

Railroad Workers  
Hazardous Materials  
Training Program  
National Labor College  
Silver Spring, MD.



Gary Quick, Peer Trainer  
Carl Fields, Peer Trainer



***Sleep,  
Sleep Deprivation and Worker  
Fatigue***

***“To sleep, perchance to dream –  
ay, there is the rub”***

***Hamlet***

# Objectives

- Define sleep and identify its importance to our health
- Identify sleep deprivation and sleep debt
- Discuss irregular sleep cycles and mitigation
- Recognize fatigue and how it affects cognitive responses and situational awareness
- Identify and discuss fatigue mitigation

# What is Sleep?

Sleep is a naturally, regularly occurring condition of rest for the body and mind, during which the eyes are usually closed and there is little or no conscious thought or voluntary movement.

*It is the body's time to recharge itself*

# What happens during sleep?

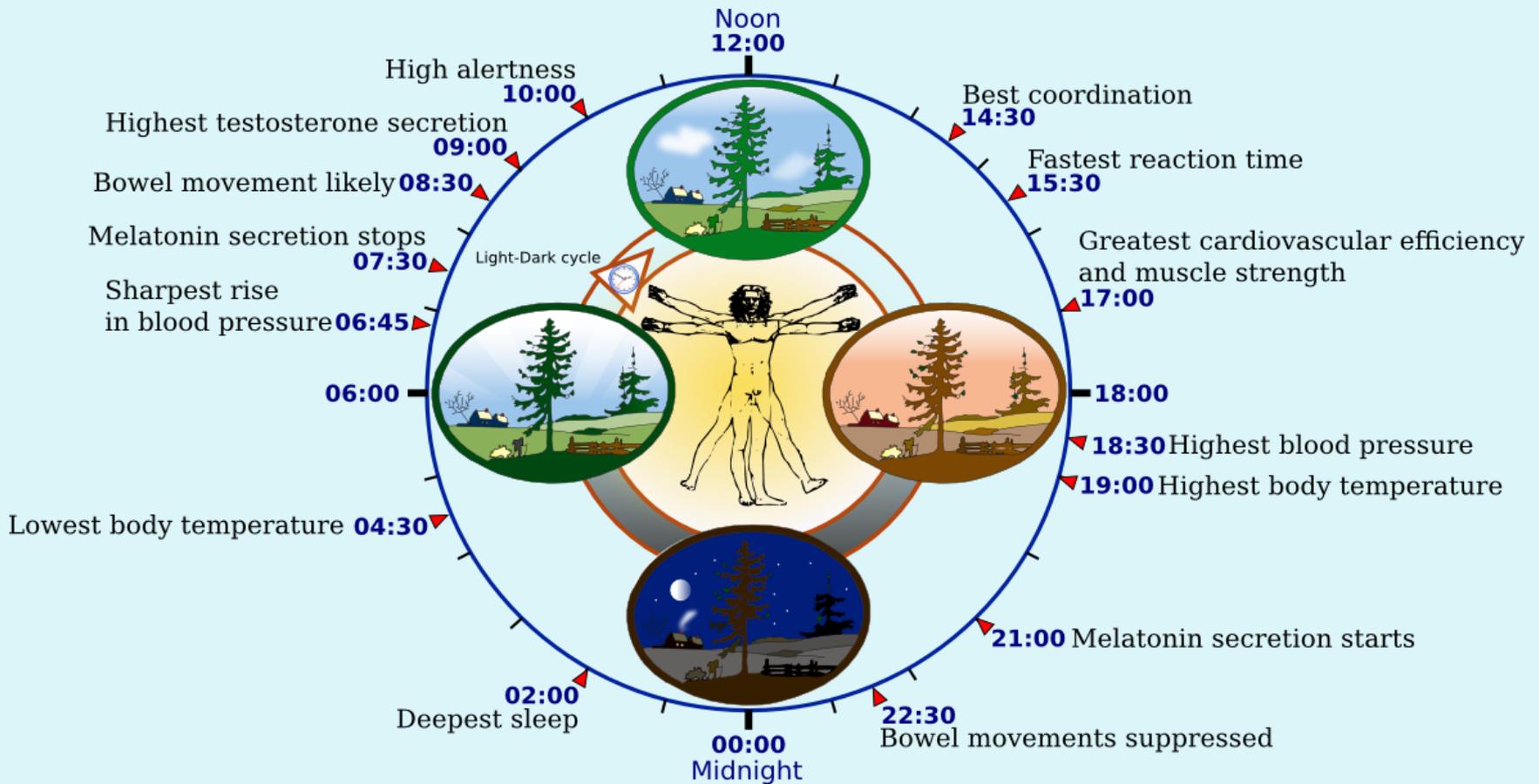
1. The body heals and repairs itself
2. Rebuilds damaged and worn tissue
3. Restores chemical balances in the body

# What does the brain do during sleep?

1. Brain activity is constant
2. The brain organizes and files memories and thoughts
3. It produces more NK cells to fight infection and disease
4. It orders the pituitary gland to produce more growth hormone in children

# Human Biological Clock

## Circadian Rhythms



# Stages of Sleep

## *NonREM Sleep*

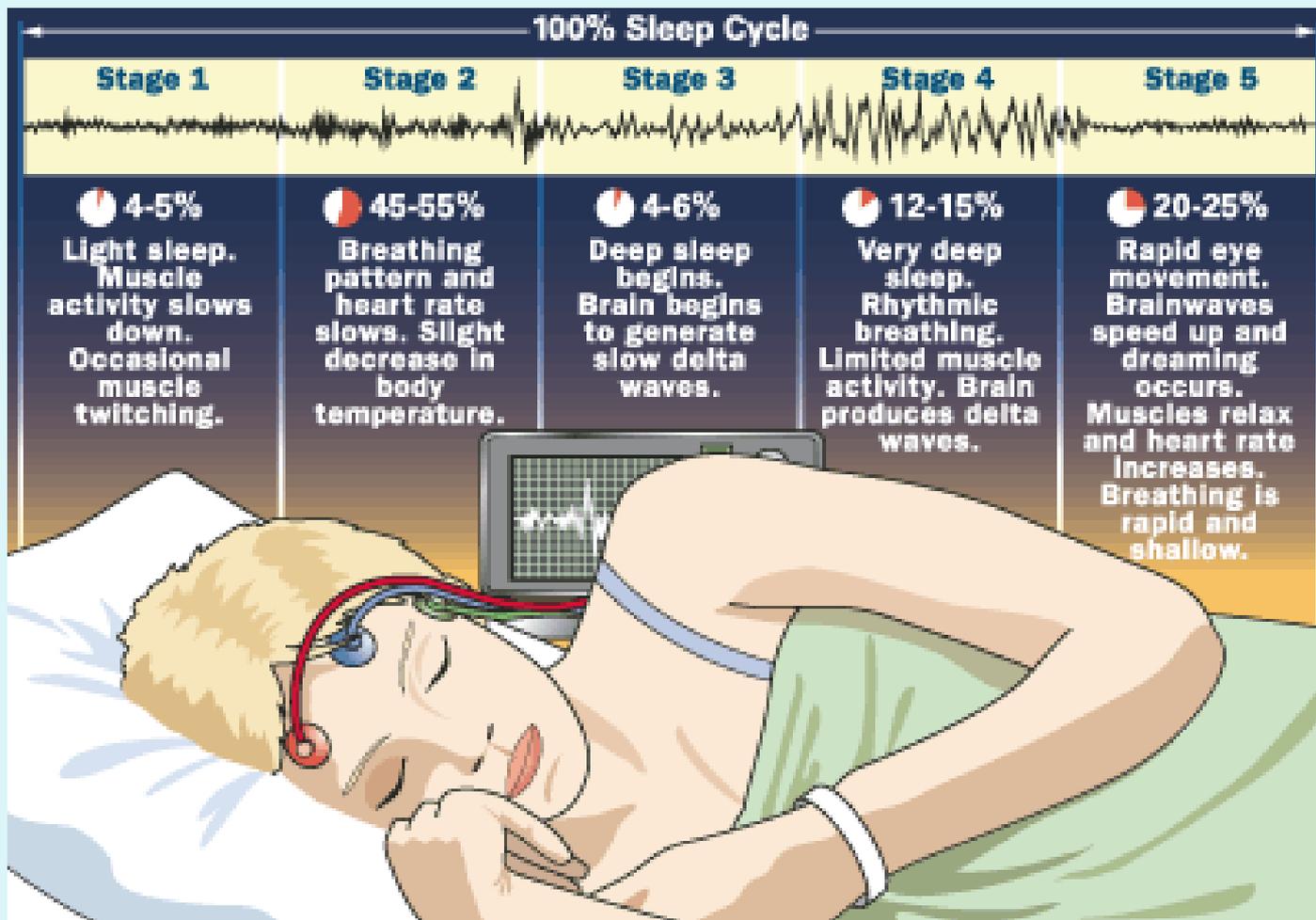
Stage 1 – Transition sleep (5 minutes or less)

Stage 2 – Heartbeat & Breathing slows, body relaxes (30 minutes or more – 50% of sleep)

Stage 3 & 4 – Slow Wave Sleep (SWS) – very deep, little to no body movement, very restorative..

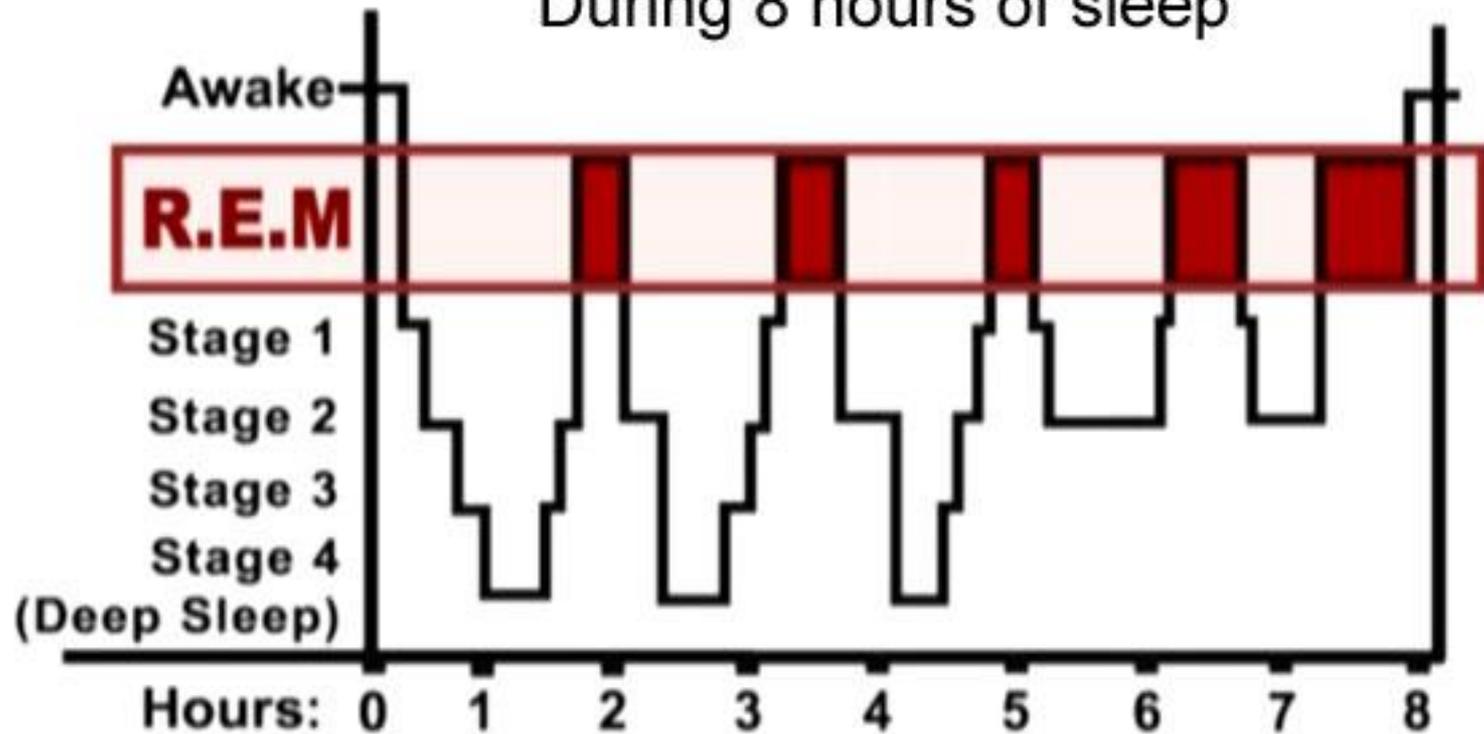
# Rapid Eye Movement Sleep REM

- When most dreams occur
- Body is paralyzed but blood pressure, heartbeat and respiration rises
- First session is about 10 minutes, but each successive session is longer with last one lasting one hour or more
- 20-25% of all sleep



# Sleep Cycle

During 8 hours of sleep



# How much Sleep is enough?

- Each person's needs are different
- Requirement changes throughout lifetime
- As an adult 7-8 hours per day is considered optimal
- It is a physical requirement, the body needs to recharge

# Sleep Deprivation

- A disruption and reduction in the number of hours of sleep normally needed by a person
- Caused by:
  - Work Hours
  - Family Commitments
  - Irregular Schedules
  - Dyssomnias

# Sleep Debt

- The difference between the number of hours you actually sleep and the number of hours you should have slept.
- Accumulative over time
- Can lead to sleep to both temporary and chronic sleep deprivation

# Consequences of Sleep Debt

- Lack of Mental Alertness (forgetfulness, situational awareness)
- Poor Brain Functions/Decisions (cognitive impairment, poor judgment and coordination)
- Reduction in Productivity (increase risks of accidents and injury)
- Poor Health (colds, flu, heart disease, diabetes, obesity, depression, high blood pressure)
- Irritability, mood swings, crankiness, inability to deal with stress

# Adjusting to New Sleep Cycles

- Recognize your need for adequate sleep
- Be cognitive of your own sleep habits
- Create a sleep sanctuary for yourself
- Get family and friends on board to your needs
- Be aware of your own sleep deprivation and sleep debt

# Worker Fatigue

***“While alcohol is often associated with impairment, operating a vehicle while fatigued can be just as deadly”***

***NTSB Chairman, Deborah A. P. Hersman***

***March 5, 2012***

# What is Fatigue?

Webster's Dictionary defines fatigue as:

- a. Weariness or exhaustion from labor, exertion or stress
- b. Temporary loss of power to respond that is induced in a sensory receptor or motor end organ by continued stimulation
- c. Subsequent breakdown of the physical and mental capabilities of an individual

# How is Fatigue different from Sleepiness?

- Sleepiness can usually be corrected by sleep
- You can be fatigued without being sleepy
- Fatigue causes difficulty concentrating, which can lead to anxiety and stress
- Fatigue causes a gradual decrease in stamina
- Fatigue can make it difficult to stay awake and to sleep
- Loss of social interaction

# How do we become Fatigued?

- Lack of sleep
- Repetitive work
- Circadian Rhythm Disruptions
- Whole Body Vibration
- Excessive hours
- Stress

# How do we become Fatigued?

- Movement Restriction
- Humidity/Heat
- Cold Temperatures
- Acoustical Noise
- Health/Diet
- Altitude

# Effects of Fatigue

- Safety
- Loss of Situational Awareness
- Loss of Cognitive Recognition
- Lost Productivity
- Personal Effects

# Signs and Symptoms of Fatigue

- Forgetfulness
- Poor Decision Making
- Slower Reaction Times
- Reduced Attention
- Fixation

# Signs and Symptoms of Fatigue

- Poor Communication/Response
- Apathetic
- Lethargic
- Nodding Off
- Itchy Eyes
- The Need to Sit

# Fatigue Mitigation

- Napping
- Caffeine
- Sleep Inertia
- Bright Lights
- Diet
- Chewing

# Fatigue Mitigation

- Chewing
- Health
- Exercise
- Medication
- Education and Training

# Workplace Fatigue Mitigation

- Changing Work Schedule/Job
- Breaks
- Alertness Monitoring Devices
- Temperature
- Split Shift

# Workplace Fatigue Mitigation

- Working Together
- Agreements with Labor & Management
- Social Interaction
- Standards
- Economic Decisions/Considerations

# Fatigue Myths

- Fatigue is the same as being tired
- Fatigue is just about falling asleep
- We are the best judge of our Fatigue
- Older people suffer more from Fatigue

# Fatigue Myths

- “I know how tired I am”
- “I’ve lost sleep before and I did just fine”
- “I am motivated enough to push through it”
- “This is so simple I can do it while asleep”

# Fatigue Facts

- Chronic Sleep Disorders affect 60 – 80% of all shift-workers (rail/truck)
- Chronic Fatigue affects 80% of all shift-workers
- Fatigue related accidents caused more than \$50 million in damages in 1995
- The NTSB has issued more than 80 Fatigue recommendations to the rail industry alone.
- It is just as prevalent in younger workers

# National Highway Traffic Safety Administrative Conservative Estimates

Each year there are 100,000 police reported traffic accidents as the direct result of driver fatigue resulting in an estimated:

- 1,550 deaths
- 71,000 injuries
- \$12.5 billion in monetary loss

# Operating Vehicles while Fatigued

- There currently is no test to determine sleepiness/fatigue as there is for intoxication
- State reporting practices are inconsistent/no police training in recognizing fatigue
- Fatigue related accidents often attributed to other causes (intoxication, loss of control, cell phone use - texting)
- Difficult to quantify due to heightened awareness level of driver prior to accident

# What is Situational Awareness?

A form of “Mental Bookkeeping”

- Perceiving the Information
- Interpreting the meaning of the information with respect to task goals
- Anticipating the consequences in order to respond

# Fatigue Factors in Situational Awareness

When Fatigue is factored in you tend to lose/misinterpret the requirements of a task:

- Making Informed Decisions
- Acting in a Timely Manner
- Comprehension of the Task at Hand
- Interpret what others are doing
- Asking for help when you are unsure of the task at hand, over confident

Fatigue may deprive you of  
anticipating  
what will/may happen next by not  
having:

- Information Sharing
- Mutual Knowledge
- Mutual Awareness
- Task Awareness

# What is Cognitive Overload?

A loss of Situational Awareness,  
Communication Confusion, and possible  
Lack of attention to indicators such  
As safety related issues  
May be intensified in younger workers  
learning new tasks

# Safe to Work or NOT?

- How Fatigued does an individual have to be in order to be considered “*not safe*” to work?
- It is not only alcohol and drugs which impair judgment, but fatigue as well.
- Transporting hazardous materials through densely populated areas-catastrophic consequences may occur.

# What Can We Do?

- Education, Awareness and Training
- Use past research and focus on future efforts
- It is a *Human Issue*, not an operating issue
- A Regulatory and/or Legislative Approach

How Can We Heighten the Awareness in  
Younger Workers on the Dangers  
Associated with Sleep, Sleep Deprivation,  
and Worker Fatigue

?