**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
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| **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)
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| **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
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| **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
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| **Insulin \*** | satiety | Secreted by pancreas* acts in the hypothalamus (ARC) and other brain regions (in addition to significant actions in the body)
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| **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
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| **Melanocortins****POMC:** pro-opiomelanocortin$α$**-MSH** | satiety | POMC neurons are located in the brain stem and hypothalamus* POMC is the precursor for $α$**-MSH**
* projects to 2nd-order hypothalamic regions (LH & PVN)
* then to limbic and reward networks (VTA and NAcc)
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| **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)
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| **Orexin** | hunger | Originates in the lateral hypothalamus* projects to cortex, limbic, and reward networks
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| **PYY**: peptide YY | satiety(short-term) | Produced in gastrointestinal track* inhibits feeding by inhibiting NPY, stimulating POMC
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\* indicates additional functions beyond eating and appetite are known but not described here