**Topic: Hypertension**

# Alteration in Glucose Metabolism and Adipose Tissue Induced by Zinc Restriction and High Fat Diet during Growth

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**Introduction**: Metabolic diseases as obesity and diabetes lead to an increase in cardiovascular risk, morbidity and mortality. Zinc is an essential micronutrient for carbohydrates and lipids metabolism. In previous studies, we have demonstrated that zinc deficiency induces cardiovascular and renal alterations associated with an increase in blood pressure.

**Objective:** To evaluate in adult male rats if prenatal and postnatal zinc restriction aggravates the effects of a high-fat diet (HF) during post-weaning growth in systolic blood pressure (SBP), morphology and oxidative stress of retroperitoneal adipose tissue (RPAT) and glucose metabolism.

**Methods**: Female Wistar rats received control (C, 30ppm) or low-zinc diet (L, 8ppm) during pregnancy and lactation. At weaning (day 21) C pups were fed C (Cc) or C-HF diet (CcHF). L offspring received L (Ll) or L-HF diet (LlHF). 60% of total calories of HF hypercaloric diets correspond to fat. Oral glucose tolerance test (OGTT) was performed at day 74 (area under curve (AUC)). On day 81 SBP was evaluated, then rats were sacrificed to evaluate RPAT weight, morphology and oxidative stress (lipid peroxidation (TBARS), Catalase (CAT), superoxide dismutase activity (SOD)).

**Results**: Table. Two way ANOVA, test Bonferroni (n=6/group *p<0.01 vs Cc, †p<0.01 vs Ll, ‡p<0.01 vs CcHF) Zinc restriction induced RPAT adipocyte hypertrophy accompanied by an increase in lipid peroxidation. HF diet administration resulted in an increase in adipocyte size and a reduced cell density in RPAT of CcHF and LlHF. In addition, HF rats showed a reduced SOD activity that would affect RPAT redox state.

Morphological and oxidative stress alterations observed in RPAT would affect carbohydrates metabolism.

**Conclusions:** Both HF and L diets contributed to a glucose intolerance state, considering the higher glycaemia at 180min of Ll and the increase in AUC in CcHF and LlHF. Moreover, HF only increased RPAT weight in zinc-deficient rats. Zinc restriction and HF diet induce changes in RPAT that would lead to a reduced glucose tolerance, contributing to metabolic and cardiovascular diseases development.

**Keywords**: glucose metabolism, adipose tissue, Zinc restriction, high fat diet, redox state

Table

| | **Cc** | **CcHF** | **Bb** | **BbHF** |
|---|---|---|---|---|
| SBP(mmHg) | 125±1 | 129±5 | 136±1* | 131±2 |
| RPAT(g/100g bw) | 1,9±0,3 | 2,3±0,2 | 1,5±0,2 | 2,9±0,2† |
| RPA area (µm2) | 5407±431 | 10678±589* | 8640±389* | 11635±509*† |
| Cell density (RPA/field) | 24±1 | 11, 2±0,4* | 13,6±0,4* | 11,9±0,4*† |
| TBARS (pmol MDA/mg prot.) | 0.20±0.03 | 0.30±0.04 | 0.43±0.07* | 0.38±0.08 |
| SOD (USOD/mg prot.) | 2.0±0.3 | 1.1±0.1* | 2.1±0.2 | 1.3±0.2† |
| CAT (pmol/s.mg prot.) | 0.76±0.11 | 0.64±0.04 | 0.80±0.06 | 0.66±0.06 |
| AUC (min.mg/dL) | 797±504 | 30827±971* | 27826±809 | 34851±1344†‡ |
| Bood glucose 3 hs (mg/dl) | 132±5 | 150±4* | 149±4* | 165±7* |