetic hGH (supplied by Kabi Vitram) showed: EP=243±13 to 301±21 (24% increase, p < .025), SC=120±17 to 139±31 (18% increase), and RP=110±10 to 104±12 nMoles/10⁶ cells. Addition of hGH antibodies blocked the glucose incorporation in EP adipocytes using both pituitary and biosynthetic hGH, while insulin antibodies did not prevent this increase. We conclude that this insulin-like metabolic effect is caused by hGH, not an insulin-like impurity. EP fat cells demonstrated the highest number of binding sites and glucose incorporation, followed by SC and then RP fat cells. These results suggest different metabolic responses to hGH for adipose tissue from different locations.

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THYROTROPIN (TSH) RESPONSE TO THYROTROPIN RELEASING HORMONE (TRH) IN CHILDREN & ADOLESCENTS WITH OBESITY.
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A number of abnormalities in hypothalamic pituitary functions have been reported in non-endocrine obesity. No reports are available on hypothalamic pituitary-thyroid status in children with obesity. TSH response to TRH was studied in 47 obese patients (Gr.A) (mean age 12.4±0.5 range 5.1-19.2 yrs; 25: 22) & compared with 24 short-normal controls (Gr.B) (mean age 12.3±0.6 range 5.2-17.5 yrs; 18: 6) Mean % overweight 64.8±6.1 range 11.3-226.0. TRH test was done with IV bolus 4ug/kg/BW (maximum 250 ug) of TRH after overnight fast of 10 hrs. There was no significant difference in basal levels of T4, T3, free T4 & TSH. 34.0% of Gr.A had augmented TSH response (Peak TSH > 20 uIU/ml). Mean TSH response was significantly higher in Gr.A vs Gr.B.

Gr	TSH u IU/ml mean ± S.E.							
	Basal	15	30	45	60	90	120	Peak
A	3.8	18.2	19.3	16.0	12.6	8.5	6.2	20.5
	±0.2	±1.1	±1.3	±1.1	±0.8	±0.5	±0.4	±0.4
B	3.0	12.6	14.3	11.9	10.1	7.3	5.6	14.4
	±0.3	±0.7	±0.8	±0.7	±0.6	±0.5	±0.4	±0.8
P	N.S.	< 0.001	< 0.005	< 0.005	< 0.02	N.S.	N.S.	< 0.001

The higher/augmented TSH response to TRH in obese children could be a evidence of hypothalamic pituitary dysfunction, of partial peripheral resistance to thyroid hormone, or of minimal thyroid insufficiency.

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IMPAIRED SOMATOMEDIN (SM) GENERATION TEST IN POORLY CONTROLLED INSULIN DEPENDENT DIABETES MELLITUS (IDDM). R. Lanes, B. Recker, P. Fort, F. Lifshitz. Department of Pediatrics, North Shore University Hospital, Manhasset, NY 11030, and Department of Pediatrics, Cornell University Medical College, New York, NY 10021.

Recent studies have suggested a partial block in SM production or growth hormone (GH) action in IDDM. Twelve diabetic children (9 males and 3 females with a mean age of 11.2 ± 3.3 years), six in good control (HbA_{1c} 7.9 - 11.2%) and six in poor control (HbA_{1c} 12 - 15.6%) were studied as follows: the GH response following 100 ug of oral clonidine and the SM generation capacity after i.m. administration of 0.2 u/kg/dose of hGH for 4 days. Poorly controlled diabetics had a significantly higher mean ± SD GH increase after clonidine than did well controlled patients (17.4 ± 4.9 vs 5.7 ± 6.0 ng/ml; p < 0.004); the basal GH of both groups were similar (1.6 ± 0.7 vs 2.3 ± 1.4 ng/ml). In contrast the SM response to hGH was significantly decreased in poorly controlled children as compared to well controlled (Δ of 0.3 ± 0.3 vs 1.2 ± 0.4 U/ml, p < 0.002). The basal SM levels of both groups were normal for age. GH and Δ SM correlated with HbA_{1c} levels (r = + 0.80, p < 0.01; r = -0.79, p < 0.01, respectively); there was no correlation with plasma and urine glucose or serum cholesterol, cortisol and transferin. Our data indicate a blunted SM response to hGH in poorly controlled diabetes; this defect in SM generation is apparently not present in well controlled IDDM. A biologically inactive GH molecule seems unlikely, but circulating inhibitory factors or a still unclear metabolic rearrangement may be contributing to this defect.