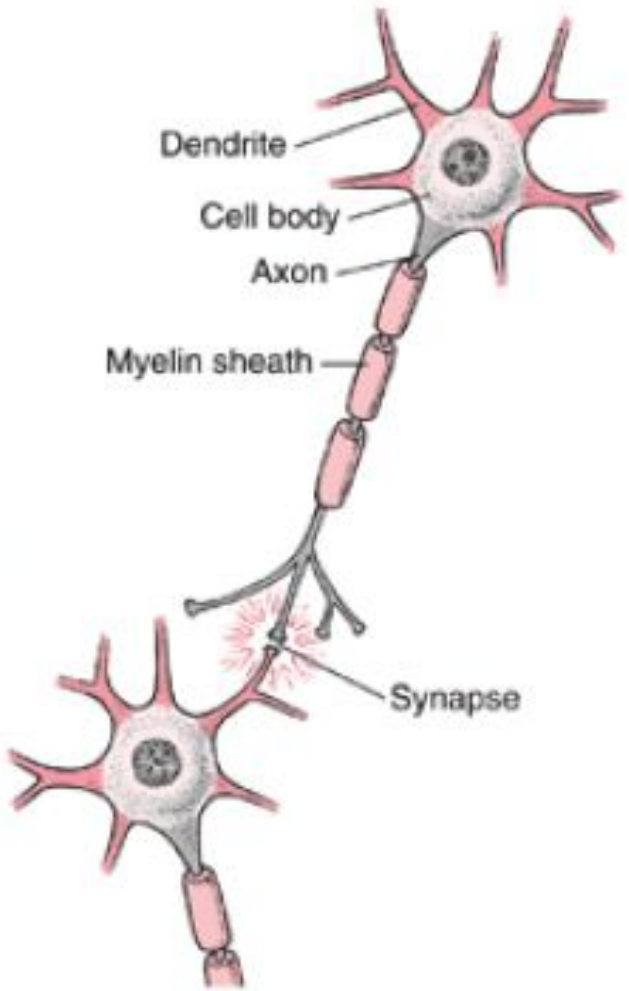
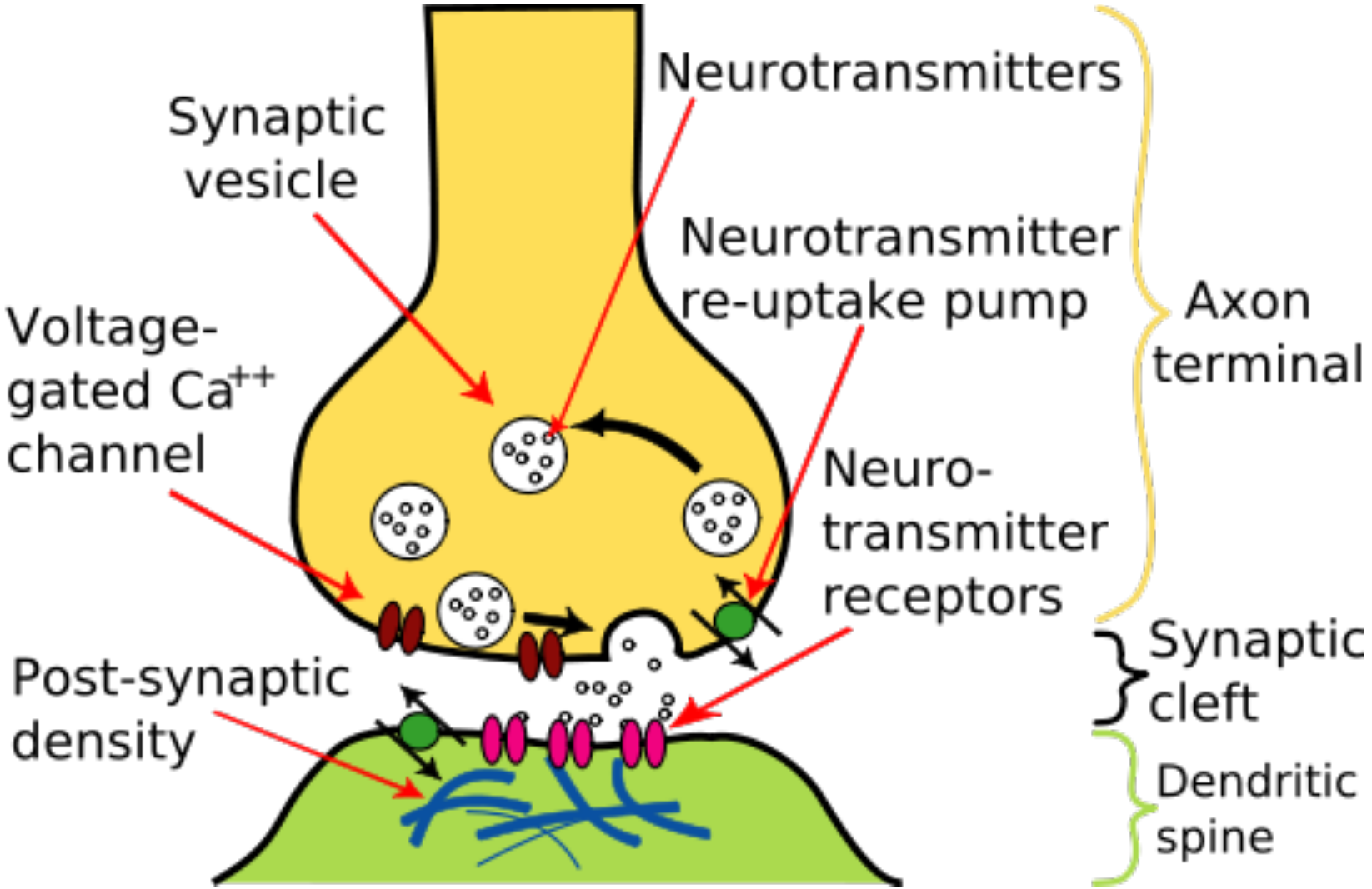

Brain Chemistry

Stuff you probably already know



- If neurons receive enough input, they “fire”
- Electrical impulses control the firing of neurons

How do neurotransmitters work?

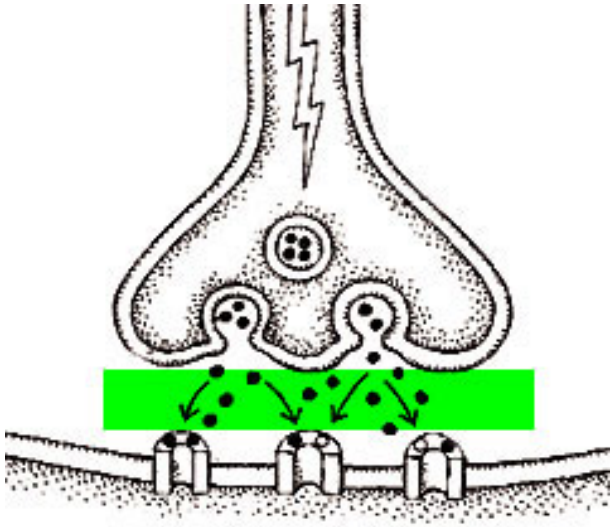


Serotonin

- Affects appetite, sleep, learning
- **Elevates mood**
- Reduces aggression
- Makes you resistant to **depression** and **anxiety**
- Makes people think more positively of intimacy and **romance**
- Levels are lower during **winter** months

Serotonin

- Antidepressants (SSRIs)
- Health supplement 5-HTP
- Foods with **tryptophan**
  - Turkey!, soy beans, tuna, salmon, rye, nuts, eggs, avocado, flax, olives, fish oil….



Endogenous Opioids

- **Pain relief**
- Includes endorphins
- Reduces stress
- Create a sense of **well being**, even **euphoria**
- Affects sexual behaviour, appetite, body temperature
- Involved in reward and addictive behaviour

Endogenous Opioids

- Strenuous exercise
- Sex
- Opium
- Codeine
- Morphine
- Heroin

Dopamine

- **Pleasurable reward**:
  - released during pleasurable situations
  - causes you to seek out rewards
- Role in **addiction**
- Affects motivation, **arousal,** decision making
- Improves focus and attention
- Sexual gratification
- Increases **sociability**

Dopamine

- Food
- Sex
- Rock n Roll?

- Cocaine
- Methamphetamines
- Alcohol

- World of Warcraft
  - and other addictive video games

Dopamine

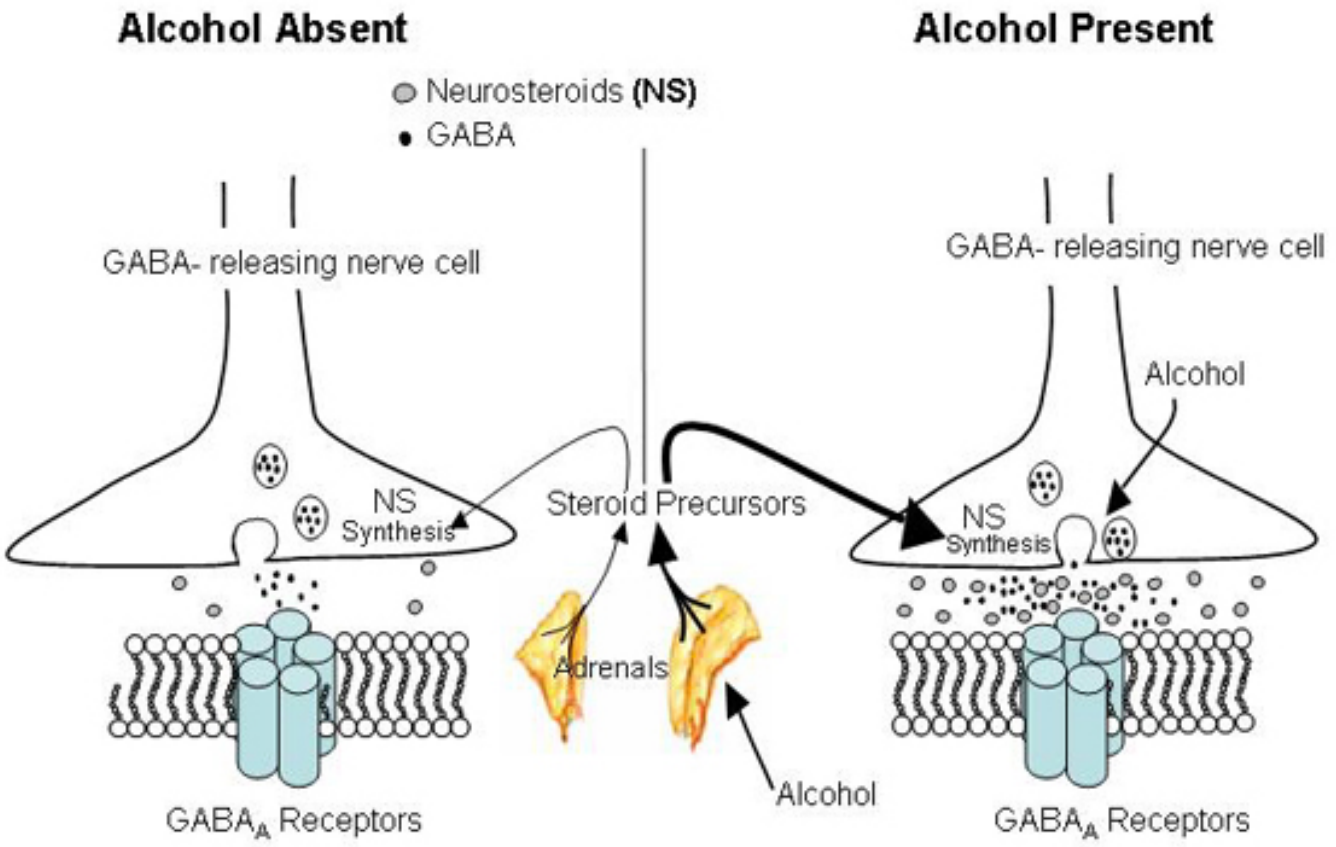
- Having too much makes you crazy
  - **Schizophrenia** has been linked to high levels of dopamine
- Having too little makes you shake
  - **Parkinson's Disease** is due to Dopamine deficiency
  - Taking anti-psychotics for long periods can cause **Dystonia - drug induced Parkinsonism**
  - Deficiency may cause **ADHD** and **Restless Legs Syndrome**

Gamma Amunobutyric Acid (GABA)

- Promotes **relaxation**
- **Relieves anxiety**
- Improves mood
- Can induce **sleep**
- Can release sex hormones
- Inhibitory neurotransmitter **- sedative**
    - sluggish movements
    - slurred speech

Gamma Amunobutyric Acid (GABA)

- **Alcohol**
- Valium



Oxytocin

- Actually a hormone
- Sometimes called the "**love**" chemical
  - involved in pair **bonding**, **trust**, intimacy, attachment, **maternal love**, sex, **empathy**, generosity, **social recognition**, social memories
- Also promotes **ethnocentric** behaviour
  - trust and empathy with in-group, but
  - suspicion and rejection of outsiders
- Autistic people have less

Oxytocin

- **Physical contact** with another person
  - hugs, even handshakes

- **Eye contact**
- **Give birth**
- Have sex
  - stronger effect in women?

Cortisol

- Increases blood sugar
  - **Fuel to brain** increases
- Heightened working memory… **temporarily**
- **Suppresses immune system**
  - reduces inflammation
- Muscle aches, insomnia, fatigue, weight gain in abdomen, anxiety, decreased libido
- decreased muscle mass and bone formation

Cortisol

- STRESS!

- Corticosteroids (Cortisol)

Adenosine

- Involved in many biological processes
- Adenosine Triphosphate = ATP
- Inhibitory neurotransmitter
  - relaxes breathing
  - suppresses neuron excitability and firing rate
  - puts you to sleep
  - suppresses arousal

Adenosine

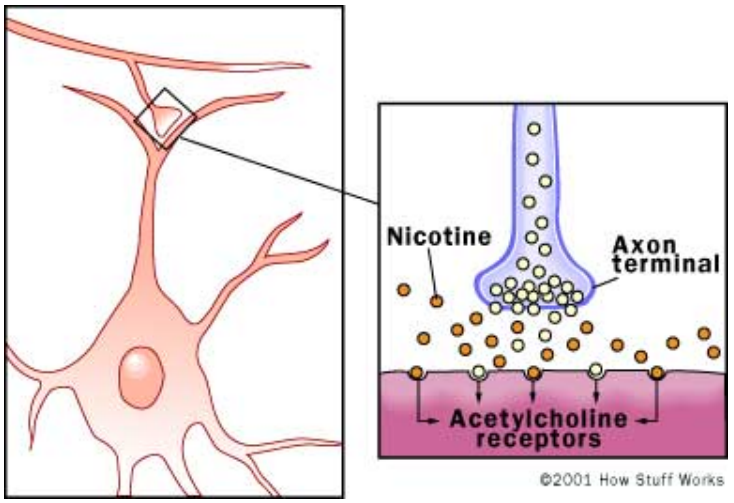
- caffeine!
  - binds to same receptors as Adenosine and inhibits its effects

Acetylcholine

- Most common neurotransmitter
- First to be discovered
- Basic transmission of nerve impulses:
- **Activates muscles**
- **Increases neuron excitability**
- Improves attention, reaction time

Acetylcholine

- Nicotine!
  - There are actually **nicotinic** receptors for ACh in your brain!



- Certain foods: liver, egg yolk, cheese, nuts, oatmeal, soybeans

- Nerve gas - causes neuromuscular paralysis by inhibiting effects of Acetylcholine

Conclusions

- Method through which all substances act on the brain
- Neurotransmitters are poorly understood
  - Notice how nearly all of them affect sleep, sex, mood, appetite…?
- Huge effects on behaviour
- Behaviour also affects neurotransmitter levels

http://sciencenordic.com/hormone-removes-pleasure-smoking

nicotine, epinephrine, estrogen, progesterone
ACETYLCHOLINE

Epinephrine (Adrenaline)

- Fight or flight response
- Increased heart rate
- Knee shaking

- Negative emotions & memories
- Enhances long-term memory formation

Epinephrine (Adrenaline)

- Danger!
- Fear