CEREBRAL OXYGENATION/PERFUSION AND CARDIAC HEMODYNAMIC DURING AND AFTER A MAXIMAL INCREMENATL EXERCISE IN OBESE SUBJECTS.

Lapierre Gabriel (B.Sc) 1,2,8, Olivier Dupuy (Ph.D) 5-7, Anil Nigam (M.D) 1-3, Sarah Fraser (Ph.D) 9, Louis Bherer (Ph.D) 5, Véronique Labelle (Ph.D) 6, Martin Juneau (M.D) 1-3, Vincent Gremeaux (MD, Ph.D) 4, Mathieu Gayda (Ph.D) 1-3

Introduction. A high aerobic fitness is related to a better cerebrovascular reserve, cerebral oxygenation-perfusion (COP) and cognitive function in healthy subjects. This relation has not been studied in obese subjects. The aim of this study was to compare COP during and after maximal incremental exercise in obese subjects (OBS) vs. age-matched healthy controls (AMHC) according to their aerobic fitness level.

Methods. Forty four middle-aged OBS and 16 AMHC were recruited. OBS were split according to the median VO₂peak into 2 groups: the obese-low fit (OB-LF, n=22) and the obese high-fit (OB-HF, n=22). VO₂peak (gas exchange), central hemodynamic (bio-impedancemetry) and COP (near-infrared spectroscopy; NIRS) were measured during and after a maximal incremental exercise. Cerebral oxygenation was measured by the oxyhaemoglobin (Δ[HbO₂]) and cerebral perfusion by the total haemoglobin (Δ[HbTot]). Central hemodynamic (cardiac index; CI: l/min/m²), arterio venous difference (C(a-v)O₂: ml O₂/100 ml blood), end diastolic and end systolic volume index (EDVi and ESVi: in ml/m²) were also measured.

Results. During exercise, Δ[HbO₂]) and Δ[HbTot] were similar between the three groups (AMHC, OB-HF, OB-HF), except at 75 % of exercise intensity, where OB-HF had higher Δ[HbO₂] and Δ[HbTot] vs. AMHC. During recovery, Δ[HbO₂] and Δ[HbTot] were similar between OB-HF and AMHC. From the 3rd min of recovery, OB-LF, had lower Δ[HbO₂] and Δ[HbTot] (p< 0,05) vs. AMHC. At peak exercise, OB-LF had higher EDVi, ESVi and a lower C(a-v)O₂ vs. AMCH and OB-HF. At peak exercise, CI was similar between three groups (AMHC, OB-LF and OB-HF). No correlation was found between COP and CI.

Conclusion. higher COP in OB-HF vs. AMHC would be explain by the fact that one of the first physiological adaptations to occur with obesity is a greater increase in blood volume. However, results at recovery, suggest that after a sustained and progressive vascular stress, the cerebrovascular vasodilation endothelial dependant is impaired only in OB-LF, as supported by evidence showing a cerebral hypopurification induced by obesity. In perspective, future studies are required to document the optimal aerobic exercise intensity and duration, that would optimally improve VO₂ peak.

Acknowledgements
This study was funded by the Montreal Heart Institute Foundation and the ÉPIC Centre Foundation.