I. Symposium - Aspects of Paediatric Obesity

Body composition and body fat in children and adolescents

Louise A Baur
Dept Paediatrics & Child Health, C29, University of Sydney, NSW 2006

At birth, term infants have approximately 15% of their body mass as fat. The % fat mass increases during the first year, subsequently decreases and stabilises until puberty. Females have a higher proportion of body fat, even in early childhood, a difference which clearly becomes more pronounced during the pubertal growth spurt.

Measurement of fat mass in childhood using body composition techniques has several limitations. Many techniques may need to be specifically validated for use in small subjects while some are not appropriate for use in young children (eg radiation risk, or the need for fat subjects to lie still). Furthermore, most body composition techniques assume a constant density or chemical composition of the lean body mass (LBM = body mass - fat mass), an assumption that is not valid in children. The LBM at birth is relatively fluid overloaded, during growth the water content of the LBM decreases and its protein and mineral content (and density) increases until at least puberty. Therefore, use of age-and-sex-adjusted constants to determine LBM (and hence fat mass) is advised (Lehman, Exerc Sport Sci Rev, 1986).

Anthropometry provides a practical measure of adiposity, suitable for clinical use or population studies. Body mass index (BMI; weight/height^2) is highly correlated with % fat mass, even in childhood. BMI should be compared with reference population values, although actual cut-points for excess adiposity are arbitrary (Larsson et al, 1 Paediatric Child Health, 1995). There are practical difficulties in the measurement of skinfold thickness in obese, as distinct to lean, subjects. Skinfold-based prediction equations for determining % fat mass need to be restricted to the populations from which they were derived.

A validation study of the Ben-Tovim Walker body attitudes questionnaire in girls 12-16 years

SE Byrnes, C Burns and LA Baur
Department of Medicine (Endocrinology), University of Sydney, NSW, 2006, Australia

A methodological problem for research investigating body-related attitudes in children and adolescents is the use of adult tools that have only been previously validated in adult populations. The primary aim of the present study was to investigate the convergent validity of one psychometrically sound instrument of body attitudes, the Ben-Tovim Body Walker Attitudes Questionnaire (BAQ), in a sample of 12-16 year old females. This was achieved by examining the association between scores obtained on each BAQ subscale with scores obtained on two widely used and validated tools in adolescent research; the body Shape Questionnaires (BSQ) and the Eating Disorders Inventory Body Dissatisfaction Subscale (EDI-BD). Girls from Years 7 to 10 were recruited from three private schools (n = 206). Participants completed standard demographic questions and the BAQ, BSQ, and EDI-BD. Height and weight were measured to calculate Body Mass Index (BMI). Strong and significant positive correlations were observed with both the BSQ and EDI-BD for four BAQ subscales; feeling fat (r = 0.82; r = 0.76), body dissatisfaction (r = 0.65; r = 0.60), salience weight/shape (r = 0.72; r = 0.54), and lower body fat (r = 0.64; r = 0.60), all p<0.001. The attractiveness subscale showed significant negative relationships (r = -0.33; r = -0.40) and those for the Strength/Fitness subscale were not significant (r = -0.25; r = 0.31).

These results indicate that BAQ can be used in a young female group to assess attitudes towards feeling fat, body dissatisfaction, salience and lower body fat with a similar degree of validity to that observed in a female adult sample (Ben-Tovim and Walker, 1991). We then examined the interaction between the BAQ subscale scores and subjects age, ethnicity, social class and BMI category. BMI category was the only parameter to show a significant interaction. The strength of the correlation between the BAQ subscales and other variables was also observed for BSQ and EDI-BD scores, p<0.01. These results suggest the BAQ is a valid tool for assessing body-related attitudes of girls 12-16 years. The findings of this study therefore extend the research utility of the BAQ for use in young females (12-16 years).

Changing dietary and physical activity behaviour in children via home based programs

Rex Milligan, Claire Thompson, Valerie Burke, Lawrie Bellin, Andrew Taggart, Andrew Medland and Michelle Spencer
University Dept of Medicine RPH, Box X2123 GPO, Perth, WA 6001 Australia

This randomised controlled trial assessed the effectiveness and practicality of a school and home based health program aimed at long term improvements in dietary and physical activity habits. A physical activity intervention was also evaluated with the aim of identifying if children identified as at higher cardiovascular risk by body mass index, physical fitness, blood pressure and cholesterol variables. At the beginning of the 1993 school year, all children enrolled in Year 6 classes at 18 randomly chosen schools were invited to participate in the project. An 87.1% positive response provided a sample size of 804 children. Effectiveness of the school based program was tested both immediately post-intervention and after a further 26 weeks. Baseline results indicated that children spent 3 times more leisure time watching television than doing even moderate physical activity. About a
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We then examined the association between the BAQ subscale scores and subjects age, ethnicity, social class and BMI category. BMI category was the only parameter to show a significant association between responses and body weight, with lower body fat (r = 0.70) and lower BMI (r = 0.70), both of which were observed for BSQ and EDI-BD scores, p < 0.001. These results suggest the BAQ is a valid tool for assessing body-related attitudes of girls 12-16 years. The findings of this study therefore extend the research utility of the BAQ for use in young females (12-16 years).
II. Symptom - Body Fat and Composition Measurement

Techniques for measuring fat mass

Boyd JG Strauss

Body Composition Laboratory, Clinical Nutrition & Metabolism Unit, Monash Medical Centre, Clayton, Victoria, Australia

It is increasingly possible and necessary to be selective in the use of body compositional techniques to assess body fat. The table which follows is a basis for such selection.

<table>
<thead>
<tr>
<th>Technique</th>
<th>Component</th>
<th>Precision</th>
<th>Side-effects</th>
<th>Portability</th>
<th>Cost</th>
<th>Applicability</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>Total Body</td>
<td>±3%</td>
<td>None</td>
<td>Bedside</td>
<td>Cheap</td>
<td>Epidemiology</td>
<td>Universal</td>
</tr>
<tr>
<td>Skinfold</td>
<td>Total Body</td>
<td>6-20%</td>
<td>None</td>
<td>Bedside</td>
<td>Expensive</td>
<td>Classification</td>
<td>Universal</td>
</tr>
<tr>
<td>Waist Circ</td>
<td>Abdominal</td>
<td>±5%</td>
<td>None</td>
<td>Bedside</td>
<td>Expensive</td>
<td>Classification</td>
<td>Universal</td>
</tr>
<tr>
<td>AH Ratio</td>
<td>Abdominal</td>
<td>±5%</td>
<td>None</td>
<td>Bedside</td>
<td>Expensive</td>
<td>Classification</td>
<td>Universal</td>
</tr>
<tr>
<td>Sagittal Ht</td>
<td>Visceral</td>
<td>±5%</td>
<td>None</td>
<td>Bedside</td>
<td>Expensive</td>
<td>Classification</td>
<td>Universal</td>
</tr>
<tr>
<td>UWW</td>
<td>Total Body</td>
<td>±2%</td>
<td>Undermining</td>
<td>Laboratory</td>
<td>Moderate</td>
<td>Healthy Young</td>
<td>BU Sports Laboratories</td>
</tr>
<tr>
<td>DXA</td>
<td>Total Body Regional</td>
<td>±2.4%</td>
<td>Radiation 1min</td>
<td>Laboratory</td>
<td>Moderate</td>
<td>Obesity Wasting</td>
<td>Widely in W't 7</td>
</tr>
<tr>
<td>X-ray</td>
<td>Total Body</td>
<td>7-8%</td>
<td>None</td>
<td>Hospital</td>
<td>Moderate</td>
<td>Widespread</td>
<td>Laboratory</td>
</tr>
<tr>
<td>MRI</td>
<td>Total Body</td>
<td>±5%</td>
<td>Radiation 5min</td>
<td>Hospital</td>
<td>Moderate</td>
<td>Syndrome X</td>
<td>Disease Needs</td>
</tr>
<tr>
<td>MRI</td>
<td>Subcutaneous</td>
<td>±5%</td>
<td>Radiation 5min</td>
<td>Hospital</td>
<td>Moderate</td>
<td>Syndrome X</td>
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</tr>
<tr>
<td>IVNAA</td>
<td>Carbon</td>
<td>±3%</td>
<td>Radiation 20hr</td>
<td>Laboratory</td>
<td>Moderate</td>
<td>Obesity Wasting</td>
<td>Disorders Specalised in Laboratories</td>
</tr>
</tbody>
</table>

By Difference: Total Body | Various | Various | Various | Various | Various | Various | Various |

Difference Methods: Weight = Fat Mass + Lean Mass

BMI = (total body weight) / (total body length)^2

The table above illustrates the various methods and equipment used to measure body composition and body fat percentage.

III. Pathogenesis of obesity and its complications

Relation between skeletal muscle fibre type and adiposity in women

AD Kriketos, LA Baur, S King, JM Bryson, GJ Cooney, ID Caterson, DGP Carey, LV Campbell, AB Jenkins, DJ Chisholm, S Lillioja and LH Storlien

Department of Medicine (Endocrinology), University of Sydney, Sydney, NSW 2006 Australia

Recent evidence in both male rats and humans indicates that the relative proportions of the major skeletal muscle fibre types influence insulin sensitivity, energy storage capacity and obesity. In rats, the total body mass of Type 1 fibres was significantly lower in obese animals than in lean controls. Furthermore, in humans, the proportion of Type 2b fibres was significantly higher in obese subjects than in lean controls. These findings are consistent with the concept that Type 2b fibres are less sensitive to insulin than Type 1 fibres. In summary, obesity is associated with an increased proportion of Type 2b fibres and a reduced proportion of Type 1 (oxidative) fibres. The results suggest that Type 2b fibres may be more important in the development of obesity.
quarter of the sample were overweight, and a third were either unfit or had abnormally high blood cholesterol levels. 13% derived more than 40% of their dietary energy from fat. The exercise program produced substantial short-term improvements in fitness, which were partially eroded when measured 6 months later. Short-term reductions were also found in fat and salt intakes in children at schools with the enrichment program, despite only small improvements in health attitudes and health knowledge scores.

A program which combines home based activities with school activities was shown to produce short term changes in dietary intake and physical fitness. However, the short duration programs did not achieve long-term changes, and continuing programs which impact on the child's behaviour at home and school are needed.

II. SYMPOSIUM - BODY FAT AND COMPOSITION MEASUREMENT

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<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>Total Body</td>
<td>±1%</td>
<td>None</td>
<td>Bedside</td>
<td>Cheap</td>
<td>Epidemiology Classification</td>
<td>Universal</td>
</tr>
<tr>
<td>Skinfold</td>
<td>Total Body</td>
<td>6-20%</td>
<td>Undressing</td>
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</tr>
<tr>
<td>Wint Circ</td>
<td>Abdominal</td>
<td>±5%</td>
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<td>AH Ratio</td>
<td>Abdominal</td>
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<td>Moderate</td>
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<td></td>
</tr>
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<td>Total Body</td>
<td>7-8%</td>
<td>Laboratory</td>
<td>Hospital</td>
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<tr>
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<td>Subcutaneous</td>
<td>±5%</td>
<td>Radiation</td>
<td>Hospital Expensive</td>
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<td>Disease</td>
<td>Needs</td>
</tr>
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<td>MRI</td>
<td>Subcutaneous</td>
<td>±5%</td>
<td>Radiation</td>
<td>Hospital Expensive</td>
<td>Syndrome X</td>
<td>Disease</td>
<td>Needs</td>
</tr>
<tr>
<td>PNNAA</td>
<td>Carbon</td>
<td>±5%</td>
<td>Radiation</td>
<td>Laboratory</td>
<td>Moderate</td>
<td>Obesity</td>
<td>Widespread in 1st World Health Region</td>
</tr>
</tbody>
</table>

By Difference* | Total Body | Various | Various | Various | Various | Various | Various |

Note: Differences between Fat Mass (FM) and FFM is derived from: BIA (Bioelectrical Impedance Analysis) BMI (total body potassium) TBIW (total body water). Each method (direct and by difference) has different assumptions. Where regression of two techniques on another is used eg. Skinfold I/OA on UWW the conversion formulae are population/disease specific.

Abbreviations: BMI = body mass index (weight/height²) in kg/m²; AH Ratio = abdominal:hip ratio, as defined by the WHO Expert Commission on Anthropometry; Sagittal Ht = Sagittal height, measured as the maximum abdominal diameter at the umbilicus; UWW = under water weight to obtain bone density; DEXA = dual energy X-Ray absorptiometry; CT = computed tomography; MRI = magnetic resonance imaging; PNNAA = air polarized neutron activation analysis for total body nitrogen and other elements like chlorine.

III. PATHOGENESIS OF OBESITY AND ITS COMPLICATIONS

Relating between skeletal muscle fibre type and adiposity in women

AD Kriketos, LA Baur, S King, JM Bryson, GJ Cooney, ID Caterson, DGP Carey, LV Campbell, AB Jenkins, DJ Chisholm, S Lillioja and LH Storlien

Department of Medicine (Endocrinology), University of Sydney, Sydney, NSW 2006 Australia

Recent evidence in both male rats and humans indicates that the relative proportions of the major skeletal muscle fibre types influence insulin sensitivity and body fat accumulation positively, such that the proportion of Type 2b fibres is linked to development of insulin resistance and obesity. (JO 19 (supp 2): 32; 1995; J Clin Invest 80:415, 1987). The aim of the present study was to investigate the relationships between body mass index (BMI) and skeletal muscle fibre type distribution in non-diabetic adult women (27 Australians, 12 American Pima Indians). Skeletal muscle was obtained from peroneous biceps of the vastus lateralis, while histochemical staining of serial muscle sections was performed using the standard myosin ATPase method and muscle oxidative capacity determined by NADH staining. Increased BMI (mean = 32 ±1.3; range = 19.1-47.6) was associated with decreased oxidative capacity of muscle (r = -0.36, p = 0.03) and with decreased % of oxidative Type 1 fibres (r = 0.42, p = 0.02). The mean % of oxidative Type 2f fibres was correlated with the % of less oxidative Type 2b fibres (r = 0.56, p = 0.004). These relationships extend associations previously found between percentage body fat and muscle fibre type proportions in males (JO 19 (supp 3):211, 1995). The rates from previous studies and the females of this study fall on similar regression lines relating these variables. In summary, obesity is closely associated with an increased proportion of glycolytic Type 2b fibres and a reduced proportion of Type 1 (oxidative) fibres. The results suggest that fibre type profile and the oxidative capacity of skeletal muscle may be important in the development of obesity.
Effects of haemodialysis on oxidation of low density lipoproteins and lipid peroxides
Wayne HF Sutherland, Robert J Walker, Madeleine J Ball and Sylvia A Stapley
Department of Medicine, University of Otago, Dunedin and School of Nutrition and Public Health, Deakin University, Melbourne.

Patients with chronic renal failure have a substantially increased risk of death from cardiovascular disease compared with age-matched individuals from the general population. Furthermore, the risk of coronary heart disease (CHD) remains high in patients treated by haemodialysis. Thus, treatments to counteract uremia do not decrease and may even increase CHD risk. Factors responsible for the development of arteriothrombosis in chronic renal failure are not well-known.

Peroxidation of low density lipoproteins (LDL) may be involved in the development of arteriosclerosis which is prevalent in patients with chronic renal failure. We determined the acute effect of haemodialysis on copper ion catalysed oxidation of LDL in vitro, in 13 haemodialysis patients to observe whether the process of haemodialysis had an acute effect on LDL oxidation.

Levels of the LDL oxidation variables, including lag phase and maximum production of conjugated dienes, and the organic lipid peroxide content of LDL were not significantly different before and after haemodialysis and 24 hours later.

IV. Management of Obesity

Improved insulin sensitivity during the hypocaloric phase of VLED-induced weight loss is due to increased non-oxidative glycolysis
Janet Bryson, Sarah King, Kate Bums, Louise Baur, Loui Swajari and Ian Carter
Dept of Endocrinology, Royal Prince Alfred Hospital, Camperdown, NSW, 2050 Australia

Insulin resistance in obesity is associated with decreased whole body glucose disposal and reduced activities of key enzymes of glucose metabolism. The effects of a very low energy diet (VLED) on insulin sensitivity were investigated in 8 nondiabetic obese subjects (6M/2F; BMI: 39.7±1.5 kg/m2) both before and after a weight loss of 10.7±1 kg. Glucose oxidation was measured by indirect calorimetry during the euglycaemic hyperinsulinaemic clamp (40mU/min) and muscle biopsies were taken after the clamp for determination of pyruvate dehydrogenase (PDHCa) and glycogen synthase (GS) activities.

The lack of improvement in glucose oxidation or PDHCa is consistent with increased fatty acids being available for oxidation as indicated by the high circulating NEFA levels. The lack of an increase in GS activity (either active or total) suggests that the improvement in non-oxidative glucose disposal is due to increased non-oxidative glycolysis. Follow up studies are needed to see if further improvements in insulin sensitivity can be seen after completion of the VLED regime and placement on an isocaloric weight maintenance diet.

Fasting Serum Levels

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Pre VLED</th>
<th>Post VLED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulin (pm)</td>
<td>108±11</td>
<td>63.1±15</td>
</tr>
<tr>
<td>NEFA (mM)</td>
<td>0.6±0.06</td>
<td>1.10±0.20</td>
</tr>
<tr>
<td>Glucose disposal (mg/min/g body wt) (mg insulin)</td>
<td>3.4±1.42</td>
<td>5.9±1.77**</td>
</tr>
<tr>
<td>Oxidative</td>
<td>1.84±0.28</td>
<td>2.40±0.41</td>
</tr>
<tr>
<td>Non-oxidative</td>
<td>1.57±0.42</td>
<td>3.51±0.67*</td>
</tr>
<tr>
<td>Insulin-stimulated PDHCa activity (mU/g wet wt)</td>
<td>1.04±0.46</td>
<td>0.97±0.65</td>
</tr>
</tbody>
</table>

Effects of dexfenfluramine on nutrient oxidation and metabolic rate
Boyd A Swinburn, Heather E Carmichael
Department of Community Health, University of Auckland, New Zealand

Dexfenfluramine (DF) is thought to suppress appetite by a central mechanism of inhibiting neuropeptide y secretion. We tested whether DF may also have a peripheral effect on respiratory quotient (RQ) or resting metabolic rate (RMR), both of which could also influence fat balance.

Obese subjects were randomised to DF (n = 11, age = 49 ± 3 years, weight = 95.8 ± 2.6 kg, BMI = 32.8 ± 0.6) or placebo (n = 9, age = 45 ± 3 years, weight = 91.6 ± 4.2 kg, BMI = 32.5 ± 0.9). Acute response (3 h) to 30 mg stat orally and chronic response (3 months) to 15mg bd were assessed by indirect calorimetry. There were no acute effects on RQ or RMR. There were no chronic effects on RMR. RQ, however, decreased significantly (p<0.01) after 3 months in the DF group (0.904 ± 0.018 to 0.856 ± 0.011) compared to the placebo group (0.902 ± 0.012 to 0.910 ± 0.014). In a multiple regression model, this decrease remained significant (p<0.0001, p = 0.06) after adjustment for group differences in sex ratio, recent weight change, recent total energy intake, and recent nutrient intake mix. Similar results were found with non-protein RQ.

We conclude that DF may chronically alter the nutrient oxidation mix such that there is a greater proportion of fat oxidation. According to Flatt's model for nutrient balance, this would be the equivalent of a reduced fat intake and should promote weight loss. DF may have peripheral as well as central actions to promote fat loss.

The effects of a 6 month exercise programme on body weight and body composition in sedentary older women
Cox KL**, Puddey IB*, Morton AR**, Beilin LJ*, Burke V* and Prince RL*
Departments of Medicine* and Human Movement**, University of Western Australia, Perth, Australia

We have assessed in 126 healthy, but sedentary women aged 40-65 whether a moderate or vigorous exercise programme for 6 months can influence body mass or composition in the absence of formal caloric restriction.

Subjects were randomly assigned to either a centre-based exercise programme or a home-based programme 3 times a week for 6 months. They were further assigned to exercise at either moderate intensity (40-55% HRmax) or brisk intensity (65-80% HRmax). Thirty women were recruited from the electoral roll to provide a comparison group. Body mass, body composition (dual energy x-ray absorptiometry) were measured before and after intervention. Subjects were asked to make no changes to their usual dietary habits.

In conclusion, the absence of formal caloric restriction 6 months of moderate or vigorous intensity exercise does not significantly change body mass but can favourably influence body composition.

Prader-Willi Syndrome - obesity, behaviour problems, undermanaged, under known
G Loughnan, K Steinbeck, A Smith and I Caterson
Department of Endocrinology, Royal Prince Alfred Hospital, Sydney, New South Wales, Australia

Obesity management of adults with Prader-Willi Syndrome (PWS) is a major problem. With earlier diagnosis and intervention affected people have greater longevity than previously reported. This adult clinic has developed highly specialised care required by this group as they become too old for paediatric services. Over the last four years 20 patients (12F:8M; satisfying major diagnostic criteria have attended. Genetic testing showed deletions in 8 patients, uniparental disomy in 3 and undetermined nondisjunction in 1. The mean age is 24.0 ± 1.5 yr. The initial BMI was 38.9 ± 1.9 kg/m2. More than 50% of the patients have signs of obstructive sleep apnoea, 4 have diabetes, 4 are on hormone replacement therapy.

Eight have been reported to display increasingly severe temper tantrums. Long term care of these patients is a major management dilemma as rarely do they eating and psychological behaviours suit standard supervised or shared environments. As independent development obesity escalates. Restricted living conditions as well as regular exercise are the keys to successful management of adults with PWS.

Dexfenfluramine and an ad libitum, reduced-fat diet: effects on body composition, dietary intake and blood lipids
Heather E Carmichael and Boyd A Swinburn
Department of Community Health, University of Auckland, Auckland, New Zealand

Dexfenfluramine (DF) is an anorectic drug which enhances weight loss while on traditional low calorie diets. We tested DF in the context of an ad libitum, reduced-fat (ALRF) diet to determine its effect on dietary fat intake, body composition and other measures.

During a 3 month run-in period on ALRF diet alone, there were significant reductions (p = 0.0001) in body weight (-2.9 kg), total energy intake (-372 kJ), fat intake (-506 g) and protein intake (-12.9 g) as well as percent caloric from fat, carbohydrate and protein and blood lipids and blood pressure.

Additional treatment for 3 months with DF caused significant decreases in total body weight (-4.1 kg), fat mass (-2.9 kg), lean body mass (-1.1 kg) and percent body fat (-1.7%), total energy intake (-98 kJ), serum cholesterol (-0.25 mM) and triglycerides (-0.35 mM). Dietary fat intake was maintained at the low level (44g daily) achieved during the run-in period. In contrast, the only changes in the placebo group were nonsignificant trends towards increasing dietary fat intake, and consequently, total energy intake.

These results suggest that DF augments weight loss while on an ALRF diet and may also have beneficial effects on body composition and blood lipids in patients. It is probably that DF allows continued adherence to a low fat diet by reducing the intake of higher fat foods.
Effects of haemodialysis on oxidation of low density lipoproteins and lipid peroxides
Wayne HF Sutherland, Robert J Walker, Madeleine J Ball and Sylvia A Stapley
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Levels of the LDL oxidation variables, including lag phase and maximum production of conjugated dienes, and the organic lipid peroxide content of LDL were not significantly different before and after haemodialysis and 24 hours later.

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Janet Bryson, Sarah King, Kate Bums, Louise Baur, Louise Swaraj and Ian Caterson
Dept of Endocrinology, Royal Prince Alfred Hospital, Camperdown, NSW, 2050 Australia

Insulin resistance in obesity is associated with decreased whole body glucose disposal and reduced activities of key enzymes of glucose metabolism. The effects of a very low energy diet (VLED) on insulin sensitivity were investigated in 8 nonobese diabetic obese subjects (6M/2F; BMI: 39.7 ± 1.5) both before and after a weight loss of 10.7 ± 1%. Glucose oxidation was measured by indirect calorimetry during the euglycaemic hyperinsulinaemic clamp (40uU/min) and muscle biopsies were taken after the clamp for determination of pyruvate dehydrogenase (PDHc) and glycerol synthesis (GS) activities.

The lack of improvement in glucose oxidation or PDHc is consistent with increased fatty acids being available for oxidation as indicated by the high circulating NEFA levels. The lack of an increase in GS activity (either active or total) suggests that the improvement in non-oxidative glucose disposal is due to increased non-oxidative glycolysis. Follow up studies are needed to see if further improvements in insulin sensitivity can be seen after completion of the VLED regimen and placement on an isocaloric weight maintenance diet.

FAasting Serum Levels

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Pre VLED</th>
<th>post VLED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulin (mU/ml)</td>
<td>108 ± 11</td>
<td>63 ± 15*</td>
</tr>
<tr>
<td>NEFA’s (mM)</td>
<td>0.6 ± 0.06</td>
<td>1.10 ± 0.20*</td>
</tr>
<tr>
<td>Glucose disposal (mg/min/g body wt/mg insulin)</td>
<td>3.41 ± 0.72</td>
<td>5.91 ± 0.77**</td>
</tr>
<tr>
<td>Oxidative</td>
<td>1.84 ± 0.28</td>
<td>2.40 ± 0.41</td>
</tr>
<tr>
<td>Non-oxidative</td>
<td>1.57 ± 0.42</td>
<td>3.51 ± 0.67*</td>
</tr>
<tr>
<td>Insulin-stimulated PDHC activity (mU/g wet wt)</td>
<td>100 ± 4.6</td>
<td>100 ± 4.6</td>
</tr>
<tr>
<td>Active</td>
<td>2.63 ± 0.49</td>
<td>1.98 ± 0.24</td>
</tr>
<tr>
<td>Total</td>
<td>4.46 ± 0.65</td>
<td>3.78 ± 0.65</td>
</tr>
</tbody>
</table>

Effects of dexfenfluramine on nutrient oxidation and metabolic rate
Boyd A Swinburn, Heather E Carmichael
Department of Community Health, University of Auckland, New Zealand

Dexfenfluramine (DF) is thought to suppress appetite by a central mechanism of inhibiting neuropeptide Y release. We tested whether DF also had a peripheral effect on energy expenditure (RQ) or resting metabolic rate (RMR), both of which could also influence fat balance.

Obese subjects were randomised to DF (n = 11, age = 49 ± 3 years, weight = 95.8 ± 2.6 kg, BMI = 32.8 ± 0.6) or placebo (n = 9, age = 45 ± 3 years, weight = 91.6 ± 4.2 kg, BMI = 32.3 ± 0.9). Acute response (3 hr) to 30 mg stat orally and chronic response (3 months) to 15mg bd were assessed by indirect calorimetry.

There were no acute effects on RQ or RMR. There were no chronic effects on RMR. RQ, however, decreased significantly (p<0.01) after 3 months in the DF group (0.904 ± 0.018 to 0.856 ± 0.011) compared to the placebo group (0.902 ± 0.012 to 0.910 ± 0.014). In a multiple regression model, this decrease remained significant (p<0.0001, p = 0.06) after adjustment for group differences in sex ratio, recent weight change, recent total energy intake, and recent nutrient intake mix. Similar results were found with non-protein RQ.

We conclude that DF may chronically alter the nutrient oxidation mix such that there is a greater proportion of fat oxidation. According to Flint’s model for nutrient balance, this would be the equivalent of a reduced fat intake and should promote weight loss. DF may have peripheral as well as central actions to promote fat loss.

The effects of a 6 month exercise programme on body weight and body composition in sedentary older women
Cox KL**, Puddney IB*, Morton AR**, Beilin LJ*, Burke V* and Prince RL*
Departments of Medicine* and Human Movement**, University of Western Australia, Perth, Australia

We have assessed in 126 healthy, but sedentary women aged 40-65 whether a vigorous or moderate exercise programme for 6 months can influence body mass or composition in the absence of formal caloric restriction.

Subjects were randomly assigned to either a centre-based exercise programme or a home-based programme 3 times a week for 6 months. They were further assigned to exercise at either moderate intensity (40-55% HRmax) or brisk intensity (65-80% HRmax). Thirty women were recruited from the electoral roll to provide a comparison group. Body mass, body composition (dual energy x-ray absorptiometry) were measured before and after intervention. Subjects were asked to make no changes to their usual dietary habits.

The exercise groups had a significant improvement in fitness assessed from maximum oxygen consumption compared to the control group (P<0.05). There was no change in body mass. Fat mass decreased and lean mass increased significantly in the exercise versus the comparison groups (P<0.05). These changes were seen predominantly in decreases in trunk fat and increases in trunk lean mass.

In conclusion, in the absence of formal caloric restriction 6 months of moderate or vigorous intensity exercise does not significantly change body mass but can favourably influence body composition.

Prader-Willi Syndrome - obesity, behaviour problems, undermanaged, under known
G Loughnan, K Steinbeck, A Smith and I Caterson
Department of Endocrinology, Royal Prince Alfred Hospital, Sydney, New South Wales, Australia

Obesity management of adults with Prader-Willi Syndrome (PWM) is a major problem. With earlier diagnosis and intervention affected people have greater longevity than previously reported. This adult clinic has been developed to develop highly specialised care required by this group as they become too old for paediatric services. Over the last four years 20 patients (12F:8M) satisfying major diagnostic criteria have attended. Genetic testing showed deletions in 8 patients, uniparental disomy in 3 and unexplained nondisomy in 1. The mean age is 24 ± 1.5 yr. The initial BMI was 38.9 ± 1.9 kg/m². More than 50% of the patients have signs of obstructive sleep apnoea, 4 have diabetes, 4 are on hormone replacement therapy.

Eight patients have been reported to display increasingly severe temper tantrums. Long term care of these patients is a major management dilemma as rarely do their eating and psychological behaviours suit standard supervised or shared environments. As independence develops obesity escalates. Restricted living conditions as well as regular exercise are the keys to successful management of adults with PWM.

Within our community there exists a great need for further education of professionals and carers as well as family support for those associated with results with this most difficult syndrome.

(Results - meansSEM)

Dexfenfluramine and an ad libitum, reduced-fat diet: effects on body composition, dietary intake and blood lipids
Heather E Carmichael and Boyd A Swinburn
Department of Community Health, University of Auckland, Auckland, New Zealand

Dexfenfluramine (DF) is an anorectic drug which enhances weight loss while on traditional low calorie diets. We tested DF in the context of an ad libitum, reduced-fat (ALRF) diet to determine its effect on dietary fat intake, body composition and other measures.

During a 3 month run-in period on ALRF diet alone, there were significant reductions (p<0.0001) in body weight (-2.9kg), total energy intake (-372 kcal), fat intake (-50.6g) and protein intake (-12.5g) as well as percent calories from fat, carbohydrate and protein and blood lipids and blood pressure.

Additional treatment for 3 months with DF caused significant decreases in total body weight (-4.1 kg), fat mass (-2.9 kg), lean body mass (-1.1 kg) and percent body fat (-1.7%), total energy intake (-98 kcal), serum cholesterol (-0.25 mM) and triglycerides (-0.35 mM). Dietary fat intake was maintained at the low level (44g daily) achieved during the run-in period. In contrast, the only changes in the placebo group were nonsignificant trends towards increasing dietary fat intake, and consequently, total energy intake.

These results suggest that DF augments weight loss while on an ALRF diet and may also have beneficial effects on body composition and blood lipids in patients. It is probable that DF allows continued adherence to a low fat diet by reducing the intake of higher fat foods.
Non-sustained weight loss and metabolic improvement following a VLED regimen
Sarah E King, Janet M Bryson, Catherine M Burns, Louise A Baur, Soji Swaraj and Ian D Caterson
Dept of Endocrinology, Royal Prince Alfred Hospital, Camperdown, NSW 2050 Australia

Obesity, in particular central obesity, is a complex clinical disorder commonly associated with hypertension, hyperinsulinaemia, dyslipidaemia and increased risk of cardiovascular disease. The effects of a Very Low Energy Diet (VLED)-induced weight loss on these obesity-linked abnormalities was investigated.

Eleven non-diabetic clinically obese subjects (7M, 4W) followed a VLED for 12 weeks or until body weight was decreased by 10-15%. Basal metabolic rate (BMR), sagittal depth (SD), blood pressure (BP), lipid profiles and fasting insulin were assessed before and immediately after the diet regimen and where possible 9-12 months after completion of the VLED. There was no contact with the subjects during this period.

Some of the significant improvements seen post-VLED were significantly different to pre-VLED levels at follow-up. The degree of change in the metabolic parameters was related to the amount of weight regain. VLEDs are efficient at producing rapid weight loss and improvements in risk factors associated with obesity. However, subsequent weight gain, accompanied by loss of these benefits, suggests ongoing counselling could be important for weight maintenance.

<table>
<thead>
<tr>
<th>Pre</th>
<th>Post</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>n=11</td>
<td>n=11</td>
<td>n=5-7</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>118.0±4.3</td>
<td>103.5±4.3</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>40.6±1.4</td>
<td>36.2±1.4*</td>
</tr>
<tr>
<td>SD (cm)</td>
<td>27.5±2.4</td>
<td>23.1±2.5*</td>
</tr>
<tr>
<td>BMRR (cal/day)</td>
<td>1896±83</td>
<td>1772±106</td>
</tr>
<tr>
<td>Tchol (mmol/L)</td>
<td>5.40±0.26</td>
<td>4.9±0.31**</td>
</tr>
<tr>
<td>LDL-C</td>
<td>3.00±0.29</td>
<td>2.52±0.32**</td>
</tr>
<tr>
<td>HDL-C</td>
<td>1.02±0.07</td>
<td>1.06±0.06</td>
</tr>
<tr>
<td>TG</td>
<td>1.80±0.11</td>
<td>1.10±0.08***</td>
</tr>
<tr>
<td>Insulin (mU/mL)</td>
<td>11.2±4</td>
<td>7.6±14*</td>
</tr>
</tbody>
</table>

*p<0.05, **p<0.01, ***p<0.001 compared to pre VLED values

V. Food labelling

Labelling and the review of the food standards code
David R Briggs
Food Standards Review Group, National Food Authority, Barton, ACT 2600 Australia

Food sold in Australia must comply with standards that are contained in the Food Standards Code. The Code contains standards for the labelling and date marking of food, the use of additives, limits on contaminants and specifications for the identity composition and analysis of certain foods. The National Food Authority, an independent statutory body established in 1991, is responsible for developing food standards in Australia. Many of the standards in the Code were developed under earlier regulatory systems and are inconsistent with the Authority’s current objectives and policies. To promote consistency and reflect its objectives and policies in all standards, the Authority is currently undertaking a review of the Code, including the requirements for food labelling.

To make a prudent selection from the wide range of foods that is generally available, it is important that consumers are able to identify foods which, as part of an overall diet, provide the necessary balance between nutrient and energy intake essential to good health. Careful consideration needs to be given to what information should be required on food labels and how it is to be presented so that consumers can make this choice. A review of the current labelling provisions of nutritional significance and some possible new directions will be presented. Labelling requirements of nutritional significance to be discussed include the use and limitations of the nutrition information panel, the specific requirements for low joule and carbohydrate modified foods and the prohibition of certain claims. The use of the newly introduced code of practice on nutrient claims in food in providing consumers with consistent and meaningful information about claims using terms such as high, low, reduced, lite, diet, etc. will be described.

Plenary Lectures

The imperative of gold standard methodology as a basis for ethnic comparisons of body composition
Boyd JG Strauss
Body Composition Laboratory, Clinical Nutrition and Metabolism Unit, Monash Medical Centre, Clayton, Melbourne, Victoria, Australia

Gold standards in body composition

Since the landmark concepts of Wang et al, in which different models of body composition have been given a strong biological and structural basis, what can be measured, and what we should strive to measure have become much clearer. The molecular, cellular and tissue/organ compartments all have strong clinical and health implications, for which many different techniques of body composition measurement are available.

At the molecular level, total body protein is measurable by neutron activation, total body water by dilution techniques, and something approaching triglyceride fat is assessed by DEXA.

At the cellular level, ECF is also measurable by dilution techniques, and the cell mass is approximated by gamma counting. The structural materials of the skeleton are also measured by DEXA.

At the organ level, exciting advances in CT and MRI techniques have enabled organ volumes, particularly of visceral fat, to be measured.

However, a gold standard technique involves more concepts than a more capacity to measure a particular component of a particular compartment. Issues arise of cost, portability, side-effects, applicability, and availability. The assumptions associated with each technique need to be clearly understood, and, not least, the role which these assumptions play in each human group or individuals who are measured.

Race, ethnicity and body composition

"Race" is characterized by a handful of phenotypical features, of which body composition is but one group, but genetic techniques have undermined the scientific validity of this categorisation. In general, phenotypic differences between classic groups are only slightly greater than those which exist between nations, and both of these are small compared to the genetic differences within a local population.

Biological and genetic factors do not underlie ethnicity or culture, and it is common to produce biological explanations when the variable is politically or socially determined.

Recently, Senior and Bhopal have recommended that we should recognise that all current methods of classifying ethnic groups are limited, and that reports should state explicitly how such classifications are made. The potential for individual investigators to impose their personal values and ethnocentrism should be recognised. In considering differences in body composition between groups, consideration should be given equally and simultaneously to socio-economic, cultural or genetic factors.

References