Sleep & Arousal

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Outline

- Sleep stages
- Neural Control of Sleep
- Circadian Rhythm

Sleep Stages

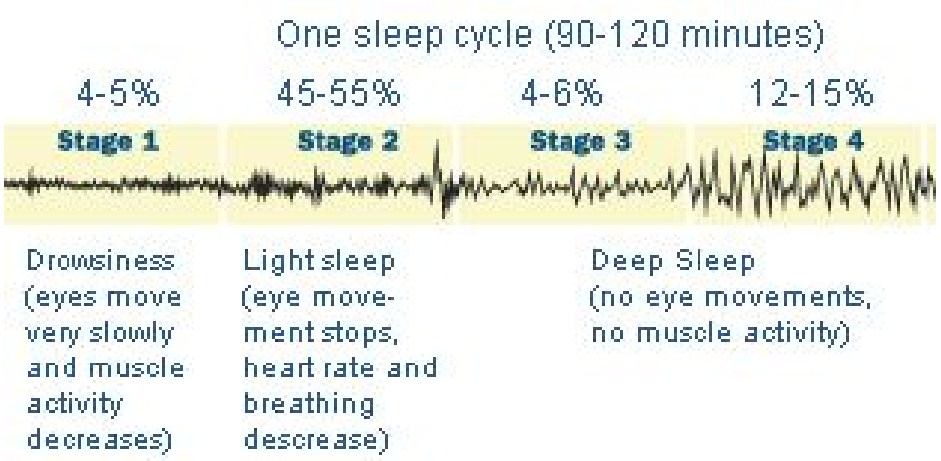
What stage of sleep corresponds to these EEG time series?

- Theta with spindles and K-complexes:
- Delta in >50% of stage:
- Delta in <50% of stage:
- Theta:

What stage of sleep corresponds to these EEG time series?

- Theta with spindles and K-complexes: **Stage 2**
- Delta in >50% of stage: **Stage 3**
- Delta in <50% of stage: **Stage 4**
- Theta: **Stage 1**

Sleep stages



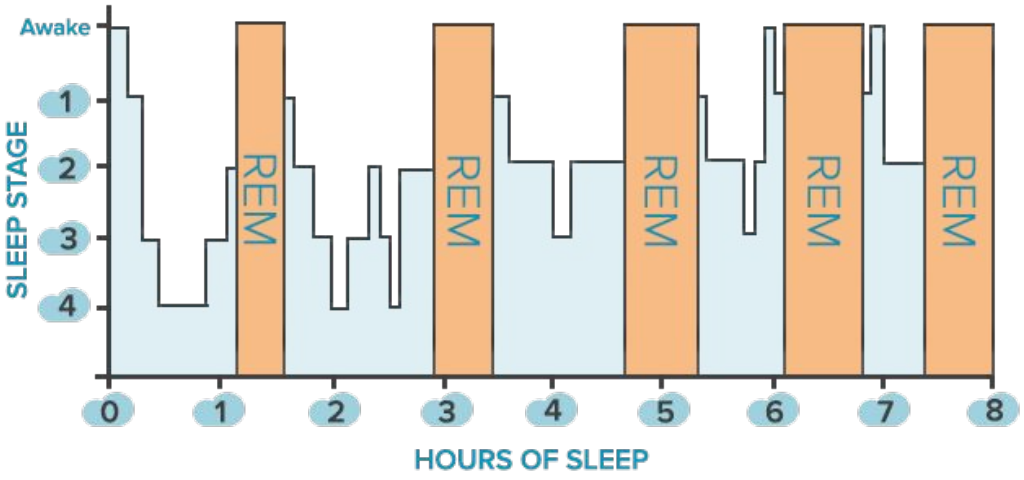
What is occurring in REM sleep

- Stands for _____
- EEG is highly synchronized/desynchronized
- Postural paralysis during REM sleep is known as _____
- Heart and breathing rates are highly stable/variable
- What happens when you are REM deprived?

What is occurring in REM sleep

- Stands for **Rapid Eye Movement**
- EEG is highly synchronized/**desynchronized**
- Postural paralysis during REM sleep is known as **atonia**
- Heart and breathing rates are highly stable/**variable**
- What happens when you are REM deprived? **You will experience poor concentration, greater irritability, greater anxiety, and potentially even hallucinations and death**

Sleep is good



Neural control of sleep

What are the functions of these areas in arousal?

- Releases orexin
- Sends ACh and Glutamate throughout the brain
- Delivers ACh to cortex
- Releases NE for alertness

A. Reticular formation
B. Locus Coeruleus
C. Hypothalamus
D. Basal Forebrain

What are the functions of these areas in arousal?

- Releases orexin **C**
- Sends ACh and Glutamate throughout the brain **A**
- Delivers ACh to cortex **D**
- Releases NE for alertness **B**

A. Reticular formation
B. Locus Coeruleus
C. Hypothalamus
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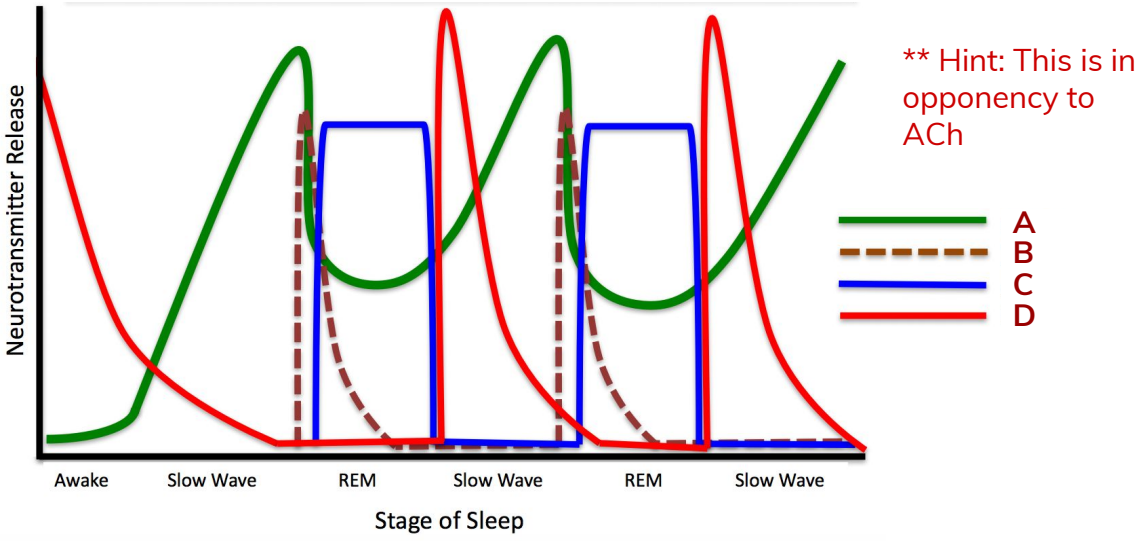
The process of getting some zzzs

- The basal forebrain initiates sleep by releasing what inhibitory NT?
- After slow wave sleep, what region releases Histamine 1?
- REM sleep is activated by the what?

The process of getting some zzzs

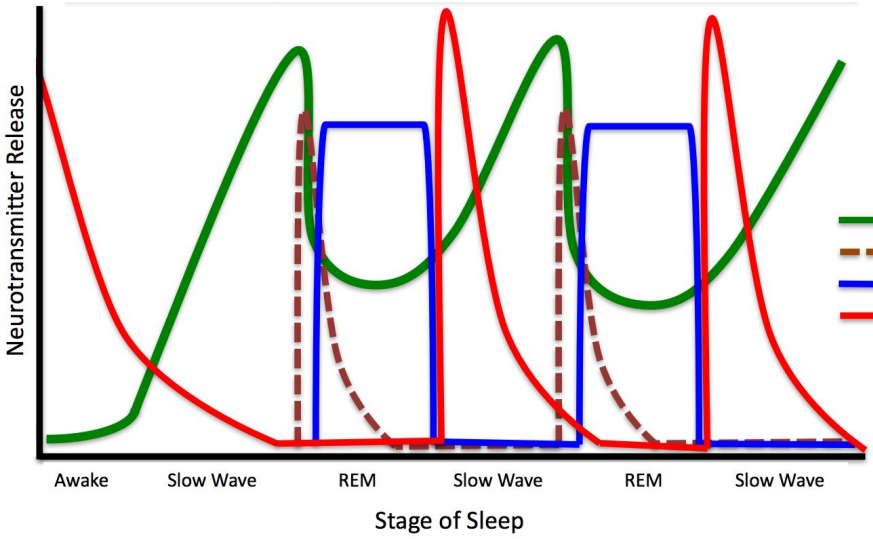
- The basal forebrain initiates sleep by releasing what inhibitory NT? **GABA**
- After slow wave sleep, what region releases Histamine 1? **Hypothalamus**
- REM sleep is activated by the what? **PGO Wave**

Which NT does each line represent?



** Hint: This is in opponency to ACh

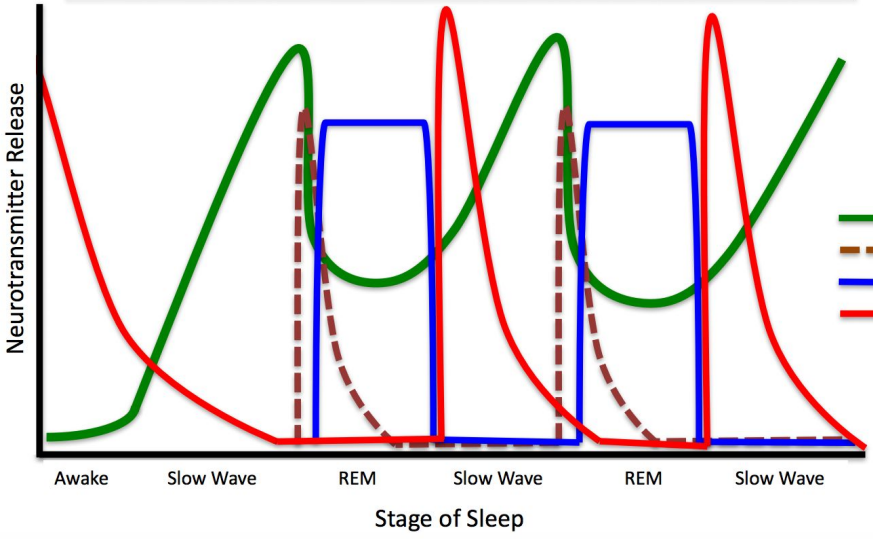
Which NT does each line represent?



** Hint: Released by the hypothalamus

GABA
B
C
D

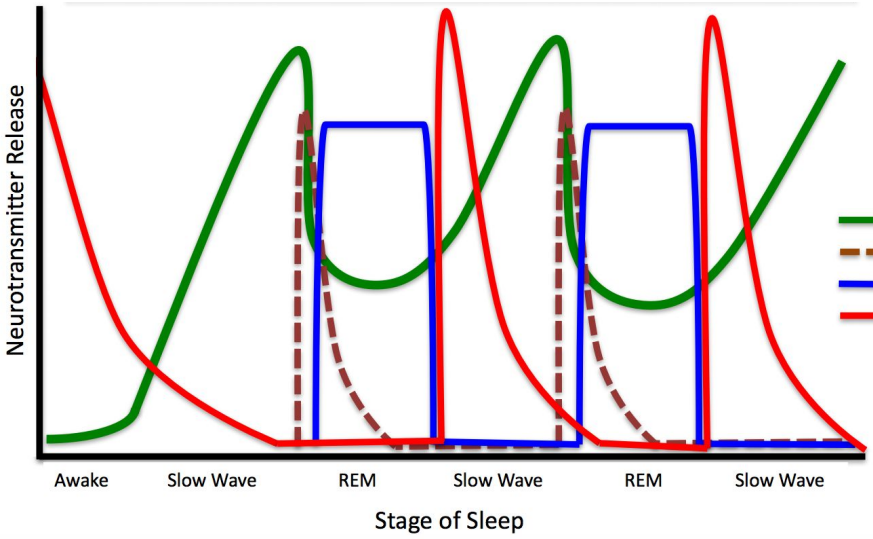
Which NT does each line represent?



** Hint: Brain is excited during REM sleep

GABA
Histamine 1
C
D

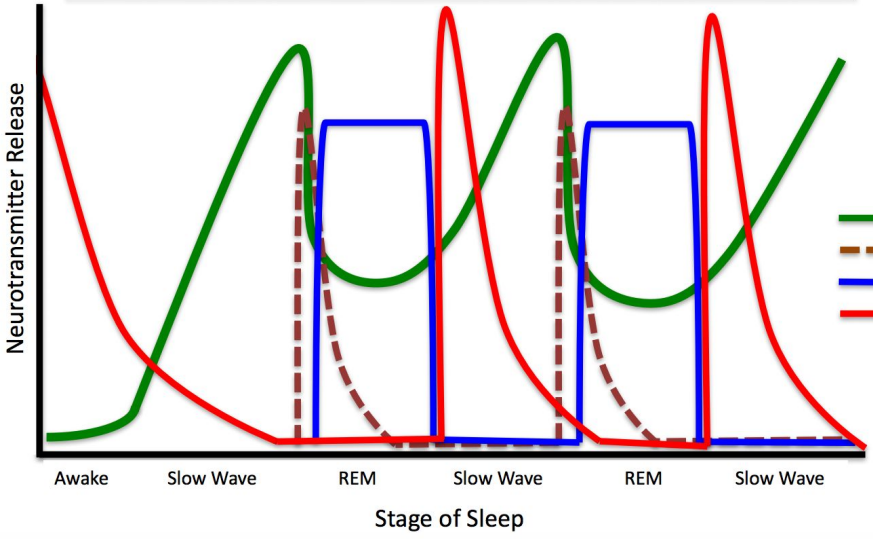
Which NT does each line represent?



** Hint: Released by the Raphe Nuclei

GABA
Histamine 1
ACh
D

Which NT does each line represent?

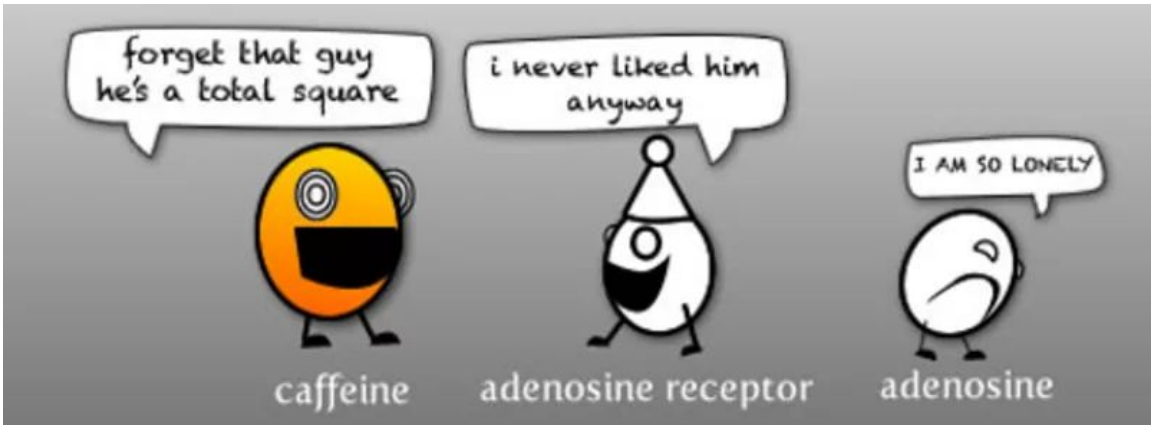


GABA
Histamine 1
ACh
5HT

What does caffeine do to your brain?

What does caffeine do to your brain?

Mimics adenosine without the ACh inhibition



The circadian rhythm

The circadian rhythm

- How long is the circadian rhythm?
- Do circadian rhythms contain a genetic component?
- Does the body make and keep its own circadian rhythm?
- What brain region controls the circadian rhythm?

The circadian rhythm

- How long is the circadian rhythm? **~24 hours**
- Do circadian rhythms contain a genetic component? **Yes**
- Does the body make and keep its own circadian rhythm? **Yes**
- What brain region controls the circadian rhythm? **Suprachiasmatic Nucleus (SCN)**

How is the circadian rhythm related to sleep?

- Specialized visual receptors contain what photopigment that reacts to ambient light?
- When ganglion cell axons reach SCN, it interacts with what gland to send information about day and night?
- This gland produces what hormone to inhibit the SCN?
- How is the circadian rhythm affected in jet lag?

How is the circadian rhythm related to sleep?

- Specialized visual receptors contain what photopigment that reacts to ambient light? **Melanopsin**
- When ganglion cell axons reach SCN, it interacts with what gland to send information about day and night? **Pineal**
- This gland produces what hormone to inhibit the SCN? **Melatonin**
- How is the circadian rhythm affected in jet lag? **The ~24 hour circadian rhythm is thrown off and thus affects melatonin production**