

# Texas Education Agency and Austin Community College

## Biotechnology Online Continuing Education Project

### MODULE 5. Medical Biotechnology Resource Page

This curriculum is designed to help high school teachers to bring a biotechnology perspective to their courses on biosciences, math, health sciences, and agriculture. These online instructional modules are self-paced and free to all Texas high school teachers to participate. Information updates about these online course modules are available at [www.austincc.edu/biotech/teaproject](http://www.austincc.edu/biotech/teaproject). The following animations, videos, and online resources are used during the fourth module of this courseware, listed here for teachers who may wish to incorporate them in their high school courses.

#### MODULE 5 OBJECTIVE 1. Regenerative Medicine

1. "Regenerative Medicine Video" at [http://www.ptei.org/video\\_viewer.html?video=assets/boneTrailerSmall.mpg&width=320&height=260](http://www.ptei.org/video_viewer.html?video=assets/boneTrailerSmall.mpg&width=320&height=260)  
These videos from the Pittsburgh Tissue Engineering Initiative are part of its education programs for scientists, students and the public-at-large. Beginning with K-12 and continuing through undergraduate and postdoctoral research, PTEI provides hands-on opportunities in addition to its online curricula to explore the many educational and career paths available to next-generation scientists and those who will work with them.
2. "Video: Tissue Engineering" at <http://www.youtube.com/watch?v=0taE4F0Wkhg>  
Wyatt Andrews from CBS News visits a laboratory at the Wake Forest Institute for Regenerative Medicine, where scientists like Anthony Atala, M.D., are researching new methods to grow body parts. (CBSNews.com)
3. "Skin Regeneration" at <http://www2.wfubmc.edu/pr/releases/printingskin.wmv>  
The Wake Forest University is a nationally-recognized center that boasts a multidisciplinary team of investigators who involved in ground-breaking stem cell research. This video shows an exciting new way to seed cells onto a scaffold for burn victims.
4. "Hydrogel Video" at <http://www.youtube.com/watch?v=Gg3YMR33sps&feature=related>  
Assistant Professor Mariah Hahn explains what hydrogels are and how they are used in her tissue engineering research at Texas A&M University.
5. "Hydrogel Animation" at <http://www.youtube.com/watch?v=HCmXGeu5yOY&feature=related>  
This animation provides a brief introduction on how to generate hydrogel channels for tissue engineering using 3D printing techniques to directly print channels in hydrogel scaffolds for the development of artificial organs and stem cell engineering. Scientists at Harvard Medical School and KAIST developed this educational animation.
6. "Bone Regeneration Animation" at [http://www.oulu.fi/spareparts/spareparts\\_project\\_site/anim/gbr02.avi](http://www.oulu.fi/spareparts/spareparts_project_site/anim/gbr02.avi)  
This animation demonstrates the placement of a collagen scaffold to promote regeneration of bone tissue with subsequent biodegradability upon healing.
7. "Animation of Blood Vessel Regeneration" at <http://www.wfubmc.edu/Research/WFIRM/Blood-Vessel.htm>  
This animation of a blood vessel was generated at the Wake Forest Institute for Regenerative Medicine. The Wake Forest University is a nationally-recognized center that boasts a multidisciplinary team of investigators who involved in ground-breaking stem cell research.
8. "Bioprinting Video" at <http://organprint.missouri.edu/www/news-forgacs-discover.php>  
This video about bioprinting demonstrates research being conducted at the University of Missouri, whose educational program provides resources in curriculum development, special summer programs and outreach.
9. "Stem Cell Animation" at <http://learn.genetics.utah.edu/content/tech/stemcells/scintro/>

This interactive animation made available by the Genetic Science Learning Center at the University of Utah, with support from the National Institutes of Health, gives you a general introduction to stem cells.

10. "Stem Cell Video" at <http://www.pbs.org/wgbh/nova/sciencenow/3209/04.html>  
*ScienceNOW* with Neil DeGrasse Tyson offers instructional videos, animations, and tutorials for the sciences through the Public Broadcasting Service, both televised and online. This animation examines a real-life example of a stem cell therapy to treat Parkinson's disease in humans.
11. "Animation: Types of Stem Cells" at <http://learn.genetics.utah.edu/content/tech/stemcells/sctypes/>  
The Genetic Science Learning Center at the University of Utah with support from the National Institutes of Health provides a comprehensive selection of educational resources in medical biotechnology. This animation demonstrates different types of stem cells that can be used for tissue and organ replacement.
12. "Stem Cell Therapies" at <http://learn.genetics.utah.edu/content/tech/stemcells/scsuccess/index.html>  
The Genetic Science Learning Center at the University of Utah with support from the National Institutes of Health provides a comprehensive selection of educational resources in medical biotechnology. This animation shows how stem cell therapies are developed by examining a real-life example of a stem cell therapy to treat Parkinson's disease in humans.
13. "Video: Growing Body Parts" at <http://www.youtube.com/watch?v=E3ml87UWBsQ>  
Morley Safer from CBS's *60 Minutes*, reports on the emerging technology of growing body parts from human cells taken directly from patients, providing new hope for amputees and patients on organ-transplant lists. He interviews scientists about their research at the Wake Forest Institute for Regenerative Medicine in North Carolina and the McGowen Institute for Regenerative Medicine in Pennsylvania about the tissues, organs, and limbs that have been regenerated in these research facilities. ([www.60minutes.info](http://www.60minutes.info))

## MODULE 5 OBJECTIVE 2. Molecular Diagnostics

1. "Making SNPs Make Sense" at <http://learn.genetics.utah.edu/content/health/pharma/snips/>  
The Genetic Science Learning Center at the University of Utah with support from the National Institutes of Health provides a comprehensive selection of educational resources in medical biotechnology. This animation will give you a better understanding of single nucleotide polymorphisms and how they can be used in the clinical laboratory.
2. "Dot Blot Animation" at <http://cf.egascheme.org/info/public/cf/rdbanimation.xhtml>  
This animation showing the use of a dot blot to detect mutations leading to cystic fibrosis is offered by the European Cystic Fibrosis Thematic Network as a part of their educational outreach.
3. "Reverse Dot Blot Video" at <http://www.youtube.com/watch?v=z1c7YsXq4bs>  
This video shows how researchers are using reverse dot blots to genotype a SNP in a gene associated with predisposition to smoking.
4. "Video: Luminex X-TAG Technology" at <http://www.youtube.com/watch?v=qPAOBij4Op4>  
This video describes how the Luminex xTAG technology can use reverse dot blots on microsphere beads to create a multiplexed assay for diagnosis of diseases and genetic disorders.
5. "Microarray Animation" at <http://learn.genetics.utah.edu/content/labs/microarray/>  
The Genetic Science Learning Center at the University of Utah with support from the National Institutes of Health provides a comprehensive selection of educational resources in medical biotechnology. This animation shows the use of a microarray to investigate the differences between a healthy cell and a cancerous cell.
6. "Video: Osmetech eSensor Technology" at <http://www.osmetech.com/video/pc.htm>  
This video shows how the Osmetech chip with ASOs attached to microelectronics detect hybridization of patient's DNA directly by attachment of a gold particle to the target DNA in place of the fluorescent dye.

7. "Animation: PCR Virtual Lab" at <http://learn.genetics.utah.edu/content/labs/pcr/>  
The Genetic Science Learning Center at the University of Utah with support from the National Institutes of Health provides a comprehensive selection of educational resources in medical biotechnology. This video provides a quick review of how PCR works.
8. "Animation: Conventional PCR versus Real Time PCR" at <http://www.scanelis.com/webpages.aspx?riD=679>  
This animation offered by Scanelis Diagnostic Labs in France contrasts conventional PCR with real time PCR.
9. "Video: Real Time PCR" at [http://www3.appliedbiosystems.com/cms/groups/portal/documents/web\\_content/cms\\_055079.swf](http://www3.appliedbiosystems.com/cms/groups/portal/documents/web_content/cms_055079.swf)  
This video by Applied Biosystems show how TaqMan probes are used in real time PCR.
10. "Video: Fluorescent Probe Systems for qRT-PCR" at [http://biosearchtech.com/flash/guides/formats\\_explained.html](http://biosearchtech.com/flash/guides/formats_explained.html)  
These videos offered by Biosearch Technologies demonstrate how Taqman probes, Molecular Beacons, Black Hole Scorpions, Amplifluor Direct probes , and Plexor probes can be used in multiplexing real time PCR assays.
11. "Video: Invader Technology" at <http://www.agbio.com/info/invader-technologies/agbio-invader-technology.html>  
This video offered by Hologic Agbio describes how the Invader Technology platform provides a diagnostic assay by signal amplification.
12. "Virtual Bacterial Identification Lab" at [http://www.hhmi.org/biointeractive/vlabs/bacterial\\_id/index.html](http://www.hhmi.org/biointeractive/vlabs/bacterial_id/index.html)  
This interactive animation offered by the Howard Hughes Medical Institute's online educational outreach is a virtual lab in a research hospital. Here you will act as a pathologist and your task is to identify a bacterial sample received from a clinician.
13. "Pharmacogenomics Animation" at <http://learn.genetics.utah.edu/content/health/pharma/intro/>  
The Genetic Science Learning Center at the University of Utah with support from the National Institutes of Health provides a comprehensive selection of educational resources in medical biotechnology. This animation describes how a pharmacogenomic test helps doctors make important treatment decisions for patients with leukemia.
14. "Gene Testing Case Studies" at <http://www.pbs.org/wgbh/nova/sciencenow/0302/01-four-flash.html>  
Hypothetical scenarios surrounding genetic testing are presented here as part of *ScienceNOW* , educational resources offered by WGBH through the Public Broadcasting Service. After reading the scenarios, you may vote on whether or not you would elect to conduct the test on yourself.
15. "Video: Patents On Cancer Genes" at [http://www.pbs.org/newshour/bb/health/jan-june10/patents\\_04-02.html](http://www.pbs.org/newshour/bb/health/jan-june10/patents_04-02.html)  
This video explores the federal court that recently invalidated patents filed by biotech companies on the human genome, igniting debate on exactly who owns genetic research.

### **MODULE 5 OBJECTIVE 3. Pharmaceutical Industry**

1. "HIV Clinical Trials" at <http://www.hivinfosource.org/hivis/clinicaltrials/actu/index.html>  
This site offered by the New York University Medical Center links you to current clinical trials being conducted on HIV.
2. "Animation: Drug Development Process" at <http://learn.genetics.utah.edu/content/health/pharma/development/>  
The Genetic Science Learning Center at the University of Utah with support from the National Institutes of Health provides a comprehensive selection of educational resources in medical biotechnology. This animation illustrates how recent developments and microarray technology are speeding up the drug development process.

3. "Video: What Is a Clinical Trial?" at <http://www.youtube.com/watch?v=ZxwKggJ2ACs>  
This video offered by the National Cancer Institute of NIH describes the FDA oversight in drug development, from preclinical testing to final approval.
4. "Interactive Map of Current US Clinical Trials" at <http://clinicaltrials.gov/ct2/search/map/click?map.x=168&map.y=171>  
This site offered by NIH allows you to browse an interactive map showing the location of all current clinical trials in the US.
5. "Drug Delivery Video" at <http://www.youtube.com/watch?v=ybK5TIGNNFA>  
This video describes the role of nanotechnology in current technology in drug delivery. This is one of a selection of intriguing movies which are available for free download from the EPSRC Nanotechnology Image Library at <http://www.nanofolio.org/images/>.
6. "Nanotechnology Video" at <http://www.youtube.com/watch?v=TVch-fDzet8&feature=related>  
In this video, Chris Landry, professor of chemistry at the University of Vermont, describe how nanotechnology applications are improving the efficacy of cancer drugs by delivering more medicine to patients.
7. "Targeted Medicine Video" at <http://www.youtube.com/watch?v=RBjWwlnq3cA&feature=related>  
This video outlines the fundamentals of targeted nanomedicine for cancer therapy. For more information, see <http://nanomedicine.uwaterloo.ca>.
8. "Video: Mechanisms of Vaccines" at <http://www.youtube.com/watch?v=3ykHolKAtQI&feature=related>  
This quick video explains the mechanism of immunity by vaccination.
9. "Constructing Vaccines Video" at <http://higher.ed.mcgraw-hill.com/olcweb/cgi/pluginpop.cgi?it=swf::535::535::/sites/dl/free/0072437316/120078/bio39.swf::Constructing%20Vaccines>  
This animation, offered by McGraw-Hill Higher Education, a dominant publisher of educational textbooks, reviews the construction of different types of vaccines.
10. "Gene Therapy Animation" at <http://www.youtube.com/watch?v=imL1Zmi3mWk>  
This interactive animation, offered by WNET through the Public Broadcasting Service, provides an overview of gene therapy strategies.
11. "Gene Therapy Video" at <http://www.youtube.com/watch?v=imL1Zmi3mWk>  
This video demonstrating gene therapy in liver tissue, was produced by Cortical Studios, a bioinformatics company that combines 3D animation, multimedia and scientific knowledge with an academic background in the fields of biotechnology and molecular cell biology.
12. "Animation: Gene Therapy Vectors" at <http://learn.genetics.utah.edu/content/tech/genetherapy/gttools/toolbox.swf>  
The Genetic Science Learning Center at the University of Utah with support from the National Institutes of Health provides a comprehensive selection of educational resources in medical biotechnology. In this interactive animation, a "Vector Toolbox" is used to explore gene therapy approaches.
13. "Design Gene Therapy for CF" at <http://learn.genetics.utah.edu/content/tech/genetherapy/cysticfibrosis/>  
The Genetic Science Learning Center at the University of Utah with support from the National Institutes of Health provides a comprehensive selection of educational resources in medical biotechnology. This animation explores the development of gene therapy as a potential cure for cystic fibrosis.
14. "Video: Challenges of Gene Therapy" at [http://www.youtube.com/watch?v=U7ryTfn\\_qrg&feature=related](http://www.youtube.com/watch?v=U7ryTfn_qrg&feature=related)  
In this video interview, some of the challenges associated with gene therapy are explored.