

WAT to BAT transdifferentiation of omental fat in adult humans affected by pheochromocytomas

Andrea Frontini, Alessandra Vitali, Jessica Perugini, Incoronata Murano, Chiara Romiti, Mario Guerrieri and Saverio Cinti

Department of Experimental and Clinical Medicine, University of Ancona (Politecnica delle Marche) Ancona, 60020, Italy

In small mammals and to some extent also in humans, White Adipose Tissue (WAT) and Brown Adipose Tissue (BAT) are contained together in discrete locations at subcutaneous or visceral level forming a multi-depots organ [1]. We have recently described paucilocular cells immunoreactive for uncoupling protein 1 (UCP1-ir) as morphological marker of WAT-BAT transformation in the adipose organ of cold-exposed mice (hyper-adrenergic stimulation) [2].

In this study, we examined biopsies of omental WAT depot, in 20 controls and in 12 patients affected by pheochromocytomas used as model of adrenergic stimulation in humans. Histological examination was performed by light microscopy, immunohistochemistry and Electron Microscopy. qPCR was carried out to assess relative expression of "brown" genes.

Control tissues were all formed by unilocular UCP1-negative adipocytes. Half of the omental fat samples from pheochromocytomas showed UCP1-ir multilocular cells forming BAT-islands among WAT. Several UCP1-ir paucilocular cells were also detected. Higher density of TH-ir fibres and capillaries were found in the transformed tissues. Ultrastructural examination, highlighted poorly differentiated cells in pericapillary position with features similar to those identified in supraclavicular human BAT [3].

In light of the protective role exerted by BAT against the development of obesity and other metabolic diseases, WAT to BAT plasticity could be an important target for the development of therapeutic strategies in the treatment of obesity and type II diabetes in humans.

References

- [1] Frontini A, Cinti S (2010) Distribution and development of brown adipocytes in the murine and human adipose organ. *Cell Metabolism* 7: 253-6.
- [2] Barbatelli et al. (2010) The emergence of cold-induced brown adipocytes in mouse white fat depots is determined predominantly by white to brown adipocyte. *Am J Physiol Endocrinol Metab* 298: E1244-53.
- [3] Zingaretti et al. (2009) The presence of UCP1 demonstrates that metabolically active adipose tissue in the neck of adult humans truly represents brown adipose tissue. *Faseb J* 23: 3113-20.

Key words

Human, White adipose tissue, Brown adipose tissue, remodelling, light and electron microscopy, immunohistochemistry.