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# The Science of Sleep

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# What is Sleep?

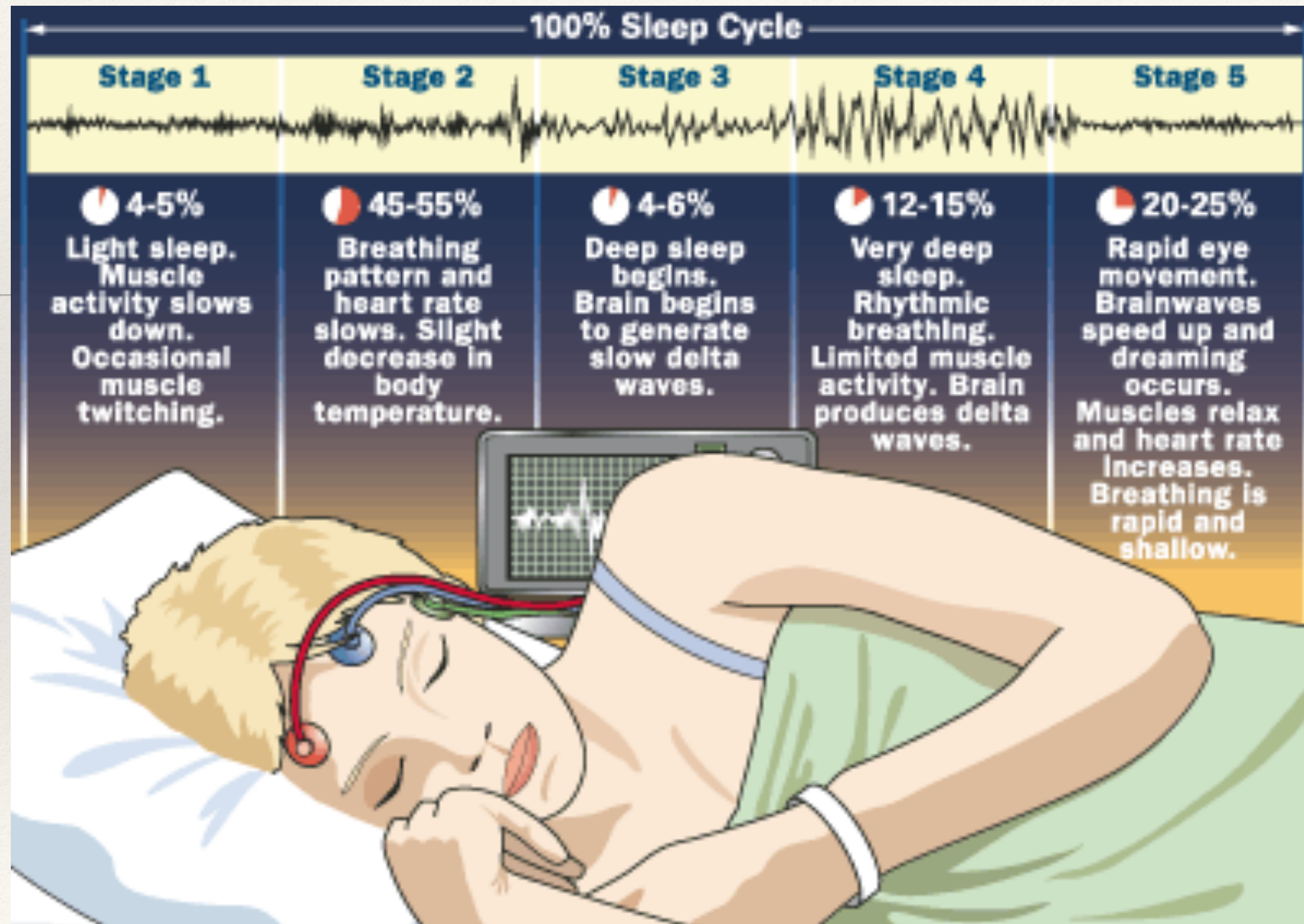
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- Sleep is a biological process
- State of reduced responsiveness to the external environment
- Restorative Function, potentially homeostatic.





# Brain Activity During Sleep





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# Sleep Processes

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- ❖ Arousal
- ❖ Tiredness
- ❖ Sleep
- ❖ Wakefulness



## AROUSAL-PROMOTING

broad activating connections to the cerebral cortex



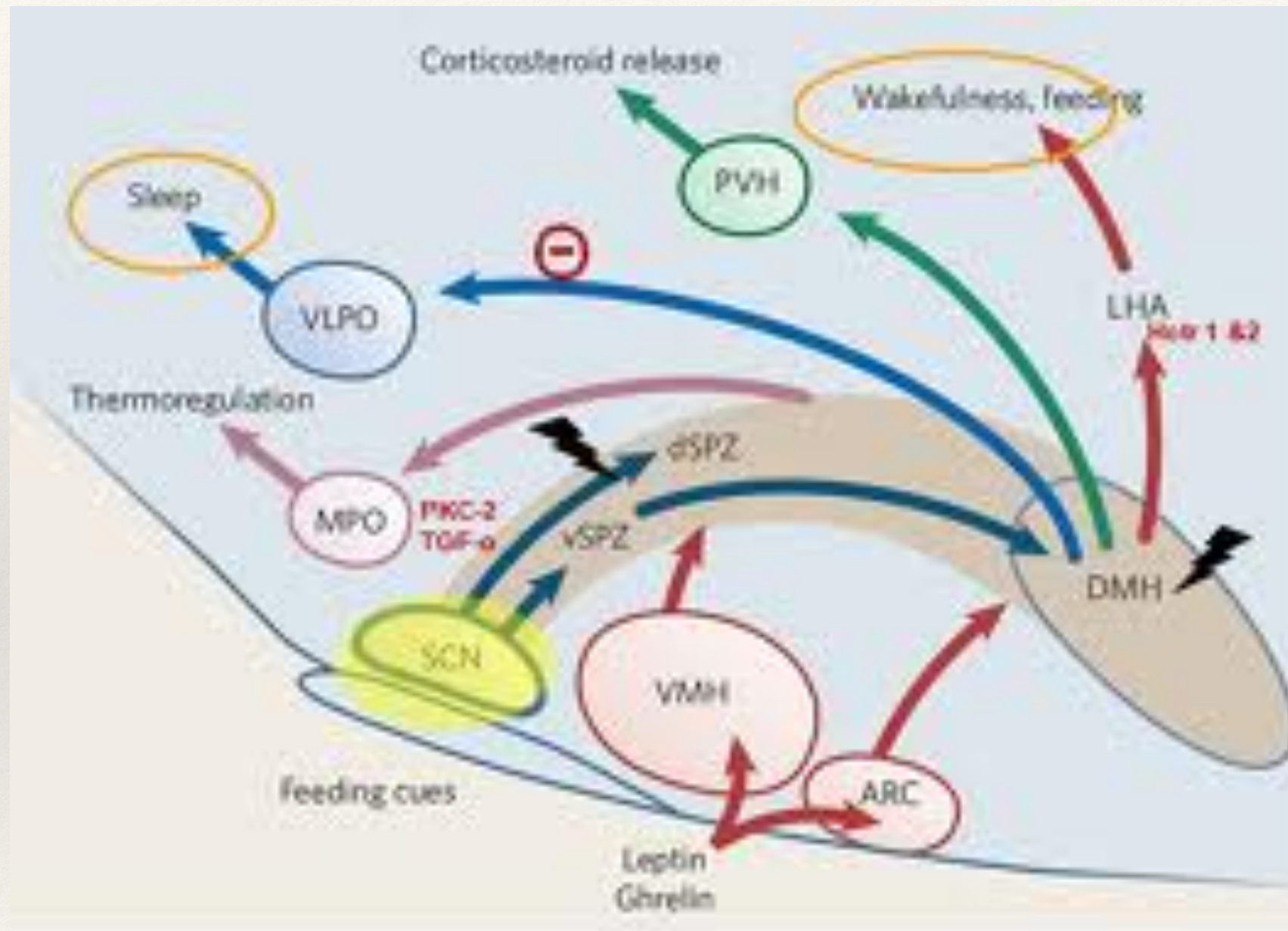
## SLEEP-PROMOTING

direct inhibitory connections to all arousal-promoting nuclei





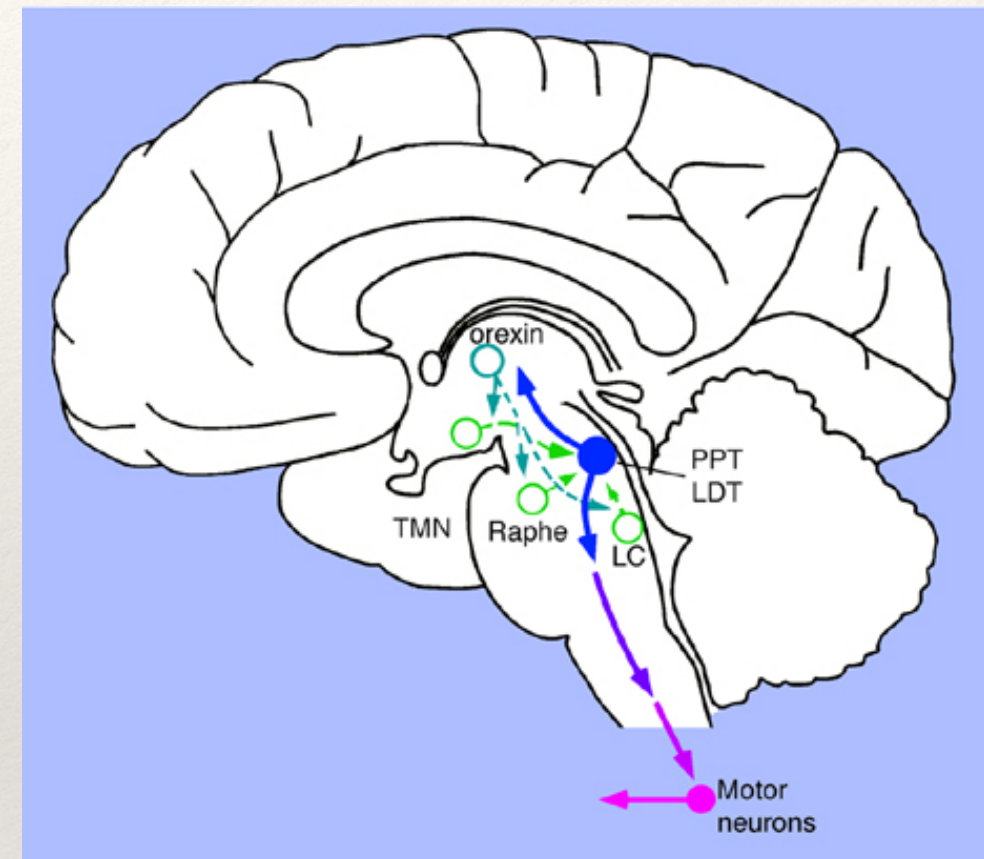
# The Hypothalamus is important for sleep and arousal transitions





# The Lateral Hypothalamus is important for transitional changes between arousal and sleep

Orexin is important for maintaining arousal whereas MCH is important for maintaining sleep.





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Is sleeping a window  
into the subconscious?

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# What is the physiological role of sleep?

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# Sleep, learning and memory

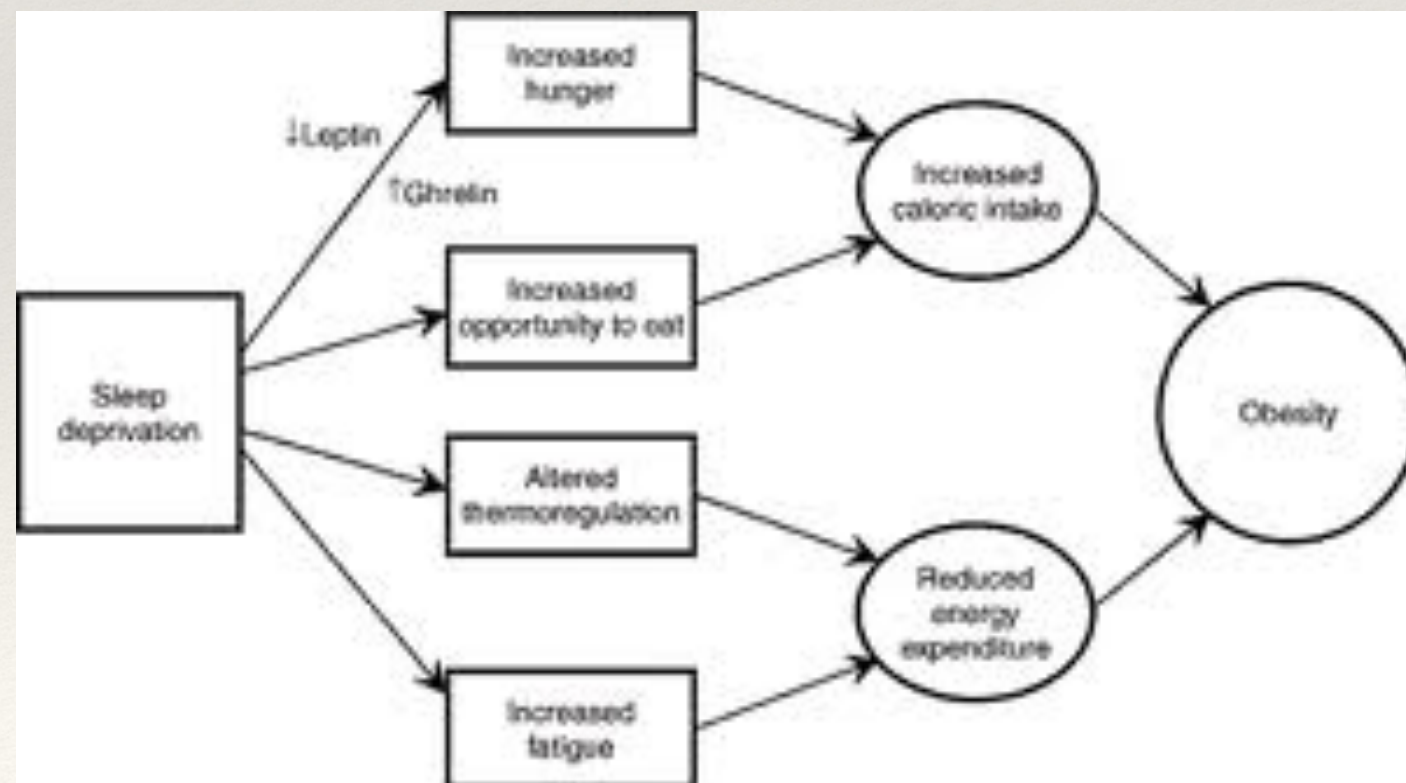
- ❖ Evidence that sleep deprivation leads to cognitive dysfunction
- ❖ Dreaming may be an "artefact" of the brain re-encoding past experiences.
- ❖ Neurodegenerative disorders are often associated with sleep disturbances





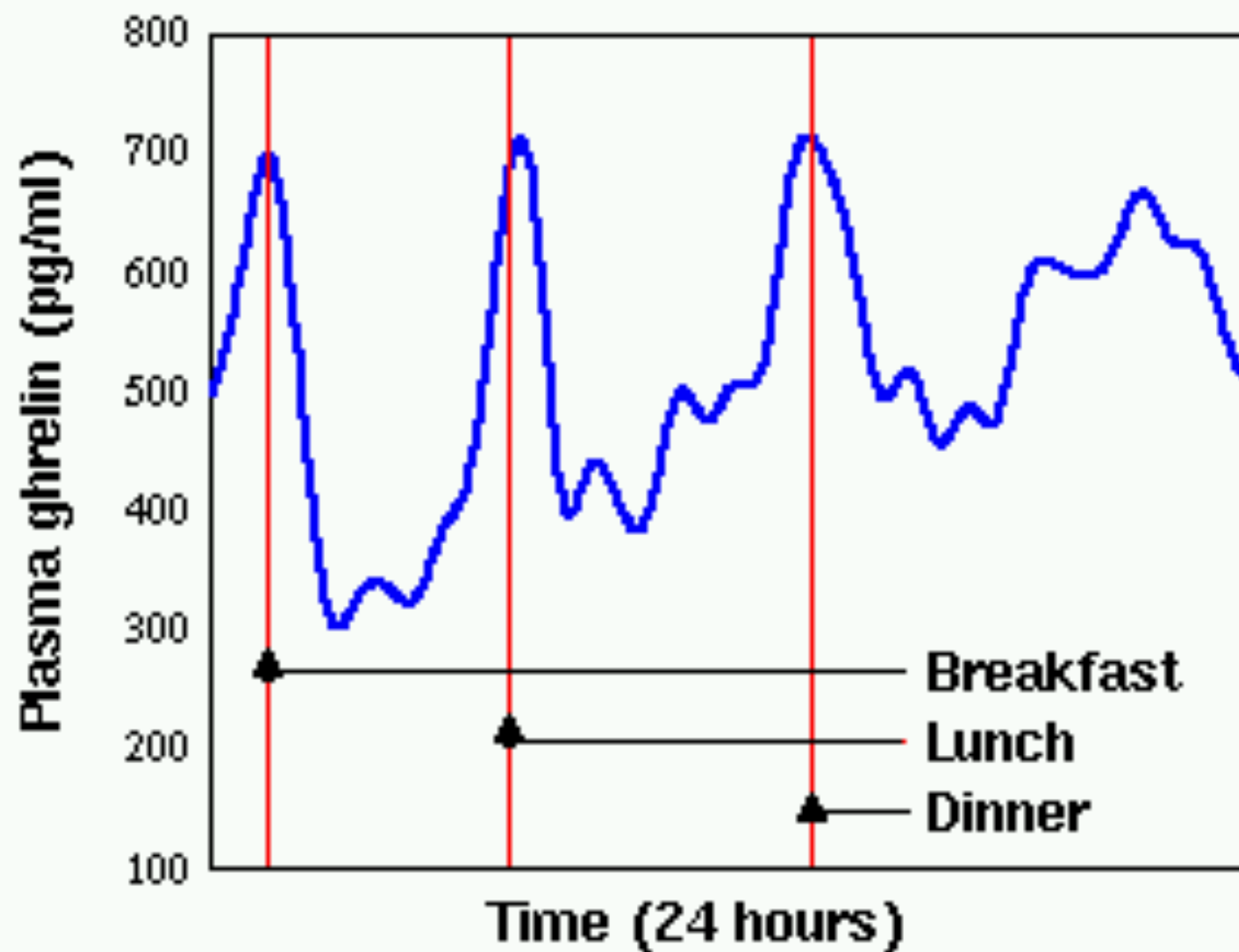
# Sleep and Metabolism

- ❖ People that have altered sleeping schedules tend to be more overweight and suffer from metabolic disorders
- ❖ Sleep disturbances can lead to metabolic alterations even in people that are not predisposed to become obese





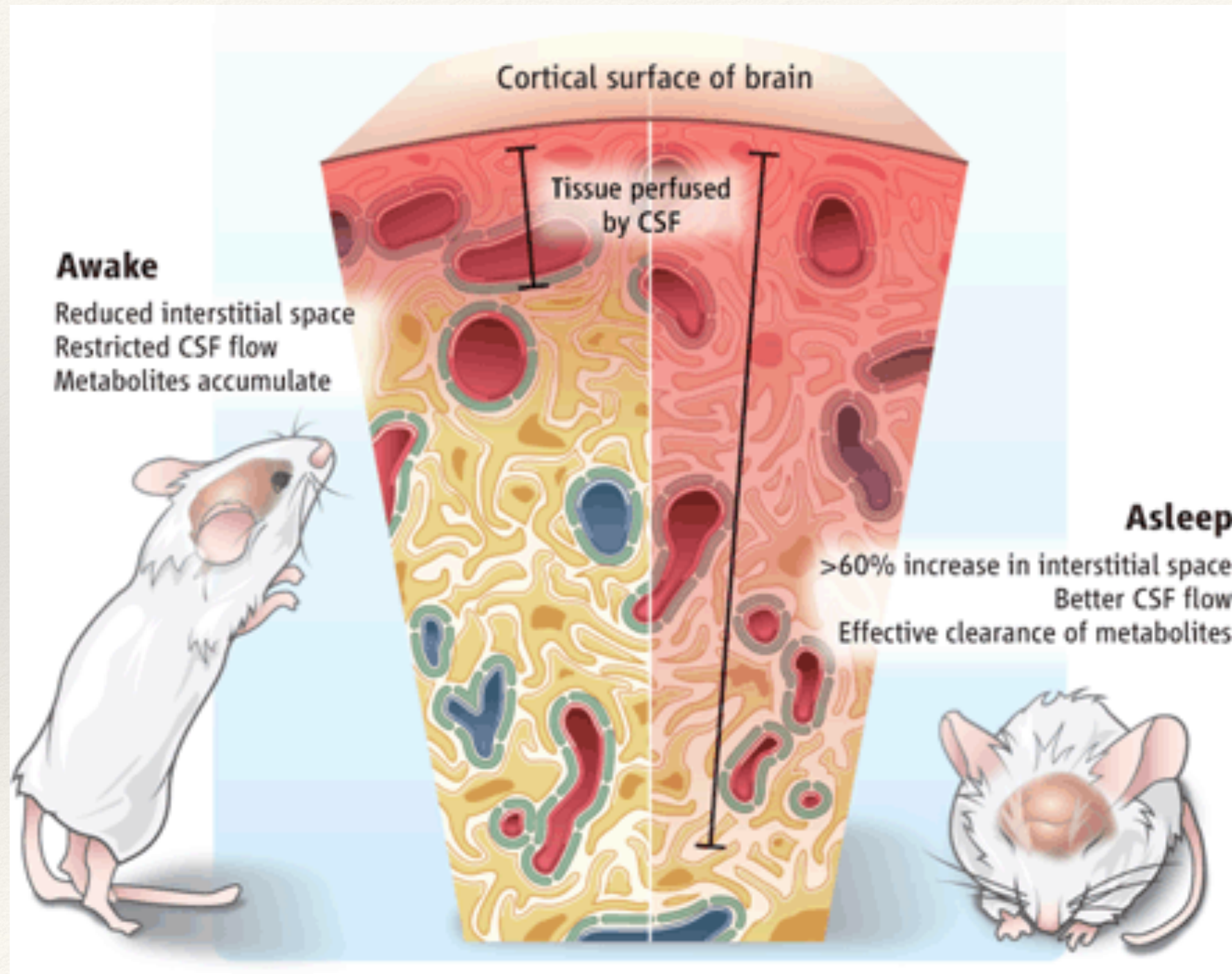
# Ghrelin and feeding



*Adapted from Cummings et al. Diabetes 50:1714, 2001.*



# Sleep is important for the clearance of cellular wastes and toxins





# Sleeping Beauty's Secret



- ❖ For Adults, minimum of 7-8 hours of sleep
- ❖ For Children under 12 minimum of 10 hours of sleep



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# Carleton University Department of Neuroscience

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