

Biotechnology Field Trips

The BTC Institute offers **Biotechnology Field Trips** to middle, high school and college students and their teachers. Designed as 1.5 to 5 hour visits to the BioPharmaceutical Technology Center in Madison, WI, field trip experiences include hands-on laboratory experiments based on molecular biology techniques. Field trips are offered on **Tuesdays-Fridays between 9:00 AM and 4:00 PM**. This year's program features ten topics designed for students at different levels of experience. Several of these labs can be taken "on the road" to schools. Hotel costs will be added for an overnight stay.

NEW

Intermediate: Bioluminescence II - Serial Dilution with Luciferase engages with students one step further into the bioluminescence technology introduced in the Genetic Transformation & Bioluminescence field trip. Students will perform a serial dilution of luciferase, then add its substrate using a multichannel pipette. They will measure the light with a plate reader and analyze the results. Additional applications of bioluminescence technology will be discussed.

Key topics: Bioluminescence applications | Serial dilutions | Data analysis

Lab time: 1.5 - 2 hours

Cost: If more than 16 students, \$8/student; 16 students or less, \$128.00

Advanced: Restriction Enzyme Digest Inquiry allows students to take an inquiry-based approach to the laboratory, learning how to design and analyze an experiment. Students will perform a standard restriction enzyme digest to understand how DNA can be specifically cut into fragments by restriction enzymes and then separated by fragment size on an agarose gel. Then, they will change a variable within the protocol, and design and run an experiment to investigate how changing that variable affects the results.

Key topics: Scientific inquiry & experimental design | Restriction enzyme function & use in cloning | Principles of gel electrophoresis

Lab time: 5 hours (including a 30-minute lunch break)

Cost: If more than 16 students, \$14/student; 16 students or less, \$224.00

INTRODUCTORY

Genetic Transformation & Bioluminescence uses click beetle luciferase to demonstrate the transfer of a gene into cells of another species. After a 30-minute slide show about bioluminescence, students go into the laboratory to perform a simulated genetic transformation, which transfers the luciferase gene, and the ability to make bioluminescent light, into bacterial cells. This field trip is appropriate for middle school level students and beyond.

Key topics: Bioluminescence | DNA & genetic transformation | Bacteria & sterile technique

Lab time: 1.5 - 2 hours

Cost: If more than 16 students, \$6.00/student; 16 students or less, \$96.00.

On the Road Option: The cost is \$8 per student, with a minimum group charge of \$128; plus mileage at 58¢/mile.

Check out our combination discounted options:

Combine **Bioluminescence** with **one** of the following: **Restriction Enzyme Digestion and Gel Electrophoresis of DNA, or Immunology, or PCR for Genetic Screening**, and reduce your total cost: If more than 16 students, \$14.00/student; 16 students or less, \$224.00. This is a 5-hour experience, including a 30-minute break for lunch.

DNA & Principles of Gel Electrophoresis is an introductory field trip designed for middle school students. Students will separate molecules by charge and size using agarose gel electrophoresis, and will get hands-on experience with micropipettes. This field trip is appropriate for middle school level students and beyond.

Key topics: DNA structure | Micropipettes | Agarose gel electrophoresis

Lab time: 2 hours

Cost: If more than 16 students, \$7.00/student; 16 students or less, \$112.00.

On the Road Option: The cost is \$9 per student, with a minimum group charge of \$144; plus mileage at 58¢/mile.

Scientific Inquiry & DNA Extraction from Fruit allows students to take an inquiry-based approach to the laboratory, learning how to design and analyze an experiment. Students will learn about variables and controls, using those concepts as they extract DNA from fruit. This field trip is appropriate for middle school students and beyond.

Key topics: Scientific inquiry & experimental design | DNA | DNA extraction from tissues & cells

Lab time: 1.5 - 2 hours

Cost: If more than 16 students, \$6.00/student; 16 students or less, \$96.00.

INTERMEDIATE

Restriction Enzyme Digestion and Gel Electrophoresis of DNA demonstrates how DNA can be specifically cut into fragments by restriction enzymes and then separated by fragment size on an agarose gel. Students use lambda DNA and different restriction enzymes to prepare four different DNA digestion patterns.

Key topics: DNA structure | Restriction enzyme function & use in cloning | Principles of gel electrophoresis

Lab time: 2.5 - 3 hours

Cost: If more than 16 students, \$9.00/student; 16 students or less, \$144.00.

On the Road Option: The cost is \$12 per student, with a minimum group charge of \$192; plus mileage at 58¢/mile.

Immunology focuses on the scientific use of antibodies to detect proteins in the laboratory. Students purify antibodies from egg yolk and use them to detect *E. coli* and *Salmonella* proteins on a membrane.

Key topics: Antibody structure & function | Protein isolation | Use of antibodies to detect proteins

Lab time: 3 hours

Cost: If more than 16 students, \$9.00/student; 16 students or less, \$144.00

On the Road Option: The cost is \$12 per student, with a minimum group charge of \$192; plus mileage at 58¢/mile.

Polymerase Chain Reaction (PCR) for Genetic Screening explains the principles and uses of this powerful technique. Students sets up a set of PCRs using different DNA templates. Agarose gel electrophoresis is then used to analyze amplified DNA.

Key topics: PCR components & their functions | Gel electrophoresis & DNA size determination | Real-life applications of PCR & STRs

Lab time: 3 hours

Cost: If more than 16 students, \$9.00/student; 16 students or less, \$144.00.

On the Road Option: The cost is \$12 per student, with a minimum group charge of \$192; plus mileage at 58¢/mile.

ADVANCED

PCR to Detect Genetically Modified Organisms utilizes the polymerase chain reaction to identify genetically modified corn from a variety of food products including corn chips and cornmeal. Using a magnetic purification system, students isolate DNA from a food product. Samples are amplified using PCR, and DNA products are analyzed using agarose gel electrophoresis.

Key topics: GMOs & DNA isolation | PCR components & functions | Gel electrophoresis & DNA size determination

Lab time: 5 hours (including a 30-minute lunch break)

Cost: If more than 16 students, \$13.00/student; 16 students or less, \$208.00.

Short Tandem Repeats and Genetic Identity teaches in detail how DNA identification is really done by forensic and paternity laboratories. Students participating in this field trip will set up PCR to amplify short tandem repeat (STR) regions of DNA. Students will then use electrophoresis to separate the amplified DNA fragments and learn how the results are used to determine a person's genetic identity.

Key topics: Polymerase Chain Reaction of STR DNA regions | Analysis of STR data for determining human genetic identity

Lab time: 4 to 5 hours (including a 30-minute lunch break)

Cost: If more than 16 students, \$11.00/student; 16 students or less, \$176.00.

NOTE: A one-hour **Stem Cell or CRISPR** Presentation, including time for discussion, regarding stem cells may be added to any field trip experience for high school and college students for a \$20.00 fee. **Customized field trips** may be also be arranged. Previous topics have included protein purification, modified PCR and modified restriction enzyme digest activities.

For more information, please visit www.btc.org or contact:

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