Abstract:

Large fat cell size is linked to type 2 diabetes risk and may involve an enhanced rate of adipocyte lipolysis causing elevated levels of fatty acids. Our objective was to study the role of fat cell size in the regulation of lipolysis within a subject. Subcutaneous adipose tissue was obtained from 16 healthy subjects. Large and small adipocytes were isolated for each sample. Hormonal regulation of lipolysis and expression of lipolysis-regulating proteins were investigated. No effect of cell size on the rate of lipolysis was observed when lipolysis was expressed per lipid weight of fat cells. However, when expressed per number of fat cells, the lipolysis was significantly higher in large as compared with small adipocytes. This was observed in both the unstimulated (basal) state and in the presence of the major lipolysis-regulating hormones such as catecholamines (stimulating), natriuretic peptides (stimulating), and insulin (inhibiting). The receptor properties (number, affinity, and coupling) for these hormones did not differ between large and small adipocytes. However, the expression of proteins regulating the final steps in hormone signaling to lipolysis (hormone-sensitive lipase, adipose triglyceride lipase, and perilipin) was increased in large adipocytes. Independently of the donor, sc fat cell size per se determines lipolysis rates. Large adipocytes have increased lipolytic capacity, probably due to the
enrichment of regulatory proteins distal in the lipolytic cascade, to which all lipolytic signals converge (lipases and perilipin). Enhanced lipolytic capacity may link adipocyte hypertrophy to the risk of developing type 2 diabetes.