



## What is sleep?

- The intermediate state between wakefulness and death (MacNish, 1834) Characterized by neurophysiologic phenomenon or drive that results in a suspended state of being

## Stages of sleep

- Stages of sleep are defined by EEG and behavior
- Night of sleep is comprised of 90-120 minute cycles: REM and NREM
- NREM is divided into 4 stages -75% of the night
- Stage 1 (about 5%)- drowsiness and may maintain some environmental awareness, slowed asleep. A transition.
- Stage 2-When sleep can really be identified. Become disengaged from surroundings.
- Breathing and heart rate are regular and usually slowed. Body temperature drops (hence sleeping in a cool room)
- Stages 3 and 4 are deepest = slow-wave sleep - Most restorative. Blood pressure continues to drop. Breathing slows more. Muscles are relaxed. Blood supply to muscles increases. Tissue growth and repair occurs. Energy is restored. Hormones such as growth hormones are released
- REM (25%) - usually first occurs about 90 mm after falling asleep and recurs about every 90mm, gets progressively longer as the night goes on. Usually have about 4-6/night. Dreaming occurs during REM. Everyone dreams whether or not we remember them. Remembering usually has to do with how close to REM awakening occurred. Essentially no skeletal muscle tone except for diaphragm and eye muscles

## Health benefits of sleep

- REM, Stage 2, and Slow-wave sleep have all been implicated in sleepdependent memory processing
- Sleep especially helpful with synthetic memory (non-declarative)
- Memory consolidation seems to be related not just to sleep but to the amount of the various sleep stages. Sleep deprivation because it can truncate some of these stages mitigates against memory consolidation (visual discrimination, motor sequencing, motor adaptation)
- Can allow for more automatic execution
- Although sleep problems are associated with most major psychiatric illnesses, usually thought to be secondary to the illness. The associated problems may actually be bi-directional.
- One study showed that sleep may help in gaining novel insight into a task

- Population studies show that sleeping well seems to keep you alive longer. Death from all causes is lowest among adults who get 7-8 hrs of sleep. Those >9 usually had some reason why they slept more and that reason led to greater mortality
- Immune system doesn't work well - researcher at Univ. of Chicago gave sleep deprived people (4 hrs/night for 6 nights) to flu shots and measured the antibodies that were produced. Only half the normal number of antibodies in response to the viral challenge were formed. Cortisol (stress hormone) levels rose, and the sympathetic nervous system became active raising heart rates and BP
- Less insulin resistance so that mechanisms that balance glucose metabolism remain more normal. Some say that the sleep-deprived metabolic syndrome may increase the desire for carbohydrates (junk food).
- Hormone level called leptin acts to help regulate appetite. A lot of leptin results in appetite inhibition. In those who are sleep deprived the level is reduced perhaps leading to a disinhibition of appetite (get hungry). There appears to be an association between sleep deprivation and weight gain. Some researchers have raised the question of how closely tied our epidemic of obesity is to how sleep deprived we are as a culture (nation).
- Perhaps less need for stimulants like Ritalin and Adderall. Maybe some inattentiveness is actually exacerbated by sleep deprivation and our inattentiveness to valuing sleep
- Bodily systems repair in response to ntl pressure to sleep (perhaps driven by rising chemical levels)

