**Summary of Signals: (Course 4)**

This table summarizes the information about appetite hormones and gut-brain neuropeptides and their functions specific to eating and appetite.

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| **Signal** | **Function** | **Primary locations and actions** |
| **AgRP**: agouti-related peptide \* | hunger | Produced in arcuate nucleus of hypothalamus (ARC)   * antagonizes melanocortin receptors 3 and 4 (MCR3 and MCR4) located in the ARC and NTS * acts on limbic and reward regions |
| **CART**: cocaine- and amphetamine-related transcript \* | satiety | Produced in arcuate nucleus of hypothalamus (ARC)   * projects to 2nd-order hypothalamic regions (LH & PVN) * then to limbic and reward networks (VTA and NAcc) |
| **CCK**: cholecystokinin \* | satiety  (short-term) | Secreted by enteroendocrine cells the duodenum   * acts on receptors in the gastrointestinal tract and brain, notably in the hypothalamus, NTS and NAcc |
| **Ghrelin \*** | hunger  (short-term) | Secreted by endocrine cells of the gastric mucosa in stomach   * activates NPY/AgRP neurons in the ARC, inhibits POMC * acts in reward networks of the brain |
| **Insulin \*** | satiety | Secreted by pancreas   * acts in the hypothalamus (ARC) and other brain regions (in addition to significant actions in the body) |
| **Leptin** | satiety  (long-term) | Released from adipose tissue   * inhibits NPY/AgRP neurons in the ARC, stimulates POMC/CART neurons * acts in reward networks of the brain |
| **Melanocortins**  **POMC:** pro-opiomelanocortin  **-MSH** | satiety | POMC neurons are located in the brain stem and hypothalamus   * POMC is the precursor for **-MSH** * projects to 2nd-order hypothalamic regions (LH & PVN) * then to limbic and reward networks (VTA and NAcc) |
| **NPY:** neuropeptide Y | hunger | Produced in arcuate nucleus of hypothalamus (ARC)   * projects to 2nd-order hypothalamic regions (LH & PVN) * antagonizes actions of POMC * projects to limbic and reward networks (VTA and NAcc) |
| **Orexin** | hunger | Originates in the lateral hypothalamus   * projects to cortex, limbic, and reward networks |
| **PYY**: peptide YY | satiety  (short-term) | Produced in gastrointestinal track   * inhibits feeding by inhibiting NPY, stimulating POMC |

\* indicates additional functions beyond eating and appetite are known but not described here