

<b>Purines</b>		<b>Purines (cont)</b>		<b>Cannabinoids (Endocannabinoids)</b>		<b>Serotonin (5-HT) (cont)</b>	
<b>Adenosine</b>	Formed from the breakdown of ATP. Acts via adenosine receptors ( <b>A1, A2A, A2B, A3</b> ). Functions: <i>Vasodilation</i> (especially coronary arteries) <i>Sedative and sleep-promoting effects in the brain. Inhibits neurotransmitter release. Anti-inflammatory and immunosuppressive effects</i>	<b>ATP (Adenosine Triphosphate)</b>	Beyond being the "energy currency," extracellular ATP: Acts via <b>P2 receptors (P2X and P2Y)</b> . Mediates pain, inflammation, and immune responses. Can trigger cell death pathways or survival signalling.	Anandamide and 2-AG are naturally occurring ligands. Bind to CB1 (central nervous system) and CB2 (immune cells) receptors.		<b>Roles</b>	Mood regulation (CNS). GI motility. Platelet aggregation and vasoconstriction. Sleep, appetite, thermoregulation.
		<b>Cannabinoids (Endocannabinoids)</b>		<b>Cannabinoids (Endocannabinoids)</b>		<b>Receptors</b>	Multiple ( <b>5-HT1 to 5-HT7</b> ), all involved in diverse functions like anxiety, pain, nausea, and cardiovascular tone.
				<b>Histamine</b>		<b>Eicosanoids</b>	
<b>ADP (Adenosine Diphosphate)</b>	Plays a critical role in platelet aggregation. Released during tissue injury → binds <b>P2Y12</b> receptors on platelets → promotes clot formation.	Anandamide and 2-AG are naturally occurring ligands. Bind to CB1 (central nervous system) and CB2 (immune cells) receptors.		<b>Histamine</b>	Stored in mast cells, basophils, and enterochromaffin-like cells in the stomach. Released in response to allergens, injury, or inflammation. <b>Receptors: H1, H2, H3, H4</b>	<b>These are derived from arachidonic acid and include:</b>	Prostaglandins, Thromboxanes, Leukotrienes
		<b>Roles:</b>	Modulate pain, appetite, mood, memory. Regulate immune responses. Provide neuroprotection	<b>H1</b>	Inflammation, allergy (vasodilation, bronchoconstriction, itching)	<b>Key Enzymes</b>	COX (Cyclooxygenase) → Prostaglandins & Thromboxanes. LOX (Lipoxygenase) → Leukotrienes.
		<b>Cannabinoids (Endocannabinoids)</b>		<b>H2</b>	Gastric acid secretion in the stomach	<b>Roles</b>	
		Anandamide and 2-AG are naturally occurring ligands. Bind to CB1 (central nervous system) and CB2 (immune cells) receptors.		<b>H3</b>	Neurotransmission in the brain (auto-inhibition)		
				<b>H4</b>	Chemotaxis in immune cells		
		<b>Roles:</b>	Modulate pain, appetite, mood, memory. Regulate immune responses. Provide neuroprotection	<b>Serotonin (5-HT)</b>			
				<b>Location:</b>	Derived from tryptophan, found in the CNS, GI tract, and platelets.		

### Bradykinin

A nonapeptide released during tissue injury or inflammation. Very potent vasodilator and pain mediator. Increases vascular permeability and causes edema. Also causes bronchoconstriction and stimulates prostaglandin and nitric oxide release.

### Neuropeptides

These are small protein-like molecules used by neurons to communicate.

**Substance P** Pain transmission, vasodilation

**Neuropeptide Y (NPY)** Appetite stimulation, vasoconstriction

**Calcitonin gene-related peptide (CGRP)** Potent vasodilator, involved in migraines

**Endorphins/Enkephalins** Pain inhibition (natural opioids)

### Interferons

A type of cytokine (usually classified separately but functionally similar to autacoids).

Produced in response to viral infections and other immune triggers

**Type I (IFN- $\alpha$ , IFN- $\beta$ )** Antiviral

**Type II (IFN- $\gamma$ )** Activates macrophages and promotes antigen presentation

### Nitric Oxide (NO)

A gaseous signaling molecule, synthesized by nitric oxide synthases (NOS).

NO diffuses across cell membranes and activates guanylyl cyclase, increasing cGMP.

**Functions:** Vasodilation (endothelium-derived relaxing factor). Neurotransmission (e.g., in memory and learning). Antimicrobial and antitumor effects (in macrophages).

### Cytokines

Small proteins involved in cell signaling, especially in the immune system. Produced by various cells (T-cells, macrophages, endothelial cells).

**Interleukins (IL-1, IL-6)** Inflammation, fever

**TNF- $\alpha$  (Tumor Necrosis Factor)** Inflammation, apoptosis

**IL-10** Anti-inflammatory

Cytokines can act locally (autocrine/paracrine) or systemically.