

260-2017-02-16

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Today's Topics

- Wrap-up on neurotransmitters
- **Quiz 2** on Friday.
- Review Exam 1 on Friday.

Black widow spider venom causes paralysis by impeding the normal function of which neurotransmitter system?

- Glutamate (Glu)
- GABA (GABA)
- Dopamine (DA)
- Acetylcholine (ACh)

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With one exception, the monoamine neurotransmitters bind to what type of receptors?

- ionotropic
- voltage-gated
- nicotinic
- metabotropic

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- ~~ionotropic~~
- ~~voltage-gated~~ voltage gated Na⁺, K⁺, and Ca⁺⁺

- ~~nicotinic~~ ACh binds to nAChR; ACh not a monoamine
- metabotropic

The *outward* flow of this ion across the neural membrane creates what kind of PSP?

- Cl⁻; IPSP
- K⁺; IPSP
- Glutamate; EPSP
- GABA; EPSP

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- ~~Cl⁻; IPSP~~ Outward Cl⁻ -> inside less negative = EPSP
- K⁺; IPSP Make inside less positive
- ~~Glutamate; EPSP~~ Glu not an ion; transported across
- ~~GABA; EPSP~~ GABA not an ion; transported across

Serotonin (5-HT)

- Released by *raphe nuclei* in brainstem
- Role in mood, sleep, eating, pain, nausea, cognition, memory
- Modulates release of other NTs
- Most of body's 5-HT regulates digestion

5-HT anatomy

5-HT receptors

- Seven families (5-HT 1-7) with 14 types
- All but one metabotropic

5-HT clinical significance

- Ecstasy (MDMA) disturbs serotonin
- So does LSD
- Fluoxetine (Prozac)
 - *Selective Serotonin Reuptake Inhibitor (SSRI)*
 - Inhibits reuptake -> increases extracellular concentration
 - Treats depression, panic, eating disorders, others

- 5-HT₃ receptor antagonists are anti-mimetics used in treating nausea

Melatonin

- Released by pineal gland into bloodstream

Pineal gland

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Histamine

- In brain, released by hypothalamus, projects to whole brain
 - Metabotropic receptors
 - Role in arousal/sleep regulation
- In body, part of immune response

Other NTs

- Gases
 - *Nitric Oxide (NO)*, *carbon monoxide (CO)*
- Neuropeptides
 - *Substance P* and *endorphins* (endogenous morphine-like compounds) have role in pain
 - *Orexin/hypocretin*, project from lateral hypothalamus across brain, regulate appetite, arousal

Other NTs

- Neuropeptides (continued)
 - *Cholecystokinin (CCK)* stimulates digestion
 - *Oxytocin* and *vasopressin* released by posterior hypothalamus onto posterior pituitary, regulate social behavior

Non-chemical communication between neurons

- Gap junctions
- Electrical coupling
- Connect cytoplasm directly
- Fast, but fixed, hard to modulate
- Examples, retina, cardiac muscle

Gap junctions

Ways to think about synaptic communication

- Specificity: point-to-point vs. broadcast
- Direct vs. modulatory
- Agonists vs. antagonists

Agonists vs. Antagonists

- *Agonists*
 - bind to receptor
 - mimic action of endogenous chemical
- *Antagonists*
 - bind to receptor
 - block/impede action of endogenous chemical

Valium is a GABA-A receptor agonist. This means:

1. It decreases inhibition
2. It activates a metabotropic Cl⁻ channel
3. It facilitates/increases inhibition
4. It blocks an ionotropic channel

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Next time...

- Quiz 2
- Go over Exam 1

References