

- NPY/AgRP neurons express hormonal receptors
  - growth hormone (GHSR), leptin receptor, insulin receptor
  - ghrelin binds to GHSR = activation
  - leptins binds to leptin receptor = inhibition (energy expenditure)
  - insulin binds to insulin receptor = inhibition (energy expenditure)
- Ventromedial hypothalamic (VMH) nucleus expresses leptin receptors
  - leptin signalling in VMH neurons prevents obesity
  - increasing activity of POMC neurons in hypothalamus
    - via brain derived neurotrophic factor (BDNF) signalling
- Dorsomedial hypothalamic (DMH) nucleus
  - leptin responsive neurons (GABA) in DMH = energy expenditure
  - negative energy balance e.g. fasting/lactation/calorie restriction
    - increases NPY in DMH to restore energy balance
  - BDNF in DMH prevents obesity
- Lateral hypothalamus (LH)
  - orexin neurons rapidly increase food intake
    - chronically prevents obesity
    - play more important role in arousing hunger
  - melanocortin concentrating hormone (MCH) = increase food intake
  - leptin responsive neurons decrease orexin neuron secretion
- GWAS = human obesity heritable disorder
  - effects neural control of energy homeostasis

## Lecture 7

- Hedonic = desire to eat (pleasure)
- Homeostatic = need to eat
- Addiction = knowing the behaviour is not good for you, but being unable to stop
- Incentive salience = motivational “wanting” of a stimulus under certain circumstance
- Mesolimbic reward pathways
  - main neurotransmitter is dopamine
  - located in ventral tegmental area (VTA)
  - neurons project to nucleus accumbens (main site of action for reward)
- Dopamine mediates “wanting” (in nucleus accumbens)
  - required for the motivation to eat
- Mu opioid receptors mediate “liking” (in nucleus accumbens)
  - antagonists (block opioid receptors) reduce “liking”
- Liking = brain reaction underlying sensory pleasure, triggered immediately after reward
- Wanting = incentive attached to attaining a reward
- Endocannabinoid (anandamide) injection into nucleus accumbens = enhanced reward
  - anandamide is a neurotransmitter