BROWN ADIPOS TISSUE: ANTI-OBESITY POTENTIAL

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1. ABSTRACT

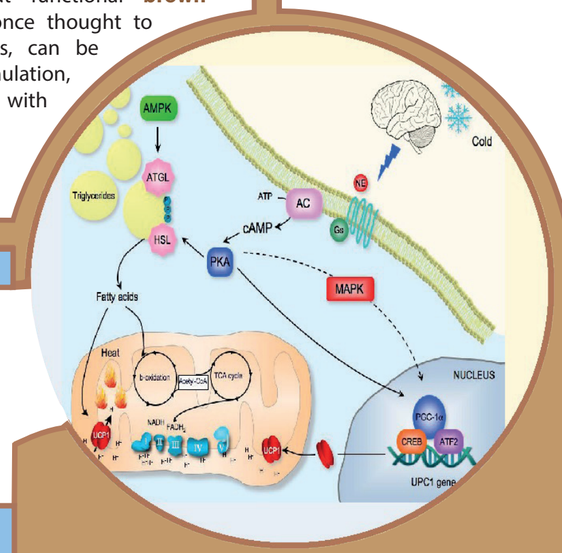
Obesity is considered a **worldwide health concern.** Most of obesity therapies are aimed at decreasing energy intake. However, recent data suggest that i**ncreasing cellular energy expenditure** could be a useful approach to reduce adiposity. **Adaptive thermogenesis**, a biological process within the brown fat by which energy is dissipated in mitochondria, is a great tool to increase energy expenditure.

Several studies have confirmed the presence of **brown adipose tissue in adult** humans.

In fact, either repeated cold exposure or daily ingestion of some food ingredients acting on transient receptor potential channels recruits BAT in parallel with increased energy expediture and decreased body fat.

2. OBESITY

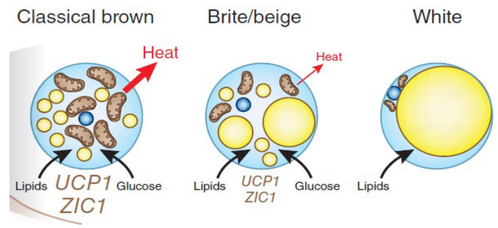
The contemporary pandemics of obesity and diabetes are devastating in size. Therapeutic strategies intended to normalize body weight and decrease adipose tissue mass must undoubtedly aim for a reduction of excessive calorie intake or an increase in energy expenditure, or both simultaneously. Unfortunately, the **existing therapeutic options** to treat obesity **are very limited**. In recent years, it was discovered that functional **brown adipose tissue** (BAT), once thought to exist mainly in humans, can be detected during cold stimulation, and is associated with decreased adiposity.



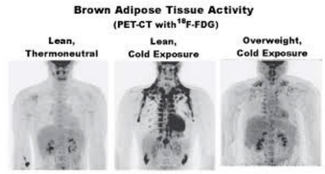
3. TYPES OF ADIPOCYTES

Adipose tissue is traditionally classified as WAT and BAT, respectively. **WAT** is the more abundant adipose tissue, and is able to **store energy** as triglycerides. Conversely, **BAT** is highly vascularized and innerved, in particular by the sympathetic nervous system. The **thermogenic property** of brown fat cells is carried out in the lots of mitochondria that it have.

Particular physiologic conditions such as cold exposure are able to induce the **differentiation** of white adipocytes into brown cells. This brown-like adipocytes (beige/**brite adipocytes**), can express a lots of UCP1, and therefore, have thermogenic property too.



4. BAT



BAT plays a key role in **cold-induced non-shivering thermogenesis**, and body weight homeostasis in animals. BAT is a **flexible tissue** that can be recruited by stimuli and atrophies in the absence of a stimulus. The recent discovery of active BAT in adult humans has rekindled the notion that BAT is a therapeutic target for **combating obesity-related metabolic disorders.**

5. THERMOGENESIS

5.1. Cold-Induced Thermogenesis by Norepinephrine

Cold exposure directly innervates BAT through efferent **symathetic nerve fibers**. The **Norepinephrine** of simpathetic terminals, activates the β3-adrenoreceptors present in the surface of bworn adipocytes. These receptors activates all thermogenesis process trough **UCP1**.

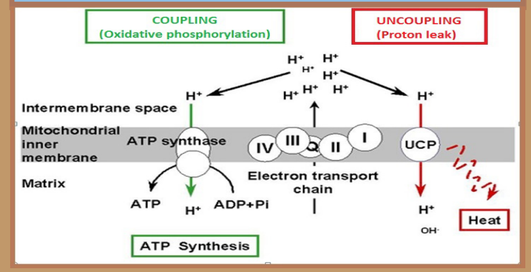
5.2. Contribution of Thyroid Hormones to Non-Shivering Thermogenesis

Recent reports suggest that the activation of BAT thermogenesis by thyroid hormones is indirectly achieved via the **hypothalamus**, where **T3** would act by increasing lipogenesis and decreasing AMPK activity. Then it also can activates non-shivering thermogenesis.

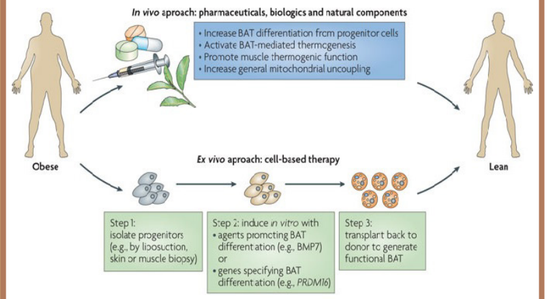
5.3. Diet-Induced Thermogenesis

Several experimental evidences support a role for BAT in the augmentation of energy expenditure that occurs in **response to feeding**.

6. ROLE OF UCP1



7. BAT AND REGULATION OF BODY WEIGHT: APPROACHES



Natural components in ex vivo approach, there are for example some food ingredients such as **capsaicin and capsinoids**, which have potential to activate and recruit BAT via activity on the **specific receptor**, transient receptor potential channels, thereby increasing energy expenditure and **decreasing body fat**.

8. CONCLUSIONS

The obesity pandemic requires new and **novel treatments**. The past few years have witnessed multiple studies conclusively showing that adult humans have functional **BAT**, a tissue that has a tremendous capacity for **obesity-reducing thermogenesis**.

Combining this knowledge with recent advances in understanding BAT differentiation has created new interest in this tissue as a possible therapeutic approach for metabolic diseases. Although many questions remain regarding efficacy, safety, practicality, and durability of such treatments, we are encouraged that both classical and novel therapies targeting BAT thermogenesis may be available in the **near future** as therapies for obesity and diabetes.