**Introduction**

- Morbid childhood obesity predisposes to metabolic disorders such as diabetes type 2.
- Two distinct types of Adipose Tissue are present (Figure 1):
  - White Adipose Tissue (WAT, unilocular, energy storage adipocytes)
  - Brown Adipose Tissue (BAT, multilocular, heat producing) identified as:
    - Classic BAT (my5 progenitors)
    - Brown-like multilocular adipocytes interspersed in WAT ("BRITE" or beige)

**Methods & Materials**

- Paraffin embedded subcutaneous abdominal adipose tissue microarrays were developed from surgical biopsies of 33 lean (BMI<85%) & 29 obese (BMI≥95%) pre-pubertal children and adolescents.
- The children were divided into three age groups:
  - Group A: 2 mos -7 yrs
  - Group B: 8-12 yrs
  - Group C: 10-15 yrs
- Staining (brown) intensity and distribution of UCP1 (triple immunostaining) were studied with immunohistochemistry.
- Mean adipocyte size and total number were estimated by image analysis (adiposoft).

**Results**

- UCP1 was expressed in the mitochondria of morphologically white adipocytes in all groups without typical beige multilocular lipid droplet morphology. (Figure 3)
- The lean and obese prepubertal children (A to C) expressed UCP1 with a higher distribution (≥50% of tissue) compared to the lean and obese adolescents (A & B) (p=0.01).
- UCP1 intensity was high in:
  - (a) 100% of Group A lean
  - (b) 50% of Group A obese
  - (c) 67% of Group B lean and 54% of obese adolescents, (p=0.022).

**Conclusions**

- The expression of UCP1 in typical white adipocytes in the children and adolescents may reflect a transitional stage of browning recently observed in young sheep studies.
- UCP1 expression during childhood may contribute towards increased metabolic rate and decreased adipocyte size in an attempt to protect against the development of metabolic disorders.
- The decreased distribution of UCP1 positive adipocytes in the adolescents may reflect the loss of browning with age and puberty that may impair further the metabolism of obese adolescents.

**References**