

Brain & Behavior: Neurons, Neural Transmission, and Synaptic Transmission**I. Neurons**A. An everyday consequence

It's easy to overlook the fact that neurons are responsible for everything that you do. We'll start with a demonstration of an everyday effect of neurons.

B. Anatomy of a neuron

Key components: dendrites, axon, axon hillock, myelin sheath, axon terminal, synapse

Key points: dendrite is the input side; axon is the output side; myelin helps transmission

II. Neuronal CommunicationA. Electrical activity of neurons

electrical transmission is generated by ions, and there are 4 key players: Na⁺, Cl⁻, K⁺ and A⁻ (negatively charged proteins)

Key terms for understanding neuronal communication:

- Resting potential
- Depolarization
- Hyperpolarization
- Graded potentials
- Action potential
- Sodium (Na⁺) channels
- Potassium (K⁺) channels
- Threshold
- All-or-none principle

B. Synaptic transmission

What happens when an action potential gets to the axon terminal? The signal must be carried across the synaptic junction. This is achieved by neurotransmitters, and we can understand neurotransmitters by with a "lock-and-key" metaphor.

III. Neurotransmitters, Mind, and Behavior

Detailed look at the neurotransmitters that are used in synaptic transmission.

A. Glutamate

Glutamate is a major workhorse of the neurotransmitters. It is an excitatory neurotransmitter.

B. GABA

GABA is the other major workhorse of the neurotransmitters. It's an inhibitory neurotransmitter. It's the major inhib neurotransmitter, causing neurons to be unlikely to fire APs. May be involved with anxiety disorders, such as panic attacks.

C. Serotonin

Provides a good example of where neurotransmitters come from: They're derived from foods that we eat. Serotonin gives us a link between your brain and Thanksgiving dinner.

Serotonin is one of the neurotransmitters involved in depression. LSD works because it appears to affect the lock-and-key mechanism of serotonin.

D. Dopamine

Dopamine shows that neurotransmitters can lead to very different psychological disorders. Imbalances in the same neurotransmitter (dopamine) can produce both Parkinson's disease and schizophrenia.

E. The tightrope of brain chemistry

IV. Back to Einstein

A feeble attempt to put everything together: Why are we each individual? It starts with differences in neural and chemical pathways. These differences are both biological and experience-based. Experience changes our brain chemistry and neural wiring, producing changes in neural circuits and in whole brain areas (as in Einstein's inferior parietal lobe).