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Neurotransmitters That Govern Hunger and Satiety

There are many neurotransmitters and neuropeptides involved in the regulation of **hunger** and **satiety**. These signals primarily interact within hypothalamic circuits—especially the arcuate nucleus (ARC), paraventricular nucleus (PVN), and lateral hypothalamus (LH).

Neurotransmitters That Increase Hunger (Orexigenic)

These neurotransmitters and related signals promote feeding behavior and increase appetite.

1. Neuropeptide Y (NPY)

- One of the most potent appetite-stimulating neurotransmitters.
- Released by NPY/AgRP neurons in the arcuate nucleus.
- Activated during fasting and energy deprivation.
- Increases food intake and reduces energy expenditure.

2. Agouti-related peptide (AgRP)

- Co-expressed with NPY; antagonizes melanocortin receptors (MC3R/MC4R).
- Strongly increases appetite.
- Activated when leptin is low (e.g., during weight loss).

3. Ghrelin

- A hormone from the stomach but acts as a neurotransmitter in the brain.
- The only known peripheral hormone that increases hunger.
- Stimulates NPY/AgRP neurons.
- Peaks before meals.

4. Orexins (Hypocretins)

- Produced in the lateral hypothalamus.
- Increase appetite and also enhance arousal, wakefulness, and reward-driven eating.

5. Dopamine

- Governs reward-driven eating (wanting food, cravings).
- Not a direct hunger signal but increases motivation to eat palatable foods.

Neurotransmitters That Reduce Hunger (Anorexigenic / Satiety Signals)

These neurotransmitters and related signals suppress appetite, promote fullness, and support energy balance.

1. Pro-opiomelanocortin (POMC) & α-MSH

- POMC neurons produce α-MSH, which activates MC4 receptors to reduce appetite.
- Activated by leptin, insulin, and high energy stores.

2. CART (Cocaine- and Amphetamine-Regulated Transcript)

- Co-expressed with POMC neurons.
- Suppresses appetite and increases energy expenditure.

3. Serotonin (5-HT)

- Major satiety-promoting neurotransmitter.
- 5-HT2C receptor activation increases POMC activity.
- Drugs that raise serotonin (e.g., fenfluramine, lorcaserin) suppress appetite.

4. Leptin

- A hormone from fat cells but acts centrally as a neurotransmitter-like signal.
- Inhibits NPY/AgRP neurons; activates POMC/CART neurons.
- Signals long-term energy status.

5. Insulin

- From the pancreas; acts in the brain to reduce appetite.
- Increases POMC activity and decreases NPY/AgRP signaling.

6. Cholecystokinin (CCK)

- Gut hormone acting via vagal afferents to produce meal-ending satiety.
- Quick-acting “stop eating now” signal.

7. GLP-1 (Glucagon-like peptide-1)

- Gut/brain peptide that increases satiety.
- Slows gastric emptying.
- Basis of GLP-1 weight-loss medications (e.g., semaglutide).

8. Peptide YY (PYY3-36)

- Released from the ileum/colon after meals.
- Inhibits NPY/AgRP neurons, reducing hunger.

Simplified Summary

Hunger Signals

- NPY
- AgRP
- Ghrelin
- Orexins
- Dopamine (reward-driven eating)

Satiety Signals

- POMC / α-MSH
- CART
- Serotonin
- Leptin
- Insulin
- CCK
- GLP-1
- PYY