Sleep and Shift Workers

Or
The Brain needs more time for the Tidal flow

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WHY DO YOU SLEEP?

DEEP THOUGHTS
BLESSING ON HIM WHO FIRST INVENTED SLEEP- IT IS MEAT FOR THE HUNGRY, DRINK FOR THE THIRSTY, HEAT FOR THE COLD AND COLD FOR THE HOT- CERVANTES
THAT KNITS UP THE RAVELL’D SLEEVE OF CARE, SORE LABOR’S BATH, BALM OF THE HURT MINDS, CHIEF NOURISHER IN LIFE’S FEAST - W.S.
“Like we say in the sewer—Time and Tide wait for no Man”
Ed Norton- The Honeymooners, 1956

DEEPER THOUGHTS

Sewer system = Lymph system

Lymph System = Sewer System

Lymph Capillaries in the Tissue Spaces

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DEEPER THOUGHTS

Sewer system = Lymph system

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Lymph Capillaries in the Tissue Spaces
The brain is not connected to lymphatic system.

Functional areas of Cerebrum
- Motor and Sensory areas
- Association areas
- Cerebral processing centers

Brain = Complex City
Brain – Energy Hog

- At rest, brain consumes 20-25% of calories: DR OZ
- Range of 350-500 calories/day dependent on size of brain and activity of brain.
- Todd Townes-Sharecare Fitness- Dr. Oz Show

- But, some individuals are more energy efficient
Energy Conservation by Reduced Size & Activity

Sleep Deprivation = Donut Desire
- Homer: Micrognathic and drinks Duff Beer
- Obstructive Sleep Apnea, = Chronic sleep deprivation
- MRI increased activity of amygdala = Donut Desire
- MRI decreased activity of frontal lobe
- governs complex decision-making and behavioral control
- Walker, M; Nature Comm. 8-6-2013

AdenosineTP = Currency of all cells
Adenosine

- Waste product of high energy neurons
- Adenosine levels in brain increase with being awake
- Adenosine promotes drowsiness by attachment to A1 receptors.
- Caffeine blocks A1 receptors
- Adenosine accumulates in the interstitial spaces between astrocytes and neurons

Our Brain after several night of short sleep

Back to the Sewer
CSF = Lymphatic System

Sleep Drives Metabolite Clearance from the Adult Brain

- Lulu Xie, Maiken Nedergaard, et al
- Science 342, 373 (2013)
- Photon microscopy in live mice
- **Sleep – 60% increase interstitial spaces**
- Sleep-striking increase in exchange of CSF and interstitial fluids
- Sleep-increased rate of Beta-Amyloid clearance
- Sleep—enhanced removal of neuron waste products (Adenosine) = restorative function of sleep
Adenosine Accumulates In Brackish Waters

Brain Similar to Estuary

The Estuary: Intestinal Channels

- Fresh
- Brackish
- Salt
- Marsh
- Ocean
- Tidal Zone

- Awake

40% increase in interstitial space
Better CSF flow
Effective clearance of metabolites
Ocean tides and waves clean estuaries

Sleep cleans toxins from the brain

Interstitial estuaries

With adequate cleaning, the neurons are open for traffic
SLEEP & SHIFTWORKERS

TIME AWAKE AND THE TIDE WAITS FOR NO PERSON

Drivers of Sleepiness

Actigraphy- Regular Sleep Pattern
Psychomotor Vigilance Task

Measures sustained attention during 5-10 minutes episodes
Scores correlate with sleepiness

Sleep Quality & Vigilance
Inpatient Nurses

- ICU and floor nurses; dayshift & nightshift
- Preshift PVT: dayshift better than nights
- PVT: ICU dayshift worse than days floor shift
- PVT: Floor dayshift faster at end of day
- Sleep Quality: ICU reports more abnormal sleep quality than floor nurses
- Sleep meds uses higher with night shift
Effect of Short Sleep and Shift Work

- Workers have chronic sleep debt even after an off day and extended sleep. They have a false sense of recovery from previous sleep debt.
- 19 hours awake; performance is equal to effect of Etoh of 0.05%.
- 24 hours = 0.10% Etoh performance.

Adverse Metabolic Consequences in Humans of Prolonged Sleep Restriction combined with Circadian Disruption

- Same study protocol without control group.
- 5.6 hours/24 hours of sleep with circadian disruption.
- 11 with mean age 23yo and 10 mean age of 60+-5 years (older).
- Increased risk of obesity and Diabetes Mellitus. Risk of 12.5lb weight increase/year.
Supervisor-Scheduler

- Avoid more than 4 night shifts in a row-need 48 hours off
- Avoid extending shift and overtime
- Avoid long commutes of shiftworkers
- Avoid rotating shift-if needed-shift forward
- Naps before or during shift-15-20 minutes
- Increase lights during early part of shift
- Thomas Roth, PhD-Medscape

Night shift Worker

- Dark glasses-drive from work to home
- Regular sleep schedule, start as soon as possible to match circadian sleepiness
- More time in bed needed!!(8-9 hours)!!
- Same schedule(work & rest days)-Ideal
- Dark room, cool, ear plugs-Turn Off Phone
- Stop caffeine 4-6 hours before bedtime
- If naps allowed during shift(15-20 minutes) at 2-3AM with caffeine after nap

HR Hiring

- Understand impact of shiftwork on performance and health.
- Night shift is not for everyone.
- Night shift is more difficult with aging
- Sleep debt increases health problems and chance of canceling a shift
- Develop education program on sleep needs for shift worker and partner as part of new employee orientation
HR Department

- Consider monitoring program with wrist monitors and incentive pay program for increased rest time during off hours.

- Develop a "short nap program" during the night shift.

Remember Time Awake and Circadian Rhythm Demand Adequate Sleep

Thank You time to wake up