SHRINKAGE OF ADIPOCYTES AS A POSSIBLE BIOLOGICAL CAUSE FOR WEIGHT REGAIN AFTER WEIGHT LOSS IN OVERWEIGHT/OBESE SUBJECTS

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Adipocytes store energy but also regulate total body energy metabolism by the secretion of adipokines [1, 2]. Preadipocyte differentiation is characterized by an enormous increase in cell volume due to the growing fat droplet. In parallel, the adipokine profile changes and a basal lamina develops as a protective shield [3] and important survival factor [4].

In the obese, adipocytes display hypertrophy linked to a further modification of the adipokine profile, which is possibly involved in type II diabetes and cardiovascular disorders. Several factors may self-limit adipocyte expansion. Overgrowth leads to intracellular hypoxia. Since oxygen is crucial for the modification of collagens, hypoxia may block the growth of the basal lamina. Further, since insulin is the key promoter of collagen maturation [5], insulin resistance may assist in blocking cell expansion. Thirdly, variation of metabolic response may prevent cell growth. In preadipocytes PPARγ stimulates fat storage, but in mature adipocytes it may induce beta-oxidation [6].

Losing 5% of the body weight reduces the risk for complications of overweight/obesity. This 10–15% reduction in adipocyte volume leads to normalization of the adipokine profile. Yet, going from feeding to starvation, molecular pathways do not absolutely revert [7]. Surprisingly, not the fatty acid but the glucose metabolism seems to be the gatekeeper of volume reduction [8].

After weight loss on a low-calorie diet 50% of subjects regain their weight within 1–2 years. Calorie restriction may hamper reconstructing the basal lamina to accommodate the shrinking adipocyte. This mechanical stress may result in an aberrant adipokine profile, including decreased leptin, which influences the eating behavior of the host to drive the refilling of adipocytes [9]. Prevention of weight (re)gain may follow from [1] fixing adipocytes at relatively low volume and blocking adipocyte (over)growth as by the use of resveratrol [10] and from [2] preventing cellular stress during weight loss.

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