proving opportunity for preclinical diagnosis. This is dependent, to some extent, on the long term stability of these marks, which is in most cases unknown. This makes their predictive value unclear. I will discuss how the meaning of the word epigenetics has changed over the last ten years and why this has caused confusion. Empirical evidence has altered our view of the importance of DNA methylation in the determination of phenotype.

Over the last fifty years, obesity levels have increased dramatically and changes to adipose tissue and epigenetic marks in adipose tissue have been detected. Whether these marks are drivers of obesity or consequences of obesity is yet to be determined. Moreover, there is some evidence that obesity can be inherited across generations, not just via DNA sequence (genotype) but also via epigenetic marks in the gametes. The idea is that mothers or fathers who have become obese transmit this to their offspring independent of any genetic susceptibility to obesity. The current evidence for this is weak.

I will discuss these ideas using data collected from studies in mice and humans.

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4

Invited talk: Hot and sweet: Brown fat beyond thermo-regulation in humans

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There are three kinds of fat tissue. White adipose tissue (WAT) stores energy and in excess leads to obesity. Brown adipose tissue (BAT) consumes energy and produces heat for thermoregulation. Beige adipose tissue (BeAT) emerges within WAT during cold exposure and manifests thermogenic function comparable to BAT. Animals with high BAT/BeAT status are protected against diabetes and obesity. Recent re-discovery of thermogenic BAT in humans has brought the relation between ambient temperature, thermogenesis and systemic energy and substrate metabolism to the forefront [1].

Humans maintain core temperature through a complex neuroendocrine circuitry, coupling environmental thermal and nutritional cues to heat-producing and dissipating mechanisms. Up to 40% of resting energy expenditure contributes to thermal homeostasis maintenance. The dynamic interplay between BAT, BeAT and WAT modulates systemic energy homeostasis and highlights the presence of a previously under-appreciated thermogenic adipose axis in humans.

In addition to well-known pituitary-thyroid-adrenal axis, recently identified endocrine signals, such as FGF21 and irisin [2], orchestrate crosstalk between WAT, BAT and muscle, tuning non-shivering and shivering thermogenesis responses. Cold-activated BAT modulates systemic metabolic and endocrine milieu, and cold-induced hormones cause bioenergetics transformation sufficient to impact whole body energy and substrate balance [3], suggesting BAT may serve important physiologic functions beyond thermoregulation in humans.

References

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5

Short-term exposure to energy-matched diets enriched in fat or sugar differentially affects memory, gut microbiota and markers of brain inflammation and plasticity

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Short-term exposure to high-energy diets impairs memory but there are limited data regarding the relative contributions of fat and sugar to these deficits or the mechanisms responsible. Here, we investigated how these different macronutrients affect memory, neuroinflammation and neuroplasticity markers and the gut microbiota in the short-term. Rats were fed matched purified diets for 2 weeks; Control, Sugar, Saturated Fatty Acid (SFA) or Polyunsaturated Fatty Acid (PUFA), which varied only in the percentage of energy available from sugar and the amount and type of fat. Memory was assessed after 8—9 days and rats were culled after 12—13 days exposure. The expression