The influence of preadipocyte differentiation capacity on lipolysis in human mature adipocytes.

Abstract:
The ability of catecholamines to maximally stimulate adipocyte lipolysis (lipolytic capacity) is decreased in obesity. It is not known whether the lipolytic capacity is determined by the ability of adipocytes to differentiate. The aim of the study was to investigate if lipolytic capacity is related to preadipocyte differentiation and if the latter can predict lipolysis in mature adipocytes. IN VITRO experiments were performed on differentiating preadipocytes and isolated mature adipocytes from human subcutaneous adipose tissue. In preadipocytes, noradrenaline-induced lipolysis increased significantly until terminal differentiation (day 12). However, changes in the expression of genes involved in lipolysis (hormone sensitive lipase, adipocyte triglyceride lipase, the alpha2-and beta1-adrenoceptors, perilipin, and fatty acid binding protein) reached a plateau much earlier during differentiation (day 8). A significant positive correlation between lipolysis in differentiated preadipocytes and mature adipocytes was observed for noradrenaline ($r=0.5$, $p<0.01$). The late differentiation capacity of preadipocytes measured as glycerol-3-phosphate dehydrogenase activity was positively correlated with noradrenaline-induced lipolysis in preadipocytes ($r=0.51$, $p<0.005$) and mature fat cells ($r=0.35$, $p<0.05$). In conclusion, intrinsic properties related to terminal differentiation determine the ability of catecholamines to
maximally stimulate lipolysis in fat cells. The inability to undergo full differentiation might in part explain the low lipolytic capacity of fat cells among the obese.