

Wake Up Students with Activities on the Genetics of Sleep Cycles



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What is Project NEURON?

- At the University of Illinois
- Educators, scientists, and graduate students
- Curriculum development
 - Inquiry-based
 - Connect to standards
- Professional development
 - Summer institutes
 - Conferences



Project NEURON Curriculum Units

- **Do you see what I see?**
 - *Light, sight, and natural selection*
- **What can I learn from worms?**
 - *Regeneration, stem cells, and models*
- **What makes me tick...tock?**
 - *Circadian rhythms, genetics, and health*
- **What changes our minds?**
 - *Toxicants, exposure, and the environment*
 - *Foods, drugs, and the brain*
- **Why dread a bump on the head?**
 - *The neuroscience of traumatic brain injury (TBI)*
- **Food for thought: What fuels us?**
 - *Glucose, the endocrine system, and health*
- **What makes honey bees work together?**
 - *How genes and environment affect behavior*
- **How do small things make a big difference?**
 - *Microbes, ecology, and the tree of life*

Available for FREE at
neuron.illinois.edu



Think-Pair-Share

1. What are some examples of circadian rhythms?
2. What can alter circadian rhythms?
3. What causes genetic variation?
4. What is epigenetics?

5 minutes: Discuss with neighbors, then share with group



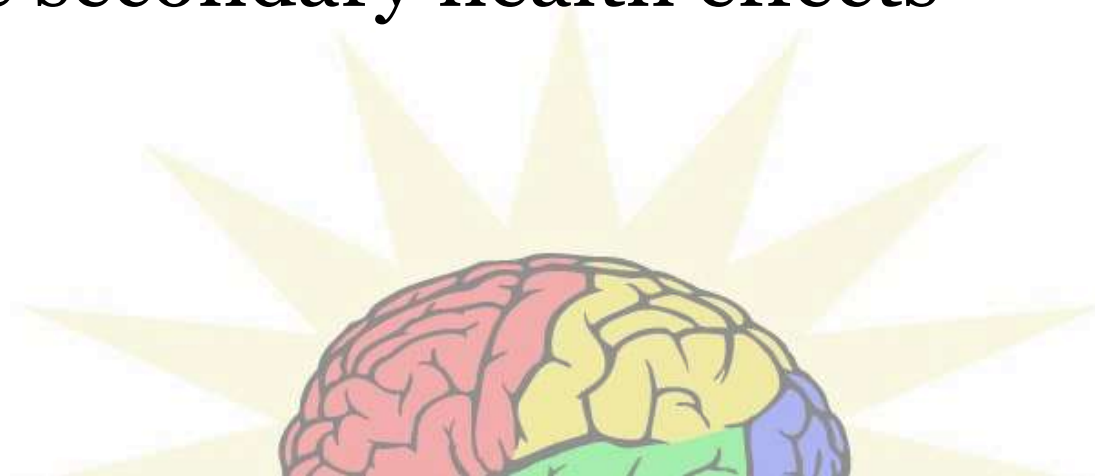
What makes me tick...tock?

1. What is a circadian rhythm?
2. Why do scientists study fruit flies to understand what makes us “tick?”
3. How can genetics change your clock?
4. Tick tock...Broken clock
5. How do environment and modern society influence our rhythms?
6. What happens to humans when normal rhythms are disrupted?
7. How can epigenetics change your clock?
8. When should the school day begin?

How can epigenetics change your clock?

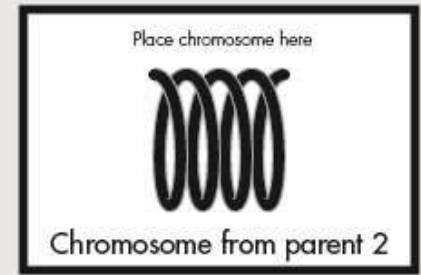
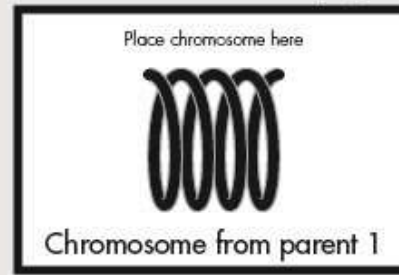
Previous knowledge

- PER2 gene regulates sleep cycles
- Careers and behaviors can affect circadian rhythms
- Disruptions to circadian rhythms can cause secondary health effects



Let's play!

Epigenome model



1. Start of generation

Record expression score



Each methyl
-1 point



Each acetyl
+1 point

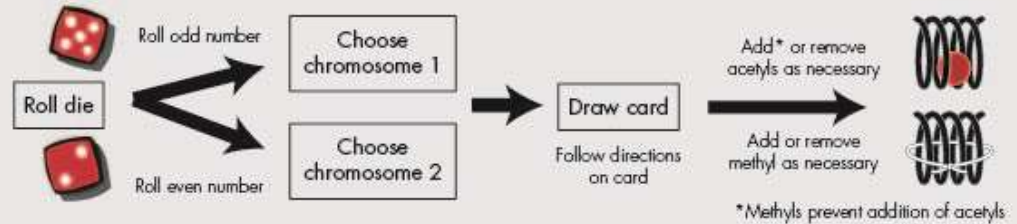


Epigenome - Score sheet

Chromosome	Methyl	Acetyl	Score
1			
2			
3			
4			

Epigenome Score Instructions:
1. Record the number of methyl groups on each chromosome.
2. Record the number of acetyl groups on each chromosome.
3. Calculate the score for each chromosome: (Acetyl groups) - (Methyl groups).
4. Add up the scores for all chromosomes to get the total score.

2. Lifetime events (3x each generation)



3. End of generation

Record expression score



Each methyl
-1 point



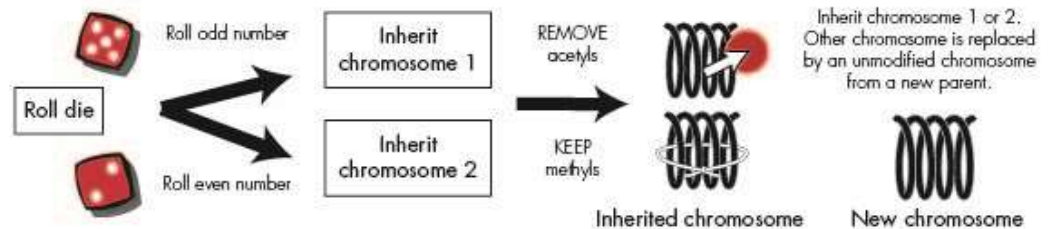
Each acetyl
+1 point



Epigenome - Score sheet

Chromosome	Methyl	Acetyl	Score
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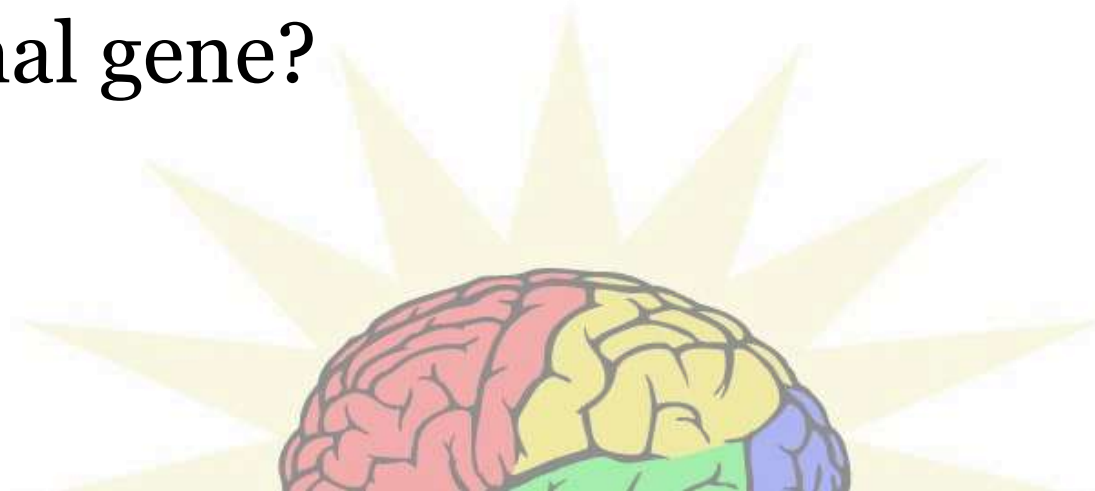
Group Discussion

- What patterns in expression did you see?
- How did the level of expression change over time?
- Are higher levels of expression always better? Are lower levels always worse?



Challenge questions

- If one gene was mutated so that it did not produce a functional product, how would the expression level change?
- If you have a heterozygote (1 mutated, 1 normal) genotype, what would be a beneficial level of expression for the normal gene?



Think About It Again...

1. What are some examples of circadian rhythms?
2. What can alter circadian rhythms?
3. What causes genetic variation?
4. What is epigenetics?

Hopefully this activity has expanded your awareness and knowledge of epigenetics!



Think-Pair-Share

1. How do you envision using this activity in your classroom?
2. What modifications would you make to the lesson?

5 minutes: Discuss with neighbors, then share with group



Acknowledgements

- NIH, SEPA
- University of Illinois

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Thanks!

For additional information visit:
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Curriculum Units Professional Development Games and Media Additional Projects About

Project NEURON
Novel Education for Understanding Research on Neuroscience

Find out more about our 2013 Summer Professional Development!

Project NEURON brings cutting-edge neuroscience to middle and high school students through classroom modules and activities based on research conducted at the University of Illinois at Urbana-Champaign. We bring together scientists, science educators, schoolteachers, and students to develop and disseminate materials that connect science with national and state science standards.

Our core project is the development of in-class curriculum units that emphasizing inquiry and active learning. These materials are tested by a dedicated group of high school teachers, to whom we provide support and professional development. We have adapted and expanded these materials into a variety of additional projects that include outreach for younger grades, informal education, and educational games and videos.

Please note that we are continuously improving this website and the materials hosted here. We work hard to create quality materials, but if you notice any inconsistencies, missing materials, etc., please let us know! We also love to hear suggested improvements or adaptations from teachers who have used our materials!

News and Events

Color Sorting Activity in The Science Teacher
March 13, 2013
The March 2013 issue of The Science Teacher features the colored candy sorting activity in an article titled, "What color do you see?" (p. 62-65).

Color Sorting Game is Back Online
February 20, 2013
The Color Sorting Game is back up on the Project NEURON web site.

Project NEURON at 2013 Public Engagement Symposium
February 6, 2013
Keep an eye out for a poster at the 2013 Public Engagement Symposium that describes FIND-Orphy.

Neuroscience Day
Neuroscience Day

March 19 @ Marina Inn
S. SIOUX CITY, NE

March 20 @ Sientle Glesko
MISSION, SD
9:00 - 3:00 with lunch provided

Hillary's blog about Science, Education, Games, and Design:
The Science Slug: <http://scienceslug.wordpress.com>

