

Here are some things to keep in mind before we start our discussion of:

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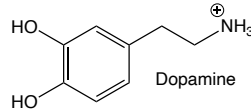
## Dopamine and Addiction

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- 1) Dopamine neurons respond to rewards such as food with reflexive, linked, **bursts of discharges**.
  - Dopamine neurons also come to respond with bursts of discharges to stimuli that immediately precede and reliably predict the reward.
  - Bursts of discharges (also called phasic firing) of dopamine-containing neurons are necessary to establish long-term memories associating predictive stimuli with rewards.
- 2) Actual dopamine neuron activity is very complicated as there can be shifts in so-called tonic activity (the overall baseline of activity) as well as phasic activity, that is the bursts of discharges associated specifically with an event.
- 3) Within the striatum, close to half of the output neurons express only D1-type receptors, and the other half express only D2-type receptors.
  - D1 receptors have low or loose binding to dopamine and are thus infrequently occupied by dopamine molecules.
    - Current thinking is that D1 receptors activate when high dopamine is released due to a **reward** being received and repeated activation leads to **learning how to anticipate and seek the reward**.
  - D2 receptors have high or tight binding to dopamine and are usually occupied by dopamine molecules.
    - Current thinking is that D2 receptors activate to stop a behavior associated with a **punishment** and repeated activation of D2 receptors leads to **learning how to avoid that punishment**.
    - **LOSS of D2 receptors therefore leads to risk-taking and an ignoring of negative consequences.**
  - Schizophrenia is a disabling psychiatric disorder with many positive, negative and cognitive symptoms that can be attributable to an imbalance between dopaminergic pathways that signal D2 and D1 receptors.
- 4) Addiction is commonly identified with habitual nonmedical self- administration of drugs. It was usually defined by characteristics of intoxication or by characteristics of withdrawal symptoms.
  - Addiction is caused by molecules that act to release dopamine.
  - **Unusually high levels of dopamine caused by drugs of addiction activate D1 receptors and decrease the number of D2 receptors on neurons**
    - **Both of these effects are amplified with increased or longer use.**