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Identifying critical periods for maintaining weight loss in obese children

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Background: Studies in adults have shown physiological protection of a 'set-point' for weight, explaining why obese adults who diet eventually regain weight.

Objective: We hypothesised that set-points for weight, and their physiological defence, are flexible in childhood but become fixed around puberty. We aimed to show that obese children who lost weight had less 'reflex' changes in satiety hormone profiles (that would drive weight regain), compared with adolescents who had experienced a similar degree of weight change.

Method: Prospective cohort study. 41 subjects; 21 obese pre-pubertal children (age 3–7 yrs; 11 male) and 20 obese adolescents (age 14–18 yrs; 10 male). Obesity defined as BMI >2.4 SDS. Subjects recruited as either 'reducers' (relative/absolute weight loss of ≧10% in the preceding 9–15 months) or 'maintainers' (controls).

Measures: Resting energy expenditure (REE), bioelectrical impedance, and fasting and post-prandial (every 30 min for 3 h) satiety hormone profiles.

Results: Post-pubertal adolescents had 31% lower Ghrelin concentrations (4–51%, P=0.03) and 50% higher Amylin concentrations than pre-pubertal children (18–91%, P=0.001). The association between Ghrelin, Amylin and GIP concentration and weight change was similar for both pre- and post-pubertal children (P=0.79, P=0.39, P=0.79 respectively). No associations were found for Peptide YY, Pancreatic Polypeptide, or active GLP1. Regarding satiety, post-pubertal reducers reported less hunger and higher satiety than pre-pubertal children (P<0.05). REE in pre-pubertal weight reducers and maintainers were similar (50 kcal lower, −143 to 242, P=0.6) but post-pubertal reducers had 250 kcal lower REE compared to post-pubertal maintainers (−68 to 572, P=0.1).

Conclusion: Satiety hormone profiles were similar between pre- and post-pubertal subjects, and contrast with adult data where weight reduction leads to sustained

increases in Ghrelin and reductions in the other hormones. These findings indicate that the physiological mechanisms which act to protect against weight change in adults develop later than in the adolescent years.