Transcription and Gene Regulation Resources on HHMI’s BioInteractive

Lectures

**Lecture: Genetics of Human Origins and Adaptation**, Sarah Tishkoff, PhD, 2011 Holiday Lectures on Science (http://media.hhmi.org/hl/11Lect2.html). Sarah Tishkoff discusses the evolutionary history of modern humans based on genetic analysis and lactase persistence as an example of a recent human adaptation.


Short Films

**Short Film: Got Lactase? The Co-Evolution of Genes and Culture** (http://www.hhmi.org/biointeractive/making-fittest-got-lactase-co-evolution-genes-and-culture). Human geneticist Spencer Wells, director of the Genographic Project of the National Geographic Society, tracks down the genetic changes associated with the ability to digest lactose as adults.

**Short Film: Evolving Switches, Evolving Bodies** (http://media.hhmi.org/biointeractive/films/Evolving_Switches_Evolving_Bodies.html). After the end of the last ice age 10,000 years ago, populations of marine stickleback fish became stranded in freshwater lakes dotted throughout the Northern Hemisphere in places of natural beauty like Alaska and British Columbia. These remarkable little fish have adapted and thrive, living permanently in a freshwater environment drastically different than the ocean.

Interactive Tutorials (Click and Learns)

**Click and Learn: Genetic Switches** (http://www.hhmi.org/biointeractive/genetic-switches). Learn how gene switches can control expression of genes in different tissues.

**Click and Learn: Regulation of the Lactase Gene** (http://www.hhmi.org/biointeractive/regulation-lactase-gene). Lactase persistence results from a mutation that changes how transcription factors interact, thereby affecting gene expression.

Animations

**Animation: Regulation of Eukaryotic DNA Transcription** (http://www.hhmi.org/biointeractive/evolution/dna_transcription_regulation.html). Learn how general transcription factors, activators, and repressors interact to regulate the transcription of eukaryotic DNA into RNA.

**Animation: DNA Transcription (basic detail)** (http://www.hhmi.org/biointeractive/dna-transcription-basic-detail). The first phase of the process of reading DNA information to make proteins starts with a molecule unzipping the DNA. The molecule then copies one of the strands of DNA into a strand of RNA, a close cousin of DNA. This process is called transcription.

**Animation: DNA Transcription (advanced detail)** (http://www.hhmi.org/biointeractive/dna-transcription-advanced-detail). The process of copying DNA into messenger RNA (mRNA) is called transcription. Transcription factors assemble at the promoter region of a gene, bringing an RNA polymerase enzyme to form the transcription initiation complex. Activator proteins at the enhancer region of DNA then activate the transcription initiation complex. RNA polymerase unzips a small portion of the DNA and copies one strand into an mRNA molecule.


Animation: The LUX Operon Controls Light Production (http://www.hhmi.org/biointeractive/lux-operon-controls-light-production). A single transcription factor controls this operon, which contains five genes necessary to produce bioluminescence.


Animation: p53 (http://www.hhmi.org/biointeractive/p53). A 3D animation showing the molecule p53 binds to DNA and initiates the transcription of mRNA.


Animation: Molecular basis of late LTP (long-term memory) (http://www.hhmi.org/biointeractive/molecular-basis-late-ltp-long-term-memory). Late LTP (long-term memory) involves dopamine activation of CREB to support new synaptic growth.

Classroom Activities


Virtual Labs

Virtual Lab: Stickleback Evolution (https://www.hhmi.org/biointeractive/stickleback-evolution-virtual-lab). The Stickleback Evolution Virtual Lab will introduce you to the science and techniques used to analyze the forms and structures of organisms—in particular, the pelvic structures of the threespine stickleback fish (Gasterosteus aculeatus). The lab includes three experiments in which you will collect and analyze data using photographs of living fish specimens and fossils.